



State of the **SANTA CRUZ RIVER**



Sonoran Institute Mission and Vision

The Sonoran Institute inspires and enables community decisions and public policies that respect the land and people of western North America. Facing rapid change, communities in the West value their natural and cultural resources, which support resilient environmental and economic systems.

Founded in 1990, the Sonoran Institute helps communities conserve and restore those resources and manage growth and change through collaboration, civil dialogue, sound information, practical solutions and big-picture thinking.

Our passion is to help shape the future of the West with:

- Healthy landscapes that support native plants and wildlife, diverse habitat, open spaces, clean energy and water, and fresh air.
- Livable communities where people embrace conservation to protect quality of life today and in the future.
- Vibrant economies that support prosperous communities, diverse opportunities for residents, productive working landscapes, and stewardship of the natural world.

The Sonoran Institute is a nonprofit organization with offices in Tucson and Phoenix, Arizona; Bozeman, Montana; Glenwood Springs, Colorado and Mexicali, Baja California, Mexico.

www.sonoraninstitute.org



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State of the Santa Cruz River—Conservation Inventory
companion document is available at: <http://tiny.cc/scrci>



Foreword

Water is the foundation for life—for our landscapes, our communities, and our economies. Rivers throughout the arid West have drawn people to their waters for millennia, linking us to the natural world and shaping our communities and heritage. However, with modern conveniences we may not consider our water’s origin or how personal water use can impact, or be impacted by, river and watershed conditions.

Looking to the future, a key challenge we face is our region’s increasingly stressed water systems due to growing populations and a changing climate. Many rivers are drying rapidly and groundwater levels are decreasing. Fortunately, Sonoran Institute and many others are striving to protect and restore rivers throughout the West.

The Santa Cruz River watershed provides drinking water for over one million people in both the U.S. and Mexico, including the city of Tucson. Though much of the Santa Cruz River bed is already dry, stretches of flowing water—seen and unseen—continue to preserve the region’s rich natural and cultural heritage.

The Sonoran Institute’s Santa Cruz River Initiative focuses on watershed restoration as a means to improve local water supplies. With our partners, we use research and science to track river health and promote innovative ideas that reduce urban water needs while enhancing local waterways. We also convene an annual event to celebrate and share the diverse conservation projects you will learn about as you read this publication.

In addition to providing good information, our goal with this report is to increase awareness and change behaviors. How can we better engage citizens and policy leaders to protect our vital water resources? Making the human connections regarding the benefits of our surrounding natural resources is the essence of the Sonoran Institute’s work. We provide communities with the tools they need to steward and protect essential natural resources.

The ultimate goal of *State of the Santa Cruz River* is to maximize our collective impact.

Join us as we tour the Santa Cruz River through time and find out how the passion of many is making a difference. Thank you for partnering with us in this vital work. With your support, we can preserve the river’s history and protect its future.

Maria Baier
Chief Executive Officer

The Santa Cruz River Valley generally refers to the lands along the river.

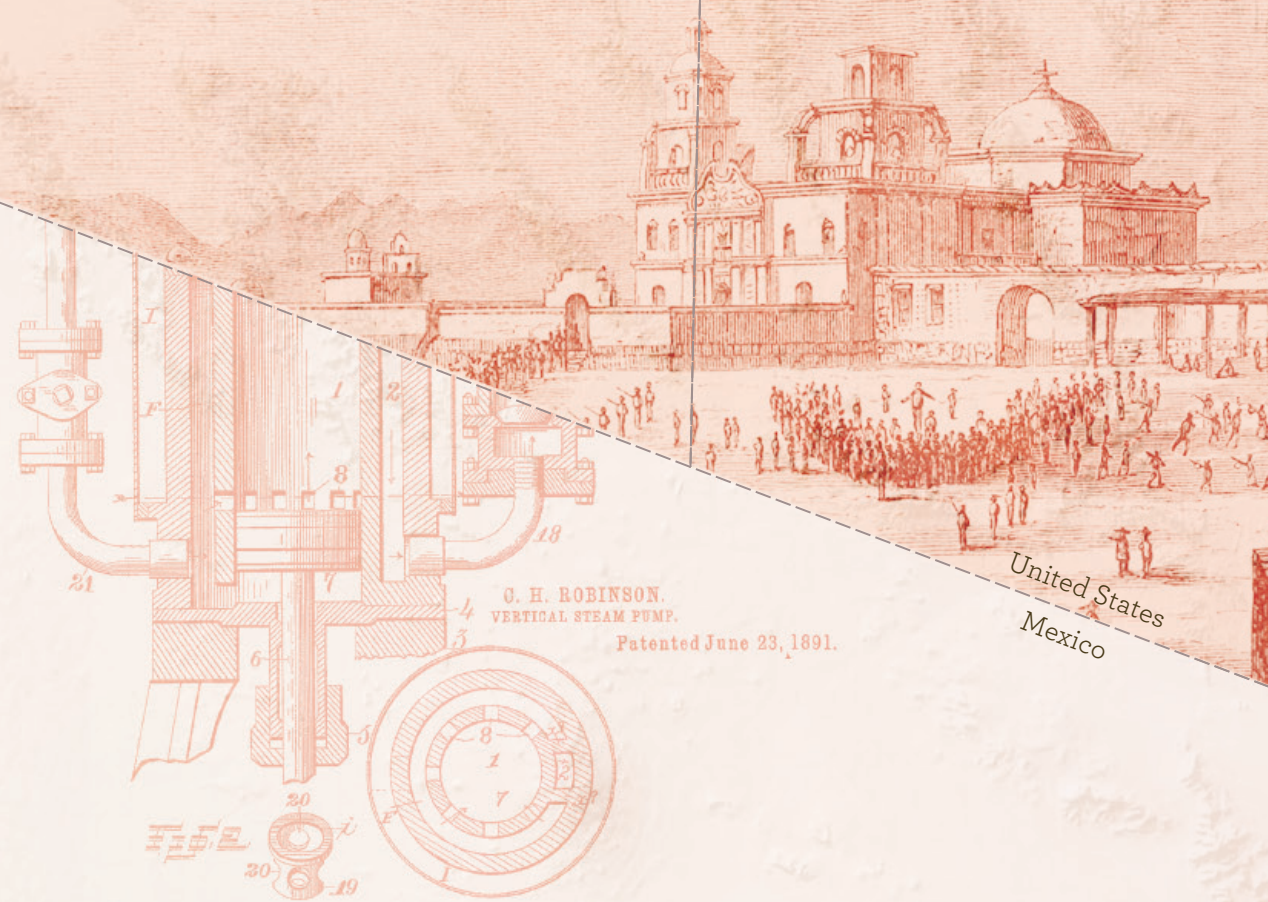
The Santa Cruz River Watershed refers to the Valley, creeks that flow into the river, and any land that water runs over, under, or through on its way to the river.

