URBANWATERS FEDERAL PARTNERSHIP
Restoring Urban Waters, Revitalizing Communities

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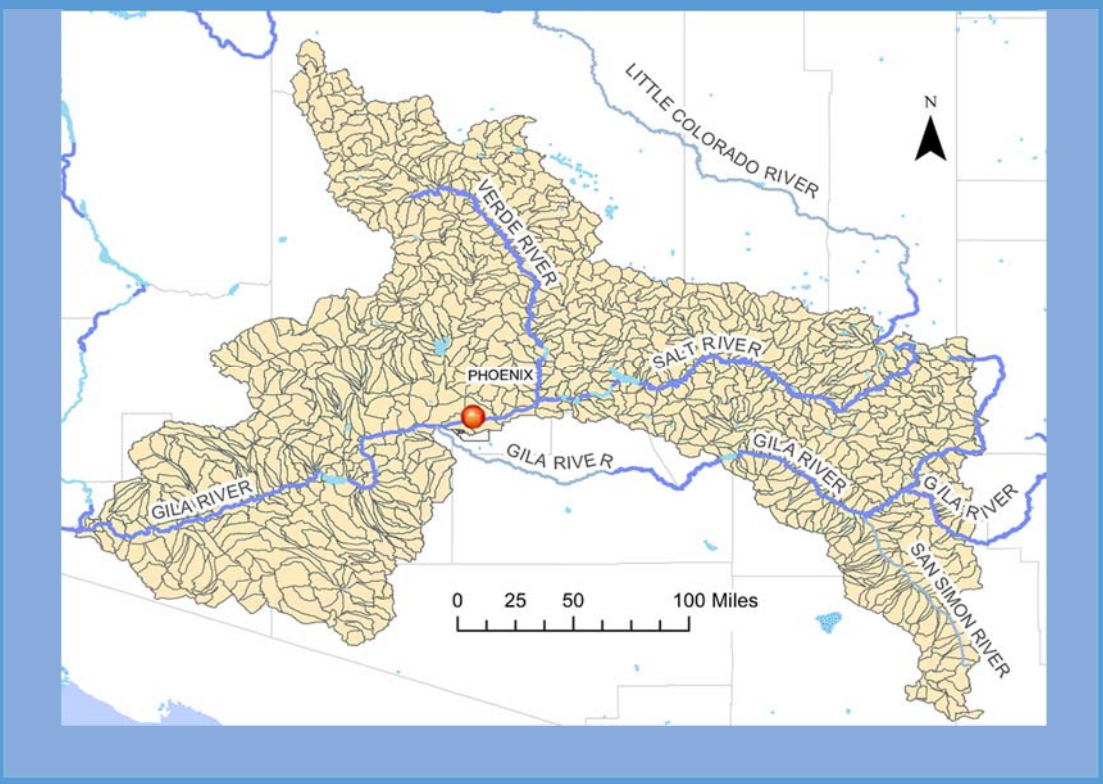
Promoting Equitable Water Supply Management Through Integrated Planning and Partnerships – An Urban Waters Project



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Disclaimer

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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 diverse needs is a complex exercise. Due to this complexity of meeting so many users' demands while balancing natural environmental systems' needs, water resource management across the United States has often taken a very siloed approach. Different sectors work on their own without high levels of collaboration with related or overlapping sectors. For example, environmental interests with a focus on ecological system integrity may overlook local social needs of a community, or industrial interests that aim to maximize profits through processes dependent on water neglect collaborative planning with local water utilities.

A useful framework for navigating these complex dynamics is Integrated Water Resource Management (IWRM), a comprehensive and holistic approach to water management and planning that integrates areas such as water supply, wastewater, and stormwater systems. In particular, IWRM can be applied to advance water conservation and reuse goals in water-constrained regions. However, traditional efforts at IWRM have often overlooked one key component – water equity. Goals for water equity should be built into any and all water resource management work, including water reuse and conservation efforts.

WATER EQUITY

According to the US Water Alliance, water equity occurs when communities: 1) have access to safe, clean, and affordable drinking water and wastewater services; 2) share in the economic, social, and environmental benefits of water systems; and 3) are resilient in the face of floods, droughts, and other climate risks.[1]

The Urban Waters Federal Partnership (UWFP) was established in 2011 to help urban communities (especially those that are underserved or economically distressed) connect with their water systems and work to improve them. With 20 designated locations, the collaboration between 15 federal agencies and more than 60 non-governmental organizations works to reconnect urban communities with their waterways through community-led revitalization efforts. The U.S. Environmental Protection Agency (EPA) has taken a lead role in many of the Urban Waters locations. The EPA Office of Water uses the UWFP to pursue a systems-based approach to water conservation and management in order to maximize economic, social, and environmental welfare in an equitable manner. IWRM strategies are prioritized while leveraging strong multi-stakeholder relationships to address specific issues such as water scarcity, water access, improved stormwater management, and riparian ecosystem restoration.

In 2020, EPA and other Federal and state partners established the National Water Reuse Action Plan (WRAP) as a coordinated public/private effort to advance water conservation, flood and drought resilience, and reuse activities across sectors and geographies. Given the focus of the Urban Waters program on using collaborative, integrated approaches to address major water and equity issues, EPA initiated an action in the WRAP to expand the use of established partnership programs like Urban Waters to achieve WRAP objectives on a larger geographic scale. WRAP Action 1.4 outlined several projects to be undertaken with the active engagement of two geographically-based water partnership programs: the

[1] US Water Alliance; http://uswateralliance.org/wec/framework

Urban Waters Program (https://www.epa.gov/urbanwaters) and the National Estuary Program (www.epa.gov/nep).[2]

The project described in this report is a core element of WRAP Action 1.4. The objective of the project was to assess data and stakeholder perspectives related to water management and equity in two freshwater ecosystems, both of which are Urban Waters partnership locations. That assessment was used to identify systemic barriers and strategic opportunities for collaborative actions to improve conditions in the targeted river systems. This report draws out lessons learned from the assessment process which can be applied and replicated in other river systems. Prospective improvements through the project model would seek to address water conservation, capture, and reuse opportunities through IWRM and collaborative local stakeholder engagement, with a major focus on more equitable services to underserved communities within the two watersheds. The project was a collaboration between EPA's Office of Wetlands, Oceans and Watersheds (OWOW), the National Park Service (NPS), and River Network (RN). It is an example of how water equity can be integrated across watersheds and sectors to become a foundational aspect of water resource management work.

This report provides the summary of the core findings of the river system project, which focused on UWFP locations in the San Antonio River Watershed (Texas) and a critical tributary to the Rio Reimagined's Salt River and Middle Gila watershed: the Upper Verde watershed (Arizona). This report synthesizes information taken from more extensive analyses (attached in appendices) conducted by the Consensus Building Institute (CBI) and Industrial Economics, Incorporated (IEc), two partners on the project who facilitated extensive stakeholder engagement and outreach and conducted watershed analyses via water equity mapping efforts. The report and appendix documents provide findings, lessons learned, and a path forward for continuing work in the two watersheds with EPA support.

2. Project Development

2A. Location Selection

Project Team members developed an initial list of 18 river systems across the country to evaluate for possible inclusion in this project. All of the locations had connections to EPA's water partnership programs (i.e., UWFP or NEP locations) and/or the Healthy Watersheds Program; while 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 an initial list of 18 river systems in relation to the objectives of this project to identify 1-2 sites that met the following criteria: **prioritization and relevance of water reuse or water efficiency issues to systems' health**; existence of **local environmental justice or climate resilience work already underway**; and the **presence of a strong cadre of local stakeholders**. Project Team members conducted extensive outreach to partners across the various locations and engaged in detailed conversations to assess locations' fit to project goals.

