

Environmental Restoration in Urban Arizona
Sharon B. Megdal*
July 2005

Introduction

Arizona's rapid growth and arid environment have stressed groundwater tables and riparian areas throughout the state. Since 1980, when Arizona enacted the Groundwater Management Act, the focus of water management efforts in the two major urban areas of the state has been on substituting renewable water supplies for groundwater.¹ The Phoenix metropolitan area has benefited from the construction of the series of dams and reservoirs that make up the Salt River Project, one of the first projects built by the United States Bureau of Reclamation. For years, cities and farms in Maricopa County have relied on water from the Salt and Verde Rivers. More recently, the Central Arizona Project, also built by the Bureau of Reclamation, has brought Colorado River water to the Phoenix and Tucson regions.

Although Arizona is dry much of the year and has been experiencing drought conditions, flooding is also a threat. Infrequent but heavy rainfall can inundate rivers and washes. The United States Army Corps of Engineers, working with county flood control districts and other local government agencies, has been the key federal partner in constructing flood control structures to limit property damage due to flooding.

Historically, these major civil works projects focused on people and their property. There were limited concerns about the impacts of increasing water use and construction of structures on riparian ecosystems. Arizona's desert environment and rapid growth, however, have resulted in significant threats to, or diminishment of, riparian areas throughout the state. A refocus on restoring degraded habitat has resulted in many efforts designed to improve, restore and/or preserve the environment. The importance of these projects to the quality of human and non-human life in the Sonoran Desert is made evident by significant actual and planned public investments. This paper provides the context for the environmental restoration efforts undertaken by the U.S. Army Corps of Engineers, in partnership with local governments in Pima and Maricopa Counties, the two most populated counties in Arizona. Discussion of a few examples of environmental restoration projects will demonstrate the importance of these efforts to the overall urban landscape.²

* The author is Director, Water Resources Research Center and Professor and Specialist, Department of Agricultural and Resource Economics, University of Arizona. She thanks Jennifer Jones and Kelly Mott Lacroix for excellent research assistance and Chris James for assistance with photos. This paper is based on a presentation made at the Urban Design in Arid Regions Second International Symposium, Tucson, Arizona, January 23, 2005.

¹ Megdal, Sharon. 2003. "How Water Management in Tucson, Arizona Has Affected the Desert's Landscape." Urban Design in Arid Zones Symposium. Santiago, Chile. Available at <http://www.ag.arizona.edu/AZWATER/presentations/mwdl.pdf>.

² The projects discussed in this paper are among those included in a study done by the author for the United States Army Corps of Engineers, entitled *Environmental Restoration Projects in Arizona: The U.S. Army Corps of Engineers' Approach*, June 2005.

The U.S. Army Corps of Engineers Approach to Ecosystem Restoration

The United States Army Corps of Engineers is part of the U.S. Department of Defense. The Corps' role in civil works has changed as the needs of the country have changed. The missions today fall in four broad areas: water infrastructure, environmental management and restoration, response to natural and manmade disasters, and engineering and technical services to the Army, Department of Defense and other Federal agencies.³ Funding for the Civil Works programs is authorized through the annual federal Energy and Water budget. Ecosystem restoration is a relatively new focus for the Corps. The purpose of ecosystem restoration is to re-establish the attributes of a natural, functioning and self-regulating system. The Corps pursues projects involving environmental restoration under multiple congressional authorities. Through its General Investigations (GI) efforts, the Corps participates in individually authorized programs. Environmental restoration projects may also be undertaken through Sections 1135 and 206 of the Water Resources Development Act (WRDA). The Section 1135 and Section 206 programs each have an annual program limit nationally of \$25 million, and each project under either of these sections is limited to a federal contribution of \$5 million. The investments associated with GI efforts are not so limited, and the federal government typically funds 65 percent of the construction costs. All projects, regardless of cost, require a local partner/sponsor.