Introduction

The Santa Cruz River has a compelling human history. Telling this story can awaken a deeper emotional curiosity about the river and entice more people to explore the region’s rich heritage. The Sonoran Institute is not the first to recognize and share the river’s fascinating story. *The State of the Santa Cruz River* builds on the work of the Santa Cruz Valley Heritage Alliance. The nonprofit Heritage Alliance provides ongoing leadership in recognizing the important link between nature and culture.

Beginning in 2003 the Heritage Alliance led a visioning and public input process that engaged representatives from the ranching, farming, business, tourism, conservation, and government sectors. This diverse workgroup launched the first comprehensive effort to identify, interpret, and preserve heritage assets along the Santa Cruz River. In 2005, the group published a *Feasibility Study for the Santa Cruz Valley National Heritage Area*, which provides the framework for the story presented in the following pages. The Sonoran Institute’s intent is to illuminate historical events that relate to natural and cultural values along the river, rather than provide a comprehensive history of the region. References that supplement and deepen this history are listed at the end of the publication.

The Santa Cruz River’s ancient and multifaceted story also demonstrates why diverse conservation actions are needed to protect it. Sonoran Institute, as well as numerous individuals, agencies, and groups are working passionately to protect the water, wildlife, artifacts, and cultural heritage of the river. The involvement of so many parties necessitates a tool that will highlight areas of overlap and potential synergies. *The State of the Santa Cruz River—Conservation Inventory*, a companion document to this publication available at <http://tiny.cc/scrci>, will foster collaboration by allowing people working on-the-ground to keep abreast of “who is doing what, where” and help identify conservation priorities. The ultimate goal is to maximize our collective impact.

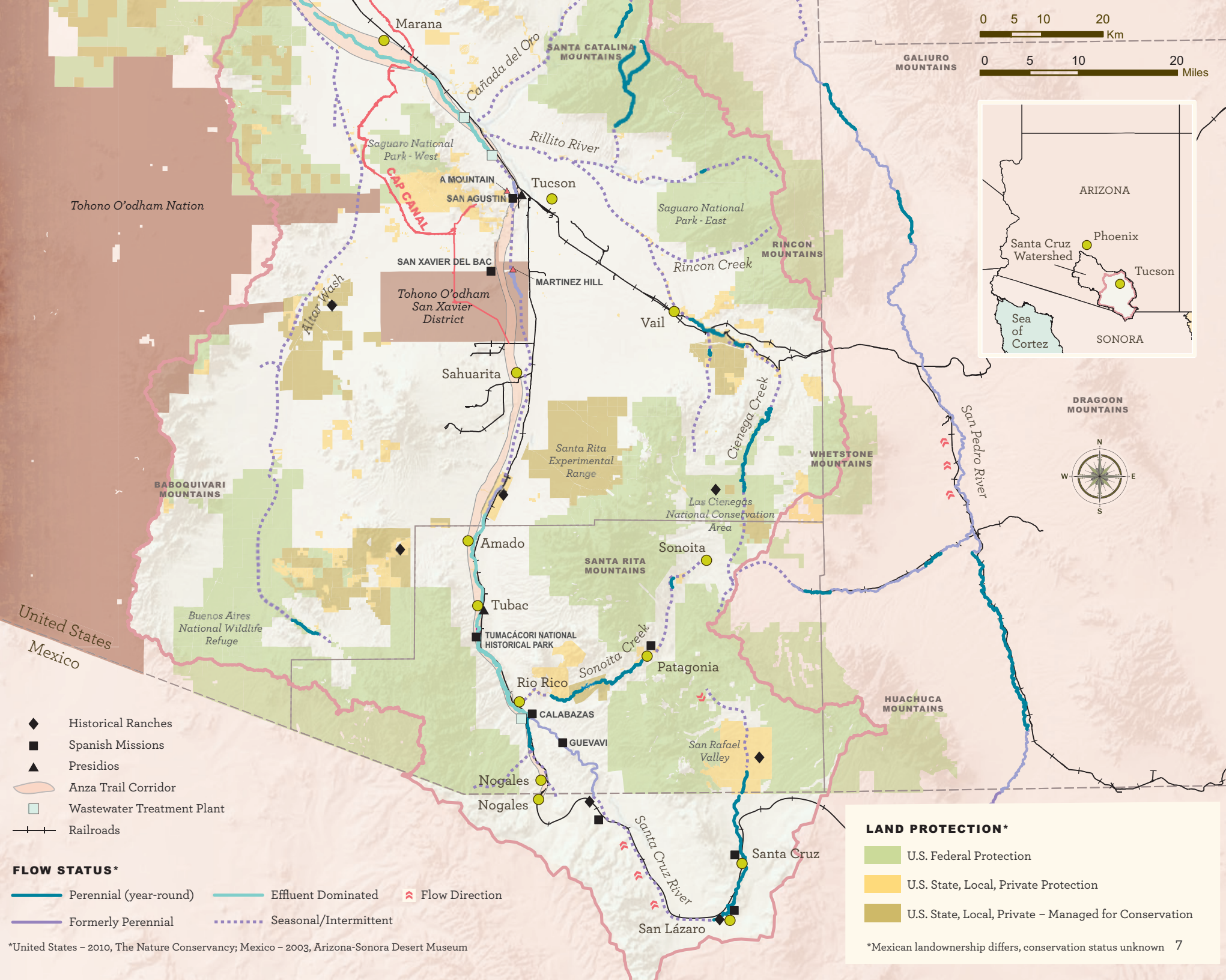


CULTURAL AND HISTORICAL CONTEXT FOR THE SANTA CRUZ RIVER

The vast and complex cultural history of the Santa Cruz River is inextricably linked to the natural history of the region. To understand the current state of natural and cultural resources and conservation efforts, we must be familiar with the river's story. This chapter provides a brief chronology of some important natural and cultural developments along the Santa Cruz River, from prehistory to the late 1900s. Construction of the Central Arizona Project water canal (completed in 1993) serves as a natural stopping point, as the canal imported water from the Colorado River and marks the end of the region's dependence solely on local water resources.



