



**City of Phoenix**

**Tricia Balluff**

**City of Phoenix Environmental Programs Coordinator**

**Testimony Before the**

**Committee on Environment and Public Works**

**Perspectives on Ecosystem Restoration with the U.S. Army Corps of Engineers**

**June 7, 2023**

### **Introduction**

The City of Phoenix is located in the Sonoran Desert and is the fifth largest city in the U.S. and the 14th fastest growing metropolitan area in the nation. Its residents enjoy 300 days of sunshine and have access to the largest municipal park system in the nation *consisting of* 48,000 acres of parks and preserves.

Phoenix Water is one of the nation's ten largest potable water utilities and is the largest potable water provider in Arizona, serving 1.7 million customers across 540 square miles and providing wastewater treatment services for nearly 2.5 million people.

The City of Phoenix is the local sponsor for multiple U.S. Army Corps of Engineers (Corps) Civil Works ecosystem restoration projects associated with the Salt River, the main river through Phoenix and surrounding cities. Phoenix has firsthand experience of the significant benefits that can arise from a partnership with the Corps Civil Works division for ecosystem restoration.

The Salt River channel runs through Phoenix, just south of downtown. It has a mosaic of land uses and varies in width from approximately 500 feet to more than 3,000 feet wide. Typical uses in and along the Salt River include landfills, sand/gravel mining, and other industrial activities. Upstream regulation via the construction of federal dams has resulted in a highly altered river flow regime. This upstream regulation and long-running land use along the river has resulted in significant degradation of ecosystem values and reduced public benefit.

Three Phoenix Corps ecosystem restoration projects are congressionally authorized for the Salt River. When all three are complete, they will create a combined 19 contiguous miles of restored

river corridor through the City, directly benefiting river flows, habitat, wildlife, water quality, recreation, and surrounding underserved and protected environmental justice populations. This is why, for the last 10 years, Phoenix has been focused on obtaining the support and funding necessary to complete the remaining projects – Tres Rios and Rio Salado Oeste.

### **Riparian Areas in Arizona**

In the arid western United States, riparian areas along perennial and intermittent rivers and streams are estimated to be less than 2 percent of total land area, and account for approximately 0.4 percent of Arizona’s total area. These riparian areas generally support typical river vegetation such as cottonwood/willow galleries. Despite the small total land coverage, riparian areas are considered the most productive habitat in North America and provide important benefits. An estimated 70 percent of threatened and endangered vertebrates in Arizona depend on riparian habitat along rivers (Johnson 1989). Riparian vegetation acts as a buffer, helping to reduce the influx of non-point source pollution into rivers and streams, a significant benefit to water quality (Zaimes, 2007). Riparian corridors are important wildlife movement corridors, particularly in urban areas where they can act as connecting corridors between undeveloped areas. This wildlife movement is important in supporting a healthy biodiversity and ecosystem and promotes genetic diversity in both plants and animals, strengthening those populations.

In Arizona and New Mexico, it is estimated that as much as 90 percent of riparian forests have been lost (Ohmart and Anderson, 1986). The outsized impacts of riparian areas in the community compared to their size make them particularly rich and productive targets for ecosystem restoration.

Arizona also has many xeri-riparian areas, or vegetated corridors along the region’s ephemeral washes. These washes generally only have water flowing through them during and immediately following a rainstorm. Although these washes do not have continuous or long-term flow, they support xeri-riparian corridors that have a higher density of trees (such as palo verde, mesquite, and ironwood) and other vegetation than the surrounding upland desert, providing important wildlife habitat and movement corridors.

Prior to development and upstream regulation, the Salt River through Phoenix was a perennial stream with cottonwood/willow stands, in-river wetlands, and other typical riparian features with a median annual discharge of 950,000 acre-feet (Thomsen and Porcello, 1991). With the regulation upstream, the Salt River now presents a patchwork of ecosystem types, depending on the quantity and consistency of water flow in each reach of the river.

### **City of Phoenix and U.S. Army Corps of Engineers Ecosystem Restoration Overview**

Since the 1990s, Phoenix has engaged with the Corps to achieve positive change in the Salt River. This has resulted in three congressionally authorized projects in the river for which Phoenix is the local sponsor. Brief summaries of Rio Salado Phoenix and Rio Salado Oeste are

below, followed by a more in depth look at Tres Rios as an example of the multiple benefits of these types of projects.

### **Rio Salado Phoenix Ecosystem Restoration Project Summary**

Rio Salado Phoenix, an ecosystem restoration and flood control project, was the first major river ecosystem restoration project to be completed in Phoenix with the City as the local sponsor. A feasibility report for Rio Salado was completed in 1997, and the project was authorized by Section 101(a)(4) of the Water Resources Development Act (WRDA) 1999(Public Law 106-53). Phoenix and the Corps signed a Project Cooperation Agreement for construction of Rio Salado Phoenix in 2001. This project restored five miles of the Salt River just south of the downtown core from 28<sup>th</sup> Street on the east to 19<sup>th</sup> Avenue on the western end.

