WRAP Pilot Project | Final Report

Integrated Water Resource Management with an Equity Lens|

San Antonio River (Texas) & Verde River (Arizona)

Version: August 31, 2021

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1. Introduction

Water is critical to the health, economic and social vibrancy, and resilience of communities, but managing available water resources to meet a community's many diverse needs is a complex exercise. Integrated Water Resource Management (IWRM), a comprehensive and holistic approach to water management and planning that integrates water supply, wastewater, ecological, and stormwater systems, provides a useful framework for navigating this complexity. IWRM principles can help advance water conservation and reuse goals in water-constrained regions in particular.

The Urban Waters Federal Partnership was established in 2011 as a collaborative effort supported by 15 federal agencies and more than 28 non-governmental organizations to focus on critical water resource issues existing in urban spaces across the United States. There are currently 20 designated locations where the partnership works to reconnect urban communities, especially those that are under-resourced and disproportionately burdened by impacts of poverty, industrial development and/or climate, with their waterways through community-led revitalization efforts. The U.S. Environmental Protection Agency (EPA) has taken a lead role in many of the 20 Urban Waters locations via the Office of Water and pursues a systems-based approach to water conservation and management to maximize economic, social, and environmental welfare in an equitable manner. Through the Urban Waters program, EPA and its partners prioritize IWRM strategies while leveraging strong multi-stakeholder relationships to address specific issues such as water scarcity, water access, improved runoff management, and riparian ecosystem restoration.

In 2020, EPA published the National Water Reuse Action Plan (WRAP) as a coordinated effort across the federal government, to advance water conservation and reuse activities across sectors and geographies. Given the focus of the Urban Waters program, it made sense for there to be a specific action within the WRAP to leverage existing work of the program. Action 1.4 of the WRAP Collaborative Implementation Plan outlined several milestones to be achieved across both the Urban Waters and National Estuary Programs to further advance existing IWRM efforts, as well as providing support to locations with an interest in the topic of water reuse.

The WRAP Pilot Project described in this report is one of the milestones established by Action 1.4. The Pilot Project set out to consider water conservation and reuse in the context of IWRM in EPA's water partnership programs in the San Antonio River Watershed (Texas) and Verde River Watershed (Arizona) with a focus on water equity. The Pilot Project is the result of a collaboration between the EPA Office of Wetlands, Oceans and Watersheds (OWOW); the National Park Service (NPS); and two national nonprofit organizations, River Network (RN) and the Consensus Building Institute (CBI). The project has also benefited from OWOW's partnership with the consulting firm Industrial Economics, Incorporated (IEc), which provided water equity mapping and analysis to support the Pilot and its potential application to IWRM efforts in other Urban Waters Federal Partnership locations.

2. WRAP Pilot Project Background, Team, Goals, and Desired Outcomes

Project Background

The National Water Reuse Action Plan (WRAP) is an ambitious effort to advance consideration of water reuse to ensure the security, sustainability, and resilience of our Nation's water resources, in light of their increasing vulnerability to a myriad of challenges.

As defined in EPA's report, Promoting Water Reuse through Partnership Programs: National Estuary Program and Urban Waters Partnerships Delivering on EPA's Water Reuse Action Plan, the term "water reuse" is broad and generally incorporates concepts such as "recycled water," "reclaimed water," "alternative water supplies," and "water resource recovery." Through an integrated approach, water reuse strategies may be coupled with the management of municipal wastewater, industry processing or cooling water, stormwater runoff, or agricultural runoff, so that any of these water sources can be captured, treated, and "reused" or "recycled" for a different application. As described in the WRAP Collaborative Implementation Plan, "water reuse can be a valuable, perhaps necessary component of integrated water resources planning to ensure safe and reliable sources of water at the federal, state, and local levels well into the future."

To maximize the benefits of IWRM to promote the sustainable use of water resources – including water conservation and reuse –the broad array of stakeholders who have a role in a community's water resource management must be involved. Partnerships are key to the success of IWRM and water conservation and reuse. EPA's Partnership Programs, which support 48 place-based, multi-stakeholder partnerships through the Urban Waters Federal Partnership (UWFP, or 'Partnership') and the National Estuary Program (NEP), provided the Project Team with a starting point for identifying locations to pilot this project to apply IWRM to address local water reuse and other water management concerns.

Project Team

This WRAP Pilot Project was launched in the fall of 2020 and was led by a Project Team made up of representatives of the EPA Office of Wetlands, Oceans and Watersheds, Partnership Program Branch; the NPS Rivers, Trails and Conservation Assistance Program (NPS-RTCA); and River Network. The Project Team later secured the consulting services of the Consensus Building Institute (CBI), who served as overall project facilitators, and of IEc, which provided mapping support for the project.

Project Goals & Outcomes

The overall goal of the WRAP Pilot Project was to support collaborative efforts to promote healthy watersheds at the river-basin scale through local action in 1-3 locations. Specifically, the Project sought opportunities where government agencies, nonprofit organizations, community groups, and others across rural and urban aspects of river systems could come together to identify common goals and plan for continued cooperation related to water supply, water conservation, water reuse, and pollution reduction.

The expected outputs of this Pilot Project initially included: (1) the creation of plans that embody an integrated approach to water resource management for one or more of the pilot locations selected that represent a river, basin, sub-basin, or watershed that includes rural and urban aspects; and (2) the

development of recommendations on how to launch or strengthen existing collaborative efforts and approaches for IWRM at the watershed level that incorporate an analysis of water equity and that bring together rural and urban considerations and concerns. To better align with the timeline, the Project Team refined the desired outcomes of this Pilot Project as follows: (1) an expansion of stakeholders engaged in IWRM (including water reuse activities) at the pilot location(s), and (2) increased awareness of the value of collaborative and inclusive approaches to achieve IWRM goals among agencies, nonprofit organizations, community groups, and others exposed to the recommendations from this effort.

Pilot Location Selection

In the initial stages of the project, Project Team members developed a list of 18 river systems across the country to evaluate for possible inclusion in this Pilot Project. All the locations included in this initial list all had connections to EPA's Partnerships Programs (i.e., UWFP and NEP locations) and/or the Healthy Watersheds Program; and some locations had connections to NPS Programs (i.e., RTCA, Wild and Scenic Rivers, National Water Trails or other designations).

In the fall of 2020, Project Team members evaluated the initial list of 18 river systems in relation to the objectives of this project to identify 1-2 pilot sites that met the following set of criteria: the priority and relevance of water reuse or water efficiency issues to systems' health; the extent of local environmental justice or climate resilience work underway; and the presence of a strong cadre of local stakeholders. Project Team members conducted extensive outreach to partners across the various locations – government agency staff, nonprofit and community organizations, utility representatives, and others – and engaged in detailed conversations using a standardized set of discussion questions as a guide. Over the course of multiple meetings and discussions, Project Team members gradually narrowed down the list of river systems and selected San Antonio, Texas and the Verde River tributary to the Salt River in Arizona as the pilot sites for this project. Both locations are affiliated with UWFP locations – the San Antonio Federal Partnership in Texas and Rio Reimagined Partnership in Phoenix, Arizona. In addition, sections of the Verde River are designated as a Wild and Scenic River (managed by the U.S. Forest Service).

From the outset, Project Team members recognized that to abide by the limitations in project funding and meet the 9-month time frame for completing the project, project activities would have to be carefully scoped across both pilot locations. In response, San Antonio was selected as the "primary" project location, in large part due to the high level of activity and engagement by the UWFP, clear "fit" with Pilot Project goals, and strength of relationships among Partnership stakeholders. In practice, this also allowed CBI and the Project Team to hold additional stakeholder meetings in that location. The Pilot Project's work in the Verde River watershed was more limited in the number and scope of stakeholder engagement activities.

3. CBI Approach & Methodology

CBI was engaged by the River Network, EPA, and the National Park Service to facilitate the WRAP Pilot project in the San Antonio and Verde River basins with the purpose and goals outlined in the section above. CBI followed a phased approach to exploring key challenges and opportunities for advancing equity-focused integrated water planning, including water reuse, in each watershed (see figure 1 below).

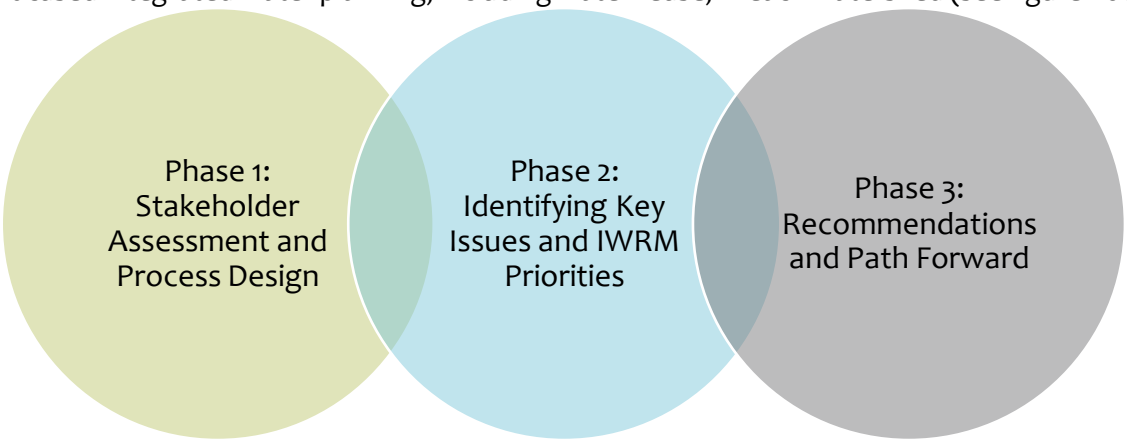


Figure 1. CBI Approach

Phase 1: Stakeholder Assessment and Process Design (January-June 2021)

Kickoff and internal convenings

CBI participated in a series of internal meetings with the Project Team (River Network, EPA, and NPS) to better understand the context, project goals, watershed dynamics, substantive issues, and relevant past efforts. CBI coordinated closely with the Project Team, EPA regional staff, and UWFP Ambassadors and location leads to refine the approach in light of the project goals, local opportunities, and anticipated challenges related to IWRM and meaningful, equitable engagement with communities. Initial discussions expressly focused on identifying engagement opportunities for underrepresented populations within both watersheds.

Stakeholder Assessment

CBI conducted approximately eight interviews with major stakeholders in each subbasin. In addition, CBI presented at UWFP meetings early in the process to share the purpose and goals of the Pilot and gather input on the scope, potential outcomes, and key stakeholders in each location. These discussions explored the possibilities of expanding water planning efforts to include important and previously underrepresented stakeholders, as well as greater emphasis on water reuse activities. The goals of the stakeholder assessment were to:

- Ensure the right stakeholders are at the table and identify what voices were missing
- Understand key issues and areas of concern related to the watersheds, past and current management or governance issues, and relevant stakeholder dynamics
- Gauge the willingness of stakeholders to engage in discussions related to water reuse and/or other integrated, inclusive water planning strategies and goals
- Understand how stakeholders envision successful and inclusive participation and learn more about past efforts to engage members of underrepresented communities

- Identify existing opportunities and challenges for effective participation, including consideration of Covid-19 pandemic limitations
- Understand other stakeholder needs and interests (e.g., circumstances or principles under which folks might feel more comfortable or empowered to participate)

CBI worked with the Project Team to identify interviewees and refine interview questions. CBI shared the major themes from the interviews, without attribution, and worked with the Project Team to refine next steps. Assessment findings are further discussed in the location-specific sections of the report.

Phase 2: Identifying Key Issues and IWRM/Water Reuse Priorities for San Antonio Watershed and Developing Engagement Strategies for Verde Watershed – June-July 2021

The approach for Phase 2 in each watershed was closely tied to the Stakeholder Assessment findings. Recommendations emerging from the assessment interviews conducted in Phase 1 informed the goals, key messages, logistics, and support needed to promote an initial round of engagement with key stakeholders. The Assessment interviews helped inform the topics explored during the next phase and determined whether and how the team proceeded in each watershed.

In the San Antonio watershed, based on input from the UWFP Ambassador, EPA Region 6 project lead, and key UWFP members, the WRAP Project Team proposed forming an UWFP work group focused on equity and community engagement to guide the Partnership's update of its Work Plan. Expected outcomes included (1) an expansion of stakeholders engaged in water reuse and IWRM at large through the UWFP, and (2) identification of water challenges that could benefit from increased collaboration and engagement of historically underrepresented groups. The effort was also expected to highlight lessons for strengthening collaborative, integrated, water management approaches at Urban Waters Partnership locations more broadly.

In the Verde River watershed, CBI worked with the Project Team and regional EPA staff to contact key stakeholders and groups to assess interest in the Pilot and identify opportunities for future engagement on key water challenges. Outreach strategies included targeted conversations with key constituent groups as described in Section 5 below.

Phase 3: Recommendations and Path Forward (August 2021)

CBI drafted this report in consultation with the Project Team. The Project Team may consider opportunities for knowledge exchange among the two river basins or other UWFP locations, as learnings from one watershed are likely to inform efforts elsewhere.