Sea of Cortez



- ◆ Historical Ranches
- Spanish Missions
- ▲ Presidios
- Anza Trail Corridor
- Wastewater Treatment Plant
- Railroads

FLOW STATUS*

- Perennial (year-round)
- Effluent Dominated
- Formerly Perennial
- Seasonal/Intermittent
- Flow Direction

*United States – 2010, The Nature Conservancy; Mexico – 2003, Arizona-Sonora Desert Museum

LAND PROTECTION*

- U.S. Federal Protection
- U.S. State, Local, Private Protection
- U.S. State, Local, Private – Managed for Conservation

*Mexican landownership differs, conservation status unknown



PREHISTORIC PERIOD

Geologists confirm that the Santa Cruz River has a long history of cycling between phases of flowing generously and shrinking to a meager existence. We join the river's story with the earliest record of human presence—a time when climate and geology were the main factors influencing the river's flow.

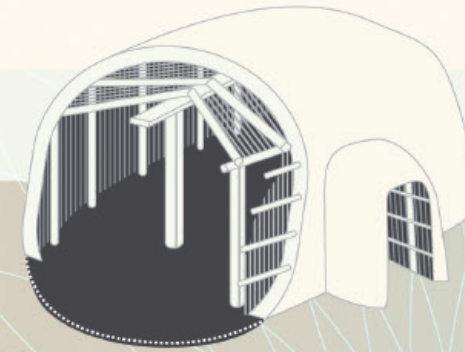
PALEO-INDIAN HUNTERS

The earliest widely accepted archaeological evidence of human occupancy in Arizona pertains to the Clovis culture, dated to approximately 11,500–10,900 B.C., a period when winters were generally wetter and summers were drier than today. Clovis peoples likely engaged in a mix of hunting-and-gathering, but are best known for hunting large mammals, such as mammoths, that are now extinct. The densest concentration of Clovis-age hunting sites with stone spear points and cutting tools is located in the San Pedro River Valley. Evidence for

Different types of Clovis points, used to hunt a variety of animals, including mammoths

Clovis peoples' use of the Santa Cruz Valley is sparse and limited to surface finds of several fragments of fluted spear points. Discoveries of unfluted spearpoints in several valley locations indicate that later Paleo-indian groups continued to hunt a now-extinct form of bison in this region.

After the Clovis period, there is currently no evidence of persistent human occupancy in the archeological record of southern Arizona for several thousand years. Climate research suggests the initial abandonment of the region coincides with a period of cooling and possibly wetter conditions in this part of North America. Several thousand years of warmer and more arid conditions followed soon after, lasting between about 7000 and 3000 B.C.. By 5500 B.C. humans were using the Santa Cruz Valley more intensely. For most of this period groups remained nomadic and moved seasonally. They exploited a diverse range of resources including wild seeds, nuts, fruits, and small animals.



TRANSITION TO AGRICULTURE AND SETTLEMENT ALONG THE RIVER

The first clear evidence of settlement along the Santa Cruz coincides with improving climatic conditions and a period when streams deposited sediments. This resulted in the building of floodplains, as opposed to erosion of them, which produced localized patches of plant and animal resources along the river corridor. From around 3500 B.C. to A.D. 500 populations across the Southwest continued to broaden their diet. Intensive use of certain native plants may represent a pre-agriculture adaptation, and local foragers eventually began planting crops. Across the region, nomadic ways of life transformed at varying rates to more sedentary and more dependent on agriculture. Early settlements were composed of groups of simple round houses built inside pits dug a few feet into the ground and made of perishable materials, such as sapling frameworks and coverings of grass thatch, which lasted only a few years.

FIRST RIVER DIVERSIONS FOR IRRIGATION

Domesticated crops, some imported from Mexico, were planted as early as 2100 B.C. and became widely utilized along the Santa Cruz River in quick succession between 1500 B.C. and A.D. 500. Maize and squash were common by 900 B.C., cotton was added by 600 B.C., common beans by 500 B.C., and tobacco by 200 B.C.. As early as 1500 B.C., crops were not just planted in areas where rain or naturally wet soils permitted, but were supported by the construction of canals and complex irrigation systems that greatly increased food production. Prehistoric groups diverted water from the river by directing surface flows into canals and then ditches to distribute water to individual plots of land.

**SETTLEMENTS TIED
TO PERENNIAL WATER**

Life along the Santa Cruz became increasingly tied to the few locales that provided year round (perennial) surface water, with habitation areas frequently shifting short distances in response to floods.

Perennial river flow is a pattern linked to local bedrock geology. For millions of years rain and snow eroded the mountains, filling the valley with rocks, gravels, and sands, sometimes kilometers deep. The mountains surrounding the river protrude through this fill much like icebergs in the sea; only their peaks poke

Several locations, such as Martinez Hill and A-Mountain, are examples of this relationship and a number contain evidence of near continuous use from the first farming settlements around 2100 B.C. to the historic period beginning in the late 1600s.