The features of each ecosystem restoration project are tailored to the physical dimensions of the site. Each project is unique, and public input is obtained as the project is planned. Although a full description of Corps' urban restoration program in Arizona is beyond the scope of this paper, discussion of a few examples demonstrates the rich nature of these efforts.

The Arizona Context

Arizona has been an early beneficiary of Corps restoration interest and investment. This interest may be due to the degradation of many rivers and other areas, especially in the heavily populated parts of the state. In other words, in Arizona opportunities for restoration are plentiful and interest is high. In Maricopa County, varying stretches of the Salt River have been the focus. Five Corps projects in Maricopa County, Rio Salado Tempe, Phoenix and Oest, Valley Akimel and Tres Rios, are located on the Salt River. Prior to agricultural development and urbanization of the Phoenix metropolitan area, the Salt River was a perennial stream fed by snowmelt from mountains in eastern Arizona. Early in the 20th century dams constructed as part of the Salt River Project caused major modifications to the river system. As diversions of water increased for urban and agricultural uses, the river's perennial flows ceased, causing the water table to drop. Today only small isolated fragments of the natural riparian ecosystem remain.

The Rio Salado Project, which is under construction, has as its planning objectives to restore riparian habitat in and around the Salt River within the Cities of Phoenix and Tempe.⁴ Once defeated by the voters, the project has been revived. Approximately \$100 million dollars will be invested for the Phoenix reach alone. The five-mile, 580 acre Phoenix reach is designed to create a complete riparian system, which incorporates a diverse mix of riparian habitat types including

³ U.S. Army Corps of Engineers. 2004. *About the U.S. Army Corps*. <http://www.usace.army.mil>.

⁴ U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division. 1998. *Rio Salado, Salt River, Arizona, Feasibility Report*. Los Angeles: U.S. Army Corps of Engineers.

mesquite, cottonwood/willow, wetland marsh, aquatic strand/scrub, open water, and open edges. A series of shallow pools in the low-flow channel will be connected by a perennially flowing stream. Wells used to provide water for the project draw from the shallow aquifer and are part of a system for recovering effluent credits accrued pursuant to Arizona's innovative system of storage and recovery.⁵ These wells do not affect the drinking water aquifers. Canals to deliver water are lined due to operational cost issues. Irrigation is used to establish the 75,000 plants and shrubs that are being planted as part of the project.

Environmental education and passive recreation opportunities are important to the Rio Salado, Phoenix project. Three parking areas allow for public access, an educational staging area and restrooms have been constructed. In addition to the investment of the public sector, the non-profit organization Audubon Arizona is building a nature center at the site. It is hoped that this project will have spillover benefits beyond the banks to nearby distressed areas of Phoenix.⁶ This project is in the inner city, an urban core written about by Mark Reisner. In *The Cadillac Desert: The American West and Its Disappearing Water*, Reisner wrote: "Phoenix owes its existence to [the Salt River], but even so it doesn't seem to hold the Salt in high esteem. On both banks, the floodplain is encroached by industrial parks, trailer parks, RV parks, but no real parks. The flood channel itself has been developed to a degree, playing host to establishments which are, by nature, transient: topless bottomless joints, chop shops, cock-fighting emporia. Paris built its great cathedral by its river, Florence its palaces or art; Phoenix seems to have decided that its river is the proper place to relegate its sin." The multiple components of the Rio Salado restoration efforts will change the urban landscape.



Rio Salado low-flow channel site preparation
Photo courtesy of Karen Williams, City of Phoenix, Arizona



Rio Salado wildlife after construction
Photo courtesy of Karen Williams, City of Phoenix, Arizona

Another significant project in the Phoenix area is the restoration effort at the confluence of the Gila, Salt and Agua Fria rivers known as the Tres Rios. This project (estimated to cost \$100 million) involves an effluent-dominated river and is the site of a demonstration wetlands, which is open to the public. The wetlands project was undertaken by the U.S. Bureau of Reclamation. The

⁵ Megdal, Sharon. 2005. "The Importance of Water Storage and Recovery in Arizona." *Arizona Review*. Tucson: University of Arizona, Department of Agricultural and Resource Economics, forthcoming.