The low flow channel was improved to a 200-foot-wide, 15-foot-deep channel capable of carrying up to 12,200 cubic feet per second (cfs) of flow. Continuously present surface water supports willow/cottonwood riparian and wetland habitat along the low flow channel. Moving laterally across the river cross-section away from the low flow channel, the restoration gradient transitions from the willow/cottonwood galleries to the xeri-riparian habitat that provides significant value in the arid southwest, including mesquite bosques, before moving to upland species on the banks of the river. In all, approximately 595 acres of xeri-riparian, riparian, and wetland habitat was restored in the five-mile stretch of river.

This section of the river was lined with multiple historic landfills, and the Rio Salado Phoenix project removed approximately 1,185 tons of tires and 138,572 cubic yards of debris and waste from the river. Over 76,000 trees, shrubs, and forbs were planted. Rio Salado Phoenix was completed in 2009. Since construction was completed, over 150 species of birds and other wildlife have been observed in the area. Species protected under the Endangered Species Act are now using the area. The threatened yellow-billed cuckoo has been documented in the xeri-riparian habitat at Rio Salado for several years; and in 2021, an endangered bird, the Yuma Ridgway's rail, was observed in a Rio Salado wetland pond for the first time. Use of this area by these species is a clear indicator of the progress of the restoration project in providing long-term habitat value. Now, schools and universities utilize the area for education and research, over 40,000 people visit Rio Salado Phoenix each year, generally via one of the several trailheads constructed as part of the project and use the maintenance roads as trails for walking and biking. Thousands more volunteer every year to help keep Rio Salado beautiful, and the project provides strong ongoing community value and recreational benefits. With the vegetation and surface water, Rio Salado Phoenix also provides an- oasis of shade and cooling in our hot, urban environment.

### **Rio Salado Oeste Ecosystem Restoration Project Summary**

Rio Salado Oeste is a congressionally authorized project in WRDA 2007 (Public Law 110-114) that has not yet been constructed. This project will continue the work of the previous project, Rio Salado Phoenix, starting at 19<sup>th</sup> Avenue on the east to 83<sup>rd</sup> Avenue on the west, restoring

approximately eight miles of the Salt River through a Phoenix industrial zone with closely neighboring underserved and environmental justice communities. While some initial design was completed, the project was placed on hold in 2009 until 2022, when the Corps received Work Plan funding to continue work on this project. In coordination with the Corps Los Angeles District, Phoenix is entering into a new cost-share agreement to complete a General Re-evaluation Report (GRR) for this project. This project is a particularly important part of Phoenix's Salt River ecosystem restoration plans, as the critical connecting piece between Rio Salado Phoenix and Tres Rios. When all three of these ecosystem restoration projects are complete, it will result in approximately 19 miles of contiguous restored river through the heart of urban Phoenix.

### **Tres Rios Ecosystem Restoration Project Summary**

Given a unique opportunity to manage a perennial (drought resistant) water source within the arid region of Phoenix, Arizona, Phoenix teamed with the Corps, Environmental Protection Agency (EPA), the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, Arizona Game and Fish, Flood Control District of Maricopa County, the Arizona Department of Environmental Quality, and numerous other stakeholders, to create a solution to effectively use the treated effluent from the largest wastewater treatment facility in Arizona. The Tres Rios project encompasses the confluence of the Salt, Gila, and Agua Fria rivers, and runs from 83<sup>rd</sup> Avenue on the east to the confluence with the Agua Fria River on the west. This project not only establishes and restores important and historical habitat along the banks and within the Salt and Gila river channels, but also provides flood control to neighboring communities and proactively integrates water quality improvement, stormwater management, and water conservation and reuse.

Phoenix is the local sponsor for this project, which was authorized in Section 101(b)(4) of the Water Resources Development Act of 2000 (Public Law 106-541). The project has included multiple phases, including constructed wetlands, mesquite bosque, a levee, and in-river restoration. To date, multiple phases of this project have been completed, with the most recent phase completed in 2012. Awaiting additional funding, unconstructed phases have been on hold since that time.

Even partially complete, Tres Rios is a strong benefit to Phoenix and the surrounding community and provides important public benefits. Professional associations, groups, and visitors from across the country and the world now visit Tres Rios to learn about this successful project.