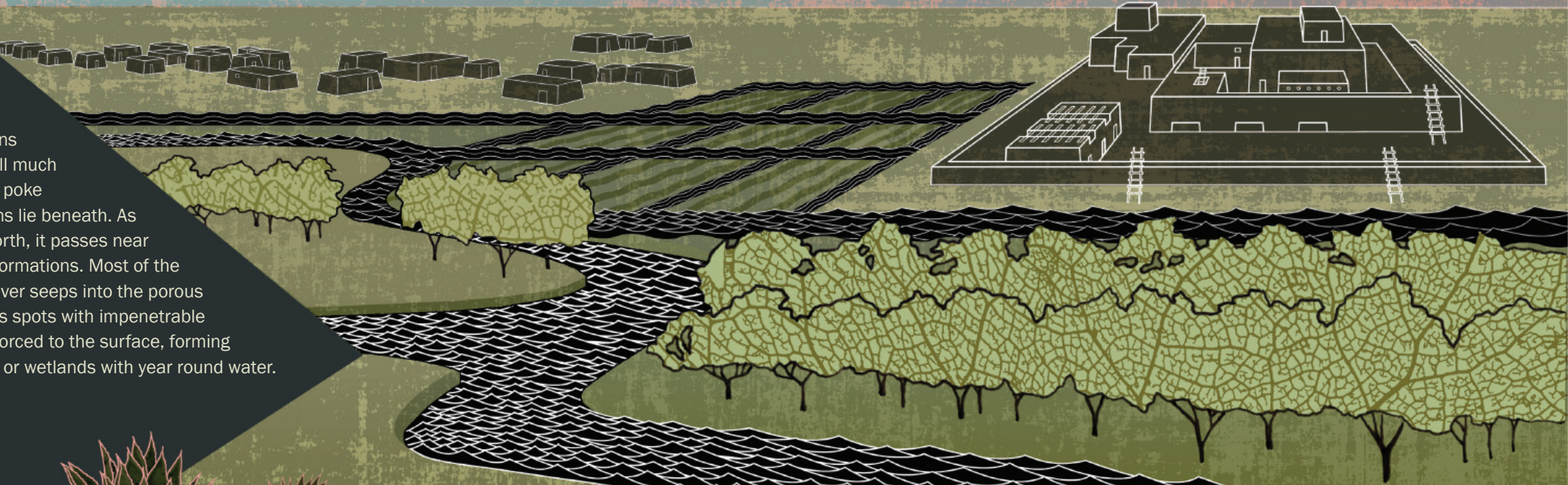
VILLAGES FORM, THE HOHOKAM EMERGE

While the rest of the basin still provided resources and a few washes and streams provided smaller scale opportunities for agriculture, the nexus of population and social development throughout the early phases of sedentary life (1500 B.C. to A.D. 500) was along the Santa Cruz.

At this time the ever-changing nature of the river became a dominant force driving social change. Downcutting events (see downcutting explanation pages 14) would periodically leave irrigation canals perched in the riverbank meters above the water necessary for sustaining agriculture. Meandering streams occasionally flooded villages and destroyed crops. Confronting these and other problems required novel solutions, and several social and political organizational patterns came and went in rapid succession—archaeologically speaking—in the centuries between A.D. 1 and 800. By the end of this era, a group emerged that archaeologists call the Hohokam.

The Hohokam were masters of irrigation and utilizing the resources of the desert. They produced surplus food allowing many individuals time to develop crafts such as ceramics, groundstone tools, textiles, and shell jewelry.

Artistic rendition of the Santa Cruz River Valley



Complex political systems also developed, likely based on beliefs that tied a ruler's power to their ability to intercede with the environment—such as stream flows and droughts—for the people.

POPULATION BOOM AND BUST

From A.D. 800 to 1150, populations increased, and at times, likely stressed the Hohokam productive capacity. Residents responded by redesigning canals to irrigate more land; farming on the upper *bajadas* (fan-shaped deposits of sediment at the foot of mountains), where growing seasons were longer and rainfall was higher; and cultivating desert plants, like agave, on otherwise un-irrigable lower-bajadas.

Around A.D. 1450 drastic population declines took place across southern Arizona. Droughts and floods likely damaged canal dependent agriculture and contributed to the end of the Hohokam in the Phoenix Basin. Though such events occurred in the past, large-scale social systems and interdependent economies may have become too complex to withstand environmental downturn.

Some researchers question if these natural calamities were severe enough to cause a collapse, especially in the Santa Cruz Valley where there is no widespread evidence of downcutting. Several alternative explanations include: gradual population declines resulting from non-nutritious foods and exhaustion of wild resources; the arrival of European diseases in the early 1500s, which suggests imprecise dating of the decline; and social triggers, such as popular uprisings against chiefs. Regardless, the lifeways identifiable as Hohokam clearly ceased, transitioning to lifeways structured by different political and social systems.



The archaeological record becomes quite sparse after the Hohokam collapse. Accounts from early European visitors describe O’odham-speaking peoples in the Santa Cruz Valley. Some, such as the Sobaipuri, lived in villages year round, others, including the Tohono O’odham, had returned to seasonal movements. Social identities were very fluid in this time, as they probably also were in the past. Though they consider the Hohokam their ancestors and were traditionally one related-people spread across a vast region, the O’odham are now divided into separate federally recognized tribes, including the Tohono O’odham now living along the Santa Cruz.

NATIVE LIFEWAYS

The connection between the Santa Cruz River and native lifeways, ancient and modern, is many faceted. This cultural connection has been deeply explored by groups like the Santa Cruz Valley Heritage Alliance. Simply put, early settlement would not have occurred without the presence of the river. Even before settlements were established, early hunter-gatherer groups traveled the corridors chosen by their prey and where wild plant resources were concentrated. In the desert, this meant areas along rivers like the Santa Cruz.

LANGUAGE

The unique mix and complexity of languages spoken in the valley were deeply impacted by the natural environment. Native languages eventually evolved into a mixing of language traditions, creating a “border” Spanish and the adoption of Spanish, English, and O’odham words across cultural lines. Many names for people and places directly tie language traditions with the natural environment, such as Tohono O’odham, or “desert people”, and Tucson, derived from the O’odham word Chuk-son meaning “springs at the foot of black mountain”.

LANDSCAPE

Some natural features of the landscape are sacred to native populations and cultural festivals often revolve around native plants and weather cycles. Baboquivari Peak is just one example of a natural feature as sacred object, but in actuality the land, river, plants, and animals are all sacred to a certain degree in traditional culture. The ceremony associated with calling down the monsoon rains is tied closely to the harvest of saguaro fruit.

NATIVE PLANTS

Native peoples of the region have used native plants and materials for food, construction and medicine for thousands of years. Modern farmers and small-scale producers learning to work with native and naturalized heirloom varieties are creating awareness of this desert bounty. Much of this traditional knowledge is being re-learned and combined with modern technology. Some of the most popular native foods include saguaro and prickly pear fruits, prized for their sweetness and versatility, and the nopal, or pad of the prickly pear. With the scarcity of timber, traditional building methods often employed saguaro ribs and mud. Devils claw fibers have been used in Tohono O’odham and earlier basket weaving, giving these baskets their distinctive black woven designs.