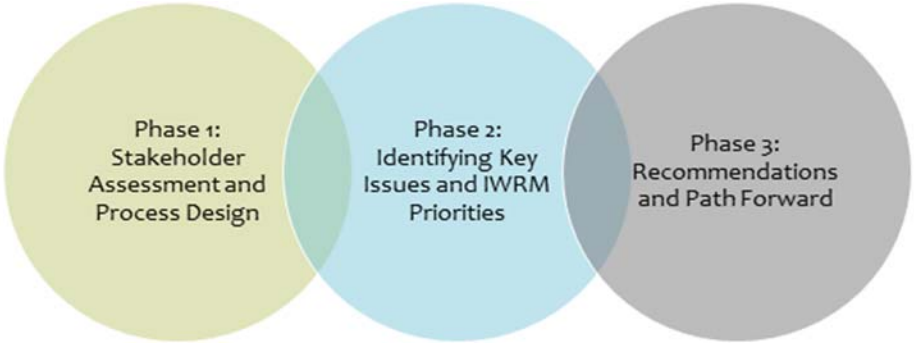
[2] The National Estuary Program is a place-based program (similar to the UWFP) established in 1987 under the Section 320 of the Clean Water Act to protect and restore the ecological integrity of 28 estuaries of national significance.

Team members selected San Antonio, Texas and the Verde River tributary to the Salt River in Arizona as the 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). To accommodate time and budget constraints, 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 project goals, and strength of relationships among partnership stakeholders. The project's work in the Verde River watershed was more limited in the number and scope of stakeholder engagement activities given time constraints for the project itself, as well as the outreach required to solidify participation in the location.

2B. Project Approach

The WRAP Project incorporated two separate levels of analysis: one grounded in extensive stakeholder engagement, led by the Consensus Building Institute (CBI), and a separate but parallel analysis based on water equity mapping, led by Industrial Economics, Incorporated (IEc).

Stakeholder Engagement **-** River Network engaged consulting firm CBI to facilitate the WRAP project in the San Antonio and Verde River basins. CBI followed a phased approach to exploring key challenges and opportunities for advancing equity-focused integrated water planning, including water reuse, in each watershed. The effort was also expected to highlight lessons for strengthening collaborative, integrated water management approaches at Urban Waters Partnership locations more broadly.



Phase I **-** CBI conducted preliminary stakeholder interviews and facilitated discussions with UWFP members to explore how water planning efforts might be expanded to include important and previously underrepresented stakeholders and to further emphasize water reuse activities.

Phase II **-** Recommendations from Phase 1 activities informed the goals, key messages, logistics, and support needed to promote further engagement with key stakeholders.

Phase III **-** CBI drafted the report included in Attachment 1 in consultation with the Project Team. The report includes a set of recommendations for advancing existing collaborative efforts, promoting more inclusive IWRM and addressing barriers to water conservation and reuse.

Water Equity Mapping / Recovery Potential Screening Application

Throughout the project phases discussed above, a parallel workstream in the project was advanced by IEc to provide visualizations integrating both social and environmental data in order to identify the most

vulnerable areas in the two locations. This project referred to these vulnerable areas as hot spots – geographic areas in which challenges with a nexus to water are being experienced disproportionately by low-income and BIPOC (Black, indigenous, and person of color) communities.

IEc worked with the EPA to utilize the Recovery Potential Screening Tool (RPS) to create numerous maps of social and environmental indicators for both the San Antonio and Verde River watersheds. The RPS tool was originally developed by the EPA's Healthy Watersheds Program to help states, territories and tribes identify priority areas for watershed restoration. It houses 284 unique indicators from many national database sources, including the National Hydrography Dataset, the US Census Bureau, and National Land Cover Database. The data are stored by Hydrologic Unit Code (HUC) at the HUC12 regional level, which delineate regional watershed boundaries at the local, sub-watershed level. IEc and EPA sought feedback throughout CBI's stakeholder engagement to establish which environmental and social indicators were the most appropriate for mapping.

IEc then took the RPS tool data and integrated it into GIS software to generate index scores that ranked the watershed regions for each location according to chosen indicators. The maps created were used to profile the watershed and to offer a more comprehensive and holistic view into each location with respect to integrated water management. Ultimately, this work also illustrates how the RPS tool could be applied in other UWFP locations around the country.

3. San Antonio Location

3A. Context

Since 2011, the San Antonio community, local agencies, and federal partners have worked 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.

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, Upper San Antonio, and Lower San Antonio watersheds. (See Exhibit 1 for a map of the full river basin.) The San Antonio River watershed holds significant value for the region, supporting native species, migratory birds, and other wildlife. 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.

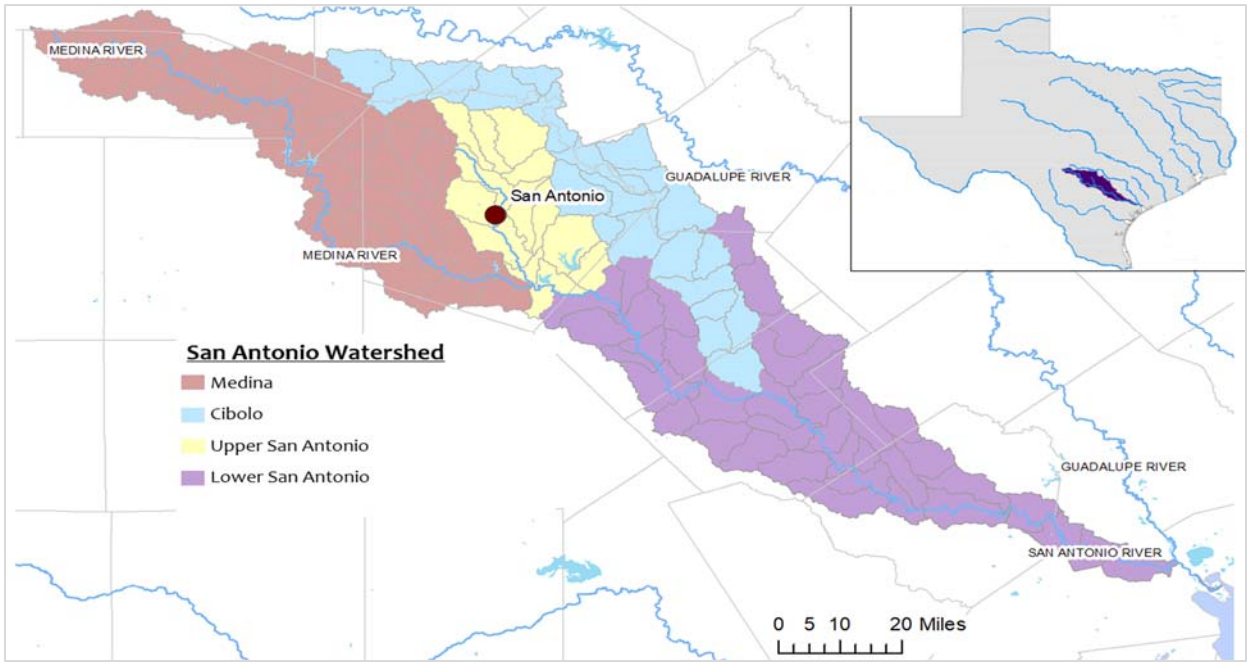


Exhibit 1. The San Antonio River Basin includes four major river basins: the Medina, Cibolo, Upper and Lower San Antonio.

3B. Approach

In the San Antonio River watershed, the focus of the project was to strengthen and revitalize the San Antonio UWFP, including broadening participation to include previously underrepresented communities in water resource management. In recent years, the San Antonio UWFP 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. Expected outcomes of this project included (1) identification of water challenges that could benefit from increased collaboration and engagement of historically underrepresented groups, and (2) an expansion of stakeholders engaged in IWRM and water reuse through the Urban Waters Federal Partnership.

Following stakeholder interviews and consultation with the UWFP Ambassador, EPA Region 6 project lead, and key UWFP members, CBI and the Project Team convened an ad-hoc UWFP work group focused on equity and community engagement to guide the UWFP's update of its work plan. Over the course of 3 meetings, the Work Group explored ways in which the UWFP can promote integrated approaches to watershed-wide issues of concern to historically disadvantaged communities.