4. Location 1: San Antonio River Watershed

Background

The 240-mile San Antonio River springs from the Edward Aquifer in Bexar County and flows through 15 counties in southern Texas to its confluence with the Guadalupe River towards the San Antonio Bay and the Gulf of Mexico. The San Antonio River Basin includes the Medina, Cibolo, Leon Creek, Salado Creek, Upper San Antonio, and Lower San Antonio watersheds. The maps below show the San Antonio River and Bexar County,

Figure 2. San Antonio River Watershed Divided by USGS Hydrological Code Unites (HUC) 12 and Bexar County
Source: Industrial Economics, Incorporated

The San Antonio River watershed holds significant value for the region, supporting native species, migratory birds, and other wildlife along its way. River flows have sustained vibrant and diverse communities and economies for thousands of years. The river and interconnected aquifer system provide drinking and irrigation water to urban and rural communities. The river's network of trails and parks also hold significant scenic, historic, and recreation values to locals and visitors alike. However, increased pressures on the river and interconnected aquifer system from trash, polluted runoff, rapid urban growth, and changing climate conditions have damaged the riparian ecosystem and pose serious water quality and quantity concerns.

Since 2011, the San Antonio community, local agencies, and federal partners have been working together through the San Antonio Urban Waters Federal Partnerships (UWFP) and other local initiatives to promote watershed health, improving community connections to waterways, and restoring damaged ecosystems.

CBI Approach and Findings

In the San Antonio River watershed, the focus of the WRAP Pilot was to strengthen and revitalize the San Antonio UWFP, including broadening participation to include previously underrepresented communities. In recent years, the San Antonio UWFP had experienced a brief period of inactivity as a result of key staff transitions, and this project offered an opportunity to re-engage stakeholders and identify areas ripe for collaboration to advance shared goals. In doing so, the project also aimed to highlight relevant learnings for EPA's work in other watersheds. Expected outcomes of this project included (1) an expansion of stakeholders engaged in IWRM and water reuse/conservation through the Urban Waters Partnership, and (2) identification of water challenges that could benefit from increased collaboration and engagement of historically underrepresented groups. The effort highlighted lessons learned for strengthening collaborative, integrated, water management approaches at UWFP locations with increased community engagement.

Phase 1: Stakeholder Assessment

Refining the Scope

The WRAP Pilot Project Team initially held a few meetings with the San Antonio UWFP leads and EPA Region 6 staff to refine the scope and identify key stakeholders in the watershed. Based on these conversations, CBI suggested narrowing the scope to focus on the topic(s) of greatest interest to local UWFP Partners in fostering an IWRM approach, including (1) the intersection of water quality, stormwater, and equity, (2) rural and urban water dynamics, (3) urban growth and integrated water and land-use planning, and (4) climate resilience (e.g., drought and flood preparedness). Initial discussions also suggested a need for increased community engagement and data-sharing related to local needs and watershed issues.

The WRAP Pilot Project Team then attended a UWFP meeting to share its initial findings and gather preliminary feedback. UWFP Members engaged in real-time polling to rank areas of opportunity and key water challenges in San Antonio, in relation to their timeliness and the anticipated impact towards the UWFP goals. UWFP members raised additional opportunities and ideas for the Partnership to add value to support existing integrated water planning approaches.

The following priorities emerged from the initial meetings and conversations:

- **Bring in a stronger equity and environmental justice lens**. Consider prioritizing projects using environmental justice layers in GIS, as part of the UWFP workplan. EPA uses EJScreen and can host a webinar to help the SA partnership implement the tool at a local level. Partners suggested looking at examples in other geographic locations, such as the Los Angeles Equity Index.
- **Prioritize multi-benefit projects**. Address the intersection between water issues, trash and solid waste management, pollution, air quality, biodiversity, etc. Explore the relationship between waste and urban water systems. For example, Alamo Area Council of Governments has programs that deal with Solid Waste Management across 13 counties. Consider opportunities that protect cultural and historic assets close to the San Antonio River, such as the San Antonio Missions (World Heritage Site).
- **Expand community outreach and education efforts**. Invite neighborhood associations to engage with issues that impact their neighborhoods, particularly those that reflect historical inequities. Connect with the communities without existing neighborhood associations (e.g., Missions San Juan and Espada).
- **Coordinate and leverage funding**: Work across silos to identify cross-cutting grant funding opportunities for multi-benefit projects and water initiatives. Set specific goals to work towards interagency coordination, such as partnering with AACOG to promote Camp Bullis Sentinel Landscape Initiative. Consider aligning the UWP workplan with the United Nations Sustainable Development Goals (SDGs).
- **Support integration of urban growth and water planning:** Work across the San Antonio metropolitan area to steer new development in unincorporated areas to better use, reuse, and protect water resources. Connect rapid growth and stormwater containment.

Stakeholder Interviews and Assessment

CBI conducted six stakeholder interviews with representatives from federal agencies, water agencies, and non-profit organizations in San Antonio between February and April to identify key water issues and opportunities that could benefit from integrated, landscape-level discussions. CBI shared the major themes from the interviews (without attribution) with EPA, those interviewed, and the San Antonio UWFP. The goal was to collaboratively shape future multi-stakeholder collaboration efforts for the second phase of the Pilot and beyond. Key findings from the interviews are summarized below. The full Assessment presentation can be accessed and at this link.

Key Assessment Findings

- **The San Antonio UWFP is valued for its role in providing opportunities for communication and connection across agencies.** Bringing major stakeholders together has been critical for the partnership's success. In terms of improvements moving forward, interviewees highlighted the need for greater structure and accountability, sustained leadership (i.e., full-time staffing), and clearer expectation and direction for UWFP efforts. Interviewees suggested following a more programmatic focus, exploring opportunities for broader education on multi-use and multi-benefit projects, leveraging partners' expertise and funding opportunities, and working towards removing some San Antonio streams from the Section 303(d) impaired streams list.

- **Key water priorities and watershed-wide challenges in San Antonio are intertwined.** Rapid urban growth and land-use changes, coupled with climate change, have led to growing demands on local water supplies (i.e., the Edwards Aquifer) and increased stormwater runoff. Increased quantity and speed of runoff exacerbates the risk and magnitude of flooding events. In addition, trash and other pollutants carried by stormwater contaminate local water supplies, as polluted streams and

waterways feed into the river and local aquifers, negatively impacting people and local ecosystems.

- **Equity is a fundamental tenet cutting across the most concerning water challenges in San Antonio (See Appendices 4-7).** Interviewees highlighted wealthier areas tend to be more flood resilient and have more green space, while historically disadvantaged communities, comprised more significantly of low-income, black, indigenous, and people of color (BIPOC), tend to be disproportionately and negatively impacted by water issues. BIPOC communities tend to rely on older infrastructure, flood more often, suffer greater water quality concerns, and rely on concrete-lined flood infrastructure as opposed to green infrastructure projects. One interviewee highlighted the emotional pain connected to some large concrete flood infrastructure, due to past fatal incidents following large rain events. The risk is especially high for individuals and communities experiencing homelessness who reside by the waterways and are therefore at greater risk during storm events. Lastly, the recent winter storm in February of 2021 that left millions of Texans without electricity and safe water highlighted infrastructure disparities and equity challenges in the state and city.

- **Prioritize community engagement and equity in the UWFP's work.** Most interviewees agreed integrating community engagement, equity, and public education could be a central element of the Partnership's work. This could be done by engaging people and organizations with more on-the-ground experience with disadvantaged communities and/or direct lived experiences to participate in Partnership efforts (e.g., community engagement specialists from partner agencies and representatives of community-based organizations and neighborhood associations). Lastly, interviewees suggested the need for increased engagement in local communities and with regional environmental organizations as part of larger scale multi-benefit projects (e.g., San Pedro Creek, past Mission Reach).

- **Build on past and current water collaboration and integrative planning efforts.** San Antonio has a long-standing history and investment in multi-stakeholder collaboration, community engagement, and IWRM (e.g., conservation, water reuse, water quality, stormwater management, restoration, etc.). Stakeholders suggested building on successful collaborative efforts underway:
  - ***Existing IWRM Efforts.*** Interviewees referred to various state-wide and local efforts to promote IWRM, including the Bexar Regional Watershed Management Plan, the Mitchell Foundation's One Water Initiative, and other efforts spearheaded by the Greater Edwards Water Alliance. Stakeholders also pointed to a series of local intergovernmental collaboration projects such as the San Pedro Creek Culture Park, improvements to the San Antonio Riverwalk area (15 miles of hiking and biking trails loved by the community) for local users around the Mission Reach, as well as improvements to the Western Side of the river using 319 Non-Point Source Pollution and Abatement Grants.
  - ***Water Reuse.*** Local water utilities and the City have invested significantly in innovation and water reuse; San Antonio Water System (SAWS) runs one the largest water reuse facilities in the country and has maintained low costs for customers. Effluent is used through an extensive network for golf courses and to support flows in the San Antonio River and San Pedro Creek. Stormwater is diverted and used in the river walk underneath downtown, then diverted and discharged downstream. In times of drought, water is recirculated and discharged near the museum reach for wildlife habitat and in the Salado reach to maintain base flows. Nonetheless, interviewees highlighted concerns with the level of nutrients in the water leading to blooms. The City is currently exploring the idea of constructed

wetlands and sees significant opportunities to expand the use of water reuse to support habitat and stream restoration. Local agencies have invested in rainwater capture, with mixed results, and may explore direct potable reuse in the future.

- ***Water Equity.*** Interviewees suggested building on local water equity efforts spearheaded by the City of San Antonio (COSA) and local water agencies (SARA and SAWS). They suggested continuing to invest in community outreach and mapping techniques to overlay social and water indicators. SARA has a variety of interactive mapping tools through the River Authority's Open Data Portal. COSA uses equity maps, referred to as Equity Atlas, that can be used to help inform equity approached to guide projects and programs to account for equity considerations (See Appendix 5).
- ***Community Engagement Efforts.*** Several interviewees pointed to the "Árbol de la Vida Project", funded by the San Antonio River Foundation, as a success story that brought together communities and neighborhoods across the city. The project reconnected communities to the river and waterways through art.

- **The WRAP Pilot project could add value by promoting inter-agency dialogue to prioritize multi-benefit/multi-use projects that advance equity**. UWFP could support equity mapping efforts to identify 'hotspots' (i.e., geographic areas in which challenges with a nexus to water are being experienced disproportionately by low-income and BIPOC communities), priority areas, and community partners within those areas (See Appendix 6 and Appendix 7). Further, the Partnership could use a collective impact approach to potential projects, focusing on economic development and environmental justice. Collective impact refers to a commitment to cross-sectoral collaboration on projects focused on solving a specific social problem. Further, the UWFP could strengthen its community engagement, education, and messaging by working alongside trusted community-based organizations and by promoting and sharing best practices among the member agencies. Stakeholders highlighted the need for a more equitable geographic distribution of multi-use and multi-benefit projects (e.g., green infrastructure), prioritizing the most impacted communities. These projects need to be accompanied by significant public education efforts, as some communities may not see the value in green infrastructure projects.

- **Promote shared messaging and tailor communication strategies to community needs.** The UWFP could build on San Antonio's "river culture" and illustrate how water issues connect with people's lives by communicating the value of projects based on community needs and priorities (e.g., water quality, recreation, art, quality of life, habitat restoration, economic development, etc.). This could take the form of a web-based "Water Hub" where partners could contribute information, share educational resources, and highlight work done with the broad public. Information needs it could serve include the following:
  - **Where does my water come from?** Better communication around water resources in the area, and how they are intertwined (groundwater, surface water, water quality, availability, reuse, conservation, ecosystem health, upstream/downstream users, etc.).
  - **Why should I care?** Understanding what communities need and value, especially when investing in multi-benefit projects (this may be less about "run-off" and more about shade, mobility, safety, etc.). Communicate how these issues impact and play a role in stakeholders' and community members' daily lives.
  - **What might the future look like?** Understanding how local users view water resources in the area. Water reuse will no doubt increase in the future. What is the public's perception?

- **Interviewees shared their thoughts on what inclusive and equitable engagement means in the context of water projects in San Antonio.**
    - **Sustained.** Efforts need to be backed up by continued funding to maintain relationships and work on building on solutions together. When neighborhoods participate, they embrace the project in a different way. Efforts should ensure the community is considered, comes together, and is invested in the outcome.
    - **Accessible.** When sharing information, it is important to provide materials in multiple languages, avoid text heavy documents, and use images and maps. Successful engagement efforts have included interactive activities, such as mapping community flooding by asking communities to identify areas of the community that flood during storm events with symbols and arrows. Interviewees suggested bringing food and fostering safe and comfortable spaces; further, they highlighted the challenges of reaching low-income stakeholders during the Covid-19 pandemic.
    - **Reciprocal.** Efforts must be centered in communities, in which community leaders and organizations are considered partners and co-creators. Agencies are encouraged to listen, beyond information-sharing, and to ground-truth goals and priorities with the communities. This means asking questions to identify what communities value and how they want to be engaged. Community-based organizations can often be the anchors and hosts for such efforts.
    - **Mindful.** The work should be centered in communities in ways that honor and respect people's connection to water, the river and waterways. It should prioritize relationships and acknowledge the relevant history and context.
    - **Respectful** engagement involves compensating communities fairly for their time, for sharing lived experience, and for guiding, informing, and improving decision-making. Agencies are encouraged to compensate community advisors' time and effort as they would other consultants and experts.
    - **Expand notion of what constitutes "public engagement."** This can mean meeting people where they are, grounding and tailoring engagement to individual communities. Providing a public notice is not enough. Conveners should consider engaging churches, faith-based organizations, and community advocates as part of the conversation to foster a sense of ownership. They should hold meetings or events outdoors, near the river, and remind people how it feels to be connected to the resource and their environment.
    - **Follow through.** Engagement efforts must ensure input is considered and incorporated into decisions. This can be challenging, as it takes time and resources to build relationships, get community buy-in, and foster trust. Interviewees highlighted the importance of securing support from regional organizations and elected officials and of better communicating the benefits of multi-benefit projects that may seem diffuse. Lastly, stakeholders acknowledged that equity conversations are challenging, particularly in light of the history of racial segregation and discrimination in the City.