PREHISTORIC TIMELINE

11,500 B.C. Paleo-Indians hunt mammoths and other now extinct animals	3500 B.C. First seasonal settlements along the Santa Cruz River	2100 B.C. First farming settlements along the Santa Cruz River, cycles of downcutting and filling began to significantly impact farming lifeways	1500 B.C. Earliest known irrigation canals diverted water for agriculture	500 B.C. Common crops include maize, squash, bean, bottle gourd	A.D. 750 Building of ballcourts is vital to Hohokam political structure	A.D. 1100 Large earthen platforms replace ballcourts	A.D. 1450s Hohokam populations decline
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MAT HEKID O JU:



DOWNCUTTING

Naturally, mountains slowly erode, floods scour river beds, and sediments are transported downstream. Rivers have a minimum flow, a natural rate of erosion that moves sediments downstream, and occasional flood flows that provide benefits like the dispersal of seeds and scouring of the river bed, which aids seed germination, among others. As some rocks and soils erode, other sediments are deposited from erosion upstream.

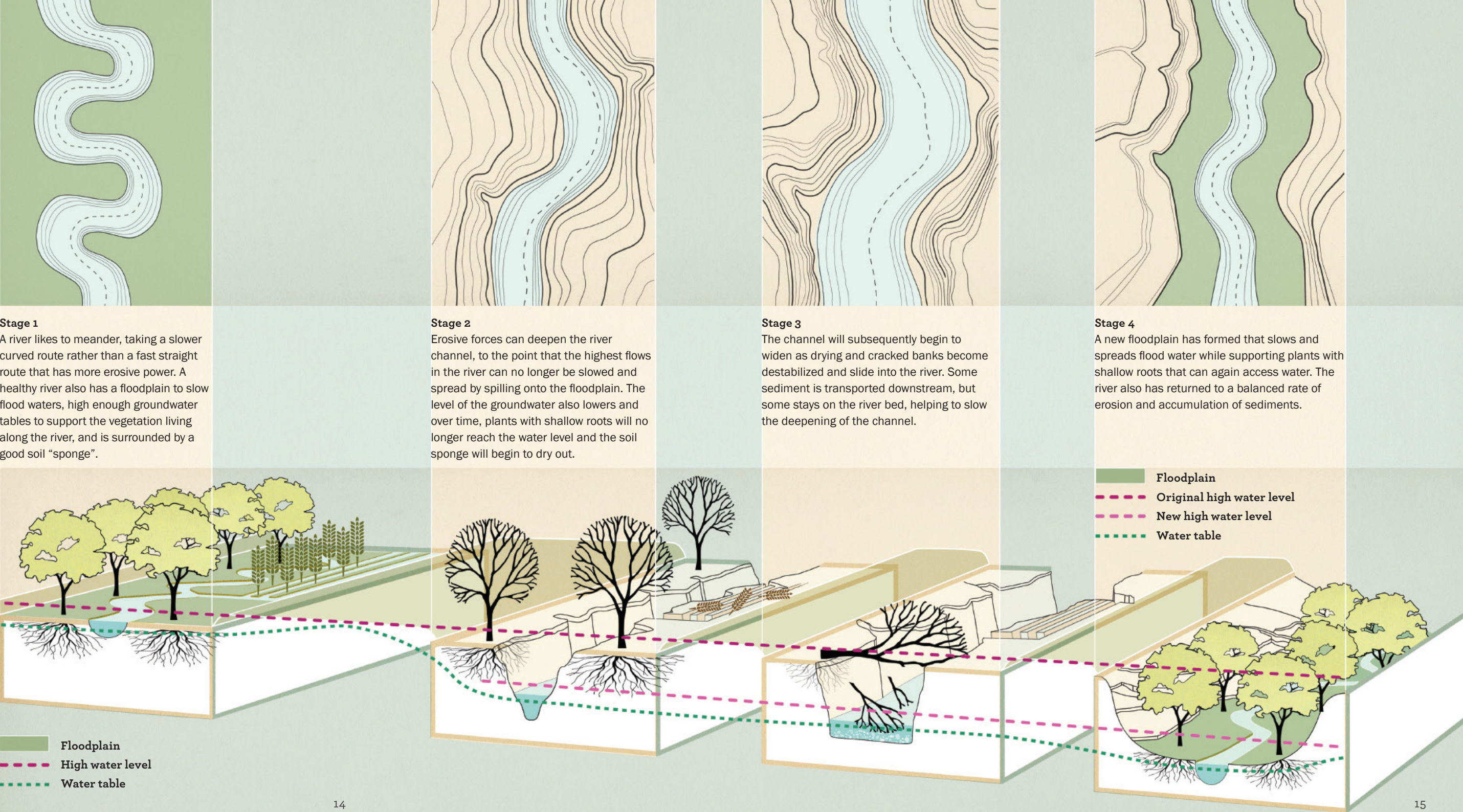
An important factor that influences the rate of erosion is the condition of the soil. Soil is the “sponge” of the earth’s surface, soaking up and holding water after it rains. This moisture is then available for plants to grow; plants in turn provide shade and reduce evaporation, while root structures help hold the soil in place, and dead plant matter increases organic content and supports microorganisms in the soil. All the biological activity in and supported by the soil helps retain the soil and infiltrate water, thus reducing soil loss to erosion and minimizing excess sediments in waterways—a major problem in the Southwest.

With natural disturbance or improperly managed land uses, the soil can lose this “sponge” effect and have greater water runoff and accelerated rates of erosion. Runoff that flows over areas with steep slopes can scour and erode more, forming a headcut or gully. Once gullies have formed, they tend to grow, eroding more of the vital sponge, draining soil moisture, and encouraging even more water to run faster off the land (one-rock gabions are a common technique to reduce erosion and restore the sponge, see page 32).

Greater run-off also means more water makes it to the river with greater energy and at high speed. The additional energy can cause the river’s natural rate of erosion to be accelerated and lead to *downcutting* (also known as channel incision)—the geologic process where erosion of the sediments in the stream bed results in the deepening of the river or stream channel. When downcutting is severe, flood waters can no longer be slowed and spread by a river’s floodplain.