For water equity mapping efforts, IEc staff selected the full San Antonio Basin to broaden the scope of watershed understanding around the San Antonio urban center. IEc incorporated data from 21 of the indicators available through the RPS tool and combined them to generate index scores for social vulnerability, human land and water use, watershed health, present and future climate vulnerability and toxicant load. For the full list of indicators, see the text box on the following page.

Vulnerability Indicators Applied from the RPS Tool

For the purpose of this combined report and the RPS Tool Analysis, a total of 21 indicators were incorporated into the analysis of the two regions. These indicators are categorized and listed below.

Social Vulnerability

1. % Low-Income Population in Watershed
2. % Minority Population in Watershed
3. % Linguistically Isolated Population in Watershed
4. % < High School Educated Population in Watershed
5. % Vulnerable Age Group Population in Watershed

Human Land and Water Use

6. Population Density in Watershed
7. Domestic, Agricultural and Industrial Water Demand in Watershed
8. Groundwater Source Protection Areas in Watershed

Watershed Health

9. % Natural Land Cover (N-Index1) in Watershed
10. Change in % N-Index1 in Watershed (2001-16)
11. Soil Stability, Mean in Watershed
12. Preliminary Healthy Watershed Analysis (PHWA) Watershed Health Index, State

Present Vulnerability

13. % 100-Year Flood Zone in Watershed
14. PHWA Water Use Vulnerability Index, State
15. Wildfire Hazard Potential, Mean in WS (2018)

Toxics Load

16. Toxic Release and Exposure Potential in WS
17. Hazardous Waste Management Sites, Count in WS
18. Risk Management Plan Sites, Count in WS

Projected Vulnerability

19. Projected Change in Annual Temperature
20. % Projected Change in Annual Precipitation, Inverse
21. % Projected Change in Annual Evaporative Deficit

3C. Stakeholder Engagement Process Findings

The following findings emerged through discussions with UWFP members, local stakeholders and Work Group members led by CBI:

- **The water challenges of greatest shared interest and priority for stakeholders in the San Antonio watershed include issues at the intersection of water quality, stormwater, and equity; rural and urban water dynamics; urban growth and integrated water and land-use planning; and climate resilience** (e.g., drought and flood preparedness).
- **Key water priorities and watershed-wide challenges in San Antonio are intertwined, creating opportunities to advance multi-benefit projects.** 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. In addition, trash and other pollutants carried by stormwater contaminate local water supplies. Stakeholders strongly support projects designed to address issues at the intersection of water management, trash and solid waste management, pollution, air quality, biodiversity, etc.
- **The San Antonio UWFP plays an important role promoting communication and connection across agencies and can bring value to the various collaborative efforts already underway.** These include IWRM efforts, water reuse initiatives and water equity efforts that are currently spearheaded by the City of San Antonio and local water agencies.
- **There is a need to incorporate considerations of equity and environmental justice more directly into the UWFP's work**. Consider prioritizing projects using equity mapping and tools such as EPA's EJSCREEN or the RPS tool. Stakeholders highlighted that these wealthier areas tend to be more flood resilient and have more green space, while historically disadvantaged communities 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.
- **There is a need to expand community outreach and education efforts**. Most stakeholders agreed that community engagement, equity, and public education could be a central element of the UWFPs work. They pointed to neighborhood associations as natural partners to engage with on issues, particularly those that result from historical inequities, and identified the need to connect with communities lacking neighborhood associations.
- **There is a need to better coordinate and leverage funding, and to work across silos to identify cross-cutting funding opportunities for multi-benefit projects and water initiatives.**
- **More can be done to integrate urban growth and water planning across the San Antonio metropolitan area.** This may include steering new development in unincorporated areas to better use, reuse and protect water resources, and promoting stormwater containment in areas of rapid growth.
- **Additional support is needed for the San Antonio UWFP Work Plan Update.** Stakeholders voiced a shared vision in moving from a project-based work plan towards a thematic approach, using equity as a guiding principle for the UWFP. Stakeholders identified the following areas as being ripe for promoting water equity: messaging/education, technical support, funding, and spanning

institutional boundaries. Topically, they suggested the UWFP focus on watershed health and resilience; stewardship, education and outreach; economic revitalization/prosperity; and collaboration and true partnerships.

3D. Water Equity Mapping Findings

The maps generated for the San Antonio region are designed to offer a holistic understanding of the watershed and to identify areas that experience comparatively high levels of social and environmental stress. To better understand population vulnerability, a series of five social indicators were equally weighted and a 100-point comparative index was generated using the RPS tool, henceforth referred to as the "broad social vulnerability index". Metrics included in these index scores include the percent of the population identified as:

- Low-income
- Minority population (non-white)
- Linguistically isolated (non-English household with low English proficiency)
- Less than a high-school education
- Vulnerable age group (below 5 and above 64).

The heatmap in Exhibit 2 illustrates the areas with the highest index scores.

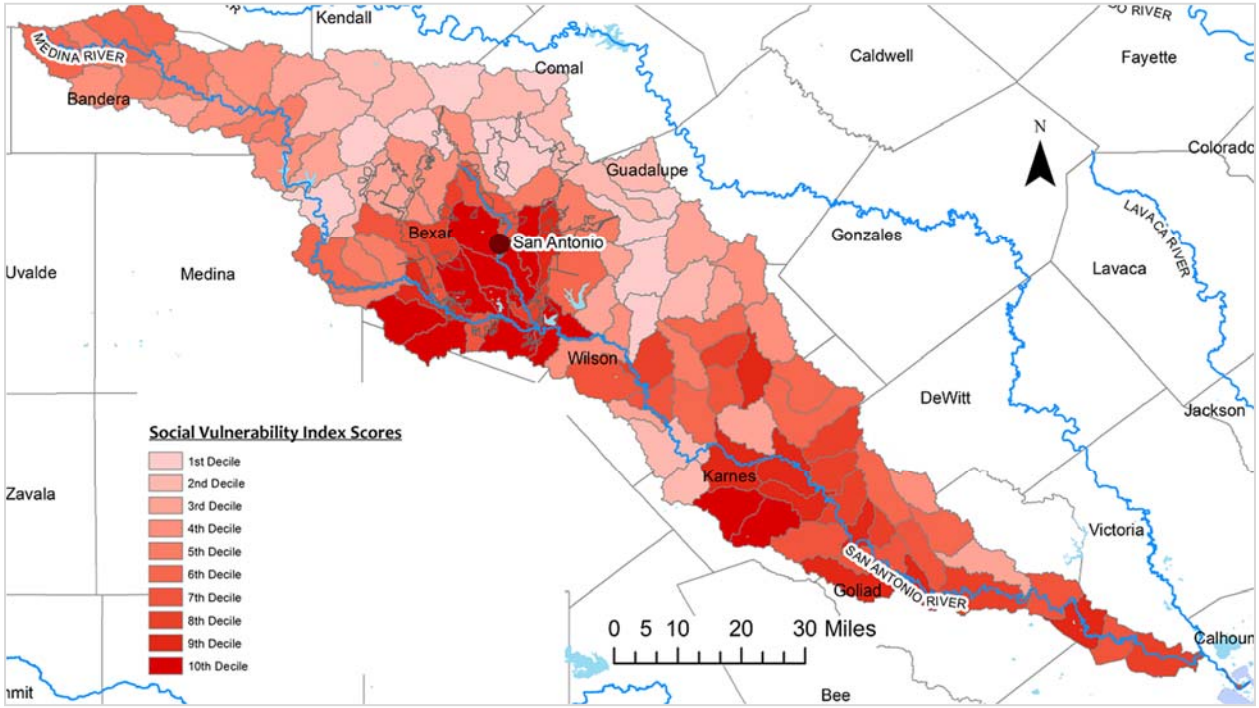


Exhibit 2. The top [10th] decile of vulnerable HUC12 regions in the watershed include the central and southern portion of the city of San Antonio and the HUC12 regions south of the city along the Medina River and directly south of the intersection between the San Antonio and Medina Rivers. Other socially vulnerable regions include the Hondo Creek region of Karnes County and central Goliad County along the San Antonio River, both downstream of the City of San Antonio.