⁶ Williams, Karen. 2005. Comment made at the Water and the Environment Conference, Radisson Hotel, Tucson, Arizona, April 6.

Corps then became involved in the restoration effort. The planning objectives are to provide sustainable and diverse native riparian habitat, reduce flood damages, and increase environmental education and recreation in the study area.⁷ The project includes water features as well as a flood control structure. Along with Phoenix, multiple agencies are partners in this project, including the Maricopa County Flood Control District. Design for this project is almost complete.



Tres Rios demonstration wetland
Photo courtesy of the City of Phoenix, Arizona

In Pima County, the Santa Cruz River, the Rillito River and other areas have been targeted for restoration. Prior to degradation, the Santa Cruz River flowed year round at San Xavier del Bac and 10 miles north of downtown Tucson. Currently, the Santa Cruz is an ephemeral river, little riparian habitat exists, banks are deeply incised, and groundwater levels are at 150 feet below surface. Northwest of the city center, riparian growth is supported by wastewater flows, flows that could be eliminated in the future as this water is reused to satisfy human needs. In the past, the Rillito River, a tributary of the Santa Cruz River, flowed perennially, meandering and supporting dense vegetation of cottonwood, willows, mesquite bosques, numerous beaver dams, and wetlands. Over the years urbanization and agriculture increased, contributing to a loss in surface water flow, a decrease in the water table, and the need for bank stabilization. Today, like the Santa Cruz, much of the riparian habitat in the Rillito River is degraded. Two major projects, Paseo de las Iglesias and Tres Rios del Norte, are planned for separate reaches of the Santa Cruz River. Two other projects, El Rio Antiguo and Swan Wetlands, have been developed for overlapping parts of the Rillito River.⁸ The Pima County Flood Control District has been the lead local agency for most of the environmental restoration projects undertaken in Pima County by the Army Corps of Engineers, although Tres Rios del Norte involves Tucson and Marana as local sponsors.

⁷ U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division. 2000. *Tres Rios, Arizona, Feasibility Report*. Los Angeles: U.S. Army Corps of Engineers.

⁸ "Environmental Restoration Projects in Arizona: The U.S. Army Corps of Engineers' Approach."



Rillito River degraded habitat
Jennifer Jones



Effluent dominated reach of Santa Cruz River
Photo courtesy of Town of Marana, Arizona

The Tres Rios del Norte project is still in the planning stage. Like its Phoenix counterpart, this project involves the confluence of three rivers/washes, the Santa Cruz, the Rillito and the Cañada del Oro in the northwest part of the Tucson metropolitan area. Planning objectives include restoring wetland and riparian vegetative communities within the river corridor to a more natural state, increasing habitat diversity by providing a mix of habitats both in the river corridor and along the riparian fringe and buffer, and reducing potential flood damages in specified areas.⁹ Because effluent is a key water resource for this growing area, continued discharges of effluent cannot be assumed. Curtailment of discharges would have environmental repercussions and this project attempts to address these impacts. The water resource considerations together with the multi-jurisdictional nature of the project make this a challenging endeavor.

The Ed Pastor Kino Environmental Restoration Project, on the other hand, is an example of a completed, off-river project. It was undertaken to improve on the degraded conditions of the Tucson (Ajo) Detention Basin, which was constructed in 1966 as a flood control element to intercept and reduce peak flood flows. Section 1135(b) of WRDA of 1986 provides specific authority for the Corps to investigate, study, modify, and construct projects for the restoration of fish and wildlife habitats where degradation was attributable to water resource projects previously constructed by the Corps. The restoration of the Ajo Detention Basin in Pima County, completed and dedicated as the Ed Pastor Kino Environmental Restoration Project in 2002, was the first Section 1135 project for the Corps. Among the objectives of the Kino project are to restore wetland and riparian vegetative communities representative of historical/optimal conditions in the region, restore habitats for target/beneficial fish and wildlife species, to maintain the existing flood protection capacity of the Tucson (Ajo) Detention Basin, and to accommodate incidental recreational activities (e.g., interpretive centers, wildlife viewing, education and research).¹⁰ The project utilizes both reclaimed water and stormwater.