Accelerated rates of erosion can be caused by numerous natural and human impacts on the landscape including but not limited to: natural—wildfire, landslide or avalanche, heavy rainfall, change in vegetation, earthquake, change in climate; and human—roads and other surfaces that do not allow rain to infiltrate, overgrazing, straightening or other alteration of floodways, clearing of vegetation.

The accompanying series of graphics help illustrate the phases of downcutting and a river’s evolution back to a more balanced and natural rate of erosion.



EARLY HISTORIC PERIOD

By the end of the 17th century, the Spanish had spread throughout what would become Mexico, and they began to venture farther north. At this time, the Santa Cruz generally flowed as multiple intermittent streams, meandering through lush riparian corridors of cottonwood and willow, with thick *bosques* (forests) of mesquite and hackberry on the upper floodplain terrace. When Jesuit missionary Father Eusebio Francisco Kino arrived in southern Arizona in 1691, he entered a region settled by the O'odham people who had been seasonally farming the banks of the Santa Cruz for about 200 years, cultivating beans, melons, and squash to supplement native food gathering. Some of the O'odham were "One Villagers" living along Santa Cruz River in the same settlements year-round, irrigating their fields with canals (Sobaipuri O'odham). Others were "Two Villagers" moving seasonally between summer villages near flood-irrigated fields and winter villages near springs or wells (Tohono O'odham).

INTRODUCTION OF RANCHING

To say that Kino's task was only to convert the native peoples to Christianity is too simplistic and belies the deep influence of Spanish culture on traditional society in the valley. When Kino set up missions to convert these peaceful peoples to the Christian faith, he introduced wheat and other winter crops that supplemented traditional food

crops. These winter crops and the permanence of the mission settlements made it possible for the Tohono O'odham to settle year-round at their riverbank villages and mostly abandon their winter settlements in the higher areas, which deeply influenced the trajectory of their culture.

Kino introduced ranching, bringing sheep, cattle, and horses, previously unknown to the area. The availability of draft animals permitted an increase in agricultural production. Over time expanding agriculture and increasing livestock herds would influence the river by leading to more water diversion in canals, or *acequias*, for irrigation and greater potential for overgrazing, which can remove too much of the vegetation that helps sustain the soil "sponge" (see soil explanation in Downcutting page 14).

COLONIALISM AND MISSIONS

Missions were set up near native villages, which were oriented to the river. The first missions established by Kino included Guevavi—the *cabecera* or head mission—and the *visitas* or visting chapels of Tumacácori and Calabazas. Other well-known mission structures associated with Jesuit Father Kino are actually Franciscan in origin, built by later missionaries on or near the sites of Kino missions. The mission church at San Xavier del Bac on the Tohono O'odham Nation is among the Franciscans' major contributions to the region's cultural legacy. Franciscans also constructed the mission at Tumacácori National Historical Park. The Park includes just over 1-mile of the Santa Cruz River, a defining feature of Park identity and cultural interpretation.

Ranching was one of the most profound changes introduced by Kino that remains a defining force in the culture and landscape of the Santa Cruz River watershed. The Spanish roots of ranching are apparent in many of the terms used in the industry and popular "cowboy" culture. For example, buckaroo is a corruption of the Spanish word for cowboy, *vaquero*, and lariat and lasso are Anglicizations of the Spanish *la reata* and *lazo*.



ESTABLISHMENT OF PRESIDIOS ALONG THE RIVER

Some native groups resisted Spanish settlement. Apache raids were a constant threat in northern Spanish territories. Raiding parties stole horses, cattle, tools, and often such a large proportion of the annual crop harvest that nearly entire settlements would be forced to relocate. In November 1751, some of the O’odham led a revolt that in just a few days killed more than 100 settlers, missionaries, miners, and native people friendly to the colonists. Many early Spanish colonists fled, including prospectors who had earlier

struck silver and gold in the region. By March 1752, under threat of the full force of the Spanish military, the O’odham agreed to peace.

Clearly mining interests and mission settlements needed protection, thus the Spanish established presidios along the river as the answer. The presidio at Tubac was established in 1753 to protect the Tumacácori mission and was followed in 1775 by the presidio at Tucson. In addition, Spanish peace policy created *establecimientos de paz* or peace settlements, where Apaches who agreed to settle near presidios received food rations from Spanish commanders, which helped promote periods of relative calm.

SPANISH EXPANSION AND EXPLORATION

Travelers and early trade networks through the Southwest followed the course of rivers to ensure access to water. Early colonial explorers travelled along the Santa Cruz River from Mexico to the Gila River, including Juan Bautista de Anza, because it offered at least some security of access to water. The stretch from Tucson to the Gila, where water flowed only infrequently, was much maligned in journals of early travelers.

Juan Bautista de Anza set out from the presidio at Tubac in 1774 to discover a land route from Sonora to San Francisco. His extensive retinue to San Francisco was comprised of families and livestock, not seasoned explorers; they could not have made it without the water the river supplied along the route and the support of friendly native populations. Sites throughout the valley provide evidence of Anza’s passage along the Santa Cruz and an effort is underway to connect them through the establishment of the Juan Bautista de Anza National Historic Trail.

Artistic rendition of the Tubac Presidio



EARLY HISTORIC TIMELINE

1500s

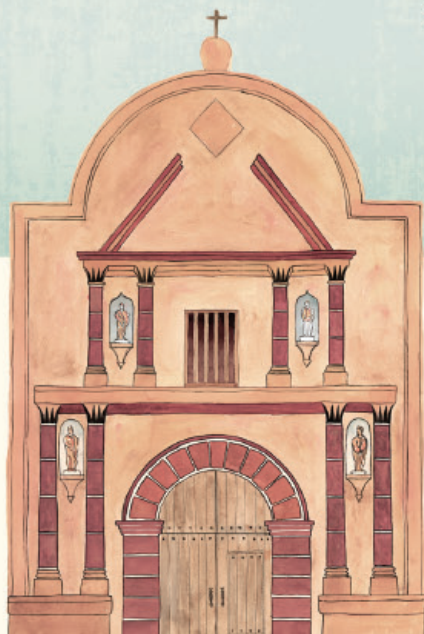
O’odham people farm along the Santa Cruz