Broad social vulnerability is more significant when considering watershed health alongside the social hotspots. Exhibit 4 visualizes the overlap between the top decile of socially vulnerable HUC12 regions and those with the lowest watershed health. The watershed health index was generated by combining three environmental indicators: the % natural land cover (N-Index1) in watershed, mean soil stability in watershed, and Preliminary Healthy Watershed Analysis (PHWA) water quality sub-index.

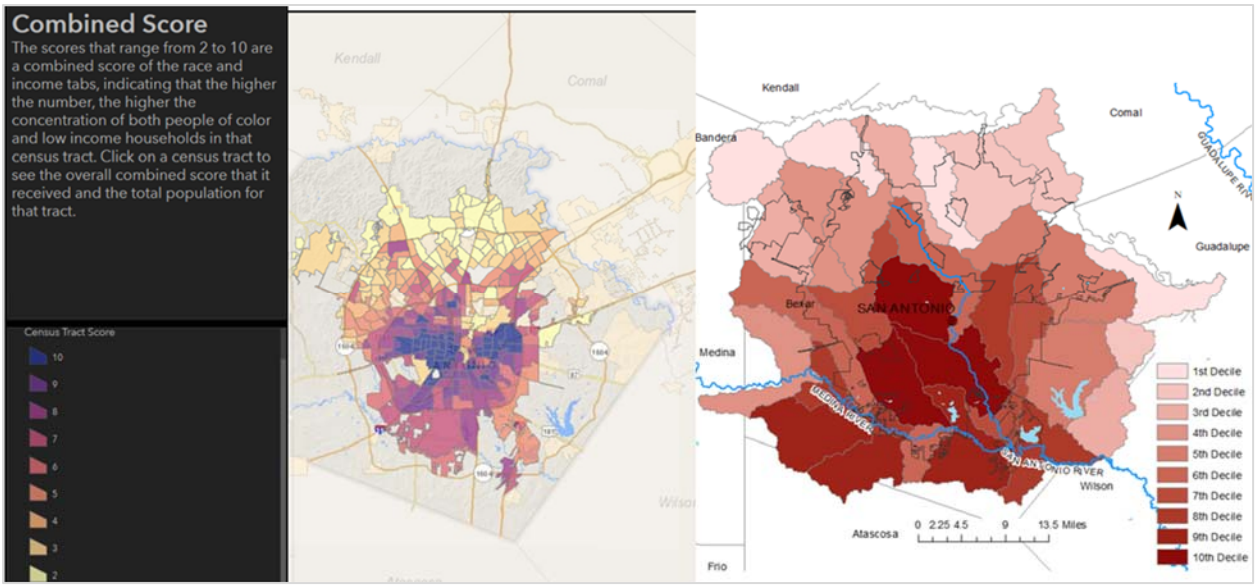


Exhibit 3. Equity Atlas low income and minority populations (left) within the city of San Antonio compared to RPS broad social vulnerability by HUC12 (right). The granularity of the San Antonio Equity map is finer and more clearly illustrates the population divisions within the city boundaries. The RPS map includes more indicators to generate the final score (percent linguistically isolated and percent vulnerable age group in addition to percent low income and percent minority). The RPS map also includes all HUC12 regions with a majority area in Bexar County, rather than only regions within the San Antonio city boundary. The map trends overlap and both indicate that central and Southern Bexar County are home to some of the most vulnerable populations.

As the hotspot maps displaying social and watershed vulnerability indicate, the HUC12 regions within the upper San Antonio River Basin through the city have the potential to benefit the most from water planning that supports environmental wellbeing **and** protects socially vulnerable populations. Increased green spaces, the development of water reuse systems, and the creation of community-driven efforts to protect the vulnerable communities against current and future environmental strain and natural disasters will help the city of San Antonio and surrounding counties to protect the population and shared water resources. Within Bexar County, communities in the central Southeast regions of San Antonio have consistently higher rates of non-high school graduates, and lower life expectancy. As of 2019, 15.6% of Bexar County received cash assistance or food stamps compared to 13.1% of Texas residents.[3] The 2019 Poverty Report also found that census tracts with the lowest life expectancy also had the highest poverty levels.[4] These high poverty levels contrast the high-income levels in surrounding areas that include military bases. Bexar County includes a series of military bases collectively known as Joint Base San Antonio (which comprises Fort Sam Houston, JBSA-Lackland and JSBA-Randolph). These military bases

[3] https://www.sanantonio.gov/Portals/0/Files/HumanServices/FaithBased/2019PovertyReport.pdf

[4] https://www.sanantonio.gov/Portals/0/Files/HumanServices/FaithBased/2019PovertyReport.pdf

provide direct and indirect jobs and increase revenue in the surrounding area. Major water infrastructure investment has been spent on wealthier areas of Bexar County, including these military bases.

The map on the right side of Exhibit 3 illustrates the broad social vulnerability index in Bexar County based on data from RPS. The map on the left side is taken from the San Antonio Office of Equity mapping project, which compiles data by census tract within the San Antonio city boundaries to show areas with the greatest low income and percent minority populations. Each census tract is scored from two to ten. These two maps show a similar distribution of vulnerable populations in Bexar County.

Outside of the city, regions south of San Antonio in central Karnes and Goliad Counties also face social and environmental vulnerability and lower resiliency compared to the rest of the watershed (see Exhibit 4). These hotspots are worth investigating more thoroughly to identify ways that water management may alleviate environmental and socioeconomic strain.

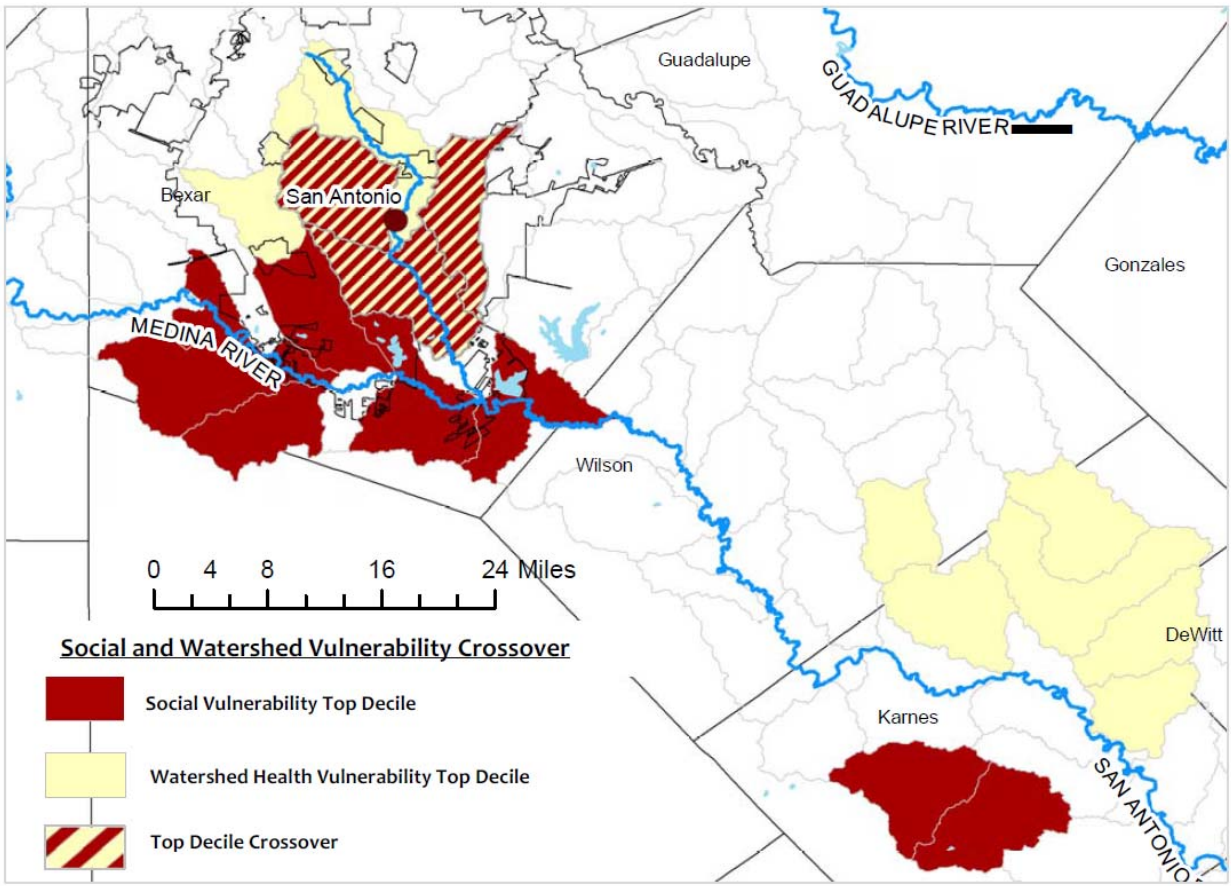


Exhibit 4. This exhibit shows the top deciles for broad social vulnerability (red) and watershed health vulnerability (yellow), and the overlap between these top deciles (striped). Areas of overlap indicate regions that fall within the top decile for both categories.