### ***Highlights of Completed Tres Rios Phases***

- Largest constructed wetland system receiving municipal effluent in the Southwestern U.S.; 250 acres and designed to receive up to 450 million gallons per day (MGD)

- Provides: attenuation of flows, emergent marsh habitat, submerged and floating aquatic plants, native riparian islands and banks around wetlands, and effluent polishing (particularly nitrogen and residual chlorine)
- Overbank Wetlands (approximately 130 acres); a 2.5-mile gravity-fed series of wetland ponds
  - Provides: wetland and aquatic ecosystems, riparian communities, improved flood control, conveyance of reclaimed water for downstream uses, passive recreation and fishing, and education and community benefits
- Flood Control Levee on the north bank; approximately 2.3 miles
  - Provides: flood zone protection for neighborhoods on the north bank of the Salt and Gila rivers east of the confluence with the Agua Fria River
- In-River Restoration (partially complete); approximately 2.5 miles of in-river restoration in the Salt and Gila rivers
  - Provides: low flow channel conveyance improvements for flood risk management; invasive species removal; wetland, aquatic, and riparian ecosystems; passive recreation and fishing; and conveyance of reclaimed water for downstream uses

### ***Benefits Overview of Tres Rios***

A few of the benefits experienced by Phoenix and the surrounding communities through the construction of Tres Rios are listed briefly below. The benefits highlighted in italics are carried forward for further discussion in the following sections.

- *Improves effluent water quality; the treatment wetlands polish treated effluent to further remove nitrogen, whole effluent toxicity, and total residual chlorine*
- *Expands native habitat and provides consistent discharge to the Salt and Gila rivers to sustain and improve existing aquatic, wetland, riparian, and xeri-riparian habitats*
- Provides flood control through levee establishment and improved hydraulic efficiency
- Conveys treated effluent to downstream users to satisfy contractual obligations
- *Provides fire risk reduction through the removal of invasive species*
- *Provides a platform for community recreation, involvement, education, and access to natural spaces*
- Sequestration of carbon through the development of biomass within the wetland and riparian areas
- Assist in reduction of the region's heat island signature by providing shade and evapotranspiration
- Passive recharge of local groundwater aquifer(s)

### ***Wastewater Treatment***

Tres Rios had its genesis in 1994, when the need for an alternative treatment solution for advanced nitrogen removal was identified pursuant to Clean Water Act National Pollutant Discharge Elimination System (NPDES) permit recommendations from the EPA. Small-scale demonstration ponds were constructed near the 91<sup>st</sup> Avenue Wastewater Treatment Plant in Phoenix and proved successful as an additional phase of treatment. Using 13 years of research and exploratory science from the adjacent prototypical demonstration wetlands, the project sponsors and the design team were able to apply the unique learning to the full-scale wetlands design.

Designs then moved forward to construct full-scale wetlands for final water finishing before discharge effluent to the receiving Water of the U.S. (Salt River). These full-scale wetlands became one of the first phases of Tres Rios to be completed.

These wetlands (known as the Flow Regulating Wetlands) were carefully designed to improve the quality of the treated wastewater produced by the 91st Avenue Wastewater Treatment Plant. These wetlands use a natural and passive method to effectively remove chlorine from the disinfected wastewater. Additionally, they help convert and remove nitrogen compounds from the wastewater. The wetlands transform ammonia through several processes into nitrogen gas, which is then released into the atmosphere. By implementing this eco-friendly infrastructure, the City has avoided the need to spend \$375 million on extra mechanical treatment equipment for the 91st Avenue Wastewater Treatment Plant.

As a result, Phoenix has a highly valuable wetlands that demonstrate the capability to engineer facilities that not only meet functional requirements and comply with regulatory concerns, but improve the environment and habitat quality while also providing community benefit.

#### *Creates and Sustains Native Habitat*

Tres Rios' use of treated wastewater effluent to support ecosystem restoration components makes this Corps ecosystem restoration project unique. Habitat restored thus far at Tres Rios includes hundreds of acres of wetland and riparian habitat on the north bank of the Salt River and in the Salt and Gila river channels. Similar to Rio Salado Phoenix, the cottonwood/riparian habitat is focused along the wide low flow channel within the larger river channel with habitat transitioning to xeri-riparian and mesquite bosque habitat moving laterally away from the low flow channel.

Through the treatment and direction of effluent discharge, Tres Rios provides a consistent flow of water to the Salt River that sustains and improves aquatic, wetland, and riparian habitat. Combined with the invasive species removal and native species plantings that occurred, this has resulted in Tres Rios designated as a "Globally Important Bird Area" by the Audubon Society.

Capturing the diversity of the arid southwest's riparian and xeri-riparian ecosystems within Tres Rios expands the functional use of the ecosystem restoration effort. As a result, the area

currently supports more than 200 species of birds and other wildlife, including species listed as threatened or endangered under the Endangered Species Act.

The removal of stands of saltcedar, a highly competitive and invasive tree that has now invaded nearly every drainage system in the arid southwest, will be beneficial in the short-term and long-term to native habitat. Short-term, removal of saltcedar gives native riparian species the space and opportunity to grow with a competitive advantage. Long-term, saltcedar secretes salt at a high rate which is deposited on the soil and can be a deterrent to native plant species. Removing saltcedar may allow the soils to attenuate over time and make the area more conducive to continued native vegetation germination and growth.