1680s

Spanish colonist José Romo Vivar establishes ranch at San Lázaro

1690-1700s

Most Spanish missions in the region are established



Church facade of San José de Tumacácori

1691

Father Kino establishes missions at Tumacácori and Guevavi and introduces winter crops and ranching

1736

First major discovery of silver brings rush of prospectors



Ruins of Tubac Presidio

1753

Tubac Presidio established

Ruins of Mission San Cosme / Mission San Agustín



1767

Jesuits expelled from Spanish colonies; Franciscans expand farming and construction of mission buildings

1774

Juan Bautista de Anza follows the Santa Cruz while finding route to San Francisco



Mission San Xavier

1775

Tucson Presidio established

MEXICAN PERIOD

In the 19th century, the region faced a period of political instability and cultural mixing as different groups tried to retain or gain control. Though records indicate the region experienced water surplus and shortage that was influenced by climate, geology, and the population demand for water, the river continued to be an important resource and the primary source of water. More importantly, this period marked the first step in politically dividing what is now a trinational river (United States, Mexico, Tohono O’odham Nation).

INDEPENDENCE FROM SPAIN AND INSECURE LIFE ON THE RANGE

While much is made of the Santa Cruz River being an international river, for most of human history the river was not divided by borders. After thousands of years of Native American presence, the Santa Cruz was claimed by the

Spanish and later became part of Mexican territory. In Sonora and the other northern reaches of the Spanish colonies, the transition from Spanish rule to Mexican rule came by way of decree rather than at gunpoint. On September 16, 1810 a loose coalition of Mexican-born Spaniards, Mestizos, and Native Americans declared independence from Spain, marking the beginning of the War for Independence. After 11 years of intense fighting and guerrilla warfare, mostly in southern Mexico, Spain signed the Treaty of Cordoba, and Mexico was free of Spanish rule.

For those living on the frontier along the Santa Cruz River, very little changed immediately. However, the Mexican government proved unable to maintain the peace with the Apache and raids began again. Tubac was virtually deserted by the late 1840s, after a series of particularly violent attacks on the town

prompted the population to flee to the presidio at Tucson. In addition, ranches along the river from San Lázaro to Tucson experienced a period of instability under Mexican rule and many were abandoned.

CONFLICT WITH THE UNITED STATES AND DIVISION OF A WATERSHED

When the Mexican government was only 25 years old, they faced a war with the United States who desired more western territory. Upon resolution of the Mexican American War in 1848, Texas and California became part of the United States, as did the northern portions of Arizona and New Mexico. The Gadsden Purchase of 1854, the last major U.S. acquisition of territory, brought the southern portions of New Mexico and Arizona under U.S. control. This divided the river, leaving the headwaters and most of river in the U.S., while the southernmost “U-turn” remained in Mexico.

LA FRONTERA/THE BORDER

The border is a political and physical entity, impacting culture and nature in the region. The political boundary results in fragmented environmental policy with environmental regulations, grazing practices, and urban development patterns varying significantly from one side of the border to the other.

The border fence itself can have substantial physical impacts on both natural and cultural resources. Often constructed in areas that rely on a network of washes and sheet flow to disperse seasonally heavy rains, the fence can act as a barrier, blocking and redirecting flows that can cause severe flooding problems. The fence can also block or severely impact migration patterns for wildlife such as Sonoran pronghorn, jaguars, and Cactus Ferruginous Pygmy owls.



1810

Mexican War for Independence from Spain begins

1821

Treaty of Cordoba frees Mexico of Spanish rule

1821

Mexican land grants create large ranches along the Santa Cruz River

1840s

Apache hostility creates instability for ranches and presidios

1846

Mexico enters war with the United States

1846

First “official” American exploration of the Santa Cruz Valley with the arrival of the Mormon Battalion

1848

Treaty of Guadalupe Hidalgo ends war, Mexico cedes lands in northern Arizona

1854

Santa Cruz River divided with U.S. Gadsden Purchase of lands in southern Arizona

In addition, the border fence drives immigrants and smugglers into more remote areas, creating problems of environmental degradation and trash, but also leading to enormous loss of human life. Consequently, border patrol activities are increasing in remote areas, disrupting wildlife with vehicle and noise pollution and damaging sensitive desert lands with new roads.



Geronimo, Chiricahua Apache leader, 1898

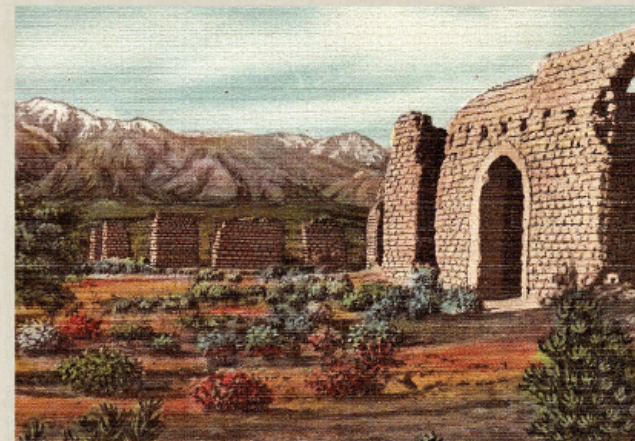
AMERICAN TERRITORIAL PERIOD

Though most of the Santa Cruz River watershed became U.S. territory, Mexican influence on the culture remained strong and cultural exchange continued. Most of the people living in the watershed were ranchers or farmers, though the building of railroads would bring great change in urban development and demographics, as well as the expansion of mining operations. At this time, the river, long viewed as a resource for its surface flows, was now viewed as only the visible portion of a much larger underground supply that could be accessed with the use of pumps. This period marks the start of a shift from dependence on the river's surface flows to local groundwater supplies—which would dramatically change the course of the river's story.

HOMESTEAD ACT, REDUCED APACHE THREAT, AND AN INCREASE IN RANCHING

Though ranching and farming were already common, the Homestead Act of 1862 brought many new settlers to the area. Many homesteaders hoping to receive title to the land were Mexican immigrants. For remaining on the land for five years and making productive use of it, homesteaders were given title to the land and American citizenship.

Homesteaders and other ranchers became significantly more secure due to renewed American efforts to quell Apache attacks and re-establish a military presence at Camp Lowell in Tucson. The Chiricahua Apache led by Cochise signed a treaty in 1872 agreeing to peace. However, some Apache led by Geronimo continued to fight and were pursued by both U.S. and Mexican forces.