4. Verde River Location

4A. Context

As of September 2020, Rio Reimagined became the newest UWFP location, bringing together eight river communities to protect, restore and revitalize the river corridor. Initially, the project was intended to focus on the Rio Reimagined UWFP location, which is located in the Phoenix area encompassing a 58-mile stretch of the Salt and Gila Rivers in Arizona's Middle Gila watershed.

However, when information about the WRAP project was shared with Rio Reimagined partners, many did not feel the Salt and Middle Gila River watershed was in a position to pursue a project in the near term due to: local sensitivities surrounding source water management; the short project timeline; and the UWFP location's limited staff capacity, given its recent addition to the UWFP system and its lack of a designated Ambassador. The WRAP project team was advised to shift the focus to the Upper/Middle Verde, due to existing collaborative efforts underway and opportunities to build on their momentum and expand water reuse in an integrative way. While stakeholder engagement through CBI focused on portions of the Verde River basin, IEc undertook a larger scope for data visualization and mapping across the entire Salt/Gila/Verde watershed to provide greater context for regional IWRM with utility to a greater number of stakeholders working with the UWFP. Water equity mapping for the Arizona location of the project therefore encompassed the three river systems (see Exhibit 5).

The 192-mile Verde River is one of the last vibrant and flowing rivers in Arizona. It passes through federal, state, tribal and private lands, before reaching the confluence with the Salt River near Phoenix. Given its upstream location from the Rio Reimagined UWFP location, it is a direct supply of water to the entire river corridor (tied to the Salt and Gila Rivers). 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. The Verde River watershed is generally divided into three subsections (see Exhibit 6 below) including the Upper, Middle and Lower Verde. Given existing stakeholder collaboration and interest in the project, CBI focused their stakeholder engagement in the Upper and Middle portions. 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 into two major reservoirs, the Horseshoe and Bartlett dams, before joining the Salt River north of Mesa, Arizona.

Exhibit 5. 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 Verde River Basin to the North (yellow), the Salt Basin to the West (red), and the Lower Gila-Agua Fria Basin to the Southeast (blue). This entire area includes 634 distinct HUC12 regions.

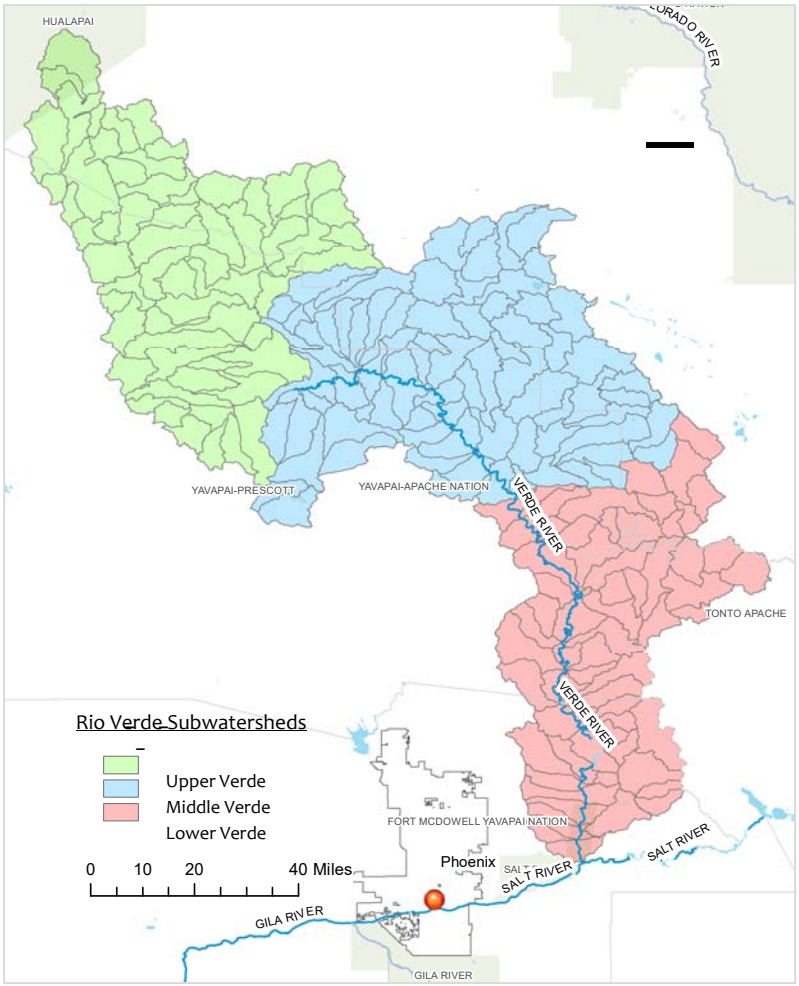


Exhibit 6. The subwatershed regions of the Verde River Watershed are the Upper, Middle and Lower Verde. The Verde River flows through these sub-watersheds to its intersection point with the Salt River.

4B. Approach

In the Verde River watershed, the goal of the project 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. Similar to the San Antonio location, water equity mapping was also created for the larger region in Arizona encompassing the Verde, Salt and Gila Rivers in order to provide more regional context on current social demographics, watershed health and land use change.

As described in the previous section on San Antonio, CBI used a multi-phase approach to engage stakeholders in Arizona, specifically in the Upper and Middle Verde River basin. CBI first conducted stakeholder interviews to identify key water issues and opportunities and then designed a more targeted engagement effort that culminated in a meeting with a small group of representatives from local non-profit organizations, watershed coalitions, and one of the tribal government representatives to outline the second phase of the WRAP project in the Verde River watershed. The strong take-away from that discussion was that the most promising forum through which to advance water equity, reuse, and integrated planning in the region is through an update to the Section 208 Water Quality Management Plan.

Although stakeholder conversations for the project primarily concerned the Upper Verde River Basin, the visualization scope taken on by IEc was designed to analyze the broader watershed area comprised of the Verde, Salt and Gila Rivers. Applying the same approach as used for the San Antonio watershed, indicators were selected from the RPS tool to help the Project Team identify watershed vulnerability hotspots for this region. These were then combined to create a set of indicator indices to allow the overlay of environmental and social factors tied into water equity concerns.

4C. Stakeholder Engagement Process Findings

The following findings emerged through discussions with UWFP members and local stakeholders:

- **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**. A significant proportion of the population relies on septic tanks, which in turn limits regional capacity for water reuse, recharge, and storage and presents 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.** 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. However, the funding and resources needed to support equitable IWRM need to be made available. Stakeholders pointed to a lack of sustained statewide funding and leadership to support IWRM at a larger watershed or regional scale.