Phase 2: Integrated Water Resources Management with an Equity Lens

Convening Equity and Engagement Work Group

As a result of the significant interest in increasing the equity focus of the San Antonio UWFP, the WRAP Project Team convened a Work Group within the UWFP that focused on equity and community engagement to guide the Partnership's update of its Work Plan. The Work Group's purpose was to help the Partnership update its Work Plan to promote and support multi-benefit water projects and strategies, with the goal of enhancing integrated water planning to promote equity in the watershed.

The Work Group explored ways in which the Partnership can promote integrated approaches to watershed-wide issues of concern to historically disadvantaged communities (e.g., access to safe and reliable water, pollution, flooding, neighborhood quality-of-life, etc.).

As shown in Figure 3 below, the Urban Waters Equity and Engagement Work Group met (virtually) three times for two hours from late June to early August 2021. Through the meetings, participants:

- Gained understanding of each other's interests, needs, and concerns
- Shared a joint vision for water equity in San Antonio
- Suggested strategies to map and address water inequities in the watershed
- Shared best practices and lessons related to community engagement in water planning processes
- Identified who may be missing from the 'table,' what barriers exist to their participation, and how to best engage them; in particular, identified engagement opportunities for under-represented populations within the system

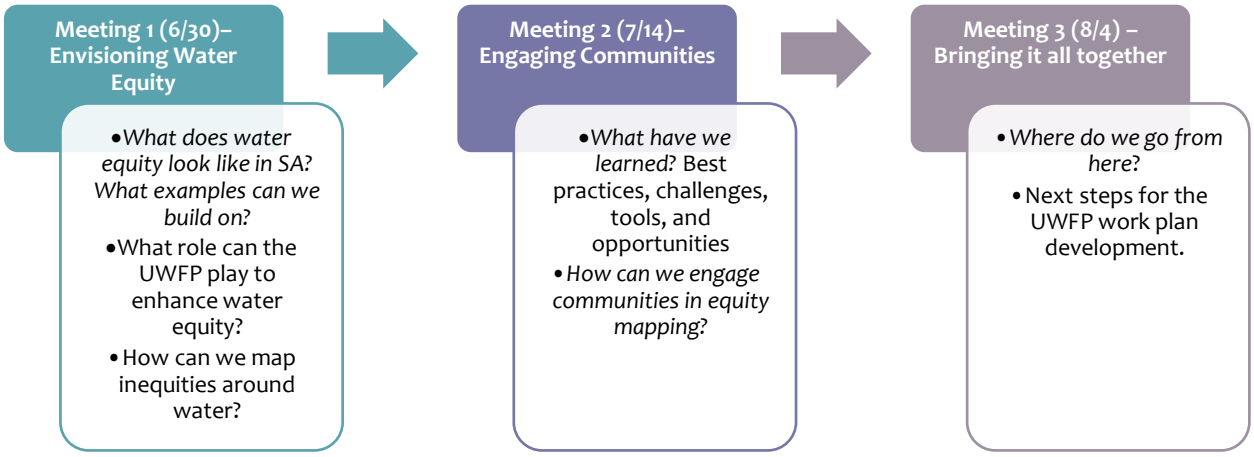


Figure 3. Equity and Engagement Work Group Meetings

The Work Group was composed of approximately 12 individuals who represented diverse interests and could address linkages between water planning and historically disadvantaged communities (see Appendix 2). The Work Group served as a "brain trust" that fostered rich dialogue and brainstorming among a diverse composition of individuals from diverse organizations (federal agencies, local agencies, and community organizations), experiences, roles, and ages. CBI structured the conversation to encourage active participation, shared visioning, reflection, and opportunities to draw on individual and collective experiences. The Work Group's discussions and recommendations are summarized in the sections below.

Water Equity Mapping

Start by envisioning what 'water equity' looks like.

Crafting a shared vision can create a space for inspiration, creativity, and shared understanding, revealing participants' key interests. During the first meeting, Work Group participants crafted a shared vision for water equity in San Antonio, informed by the US Water Alliance's Water Equity Framework. The framework outlines three pillars for water equity: (1) Accessing safe, clean, and affordable drinking water and wastewater; (2) sharing in the economic, social, and environmental benefits of water systems; and (3) fostering community resilience in the face of floods, drought, and

other climate risks. The Work Group's vision for water equity in San Antonio includes the following themes:

- **Water resources are of good quality and affordable for everyone, including the environment.** This means considering the costs of pollution (e.g., trash, micro-plastics), balancing the needs of nature and people, including public health and safety impacts related to potable and non-potable water quality.
- **Multi-benefit flood control management.** This includes following the "do no harm principle," particularly related to flood control infrastructure, and ensuring stormwater management does not disproportionately impact some communities.
- **Restored relationship and connection between communities and their waterways.** Communities feel a sense of ownership, pride, and integrity across all waterways.
- **Creeks and rivers are clean, safe, beautiful, and enjoyable for everyone.** Access to nature and recreation is equitable (e.g., trails, open spaces, parks, kayaking, etc.) and promotes safe harvesting of fish, plants, and other cultural/traditional values.
- **No part of the city is overlooked**. Due attention and appropriate funding is allocated to maintain public spaces in all neighborhoods, in a way that is safe, designed for all users, supports local biodiversity, and improves public perception around waterways (not concrete ditches, but rather beautiful public spaces).
- **Equitable engagement**. Agencies hear directly from community voices what they value and need. All voices are heard.
- **Equitable education and stewardship.** This includes (1) a collective sense of responsibility to restore and care for waterways, (2) equitable access to data, information, and knowledge, (3) sufficient resources and opportunities to engage communities around water, and (4) education programs that provide opportunities for kids across San Antonio to be exposed to healthy rivers and understand the value of riparian systems.
- **Honest reckoning with the City's history of injustice and inequity.** There is a true exploration of the root causes of existing disparities, with an acknowledgement of the current-day impacts of redlining and segregation. Projects and funding prioritize the most impacted communities.

Build on work underway to develop equity mapping tools.

After creating a shared vision for equity, stakeholders can begin identifying the desired approach, purpose, and use of water equity mapping tools. At a national level, there are a series of tools and guides available (see Appendix 3).

In San Antonio, equity is part of the City's overarching policy and commitment. The City's equity index guide's efforts and resource allocations. The Work Group received presentations from Murray Myers, City of San Antonio, and Michelle Garza, San Antonio River Authority (SARA), on equity mapping work underway used to identify priority areas in the city for specific climate and water strategies [Access City of San Antonio Slides | SARA Slides]. Then, participants identified potential indicators to map water inequities, focused on the three pillars identified by the US Water Alliance. The table below summarizes initial ideas.

Table 1. Potential Equity Mapping Indicators

Water Equity Pillar	Potential Indicators
1. Access to safe, clean, affordable drinking water and wastewater services	• Age of pipes/infrastructure • Cost of water utilities (equitable rates) /as a percentage of household income • Demographic data (i.e., income level, education, ethnicity) • Distribution of incentives provided (e.g., access to rebate programs, etc.) • Health data disparities • Map delinquent accounts/shut offs • Mapping recreational water uses • Rainwater harvesting • Real cost of potable water for irrigation • Sanitary Sewer Overflow Data (SSO) • Stormwater fees – or other variables (e.g., property values) • Use of reclaimed/recycled water to identify areas of opportunity • Water contamination sites
2. Share in the economic, social, and environmental benefits of water systems	• Access to and quality of parks/green spaces – distance from recreation entry points • Air quality changes • Awareness/knowledge of city outdoor amenities and resources • Demographic data (i.e., income level, education, ethnicity) • Gentrification trends • Heat mapping • Investments in habitat restoration • Jobs/unemployment data • Location of flooding and other water quality challenges • Water availability for wildlife - much of the river is made up of wastewater reuse, reduce use of potable water for irrigation.
3. Foster community resilience in the face of a changing climate	• Access to flood insurance and other recovery support services • Access to generators and cooling appliances (AC, shade structures, etc.) • Age of infrastructure and access to capital • Areas of past flooding / flood risk • Cooling centers • Density of green infrastructure projects (recharge/absorption capacity) • Distance to waterways / qualitative assessment of river stretches • Education curricula – particularly access to environmental education • Flood damage centers • Food security – percentage of kids in school lunch programs • Green/open space – access to parks, rivers, and other natural environments • Healthy riparian/floodplain protection • High priority water quality areas • Income/financial distress • Tree canopy • Urban heat hot spots

A subset of the Work Group then met to discuss next steps to use equity mapping to inform the Urban Water Partnership's work to advance equity through local water projects (collectively and individually). This group discussed how local, existing equity data and maps can (1) be augmented or improved with federal data and tools, and (2) used by the UWFP to identify hot spots and priority areas to focus and develop water projects and/or programmatic approaches to water and equity in San Antonio. Participants included representatives from SARA, EPA Headquarters and Region 6, Bexar County/Salado Creek Restoration Oversight Committee, and Industrial Economics (IEc). IEc supported the WRAP Pilot Project Team by exploring opportunities to use EPA's Recovery Potential Screening (RPS) Tool developed by Healthy Watersheds program to identify disproportionate impacts on Environmental Justice communities, as well as finding ways to present information in accessible manner for community education and engagement. IEc maps are available in Appendices 4-7.

The group discussed the following desired use and focus for water equity mapping in San Antonio:

- The UWFP can build off ongoing work with the City, SARA and SAWS (e.g., water quality data, flood damage centers, access to infrastructure), and then overlay data layers to identify areas of neglect. It may be useful to consider using the Title VI Overlay, which includes housing, infrastructure, flood control, public safety, enhancement projects, infrastructure, and other indicators. Title VI of the Civil Rights Act, prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance.
- A water equity mapping tool can be used to identify hotspots and priority areas in the watershed. When equity maps are used to identify and prioritize projects that have the greatest impact mitigating existing inequities, they can help ensure the Partnership's focus and efforts are leading to concrete benefits to underserved communities. Stakeholders suggested sharing definitions clearly and being explicit about the intersectionality between race and income. Underrepresented communities tend to be low-income communities of color.
- This tool could help the UWFP be better positioned to pursue multiple funding opportunities focused on advancing equity and environmental justice. The UWFP can identify potential partners, NGOs, community organizations, and neighborhood associations in priority areas.
- Equity maps can be shared with partners to guide decisions, prioritize their existing funding, pursue additional future opportunities in priority areas, and influence policy discussions. Data could help develop services, use funds to improve water connections, and be able to impulse economic development and map environmental impacts.
- The data and maps can be used to tell a compelling study and guide IWRM efforts in San Antonio and beyond. The WRAP Pilot Project Team can support equity mapping in other locations **following the tiered approach outlined** below, as part of a process to assess local priorities and opportunities related to water management.

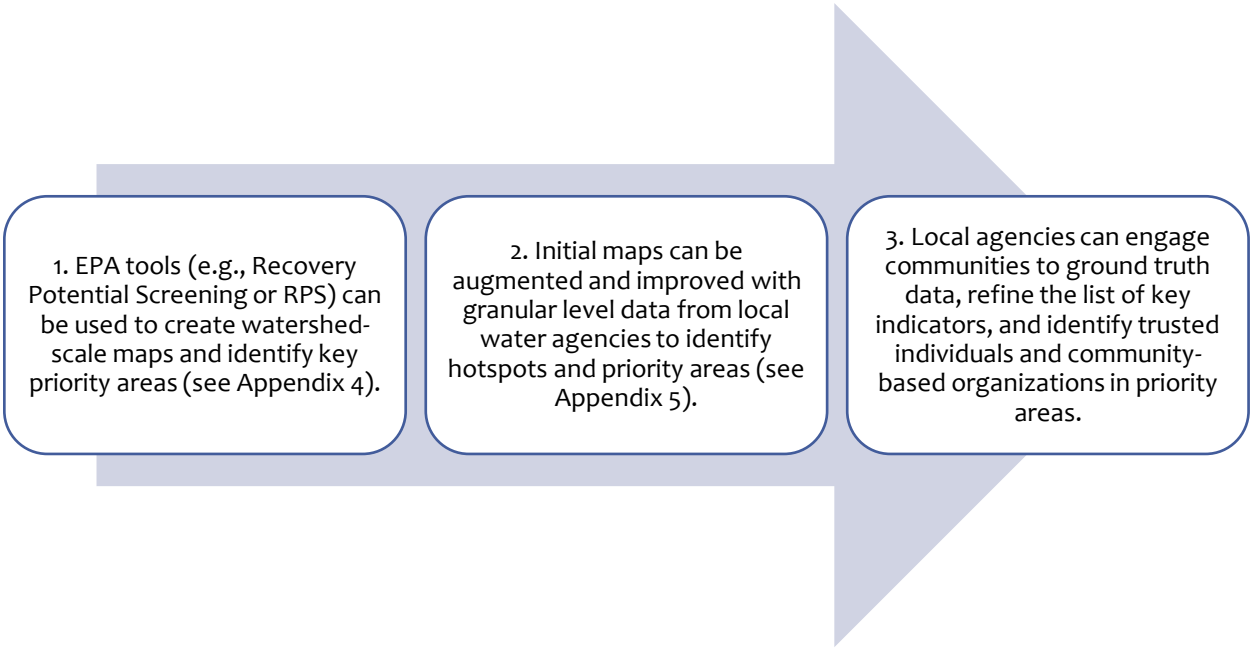


Figure 4. Equity Mapping Tiered Approach

2. Meaningful Community Engagement

Engaging communities in meaningful ways is key to advance water equity.