⁹ U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division. 2003. *Preliminary Draft Environmental Impact Statement, Tres Rios del Norte Feasibility Study*. Los Angeles: U.S. Army Corps of Engineers.

¹⁰ U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division. 1998. *Tucson (Ajo) Detention Basin, Pima County, Arizona, Final Ecosystem Restoration Report*. Los Angeles: U.S. Army Corps of Engineers.



Ed Pastor Kino Environmental Restoration Project
Jennifer Jones

Lessons Learned

Some important lessons have been learned from the projects discussed here as well as others in Maricopa and Pima counties. Each project represents an effort to improve on extant environmental conditions. They are examples of barren locations being brought back to life, and/or areas that, without intervention, will deteriorate. Each of the Corps environmental restoration projects includes a wide array of public and private interests. As previously noted Rio Salado, Phoenix will have a major nature center built by the Audubon Society. Tres Rios in Phoenix is a large-scale project that is moving forward with the involvement of many local partners, including local Native American tribes. Development of the Tres Rios del Norte in Tucson, also with multiple local sponsors, is ongoing.

The Army Corps process requires significant study and public airing of options. The Rio Salado projects represent an effort that came back to life after the public failed to approve a tax to support a large-scale project. One project proposed for Tucson, Agua Caliente, did not move forward due to local concerns. Perhaps not coincidentally, the site is already a beautiful area that is highly valued by the community. Although obtaining public input is part of these efforts, the outreach is usually to individuals living near the project area. The general public often knows little about these efforts. If aware of the efforts, they may not be aware of the role of the participants, including the federal government. If the projects do not require a revenue source or financing that must be approved by the public, they also may not be aware of the costs. In addition to Army Corps funding, other public funding sources include the Environmental Protection Agency, the Natural Resource Conservation Service of the United States Department of Agriculture, and, in Arizona, the Arizona Water Protection Fund. Private entities, such as The Nature Conservancy, the Sonoran Institute, and individual landowners, fund ecosystem restoration efforts as well.

The projects are like most major public works projects; they take significant time from conception to design to construction. And, even after project construction/ implementation, it will

take time to see the results. Over time, the landscapes are likely to look very different as a result of these projects.

In summary, ecosystem restoration projects can involve major investments, and their development phases can span many years, even decades. Once completed, observable results may take time. Ecosystem restoration projects may be part of multiple-purpose projects and/or other infrastructure projects and usually involve multiple partners. Finally, vision is important. These projects often result from “outside the box” thinking.

Interestingly, some restoration is taking place in urban Arizona “accidentally.” That is, riparian growth important to birds and wildlife results in an unplanned way from stormwater flows and/or wastewater discharges. Tres Rios in Phoenix and Tres Rios del Norte are two examples of significant riparian areas that could be considered accidental. These areas, which may be limited in size, can also provide benefits in unexpected places. For example, wetland habitat has been created by stormwater and wastewater at the intersection of two freeways in Maricopa County.



“Accidental” environmental restoration under two freeways in Maricopa County
Photo courtesy of the Maricopa County Flood Control District, Arizona

Involvement in ecosystem restoration extends beyond the urban areas of Arizona. Projects may range from those of individual landowners to the recently approved \$630 million, 50-year, multi-state Lower Colorado River Multispecies Conservation Program. Whatever their size, these important efforts are changing urban and non-urban landscapes alike.