- The 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.
- There is a massive need to secure new state or federal funding to advance IWRM and water equity, prioritizing multi-benefit projects (i.e., restore riparian corridors and fostering water conservation/reuse); enhanced community outreach on IWRM and sustainable growth; and improved climate resiliency.
- Efforts to promote IWRM, water conservation and water reuse need to be longer-term and have clear follow through. The state of Arizona lacks the resources invested in similar initiatives in California and could benefit from 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.
- Updating the Areawide Water Quality Management Plan (208 Plan) is a prime opportunity to leverage the existing partnerships and incorporate water reuse into integrated planning, as the current plan is almost 20 years old. There is a need for federal partners to provide funding, technical and facilitation support to address the existing resource and capacity limitations for such an effort. Specifically, the Verde watershed would benefit from EPA advocating to the Northern Arizona Council of Governments (NACOG) and the Arizona Department of Environmental Quality (ADEQ) that an updated 208 plan is a priority.
    - An updated 208 plan would foster water reuse and provide certainty and clarity around effluent discharge, consistent with the Clean Water Act. 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. For a detailed list of the key issues that stakeholders suggested for inclusion in the 208 Plan, see the full CBI Report (Appendix I).

4D. Water Equity Mapping Analysis Findings

As with the San Antonio location, IEc combined a series of indicators from RPS to create index scores and map overlays in order to better visualize the areas with the highest relative vulnerability across multiple social and environmental categories. They calculated the broad social vulnerability index and the watershed health vulnerability index using the same combination of indicators as used for San Antonio. The results are shown in Exhibit 7 and 8.

As can be seen in the exhibit, particularly high values for social vulnerability occur north of the Salt River around the Fort Apache-White Mountain Reservation. Additional vulnerability hotspots fall within the central and southern boundaries of the city of Phoenix, as well as the western half of Maricopa County along the Gila River. Some additional areas of vulnerability include northwestern Maricopa County and in the upper reaches of the Verde River watershed.

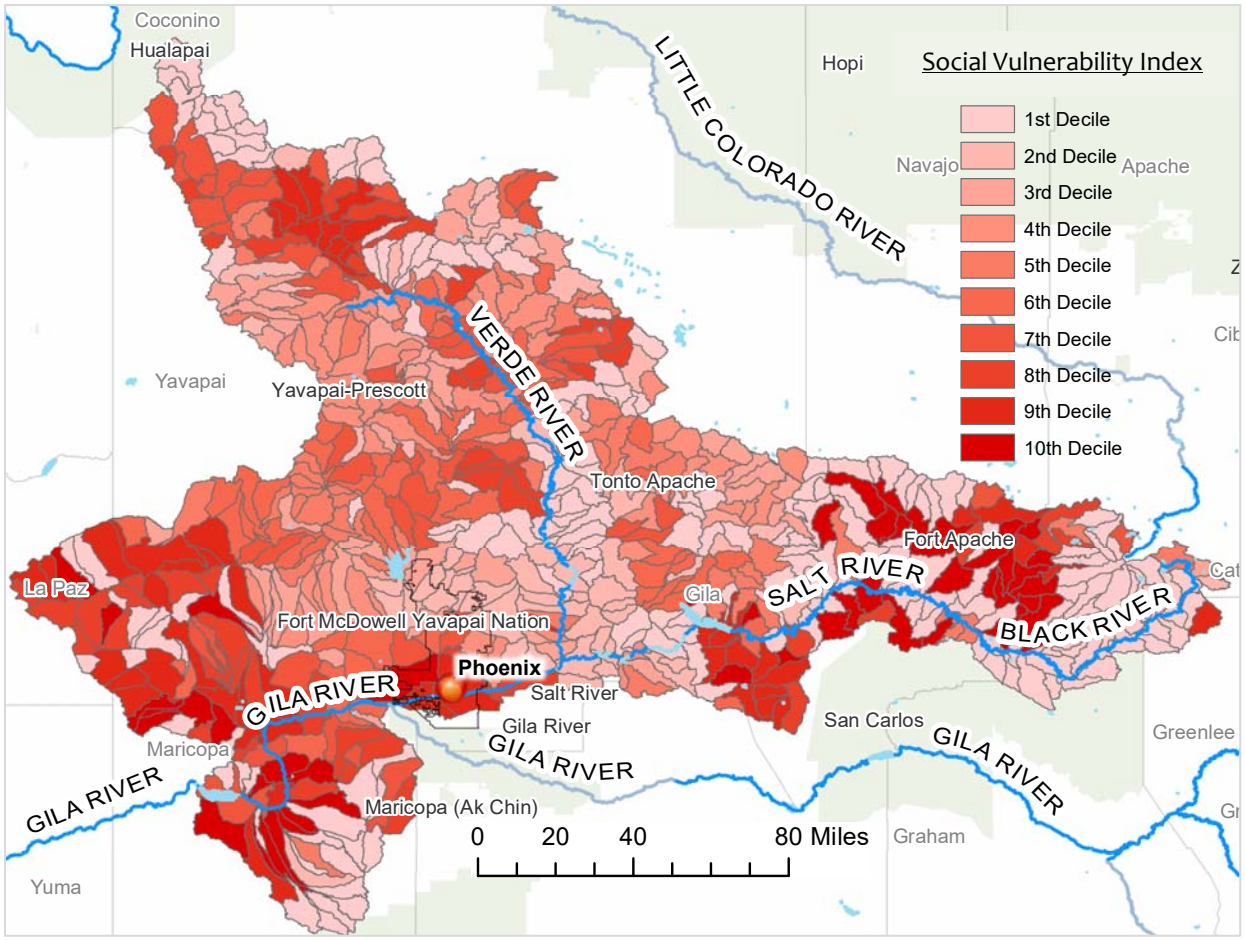


Exhibit 7. This heatmap displays the broad social vulnerability index across the Verde, Salt and Lower Gila watersheds, by decile. These scores integrate data from five indicators: the population identified as low-income, the percent minority (non-white), percent linguistically isolated, percent with less than a high-school education, and the percent vulnerable age group (below 5 and above 64).

Regions with the greatest watershed health vulnerability in the Salt, Gila and Verde River watersheds include the series of HUC 12 regions along and north of the Gila River, ranging from Phoenix through central Maricopa County, the Middle Verde subwatershed and parts of the Salt River (see Exhibit 8).

Maricopa county is the most populous county in Arizona, with over four million inhabitants, most of whom reside within and surrounding the city borders of Phoenix. In August 2021, 86% of Maricopa County was classified as a severe drought region by the National Oceanic and Atmospheric Administration.[5] Water management practices in the Upper Rio Verde and along the Salt River to the west ultimately impact the water flowing downstream towards Maricopa County via the Gila River. This water is needed to support the substantial agricultural land use in Maricopa and in Pinal County to the west.

[5] Historical Conditions for Maricopa County, Drought.gov

The Central Arizona Project (CAP) supplies water to nearly 80% of the state's population and significantly benefits Pinal County and to a lesser extent the population of Phoenix.[6] This said, regions within and just outside of the northern Phoenix city boundary (through which the CAP canal system runs) fall into the top decile of most vulnerable areas for watershed health based on natural land cover, soil stability and the EPA water quality index (Exhibit 8). Although these regions have access to water via the canal system, the health of these subwatershed is worthy of consideration in future water management planning. Subwatersheds outside of the Phoenix area with greater watershed vulnerability include those around Cottonwood near the border between Yavapai and Coconino counties extending to the west and East from the upper Verde River. Additional watersheds with high vulnerability include the HUC12 regions surrounding Roosevelt Lake, the largest visible lake along the Salt River in Exhibit 8.