The Equity and Engagement Work Group also discussed their experiences with community engagement in water projects in San Antonio. Participants reflected on the elements that contributed to the success and failure of past experiences, as well as shared their suggestions for how to apply those lessons learned in the Partnership's work to advance water equity through upcoming projects.

Table 2. Lessons Learned from Community Engagement Experiences

Works Well	Does Not Work Well
✔ **Educate people on the rationale behind decisions** (e.g., why was the infrastructure constructed, expected benefits, etc.). ✔ **Offer various forms of engagement** (e.g., workshops, charettes, community meetings, direct mail, mobile messages, advertisements, storytelling, social media, etc.). ✔ **Engage communities actively** throughout the process (in the design, planning, implementation, monitoring, and evaluation). ✔ **Listen first, then incorporate input in decisions** (e.g., modify design based on community feedback). ✔ **Design water projects for all users** (e.g., make projects ADA accessible). ✔ **Ensure sustained and ongoing engagement to build and maintain trust** (e.g., begin with public meetings to inform the community about the inconvenience with constructions and the longer-term benefits of a given project). ✔ **Go back to the community after implementation.** Just because your project is done, it does not mean your work is done. Find ways to show the value of the projects, go back to the community to gather input, assess design flows, and opportunities for improvement. ✔ **Build community partnerships and maintain trust by following through.** Move beyond lip service. Find the resources to implement community ideas to improve projects. ✔ **Start small, prioritize personal relationships, and listen to what communities want/need.** Communities are underserved in different ways. Show up, work with schools and community organizations, and begin with feasible projects. ✔ **Acknowledge native and indigenous culture, connect with traditional values, celebrate diversity and multi-ethnic roots.** Broaden engagement efforts in a way that connects with diverse communities, in different languages. ✔ **Make engagement accessible.** Offer verbal and non-verbal translations.	☒ **Engagement as an after-thought.** Lack of communication and participation from the start. Informing the community last minute. ☒ **"Retrofit engagement",** bring the community in after decisions are made and people are upset with the process. ☒ **Inaccurately depict community engagement efforts** to maintain a positive image. ☒ **Lack of signage and education to inform communities of existing threats or benefits of specific projects** (e.g., failure to indicate degraded water quality or other public health hazards). ☒ **Token participation,** check the box and move on. ☒ **Virtual engagement only.** During Covid-19, community engagement has been challenging given the digital divide. Not all households have access to the technology needed to participate.

Incorporating Equity into existing Planning Efforts

Find actionable ways to incorporate equity and community engagement into existing plans.

During its last meeting, the Equity and Engagement Work Group discussed potential updates to the UWFP work plan to better integrate water planning across agencies in ways that meaningfully engage and prioritize the needs of historically disadvantaged communities. The most recent UWFP Work Plan was updated during the summer of 2017 (access here). While the Work Plan was focused on specific large-scale projects, the hope for the new Work Plan is to pursue a "living document" approach, focused on thematic areas based on local priorities and concerns.

Work Group participants brainstormed the Partnership's future to help address the needs of historically disadvantaged communities and improve connections between communities and their waterways. Participants reflected on opportunities for the UWFP to promote water equity in San Antonio. Five key themes emerged:

1. **Messaging/education** – Coalesce the federal 'family' and local agencies around a cohesive messaging and unified support for projects that advance water equity. A key focus would be communicating the "why" behind projects and policies, as well as the value of healthy waterways and the implications of neglect. Promoting consistent messaging through the Partnership's umbrella can increase legitimacy and show unity across agencies. The UWFP can support educational projects and initiatives that generate pride in the neighborhood, such as signage that recognize community contributions as families walk along rivers and creeks.
2. **Technical support –** Assist local community members, living near waterways, with technical support and other opportunities that foster stewardship and communicate the value of preserving and restoring waterways through natural strategies. Help develop tools (i.e., water equity maps) to support partners and guide efforts.
3. **Funding –**Share funding opportunities and help advance work led by local agencies, NGOs, and community associations. Help mobilize funding to support projects that meet many federal agencies' priorities and provide multiple needs (water quality, economic development, flood management, etc.). Share funding opportunities and guide partners through grant applications to increase odds of securing funding (e.g., letters of support, invite funders to meet with UWFP and local groups).
4. **Span Boundaries–** Connect federal agencies, local entities, and community organizations to collaborate on projects. All levels of government (federal, state, and local) would work towards the same direction in prioritizing climate change mitigation and environmental protection. Starting at a federal level, organizations can help set the intention and approach, state and local organizations can help connect with grassroots efforts and CBOs to identify community needs, priorities, and engage citizens in long term monitoring, oversight, and stewardship.
5. **Support Small, Community-Based Projects –** Support smaller projects that communities can *see and feel,* projects that are more accessible and tangible to the community. Instead of prioritizing mega water projects, pursue smaller-scale multi-benefit projects that promote connection with local waterways (e.g., low impact development, community gardens, community art projects like the Arbol de La Vida) in historically disadvantaged and underrepresented communities. Small projects can help build community buy-in for work that improves people's lives and supports pride and ownership in neighborhoods. Further, this approach can help build support for bigger water initiatives.

Thematic Areas based on Local Priorities

Work Group participants brainstormed potential *thematic areas* for an updated UWFP Work Plan, detailed below (Figure 5). Participants like the idea of following New Orleans' Work Plan approach and assigning co-leads per thematic area, emphasizing that this approach promotes shared accountability. Further, they would like to consider using a "report card" approach to assign grades to specific themes to measure progress. The Work Group recommended embedding equity as its own 'statement of principle' or pillar throughout the document and across the themes (rather than as its own theme of Equity/Engagement). They also recommend indicating how equity will be enhanced and considered in the implementation of projects under each specific theme. Equity mapping could help guide and prioritize projects in specific thematic areas.

Watershed health and resilience

- Promoting ecosystem restoration and water-related recreation
- Reduce flooding, while serving low-income communities through multi-benefit projects
- Address the intersection between water issues and trash and solid waste management, pollution, air quality, biodiversity, etc.
- Explore the relationship between waste and urban water systems.
- Water quality and public health

Stewardship, education, and outreach

- Communicate the value of water, why it is important to protect water resources, and what happens if you don't.
- Promote awareness of water availability and foster prudent water use.
- Promoting art projects near the river and creeks to restore community connection with waterways

Economic revitalization/prosperity

- Consider opportunities that protect cultural and historic assets close to the San Antonio River, such as the San Antonio Missions (World Heritage Site).

Collaboration and true partnership

- Connect local needs to funding sources (including networking, grant-writing training for NGOs, identifying relevant opportunities)
- Leverage funds to help support work and breaking down siloes
- Utilize the UWFP venue to share ideas and develop best practices for working with community partners to identify local needs, build long-term buy-in, transition long-term stewardship to local neighborhoods
- Participate in community meetings and listening sessions as relevant

Figure 5. Potential Themes for UWFP Work Plan

Phase 3: CBI Recommendations and Path Forward

Work Group members expressed overwhelming appreciation for the UWFP's interest in breaking down silos, bringing agencies together, and engaging communities in meaningful ways. There was strong feedback that the Equity and Engagement Work Group discussions advanced through the WRAP Pilot project were both valuable and meaningful. The participants shared a deep commitment for advancing equity and expressed desire for continued engagement in future efforts. We recommend building on current momentum to support the UWFP as outlined below.

1. Support the San Antonio UWFP Work Plan Update

As detailed in the sections above, participants supported the idea of moving from a project-based Work Plan towards a thematic approach, using equity as a principle behind the Partnership's work. Further, stakeholders expressed interest in moving from large water projects towards community-based projects that offer multiple benefits. They emphasized that community-based projects should be in line with collectively defined thematic areas, grounded in local values and priorities, and pursued in partnership with community leaders and community-based organizations in priority areas or equity "hotspots." The updated Plan would engage a more robust partnerships to identify new projects and be better equipped to secure funding for implementation.

2. Support Water Equity Mapping Efforts in San Antonio

The Equity and Engagement Work Group strongly advocated advancing efforts focused on water equity by identifying hotspots and most impacted areas in the watershed, then, prioritizing funding, projects, and community engagement in those areas. The WRAP Pilot Project Team could provide facilitation and technical support to move equity mapping efforts forward in various ways:

1. Continue facilitating meetings to support local efforts to layer the City's equity matrix with existing water indicators in coordination with local water agencies (i.e., SARA and SAWS), and help identify and fill gaps in the data.
2. Once maps are completed, support the UWFP to identify priority areas and most vulnerable communities in the city and connect with local, trusted partners in those areas. The Partnership could find ways to engage those priority communities and broaden representation to include their perspectives in UWFP meetings.
3. Support the UWFP in working with community partners to ground truth data, co-host various community engagement efforts, and refine maps to better reflect community lived experiences, priorities, needs, and preferences. Community partners would be considered anchors and hosts, shaping the content and logistics of engagement efforts.
4. Provide facilitation and strategic support to UWFP leads to identify partners to help fund, design, and implement community-based projects in key areas (based on local priorities).
5. Help develop educational resources and update the website to share resources and information about ongoing initiatives and upcoming opportunities with the broader community.
6. Work with the UWFP to maintain a feedback loop between community, local, state, and federal agencies through the Partnership meetings. Make space in meetings to share best practices and provide support communicating, sharing funding opportunities, scaling efforts.

5. Location 2: Verde River Watershed

Background

The Verde River is one of the last vibrant and flowing rivers in Arizona. The 192-mile desert river flows through federal, state, tribal, and private lands in the heart of Arizona, before reaching the confluence with the Salt River near Phoenix. The Verde holds important historic, cultural, religious, economic, recreational, scenic, and ecological value for the region.

The headwaters of the Verde are north of Prescott. The Upper Verde base flow is fed by interconnected aquifers in the Big Chino basin, flowing through red-rock canyons and supporting a lush riparian habitat. Further along, a series of tributaries (i.e., Sycamore Creek, Oak Creek, Wet Beaver Creek, and West Clear Creek) and washes feed in the Middle Verde River/Verde Valley, supporting local communities and economies. Downstream, a stretch of the Lower Verde is designated a National Wild and Scenic River. The river continues to flow until it reaches two major reservoirs, the Horseshoe and Bartlett dams, before joining the Salt River north of Mesa, Arizona. Water from the Verde River accounts for approximately 40% of the surface water delivered by the Salt River Project to the Phoenix-area for municipal and agricultural use.

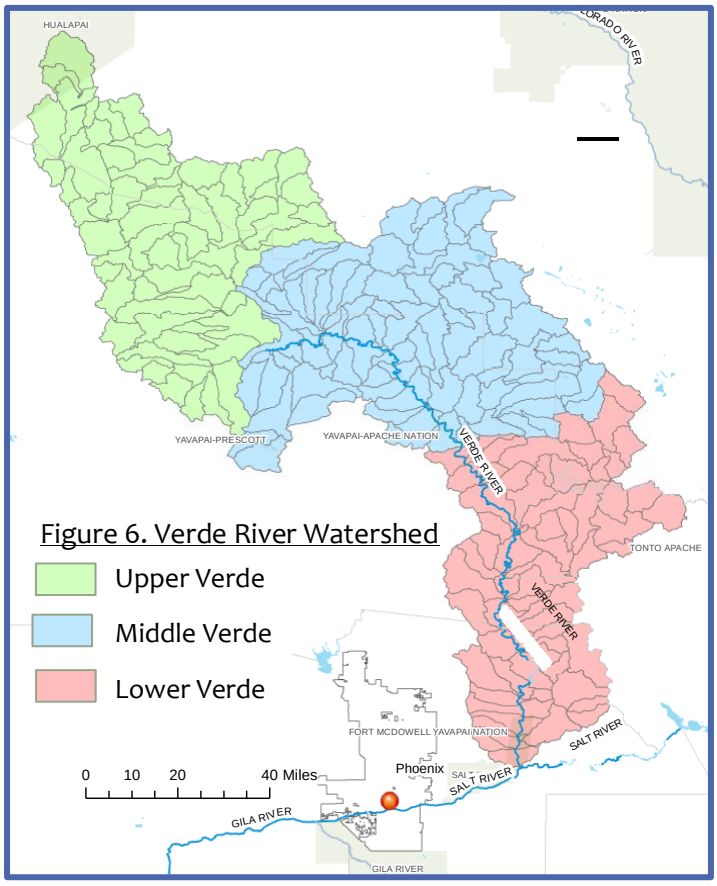


Figure 6. Verde River Watershed

The Verde River's watershed health is key to sustain life for both communities and ecosystems in the region. However, increased demands on the river and interconnected aquifer system, rapid growth, and land-use changes, and changing climate conditions are threatening the Verde river's health and vitality.