Riparian habitat also provides many additional benefits that are sometimes overlooked, including improving water quality in rivers, increased evapotranspiration and lower heat, filtration of nutrients through plant uptake, and benefits to surrounding and visiting community members.

#### *Fire Risk Reduction*

Removal of invasive species has provided critical fire risk reduction for the region. As mentioned previously, a competitive invasive species in the arid southwest is the saltcedar (*Tamarix* spp). Saltcedar is a shrubby tree that grows in dense patches, is more tolerant of a diversity of soil conditions than many native riparian species, and also results in a significant amount of vegetative debris accumulating in the understory. When fire occurs, saltcedar can burn hot and fast. After the fire, saltcedar generally sprouts vigorously and has increased flowering and seed production, allowing it to recover from fire more quickly than many native riparian species. This exacerbates the loss of native biodiversity as saltcedar replaces native vegetation and creates a growing fire risk in southwest riparian areas.

Tres Rios removed a substantial amount of saltcedar, particularly within the river channel. This removal and the preservation and additional planting of native riparian vegetation improves fire risk both in terms of fire frequency and severity.

#### *Recreational Benefits*

Tres Rios provides co-benefits to the community by providing access to natural riparian spaces in our urban environment, which social sciences research indicates provides important physical, mental, emotional, and social benefits to individuals, our community, and the City. The community also benefits from the carbon sequestration, shading and evapotranspiration effects of ecosystem restoration, which are important heat reduction elements in our desert city.

The success of Tres Rios has drawn visitors from across the country and the world, resulting in economic benefits to area businesses and knowledge-sharing in the scientific community. Tres Rios has been used for multiple research studies, including at least one tracking behavior of the threatened Yuma Ridgway's rail.

Although not the primary purpose of Tres Rios, with excellent birdwatching, fishing, biking, and walking opportunities and the heat reduction benefits that come with vegetation and the river, Tres Rios offers plentiful enticements to the community to get outside and connect with nature.

### **Next Steps for Tres Rios**

Although close to completion, Tres Rios was on hold from 2012; however, the project received \$1.8 million in Community Project Funding in fiscal year 2022 for the Corps to complete a Post-Authorization Change Report (PACR) to update the costs necessary to complete Tres Rios.

Future steps and anticipated benefits include:

- Continuing improvements to the low flow channel for flow conveyance and native riparian habitat in the river
- Continuing removal of aggressive and high fire risk invasive species
- Continuing improvements to native biodiversity and wildlife habitat
- Increasing local community access to a natural space

The Corps Los Angeles District has been working for the past year on the cost update for the remaining phase of Tres Rios. Phoenix looks forward to the benefits of this project multiplying further when the project is authorized in the upcoming WRDA 2024 bill to complete the Tres Rios project.

### **Conclusion**

Phoenix anticipates the benefits we have already seen from City's other ecosystem restoration projects, to expand even further upon completion of Tres Rios and construction of Rio Salado Oeste. When these three ecosystem restoration projects are complete, there will be approximately 19 miles of contiguous restored river habitat through the heart of Phoenix, multiplying the benefits beyond what any one of these projects achieves on its own. These projects are all part of Rio Reimagined, the 20th EPA Urban Waters Federal Partnership location and are a top priority for Phoenix Mayor Kate Gallego.

Phoenix is appreciative of the many benefits that have come from collaborating with the Corps Civil Works team on ecosystem restoration projects, and we fully support the Corps' mission in undertaking and completing ecosystem restoration, particularly in the southwest. Ecosystem restoration benefits not just the city directly involved, but the broader community and region.

### **References**

Johnson, A.S. 1989. The thin green line: riparian corridors and endangered species in Arizona and New Mexico. In: Mackintosh, G. (ed.), In defense of wildlife: preserving communities and corridors. Defenders of Wildlife. Washington, DC. pp. 35-46.



Ohmart, R.D. and B.W. Anderson. 1986. Riparian habitats. In: Cooperrider, A.Y. et al. (eds.), Inventory and monitoring of wildlife habitat. U.S. Bureau of Land Management Service Center. Denver, CO. pp. 169-199.

Thomsen, B.W. and J.J. Porcello. 1991. Predevelopment Hydrology of the Salt River Indian Reservation, East Salt River Valley, Arizona. U.S. Geological Survey Water-Resources Investigations Report 91-4132.

Zaimes, G. 2007. Defining Arizona's Riparian Areas and Their Importance to the Landscape. In: Zaimes, G. (ed.), Understanding Arizona's Riparian Areas - AZ 1432. University of Arizona Cooperative Extension, Tucson, AZ. pp. 1-13.