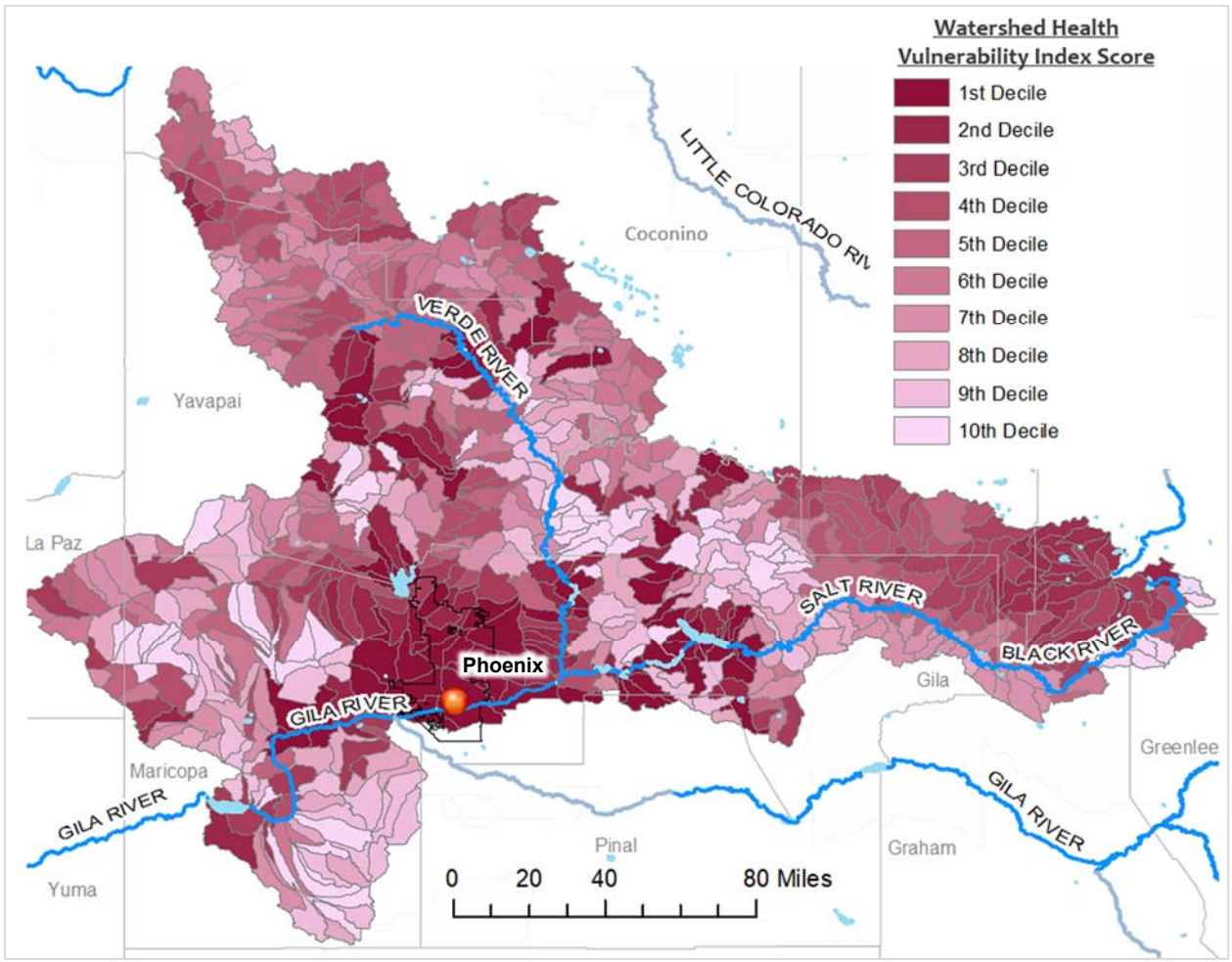


Exhibit 8. This map displays the watershed health vulnerability index, which was generated by combining three environmental indicators: the % natural land cover (N-Index1) in watershed, Soil stability mean in watershed, and Preliminary Healthy Watershed Analysis (PHWA) water quality sub-index. The top decile (darker colors) indicate areas with the highest vulnerability, or the lowest scores for these combined indicators.

[6] https://www.cap-az.com/water/cap-system/water-operations/system-map/

The map below (Exhibit 9) shows the crossover between the social vulnerability and watershed vulnerability indices. As with the San Antonio mapping, this allows us to identify some portions of the subwatersheds that could be considered “hotspots” in need of the most attention regarding water equity issues.

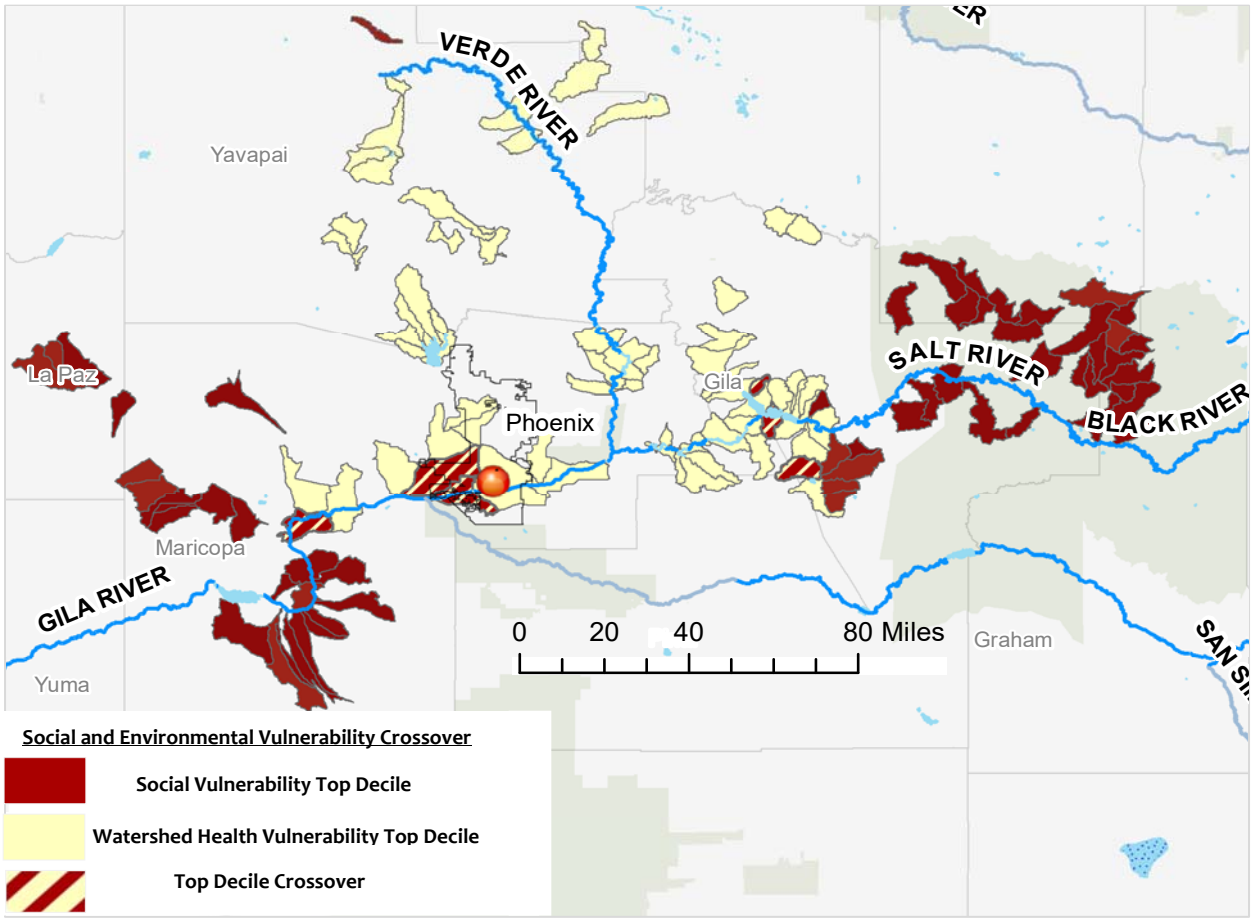


Exhibit 9. Top decile crossover between socially vulnerable HUC12 regions and those with the greatest watershed vulnerability based on the watershed health indicators. Striped HUC12 regions indicate areas of crossover between the HUC12 regions within the top decile for both indices.