CBI Approach & Findings

In the Verde River watershed, the goal of the WRAP Pilot was to explore opportunities to support current collaborative efforts while identifying potential gaps for water reuse and other integrated water planning. A concurrent goal was to highlight water-related challenges for smaller, under-resourced communities and opportunities to engage those who have not historically been at the table in regional water resources planning.

Phase 1: Stakeholder Assessment

Refining the Scope

The WRAP Project Team initially held a few meetings with Rio Reimagined UWFP leads and EPA Region 9 staff to refine the geographic scope and identify key stakeholders in the watershed. Initially, the Pilot Project was intended to focus closer to the geographic focus area for the Rio Reimagined UWFP location. However, when the Rio Reimagined Partnership shared information about the WRAP Pilot project to its members, many Rio Salado/ Rio Reimagined corridor partners and public agency stakeholders did not feel the Salt and Gila watersheds were in a position to pursue a pilot in the near term due to the local sensitivities surrounding source water management and the short project timeline. The WRAP pilot team was advised to shift the focus towards Upper/Middle Verde, due to existing collaborative efforts underway and opportunities to build on the momentum and expand water reuse in an integrative way. Furthermore, the Verde River is situated upstream from Rio Reimagined as a direct supply of water to the river corridor and therefore has significant implications for the UWFP location.

Stakeholder Interviews and Assessment

CBI conducted eight stakeholder interviews in the Verde watershed in April-May to identify key water issues and opportunities that could benefit from integrated, landscape-level discussions. CBI presented the major themes from the interviews (without attribution) with EPA staff, interviewees, the Rio Reimagined/Urban Waters Partnership, and the Sustaining Flows Council, with the goal of identifying opportunities for future multi-stakeholder collaboration, and to gage the level of interest in exploring these ideas through collaborative discussions during the summer of 2021. Several key findings from the interviews are summarized below. The full Assessment presentation can be accessed at this link.

Key Assessment Findings

- **The Upper, Middle, and Lower Verde River face unique challenges and opportunities**. Major watershed-wide challenges in the Verde include rapid growth and land-use changes, unregulated groundwater pumping, and a lack of coordinated land-use and water planning, which negatively impact water quality, availability, and reliability. Some interviewees expressed growing concerns with the lack of attention given to water quantity issues that threaten the river's perennial flows, due to their political sensitivity. In addition, stakeholders pointed to the disparities in maintenance of water infrastructure throughout the watershed as a significant equity concern. Small, under-resourced cities lack resources to make needed capital investments. A significant proportion of the population relies on septic tanks, which in turn limits regional capacity for water reuse, recharge, and storage and present a water quality hazard. Stakeholders echoed concerns about climate impacts on local water resources, such as increased water stress, sustained drought, and increased risk of wildfire risk and flooding.
- **The Verde River watershed is ripe for integrated planning.** The Verde is a very special place, where people come together around their love of the river and their genuine interest to protect its flows and health. There is an array of past and ongoing multi-stakeholder collaboration focused on conservation, reuse, restoration, recreation, stormwater management, and climate resilience. Stakeholders suggested building on successful collaborative efforts underway, such as the Watershed Improvement Plan (2009-2013), the Verde Watershed Restoration Coalition, the Sustaining Flows Council, the Verde Front, the Verde River Exchange, the Northern Arizona Climate

Action Plan, among others. Stakeholders highlighted the value of going beyond and convening an integrated watershed-wide planning process to add value to the region by fostering relationships and understanding across interest groups, addressing/uncovering root causes of persistent water challenges, and working towards collective solutions. This could entail hosting integrated planning efforts and dialogues focused on bringing together small, dispersed, under-resourced communities to address watershed-wide issues, identify opportunities for collaboration, pursue "low-hanging-fruit" projects with watershed-wide benefits, and share the otherwise high-cost burden of multi-benefit projects.

- **Efforts in the Verde are strongly influenced by larger policy processes and dynamics.** Specifically, the ongoing Gila River general stream adjudication process will impact all water users and uses in the Verde River by determining their water rights allocation and priority date. The adjudication process includes the quantification and settlement process for the Yavapai-Apache Tribal water rights. Any/all conversations about water availability and demands will be inextricably linked to the legal adjudication process, which has been underway for 45 years and has yet to be settled., Meanwhile, the legal process may limit stakeholders' ability to share information or have candid conversations about projected supplies and demands. Further, although tangential, the implications and impacts of drought and shortage triggers on the Colorado River Basin can impact the Verde by diverting state funding and attention, and potentially increasing reliance on the Verde River in the Phoenix metro area.
- **Tribes need to be at the forefront of integrated planning efforts in the Verde**, particularly when focusing on equitable water management and engagement. The Verde River flows through four Tribal Nations: the Yavapai-Prescott, Yavapai-Apache, Fort McDowell Yavapai Nation, and Salt River Pima-Maricopa Indian Community at the confluence of the Salt and Verde rivers. Tribes need to be consulted and invited to help shape and participate in any efforts undertaken in the watershed. The Verde River is core to Tribal Nations' identity, and Tribes like the Yavapai-Apache are leaders in integrated thinking and reuse in the watershed and are committed to protecting healthy river flows.
- **Federal funding could support integrated water planning with an equity lens.** Stakeholders pointed to the lack of sustained statewide funding and leadership to support an integrated approach to water resources management (IWRM) on a strategic, watershed scale. Interviewees shared the following ideas and opportunities to advance IWRM and leverage the momentum created by existing collaborative efforts in the watershed:
    - **Showcase, fund, and scale multi-benefit projects** (e.g., restore riparian corridors and wetlands, improve water quality, enhance groundwater recharge, and flood resilience, foster water conservation and reuse, maintain recreation opportunities, enhance public health, and quality of life).
    - **Provide technical assistance and funding to enhance water resiliency and equity**. EPA and its partners could support efforts to bring together local officials, planners, water managers, non-governmental organizations, and community groups to foster sustainable, water-smart growth. This could also include identifying equity hotspots to guide future water projects and engagement efforts, offering technical support grants to assess barriers and constraints to implementing multi-benefit projects, and collaborating with low-income communities to fund and build capacity for small water projects.
    - **Support Tribal efforts to promote innovative, integrated water planning and maximize water reuse** in compliance with the Clean Water Act, particularly to meet the nutrient standards. The Pilot project could help identify long-term water needs and key opportunities for multi-benefit solutions at a watershed level to support those needs.

Further, EPA and its federal partnerships could support and enhance the Tribe's integrated model.

  - **Provide funding and support to enhance community outreach**. Small, dispersed, under-resourced communities need funding, facilitation support, and technical support to conduct IWRM planning to ensure sustainable growth and water supply reliability, in a way that reaches and engages key stakeholders and historically marginalized/underrepresented communities. Interviewees mentioned that much work remains to bring in an equity lens to the Verde watershed in Arizona. Tribal and non-Tribal communities alike lack the resources and technical expertise needed to plan and prepare for climate resilience. Low-income and Hispanic communities tend to be absent from water planning processes and conversations. Intentional and meaningful engagement efforts require time and sustained resources. An interviewee shared the project Disadvantaged Community Outreach Evaluation Study pursued in Los Angeles, California, as an example of successful effort that could guide work in the Verde.

- **Interviewees emphasized the urgent need to support and fund an updated Areawide Water Quality Management Plan (208 Plan).** The current Plan is almost two decades old. Federal partners could support this through funding, technical and facilitation support to address the existing resource and capacity limitations for such an effort. An updated 208 plan would foster water reuse and provide certainty and clarity around effluent discharge, consistent with the Clean Water Act. Currently stakeholders do not fully understand the rationale behind existing nutrient standards and have faced challenges in meeting those standards. Existing regulations limit stakeholders' ability to directly discharge water into the River or recharge water near the River to support its flows. As a result, they have been unable to fully utilize and reuse effluent in the watershed. Interviewees mentioned the need to clarify the River's nutrient loading capacity and develop management strategies accordingly. In addition, an updated 208 plan would add certainty and clarity around potential opportunities to maximize water reuse and enhance integrative water planning. The plan could (1) help identify multi-benefit solutions (e.g., maximize water reuse, improve stormwater capture and management, retire septic systems); (2) assess barriers and constraints for implementation of multi-benefit strategies (e.g., regulatory obstacles, funding); and (3) foster strategic thinking at a watershed scale.

Phase 2: Integrated Water Resources Management with an Equity Lens

Overall Direction from Key Stakeholders

As initially envisioned, this phase consisted of targeted engagement efforts to further explore opportunities identified through the initial Assessment with a broader, diverse array of watershed stakeholders. On July 1, 2021, CBI convened a meeting with a small group of representatives from local non-profit organizations, watershed coalitions, and one of the Tribe's attorneys, to outline the second phase of the WRAP Pilot project in the Verde River watershed. CBI sought participants' input on engaging a diverse group of stakeholders to explore possibilities to advance IWRM and equity work through this Pilot project. CBI proposed convening a multi-stakeholder workshop in August to present assessment findings, determine priorities, and explore possible next steps for furthering this work. **The strong take-away from the July 1 discussion was that such a discussion was not yet ripe, and that the most promising forum through which to advance water equity, reuse, and integrated planning in the region was an update to the 208 plan.**

Stakeholder Input for EPA Regarding Integrated Planning More Broadly

- **Engaging communities directly takes time and resources.** To illustrate this point during a group discussion, one stakeholder highlighted a nearly 20-year-old process in Los Angeles to engage communities in integrative water management, which has included roughly $1 million in planning grants and $150 million in project grants. The process started as an agency-level planning effort, resulting in an improved understanding of needs and priorities tied to Integrative Water Resource Management (IWRM). The agencies then realized key voices were missing and began investing in community-based initiatives to hear directly from communities. The project employed community organizers to go directly to people in the communities, including Tribes, to get a better understanding of their needs and priorities. It has been a successful effort through the commitment of significant time, resources and long-term vision.
- **Efforts need to be longer-term and have clear follow through.** Arizona lacks the resources invested in similar initiatives in California and could use EPA support. That said, efforts need to be sustained and longer term to gain people's trust. Further, some watershed groups have struggled to engage municipalities and local leaders in these types of discussions. A process like this would be a heavy lift and require a longer scope.
- **A broader assessment may be needed**. One participant suggested conducting a longer assessment process to hear from a larger array of regional stakeholders and their needs, as well as to identify political issues, challenges, and barriers. He suggested finding ways to assess residents' perceptions of the value of the watershed. Roughly 30 groups regularly attend meetings in the Verde, but many others, including small jurisdictions, are not engaged.
- **Start at a high level and determine the steps needed to do integrative planning in the Verde.** Water policy challenges in Arizona make implementing projects in the watershed very difficult. Current policy obstacles interfere with stakeholders' ability to expand reuse and maximize the use of effluent. The Verde has many planning needs. The first step could be to focus at a broader level, with less outside time pressure, and build the foundation for a regional integrative planning effort that involves the cities and Tribes on both sides of the mountain (including the Upper Verde Valley, if Prescott stakeholders want to engage). Efforts can focus on further exploring integrative planning opportunities in the Verde. Many currently believe this could be best achieved by updating the 208 plan. (The latest 208 plan is from 2004.)
- **Efforts should aim to address practical problems and identify low-hanging fruit.** When the Yavapai-Apache Nation looked at septic and wastewater issues regionally, they realized that 60% of the communities are on septic tanks. This is potentially a ripe opportunity for regional cooperation. It would require setting aside politics and identifying what communities need to do to connect septic systems with existing wastewater infrastructure.
- **Establishing a more progressive 208 plan is a great starting point.** The goal would be to move beyond traditional strategies (e.g., concrete channeling) towards more innovative strategies (e.g., water reuse, low-impact development, LID, green and multi-benefit infrastructure) through a competitive process. EPA could support cities in advocating to the Northern Arizona Council of Governments (NACOG) that an updated 208 plan is a priority. Arizona is advancing its thinking on reuse and regional wastewater management, and state leaders are pursuing a One Water approach to water management. The Verde watershed should be a particular priority for integrated water planning due to the lack of alternative renewable supplies.
- **Greater clarity is needed about what projects like this are 'piloting.'** While one of the goals of the WRAP Pilot project was clearly to explore ways for EPA to help advance integrative planning and

water equity at the various Urban Water Federal Partnership locations, it was unclear what the Pilot proposed to do at this particular location and why.

- **Develop a clearer definition of what is meant by 'underrepresented' or 'under-served' groups in the area.** In the context of the Verde River watershed, participants shared that small, rural communities tend to be underrepresented in state water planning processes. Some cautioned that some small communities have louder voices than others and have greater influence over decision-making. Participants suggested focusing particularly on low-income neighborhoods, including Tribes and other communities of color. When talking about reuse, Pilot efforts such as this should focus on towns and cities that are able to make those choices, with a focus on benefiting those neighborhoods at greatest risk (e.g., poor water quality, unreliable potable water and/or wastewater systems) and in most need of support.

Based on feedback from the July 1 stakeholder discussion, CBI recommended that rather than convening a multi-stakeholder meeting in August, the WRAP Pilot Project Team explore pathways to attain funding and assistance to move towards a more regional, integrative, and innovative 208 plan in the Verde. This could align with the One Water priorities at EPA and at the state level in Arizona in such a way that could maximize reuse while protecting water quality in the river.

Phase 3: CBI Recommendations and Path Forward

Support and Fund Integrated Water Planning Through a Regional 208 Plan

Interviews and discussions with key stakeholders in the Verde watershed pointed to numerous planning needs related to water quality and quantity in the watershed, which they believe could and should be addressed through a regional 208 plan. Section 208 of the Clean Water Act (CWA) directs state agencies to conduct water quality management planning in specifically designated areas. The Verde River falls under the Northern Arizona Council of Governments (NACOG) purview. In addition to the current plan being nearly 20 years old, growth and water planning challenges are urgent in the Verde. Further, the State's innovative, one-water approach to water planning has evolved significantly in those two decades and is reflected in the creation of the Governor's Water Augmentation Council. Stakeholders pointed to the Pima Association of Government's approach as a potential model for the Verde watershed to follow (https://pagregion.com/sustainability/water-quality/208-plan/).

Key Issues to Potentially Address through a 208 Plan

While the primary focus of 208 plans tends to be that of maintaining alignment and consistency for water reuse and reclamation facilities, 208 plans can also address other potential pollutants, including stormwater runoff and solid waste disposal. An updated regional water quality management program could encourage integrated water planning, including wastewater, stormwater, surface water, groundwater, and solid waste. This could be done through innovative and nature-based strategies, such as water reuse, green infrastructure, and other multi-benefit projects.

As previously mentioned, Verde stakeholders encouraged EPA's support to advocate and encourage NACOG to set an update to a 208 plan as a priority, as well as to provide funding, technical, and facilitation support for small, under-resourced communities. Some key issues to be addressed through the update could include:

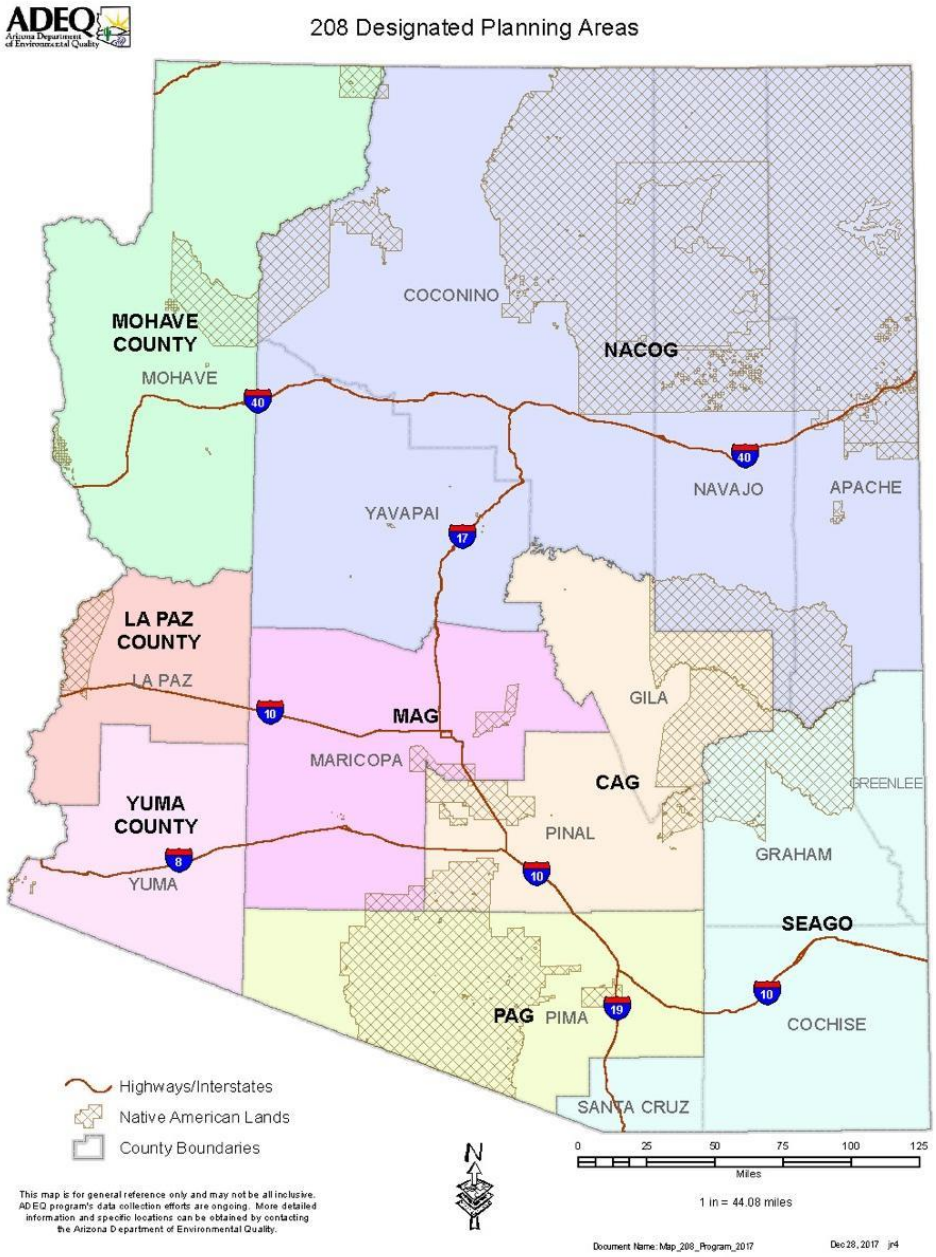
- Fostering clarity and consistency related to effluent discharge into the rivers and creeks, with the goal of aligning regulations with parallel structures at a state and federal levels and streamlining permitting processes.
- Considering strategies to encourage water reuse in compliance with the Clean Water Act (particularly related to nutrient standards) to support river flows and riparian ecosystems.
- Describing historical and anticipated point and nonpoint source water quality issues and long-term water needs, as well as potential solutions, control measures, and multi-benefit solutions at a watershed level to support those needs. This can include low-hanging-fruit projects, such as strategically retiring septic systems, connecting them to existing infrastructure, and increasing water reuse/recharge.
- Assessing barriers and constraints to implement specific projects.
- Creating a strategic action plan to recommend financial, coordination, and institutional measures necessary to implement recommended strategies
- Bringing in additional resources and capacity to share the cost burden from planning and implementing projects, particularly when considering infrastructure development and modernization. Craft policies that promote cost-effective regional planning and follow a watershed-level approach to protect the river, local ecosystems, and public health.
- Bringing in an equity and environmental justice lens to prioritize most vulnerable and impacted communities, encourage participation of historically underrepresented communities, and assess the cost and benefit of specific policy and project alternatives.
- Enhancing integrative models, such as the Yavapai-Apache Nation's watershed model to improve understanding of long-term water sustainability in the basin.
- Creating safe spaces in which diverse communities and stakeholders with divergent interests can come together, think strategically about long-term sustainable growth, and identify strategies within their control to improve watershed conditions.
- Reduce conflicts and develop guiding principles that reflect regional values and priorities.

Additional Considerations for Supporting an Updated 208 Plan

Any updates to a 208 Plan update would need to be closely coordinated with the Arizona Department of Environmental Quality (ADEQ) and NACOG, the Designated Planning Agency (DPA). In Arizona there are currently eight DPAs, as illustrated in the map below. Stakeholders in the Verde would benefit from EPA's assistance/guidance to encourage NACOG and ADEQ to prioritize the 208-plan update, as well as to find and secure adequate funding for an innovative and integrated regional water quality planning effort as proposed above.

CBI recommends coordinating with NACOG and ADEQ to determine whether pursuing a regional, watershed-level 208 plan or similar integrative water quality planning effort is possible in the near future. It would likely be beneficial to hire a consultant and a third-party facilitator to support the planning process for an innovative 208 plan in the Verde. The process could include convening a multi-stakeholder advisory group, composed of key stakeholders and partners that could help draft specific sections of the report, share data, and develop and analyze potential strategies to promote sustainable long-term growth. Strategic consultation and dialogue with Tribal Nations in the watershed will be critical to identify areas of support and partnership. This will be particularly important with respect to financial, technical, and facilitation support needed to support ongoing efforts aimed at strengthening integrated planning (e.g., integrated hydrological model), as well as

supporting collaboration with other non-tribal entities to plan and implement watershed-wide efforts to maximize water reuse and bolster resilience.



Map available at: https://static.azdeq.gov/wqmwg/wifa_dpa_map.jpg

6. Lessons Learned

Cross-cutting lessons for EPA and partners, across its Urban Waters locations, to (1) successfully engage with stakeholders in integrated water reuse planning and (2) identify and address issues of equity in those planning efforts

Selecting project locations

- **Provide clear focus and specificity from the outset.** As described in Sections 4 and 5, CBI spent an important portion of the initial stages of the Pilot clarifying the purpose/goals and scope of the project with EPA and communicating this to local stakeholders. Having a nexus with the Urban Waters program, including existing relationships, will help contextualize EPA's goals and set expectations with stakeholders at future locations.
- **Ensure there is strong local interest/opportunity** to (1) advance equity, (2) promote integrative and multi-benefit water projects, and (3) maximize water reuse. Federal funding and technical support can play a key role in advancing integrative efforts in an inclusive/equitable manner to address the needs of historically disadvantaged and underrepresented communities.
- **Begin with an assessment** to understand what efforts are already underway to enhance integrative water management, and what relevant gaps or needs exist. Federal support is more effective when building on existing work and efforts are tailored and focused to address local stakeholder needs, fill gaps, and scale successful efforts.
- **Select locations with an active UWFP or National Estuary Program area in place that has prioritized water reuse and integrated planning, and that has capacity to support the effort.** To be effective, there needs to be a multi-stakeholder "home" for the effort with a nexus to EPA. We recommend working with locations with active EPA partnerships that have expressed interest in the Pilot and have long standing relationships with key stakeholders in the area (local agencies, non-profits, etc.).
- **Ensure there is alignment between EPA goals and local priorities.** Water reuse and integrated planning can signify different concepts to different stakeholders. Prior to selecting locations, and during the early phases of a project, EPA should have clear conversations with UWFP locations about the various parties' interests, goals, and basic definitions (e.g., water reuse, IWRM, water equity), to ensure there is mutual understanding and alignment of objectives. Parties' goals may include, for instance, integrating traditionally siloed aspects of water planning (e.g., water quantity and water quality, surface- and groundwater, rural and urban, water and broader community planning, and/or others) and/or addressing regional water scarcity and water quality challenges through innovative, multi-purpose strategies such as green stormwater capture. It is important to understand how local communities' needs and priorities relate to or differ from EPA's understanding and priorities regarding water reuse and integrated planning.
- **Consider the potential role and/or impact of water-related litigation and regulatory challenges.** These can range from decades-long adjudication processes to outdated regulations that preclude creative water reuse or collaborative IWRM approaches. In some cases, it may make sense to allow those to resolve or achieve more clarity before supporting new or revived IWRM efforts. In other cases, certain legal constraints may present important opportunities for creative, integrated water solutions.

- **Offer third-party assistance** to support and coordinate with local UWFP lead(s) to help move efforts forward (considering frequent local funding/capacity limitations).

Providing effective support to advance local efforts

- **Demonstrate a longer-term commitment and communicate EPA's 'stake' in the issue or effort.** This includes outlining clear, consistent opportunities for continued engagement. Local water planners may be understandably skeptical of federal government efforts to encourage or support them to be 'integrative' or 'equity-focused,' particularly when project timelines are short, and communities are already doing some of this work. This is exacerbated by what is frequently seen as federal agencies 'parachuting in' with new ideas but leaving under-resourced communities without infrastructure or support for sustaining initiatives over time. Further, with other collaborative initiatives underway in many locations, stakeholders need a clear reason and incentives to engage. Be prepared to address questions such as, e.g., *What are EPA's specific interests in this local or regional effort? What resources can EPA provide and/or help secure, now and over time? What are the proposed tangible outcomes? What are the funding opportunities and/or other incentives to participate? How does this effort build on past initiatives and connect with future needs?*
- **Be clear that promoting water equity looks very different depending on location, and that using an equity lens changes the conversation.** Local efforts will inevitably be at different stages of embedding equity into their work. In San Antonio, equity is part of the City's overarching policy and commitment; the City established an equity index to guide its efforts and resource allocations. Assumptions around the need to integrate equity into water planning are shared. In Arizona's Verde watershed, these conversations are newer, more contested, and playing out differently. In some cases, it may make sense for EPA may be called upon to support water equity by probing and asking questions to better understand what equity looks like in a specific location and what communities are considered underserved or underrepresented, while refraining from taking a prescriptive or directive stance. In other cases, EPA may need to play more of a supportive role while learning from local expertise and efforts. Either way, prioritizing equity is a powerful way to center integrated planning efforts.
- **It takes time and resources to conduct equity-focused integrated water planning, including ensuring that historically underserved and underrepresented stakeholders are 'at the table'**. Initial efforts to assess local integrated and water reuse planning opportunities, identify and reach out to stakeholders, and analyze potential opportunities and barriers to advancing equity through water initiatives can be a meaningful and crucial first step. (A six-month timeline could be realistic for this initial stage-setting, with the goal of supporting and framing a longer-term effort.) Much more time is required, however, to (1) build relationships and trust with community partners; (2) demonstrate a commitment to support meaningful long-term outcomes for impacted communities; (3) establish the necessary credibility for partners to engage in creative, multi-purpose, multi-stakeholder planning across traditional siloes; (4) work with community-based organizations to engage those most impacted by historic water-related inequities, who may stand to gain the most from water reuse and other integrated water planning efforts; and (5) work through existing structures and processes to develop new approaches and sustainable outcomes to water planning at the neighborhood, local and/or regional levels.
- **Trust is crucial not only for meaningful planning discussions, but for the long-term viability of integrated, collaborative, multi-stakeholder water management.** Having trusted partners is an essential component of successful long-term water reuse and integrated planning initiatives.