The two indices are closely correlated across the map – areas of high social vulnerability along the Gila River south of Phoenix and the Salt River east of the city also have high watershed vulnerability index scores. Additional areas to consider that suffer from watershed vulnerability or social vulnerability are the Upper Verde subwatershed and areas upstream along the Salt River (e.g., the northern section of Graham County and the southern regions of Navajo County. These areas fall within the San Carlos and White Mountain Apache Tribal lands. It will be of particular importance when developing water reuse action plans to consider tribal communities, especially those that are not served by the CAP system. Policy and management changes in hotspot areas that focus on human equity are likely to support surrounding ecosystem health and vice versa. Additionally, the environmental stresses that occur in portions of the Verde River watershed are likely to adversely impact areas downstream of vulnerable subwatersheds.

5. Lessons Learned

5A. Lessons Learned from Stakeholder Engagement

Over the course of the project, the project team held iterative discussions on how to improve processes moving forward within the current timeline, as well as lessons learned for future endeavors tied to water equity, IWRM, and water reuse. The following section provides a summary of the most pertinent lessons learned from the start of project development all the way through the stakeholder engagement and water equity mapping efforts. These points are meant to provide useful feedback to EPA, other Federal partners, and partners in each location, on how to more successfully advance water reuse and IWRM efforts through a water equity lens.

- **There is enormous value in investing time and resources upfront to build transparent and effective relationships with communities on-the-ground for sustainable outcomes.** This project exemplified the amount of time it takes to build trust with community partners for effective engagement, something which EPA's existing partnership programs (i.e., UWFP and National Estuary Program) are well-versed in. This project created a space to learn about and provide an analysis of current barriers and motivators to advance IWRM and water reuse in both localities, with the long-term objective to enable consensus-based and effective strategic planning in these watersheds. More time is required to:
  1) build additional trust with community partners;
  2) demonstrate a commitment to meaningful long-term outcomes;
  3) establish the credibility for partners to engage in creative, multi-purpose, multi-stakeholder planning across traditional siloes;
  4) engage those most impacted by historic water-related inequities and those who may stand to gain the most from water reuse and IWRM efforts; and
  5) work through existing structures and processes to develop new sustainable approaches to water planning at the neighborhood, local and/or regional levels.
- **There is a need to develop a clearer definition of 'underrepresented' or 'under-served' groups in any given location upfront and be clear that using a water equity lens changes the conversation.** For example, in the Verde River watershed rural communities tend to be underrepresented in state water planning processes, yet in other instances, these communities have louder voices and greater influence. Participants suggested focusing particularly on low-income neighborhoods, including Tribes and other communities of color when discussing 'underrepresented' or 'under-served' groups.
- **The EPA's role may vary depending on how far along stakeholders are in embedding equity into their work.** In San Antonio, equity is part of the City's overarching policy and therefore a commitment to integrate equity into water planning is shared. In Arizona's Verde watershed, these conversations are newer, more contested, and playing out differently. In some locations, it may make sense for EPA to support water equity by probing and asking questions to better understand what equity looks like 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 experts and efforts.

- Begin with an assessment to understand what efforts are already underway and to ensure alignment between Federal goals and local priorities. Federal support is more effective when building on existing work and when efforts are tailored to address local stakeholder needs, fill gaps, and scale successful efforts. Prior to selecting locations, and during the early phases of a project, Federal partners 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.
- Demonstrate a longer-term commitment and communicate the government 'stake' in the issue or effort. This includes outlining clear, consistent opportunities for continued engagement. Local water planners may be understandably skeptical of 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 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, stakeholders need a clear reason and incentives to engage.
- UWFPs can play important roles in advancing water equity through IWRM and water reuse planning. They can provide 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. 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, supporting later developments and improvements upon watershed spatial analysis through the use of local watershed and infrastructure data. Questions related to water equity can be initially explored through a stakeholder assessment process that engages a discussion on the communities that have been historically missing from water planning efforts. Preliminary water equity mapping 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. While tools such as RPS are useful to generate broad snapshots of any river system in the U.S., maps could become more impactful when paired with local information.
- Equitable investments in infrastructure, including maintenance of existing infrastructure for water resource management, should be a top priority for all public and private partners. Specifically, in the Verde River project location, stakeholders pointed to the disparities in maintenance of water infrastructure throughout the watershed as a significant equity concern. Given the high number of septic tanks still being utilized throughout the basin, the replacement or removal of the septic tanks should be a high priority. Additionally, funding and human capital

investment could be provided to build capacity in low-income areas to initiate their own small water projects.

- **Tribes need to be at the forefront of integrated water planning efforts, particularly when focusing on equitable water management and engagement.** The Verde River flows through four Tribal Nations (Yavapai-Prescott, Yavapi-Apache, Fort McDowell Yavapi Nation, and Salt River Pima-Maricopa Indian Community). When expanded to the larger scope of the mapping efforts from this project, the Salt and Gila Rivers flow through two additional Tribal Nations: the Gila River Indian community and the Salt River Pima-Maricopa Indian community. Federal and state partners must support Tribal efforts to promote innovative, integrated water planning and maximize water reuse in compliance with the Clean Water Act.
- **Promoting inter-agency dialogue (across federal and state agencies) and using water equity mapping to identify "hot spots" can help prioritize multi-benefit/multi-use projects that advance equity.** Hot spots can inform areas to prioritize for funding, projects, and community engagement. The EPA and other Federal and state agencies affiliated with the UWFP could provide facilitation and technical support to advance equity mapping efforts in various ways:
    - Continue facilitating meetings to support local efforts to layer the City's equity matrix with existing water indicators such as those included in the EPA's RPS tool, in coordination with local water agencies (i.e., SARA and SAWS). Help identify and fill gaps in the data.
    - 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.
    - Support the UWFP in working with community partners to ground truth data, co-host various community engagement efforts, and refine equity/watershed maps to better reflect community lived experiences, priorities, needs, and preferences.
    - Provide facilitation and strategic support to UWFP leads to identify partners who can help fund, design, and implement community-based projects in key areas, based on local priorities.
    - 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, and scaling efforts.

5B. Lessons Learned from Mapping with the Recovery Potential Screening Tool.

The RPS tool is extremely valuable as a public repository of data for 284 social, environmental and stressor indicators. Given this, it has great potential to supplement IWRM and efforts such as this project, as it can help to jumpstart the visualization process to improve the understanding of social and environmental dynamics that impact water equity within and across watersheds. The tool is also

accessible to the public and downloadable directly from the EPA RPS website.[7] Lessons learned through this project about using the RPS tool to visualize water equity at the watershed level are outlined below.

- **RPS is a comparative tool, meaning that index scores are based on the raw data for the specific watershed region chosen by the user.** The index scores provide valuable insights into water equity within the selected region.
- **The tool's visualization display capabilities are limited in producing clear visualizations of a given watershed.** The tool has a user-friendly map function that is useful for quickly visualizing indicators. These maps are low resolution and cannot be used for water equity visualization. Fortunately, RPS data and results can be readily integrated into ArcGIS to produce higher-resolution maps that can be used effectively to convey water equity at the watershed and subwatershed levels.
- **Combining too many indicators to generate an index can lead to a significant amount of "noise."** The RPS tool allows users to incorporate as many social, stressor and environmental indicators as they choose. However, selecting too many indicators may obscure the relative contribution of any indicator(s) to each HUC12 index score.
- **Data stored in RPS may not be as recent or as granular as the most recent data collected locally.** Much of the data in RPS is from 2016 to 2019, while some indicators use even older data. Local agencies or communities may have more recent data that will better represent their communities and watershed as a whole.
- **Using the techniques developed through the course of this project, the RPS tool could be applied at any of the other UWFP locations.** The data in RPS is easily exportable and can be used with other software tools such as GIS to create visuals that could range in geographic scale from the full state to a handful of HUC12 regions. The modular nature of the RPS tool allows the user to easily select the region of interest and to identify data-driven hotspots within it. The tool, updated in August of 2021 to include a number of EJ social indicators, provides data from national data sources. For regions with little local data, RPS may serve as a first step toward identifying disadvantaged areas and areas that would benefit most from IWRM.

[7] Find state specific RPS tools at: https://www.epa.gov/rps/downloadable-rps-tools-comparing-watersheds