Taking the time and making the investment to build long-term relationships and trust in outside partners, such as EPA, will outlive any particular project and bear fruit in terms of long-term solutions and capacity.

- **UWFPs can play important roles in advancing water equity through IWRM, water efficiency and water reuse planning**. They can help members with technical assistance and develop cross-cutting resources (e.g., equity mapping tools), share funding opportunities, offer support and guidance (e.g., endorsement letters) to help partners secure funding, and serve as a vehicle to communicate consistent, credible messaging across the watershed. UWFP members have a depth and wealth of experience and expertise to share with one another. The partnership provides a venue for reflection, strategic planning, and exchange of best practices to align and maximize efforts underway.
- **Consider the value of 'equity mapping' as a first step in 'setting the table' among stakeholders.** Questions related to water equity can be initially explored through a stakeholder assessment, by asking what communities, neighborhoods or community-based organizations have not been historically at the table in water planning efforts but may have needs that could be addressed through water reuse or other integrated planning. An assessment can be a useful springboard for early conversations about how different communities experience water challenges and/or disparities, how to identify or measure these disparities, how these issues might be addressed through water reuse or other integrated planning, and what lessons can be learned from other communities regarding potential approaches and solutions.

8. Appendices

Appendix 1. Stakeholder Assessment Interviews

San Antonio River

Interview List

#	Name	Affiliation
1	Steven Schauer	San Antonio River Authority, Director of Government and Public Affairs
	Brian Mast	San Antonio River Authority, Government Affairs Manager
	Karen Bishop	San Antonio River Authority, Executive Services Supervisor
	Melissa Bryant	San Antonio River Authority, Director of Technical Services
2	Zuleika Morales	US Department of Housing and Urban Development, Field Office Director
3	Julio Beltran et al.	US Geological Survey, Urban Waters Ambassador
4	Eloisa Portillo-Morales	Natural Resources Defense Council, City Strategist
5	Martin Miller	San Antonio Water Systems
6	Nefi Garza	City of San Antonio, Assistant Director, Public Works

Interview Questions

1. Please share the history of your involvement with the EPA Urban Waters Federal Partnership and/or other local water planning efforts.
2. What do you see as the greatest opportunities for collaboration on local water issues and/or watershed management (e.g., water quality, equity, supply, conservation, water reuse, other)?
3. What examples have you seen of successful integration of diverse interests to broaden stakeholder engagement in water discussions? What was the outcome? What worked well or poorly?
4. Have you been engaged in what you consider 'integrated' approaches to water resources management in the past? If so, what relevant learnings can you share?
5. In what ways (if any) could the Urban Waters Partnership add value to integrated approaches to local water challenges in ways that aren't already being pursued by individual organizations or coalitions?
6. What stakeholders or communities should be engaged in a discussion of the water challenges discussed above? What voices have been potentially missing?
7. How do you envision successful, inclusive, and equitable engagement of the various stakeholders? Who would be involved? What challenges and supports are needed in light of Covid-19?
8. What *information* do you feel is most important to communicate with stakeholders and communities related to the above water challenges? In what ways?
9. Is there anything else you'd like to add?
10. Who else might you recommend that we speak with as part of this assessment? We would like this effort to be inclusive of previously underrepresented voices.

Verde River

Interview List

#	Name	Affiliation
1	Michael Byrd	Prescott Creeks, Executive Director
2	Kalai Kollus	Oak Creek Watershed Council, Executive Director
3	Nancy Steele	Friends of the Verde, Executive Director
4	Ashley Hullinger	Water Resources Research Center (U. Arizona), Research Analyst
5	Masavi Perea	Chispa AZ, Coalition and Trainings Director
6	Paula Randolph	Babbitt Center, Associate Director
7	Kim Schonek	The Nature Conservancy, Project Director for TNC Verde River Project
8	Sarah Porter	Kyl Center for Water Policy, ASU Director
9	Susan Montgomery	Montgomery & Interpreter, Legal Counsel for Yavapai-Apache Nation

Interview Questions

1. What do you see as **current needs or opportunities** for collaboration on local watershed issues and/or water resources management that aren't already being undertaken by existing organizations or coalitions (e.g., groundwater availability, drought resilience, reuse, water quality, equity, conservation, stormwater management/green infrastructure, other)?
2. What examples have you seen of **successful integration of diverse interests** to broaden stakeholder engagement and/or address equity in watershed issues? What worked well or poorly?
3. What examples have you seen of successful **'integrated' approaches to water resources management** in the watershed? At what scale?
4. What **stakeholders or communities should be engaged** in a discussion of the challenges or opportunities? What voices have been potentially missing?
5. What does **equity** mean to you in the context of integrated water resources management? What challenges and supports are needed in light of Covid-19?
6. What **information** is important to communicate to or receive from stakeholders and communities related to the above water challenges? In what ways?
7. EPA is interested in supporting the development of a road map of actions and circumstances needed to promote a regional IWRM plan in the Verde River watershed. This could entail using water resilience and equity mapping to identify hotspots, as well as analyzing current collaborative efforts and stakeholders engaged to identify gaps and opportunities to broaden collaboration and engagement of historically underrepresented groups. **Would you find this approach and possible outcomes valuable and relevant?**
8. Is there anything else you'd like to share?
9. Who else might you recommend that we speak with as part of this assessment? We would like this effort to be inclusive of previously underrepresented voices

Appendix 2. San Antonio Urban Waters Equity & Engagement Work Group

Work Group Participants

Name	Affiliation
Julio Beltran	United States Geological Survey, UWFP Ambassador
Randy Rush	United States Environmental Protection Agency Region 6
Tanya Helbig	National Park Service
Steven Schauer	San Antonio River Authority
Michelle E. Garza	San Antonio River Authority
Josie Gutierrez	City of San Antonio
Murray Myers	City of San Antonio
Frates Seeligson	San Antonio River Foundation
Annalisa Peace	Greater Edwards Aquifer Alliance
Robert Ramirez	Westside Creeks Restoration Oversight Committee
Renee Watson	Salado Creek Restoration Oversight Committee, Bexar County SMWBE
Debbie Reid	Greater Edwards Aquifer Alliance
Sarah Gorton	San Antonio Water System

Appendix 3. National Equity Mapping Tools

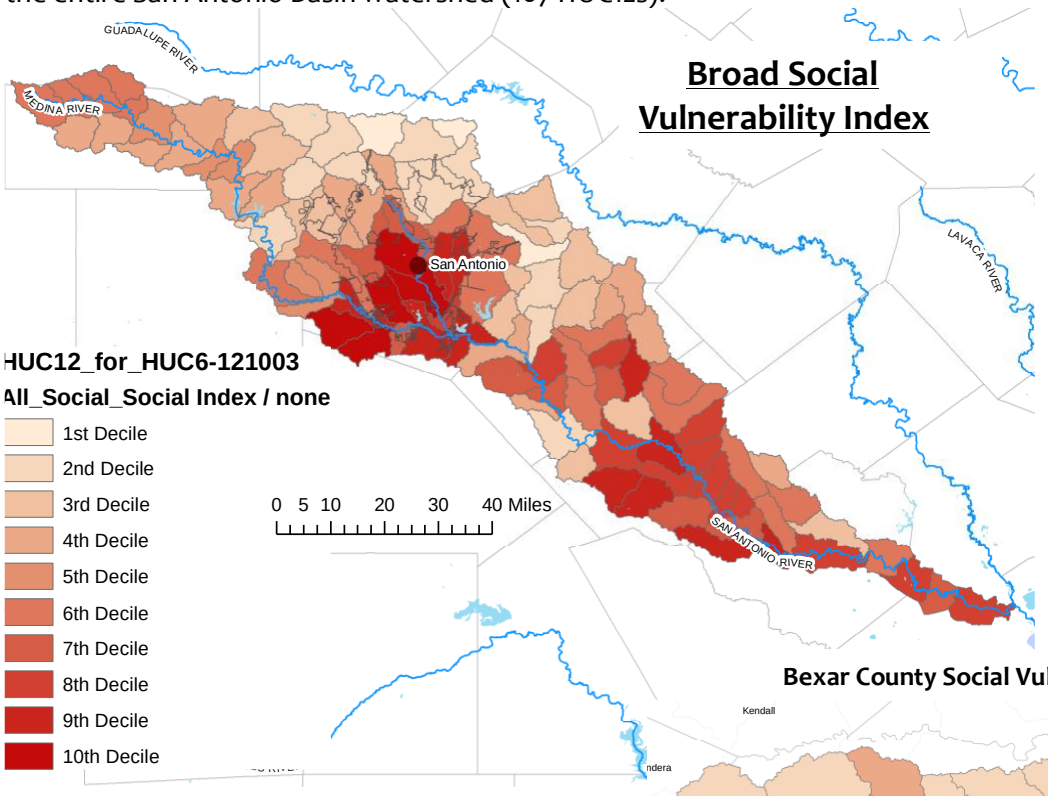
Name	Host Org.	Link
CDC Social Vulnerability Index	Center for Disease Control	https://www.atsdr.cdc.gov/placeandhealth/svi/index.html
Census Data Equity Tools	US Census Bureau	https://covid19.census.gov/pages/data-equity
EJ Screen	EPA	https://ejscreen.epa.gov/mapper/
EnviroAtlas	EPA	https://www.epa.gov/enviroatlas/enviroatlas-interactive-map
Recovery Potential Screening	EPA	https://www.epa.gov/rps
Equity Atlas	PolicyLink and USC Equity Research Institute	https://nationalequityatlas.org/
Greenlink equity map	Greenlink Analytics	https://www.equitymap.org/how-to-use
Headwaters Economics Neighborhoods at Risk	Headwater Economics	https://headwaterseconomics.org/apps/neighborhoods-at-risk/
Mapping for Environmental Justice	UC Berkeley	https://mappingforej.berkeley.edu/
Resilience & Analysis Planning Tool	FEMA	https://www.fema.gov/emergency-managers/practitioners/resilience-analysis-and-planning-tool

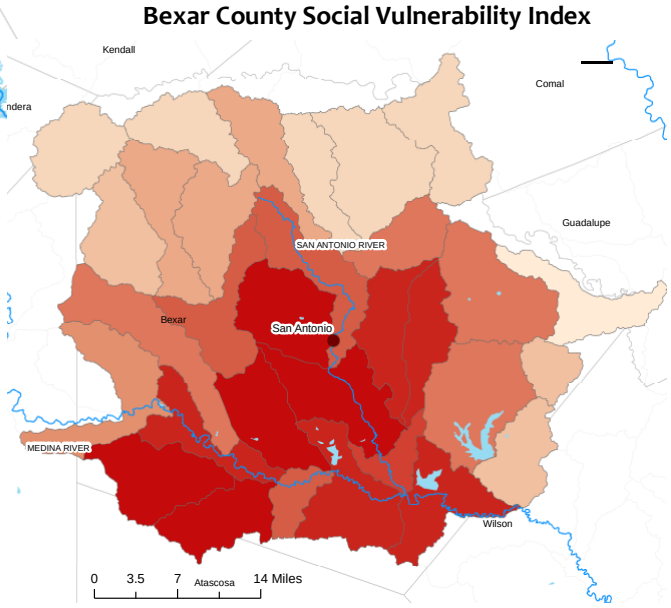
Appendix 4. Broad Social Vulnerability Index: San Antonio Watershed and Bexar County

Source: Industrial Economics Incorporated using Recovery Potential Screening (RPS) Data

The highest scores indicate greatest population vulnerability based on population % low income; % minority; % linguistically isolated, and % < high school education; and % vulnerable age group (below 5 and above 64). Data sourced from the 2018 update of the US Census Bureau American Community Survey 2013-2017 Five-Year Summary.

In Bexar County, the central city region and South/Southwestern regions of the county have the highest proportion of socially vulnerable community members. The comparative vulnerability spans the entire San Antonio Basin watershed (107 HUC12s).



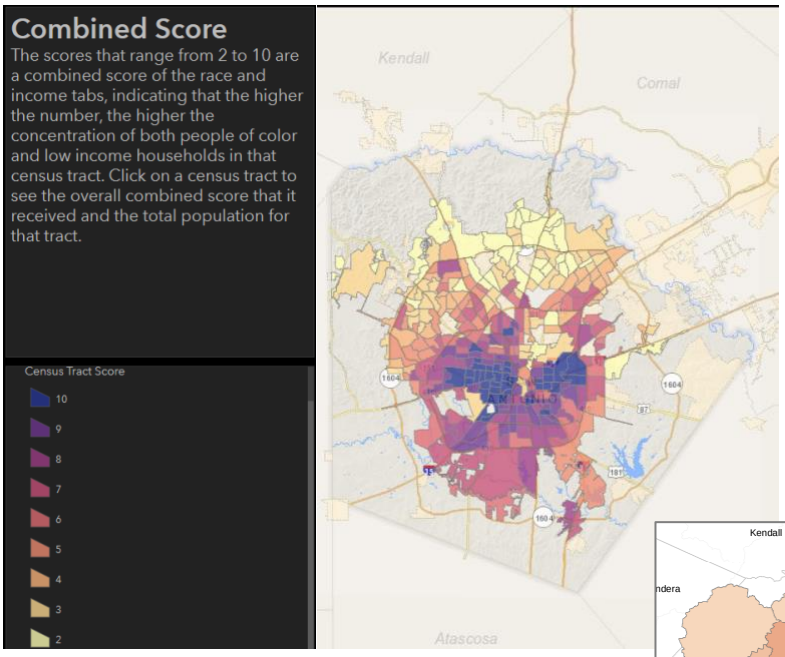


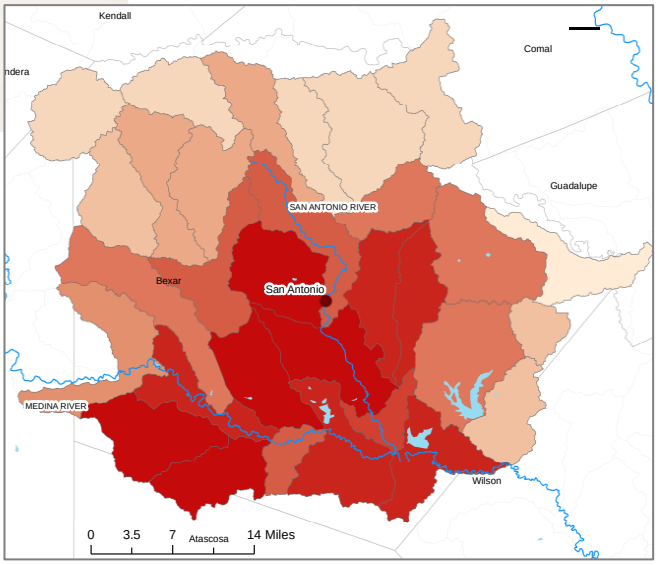
Appendix 5. San Antonio Equity Atlas Mapping vs. Recovery Potential Screening (RPS) Data

Source: Industrial Economics Incorporated using Recovery Potential Screening (RPS) Data

The map on the left below is taken from the San Antonio Office of Equity, which compiles data by census tract within the San Antonio city boundaries to show areas with the greatest low income and % minority populations. The map on the right shows Bexar County 'social vulnerability hotspots' divided by decile across the full watershed. These data were sourced from the US Census Bureau American Community Survey (2013-2017) and the map generated using the Recovery Potential Screening (RPS) tool to illustrate the same social data by HUC12 watershed regions.

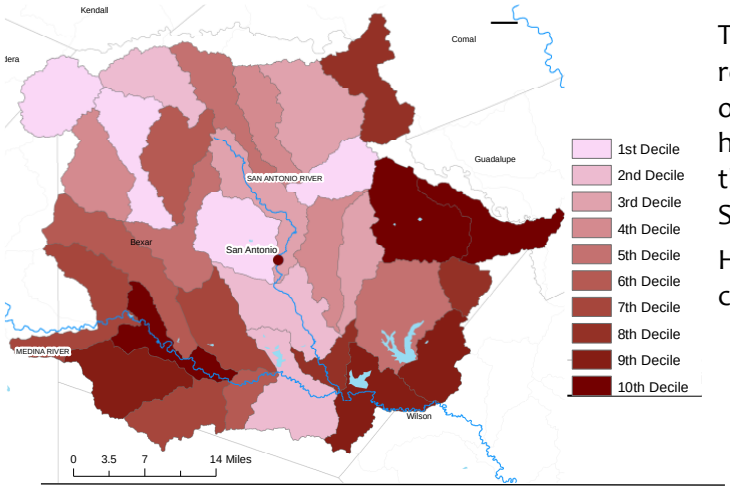
The granularity of the San Antonio Equity map is finer and more clearly illustrates the population divisions within the city boundaries. The RPS map can include more indicators to generate the final score (including the % linguistically isolated population and % vulnerable age group, in addition to % low income and % minority) and the scope can be broadened or narrowed. The RPS tool is useful when taking a broad watershed approach to vulnerability mapping. RPS may also be useful in regions of the country that do not have their own equity mapping tools.



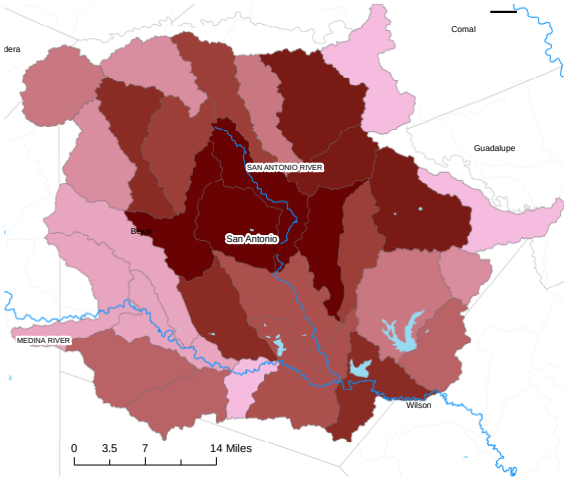


Appendix 6. Comparative Areas of Vulnerability: Bexar County

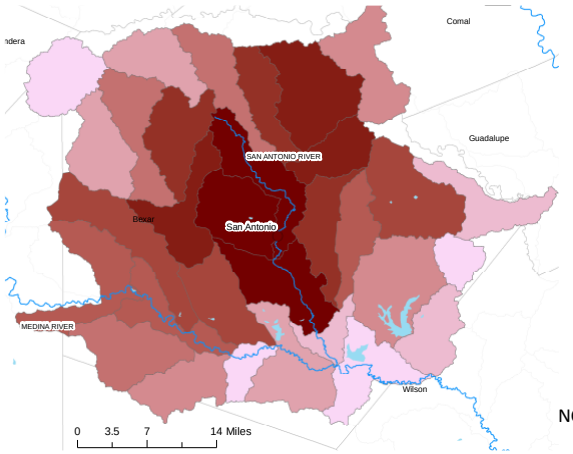
a. % 100-Year Flood Zone in WS



b. Watershed Health Vulnerability



c. Combined Water Demand in WS



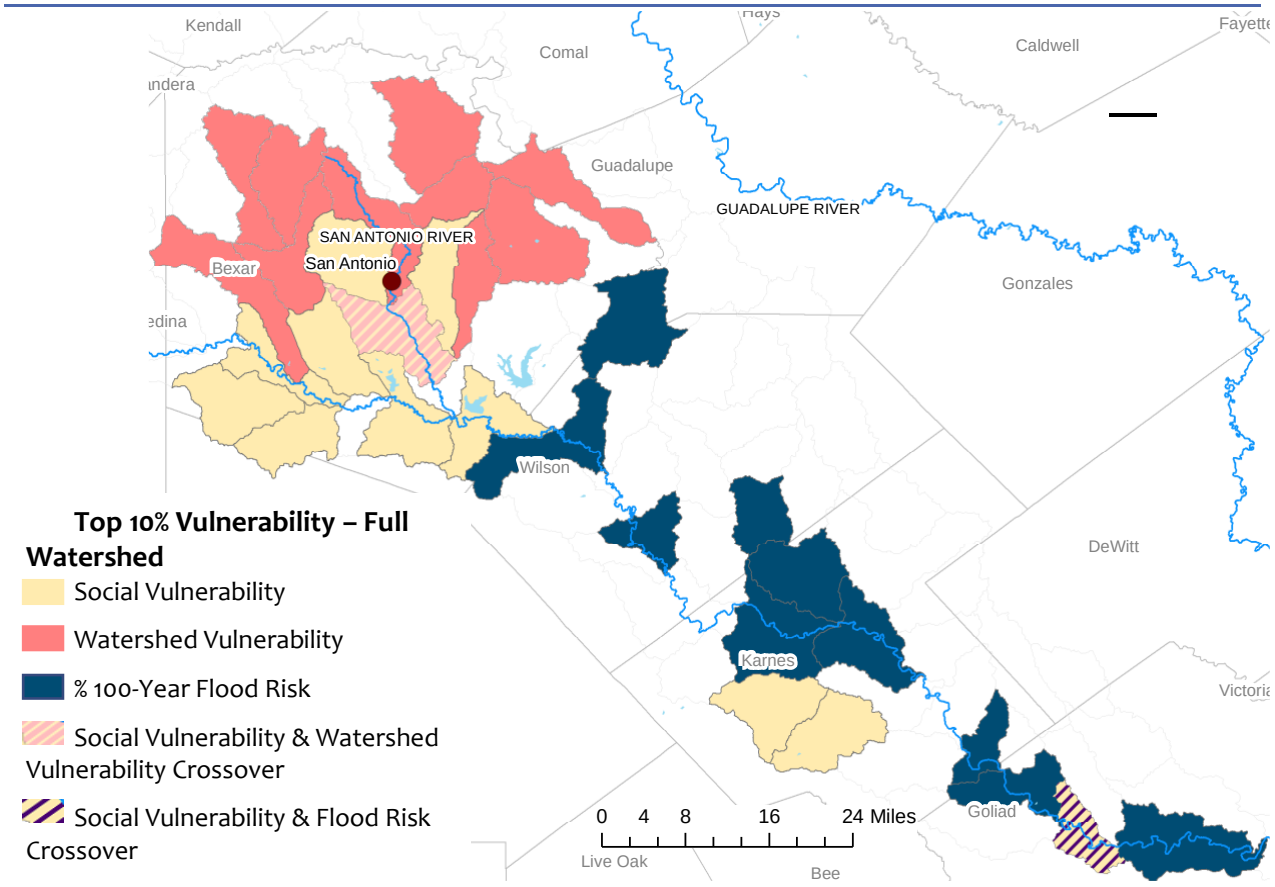
These heatmaps of Bexar County display the regions of highest vulnerability by HUC12 in each of three categories: flood risk, environmental health, and greatest water demand. Each of the three maps is divided by decile across the entire San Antonio watershed. The most vulnerable HUC12 areas fall within the 10th decile for each category.

a. %100-Year Flood Zone in Watershed. Within Bexar County, the HUC12s in the watershed with the greatest flood risk include the Cibolo Creek region to the Northeast of the county and the Lower Medina River region to the Southwest.

b. Environmental Health Vulnerability. This heatmap includes data from the 2016 EPA Preliminary Healthy Watersheds Assessment, specifically watershed health and water quality indices. Areas with the greatest environmental health vulnerability (or lowest raw scores) include the central San Antonio City region along the river and Leon Creek in the western region of the city. Cibolo Creek to the west also has a high environmental vulnerability score.

c. Combined Water Demand in Watershed. The central San Antonio city region experiences the greatest water demand in the county, significantly influenced by industrial water use. The Southwest region of Bexar County is impacted by agricultural water demand while water use in the Northeast is primarily domestic.

Appendix 7. Watershed Top Deciles: Social Vulnerability, Watershed Vulnerability and Flood Risk



While flooding and environmental resiliency are flood risk, environmental health, and greatest water demand. Each of the three maps is divided by decile across the entire San Antonio watershed. The most vulnerable HUC12 areas fall within the 10th decile for each category.

a. Social Vulnerability. The largest socially vulnerable populations occur in the region south of the San Antonio city center and along the Medina River in Southern Bexar County. Vulnerability is based on % low income, % minority, vulnerable age group and linguistically isolated populations. Additional vulnerability occurs in the Hondo Creek region of Karnes County and along the San Antonio River in Goliad County.
b. % 100-Year Flood Zone in Watershed. The HUC12s with the greatest risk of severe flooding include the Cibolo creek region to the Northeast of the county and the central Marcelinas Creek region in Karnes County. The town of Riverdale along the San Antonio River to the Southeast scores within the top 10% of both social vulnerability and flood risk in the watershed. Data is sourced from the FEMA Flood Insurance Rate Maps National Flood Hazard Layer (acquired February 2021).
c. Watershed Vulnerability. Areas with the highest environmental vulnerability scores include the Leon and Mud Creek regions in the North/Northwest region of Bexar County. The Salado Creek region in the Southwestern section of San Antonio along the river face both high environmental vulnerability and social vulnerability. Data sourced from the 2016 EPA Preliminary Healthy Watersheds Assessment and is calculated based on aquatic habitat health and change in water and land use.

Appendix 8. Verde River Basin and Surrounding Watersheds

The Verde, Salt and Gila Rivers converge just north of Phoenix, and each is a part of one or more watersheds that comprise the central and southern regions of Arizona. This area includes the Rio Verde Basin to the North (HUC6 150602) the Salt Basin to the West (HUC6 150601) and the Lower Gila-Agua Fria Basin to the Southeast (HUC6 150701). This entire area includes 634 distinct HUC12s.