Ruins of Camp Lowell



Mexican House, Tubac, Santa Cruz County, AZ

The relative peace led to a great expansion in ranching and farming in the Santa Cruz River watershed and an influx of Anglo ranchers and farmers with large amounts of capital to invest. Often these larger, more powerful ranching interests would push smaller ranches out of business, inordinately affecting Mexican immigrants. One of the largest ranches from this period, the Empire Ranch, is on the National Register of Historic Places and is now a part of Las Cienegas National Conservation Area.

Many ranches were early adopters of good range management practices, using fencing and water tanks to allow for the rotation of cattle away from the river's edge. These practices help ranchers control erosion and overgrazing. However, the rapid increase in ranching on the fragile desert grasslands proved too great. In the 1800s and early 1900s, overgrazing coupled with severe weather patterns damaged many of the valley's grasslands. Several cycles of dry summers followed by wet autumns resulted in heavy rains that washed away the soil rather than encouraging growth of new grass.



Empire Ranch

COMMERCE AND RANCHING

A major driver for the Gadsden Purchase in 1854 was to bring additional land, suitable for the railroad, under United States control. This route was also an established trade corridor due to the Butterfield Stagecoach line, which linked El Paso, Texas to the coast of California. The first rail line through Tucson utilized many existing Butterfield stagecoach stops. Both the stage route and the railroad generally followed the river and its tributaries. The completion of the railroad led to increased ranching and mining, and both continue in the region today.

Many credit early ranching and farming with providing land which municipalities now preserve as open space. Without large tracts of land set aside for early ranches and farms, towns and cities would have likely spread outward even more. Some ranchers are ensuring their properties remain undeveloped by either selling them outright for open space conservation or by establishing a conservation easement on the property.

Mining has also played a strong role in shaping the character and economy of the watershed. Copper mining presents substantial environmental impacts as operations require large volumes of water and release pollutants back into the surface and groundwater, often impacting watersheds for many decades after the completion of the mining project. The necessary access roads and invasive excavation techniques also degrade soil conditions and disrupt native flora and fauna. At the same time, modern society needs copper to function; thus a close examination of trade-offs is imperative to decision making about future mining projects in the Santa Cruz watershed.

ARRIVAL OF THE IRON HORSE AND THE GROWTH OF TOWNS

Following the gold rush in California and increased west coast development, the need for reliable transcontinental transport became more pressing. The Santa Cruz Valley provided the obvious location for a southern rail connection. The Southern Pacific Railroad built the first rail line to pass through the valley, arriving in Tucson in 1880.

The presence of the railroad had a profound impact on the development of Tucson and other towns in the Santa Cruz River watershed. With a secure and reliable link to markets in the east and on the west coast, agriculture, ranching and mining expanded. Towns like Tucson began to promote the three “Cs” of cotton, copper, and cattle (eventually adding a fourth—climate), drawing Anglos across the country in large numbers and altering the cultural makeup of the region. Increased population led to greater

demand on water, timber, and other natural resources in the watershed, leading to concerns of shortages. Thus, municipal water, gas and electric companies were founded in the larger towns in the late 1870s and early 1880s, providing greater comfort and security to life in the west.

INCREASING WATER NEEDS AND THE ARRIVAL OF THE STEAM PUMP

Growing populations put pressure on water providers to supply water. In 1887 a Tucson businessman named Sam Hughes saw an opportunity to irrigate agricultural land north of town. Using a common method to capture water from just below the ground’s surface, Hughes cut a small ditch along the river near St. Mary’s road. While initially the ditch did little to impact the river, severe flooding in 1889 began eroding banks and led to the downcutting of the river all the way to the Mission San Xavier del Bac,

roughly nine miles upstream of the ditch (see downcutting explanation page 14). Though other disturbances such as wagon roads and overgrazing likely contributed to the flooding and erosion, the deepening of the river channel between the mission and Tucson that we still see today is largely attributed to the Hughes ditch.

In the 1890s, steam pumps were brought to the region. Rather than diverting the river’s surface flows in canals, farmers could now pump groundwater for irrigation. Early pumps were inefficient and powered by burning wood, a scarce resource in the desert. This contributed to the deforestation of hardwoods such as oaks and mesquite; entire mesquite *bosques* (forests) along the river corridor in the area were lost. Over time, more efficient combustion pumps were developed and Tucson residents would quickly become dependent on groundwater for both municipal and agricultural uses.

RESEARCH AND TECHNOLOGY

The University of Arizona (UA), founded in 1885, quickly became a powerful institution in Tucson. Researchers from the UA raised some of the earliest concerns about over-pumping of groundwater in the Santa Cruz River Valley. The UA is also the birthplace of dendrochronology, or the science of tree ring dating, and is home to the Laboratory of Tree-Ring Research, a world leader in the field. This science has been instrumental in dating important archeological sites and contributing to riparian and climate change research.

In 1902 the Santa Rita Experimental Range, comprised of 50,000 acres south of Tucson, was established by the United States Department of Agriculture as a site for long-term research of Southwestern range management

practices. The purpose of the Experimental Range was to provide a mechanism for developing conservation and restoration techniques to address the problem of historic overgrazing. The site was transferred to University of Arizona management in 1988.

Urbanization and increasing populations led to the development of sewer systems in the early 1900s and the first wastewater treatment plant in 1928. There are now three major regional treatment plants along the Santa Cruz River that release effluent, or treated wastewater, into the river. This practice has restored flows in many sections of the Santa Cruz River. Research is underway on the use of effluent to recharge groundwater and restore riparian areas throughout the region.

Santa Cruz River flood at the Congress Street Bridge 1902

Workers laying track for the Tucson Street Railway on Main Street, c. 1899

Example of downcutting: photo taken near Mission San Xavier

University of Arizona, c. 1909

AMERICAN TERRITORIAL TIMELINE

1858

Butterfield Stage Coach route brings mail and passengers through Tucson

1862

Homestead Act increases ranching and farming in the valley

1874

River tri-national with recognition of Tohono O’odham, San Xavier District

1880

Southern Pacific completes the first rail line through Tucson

1889

Floods begin to erode and downcut the river upstream of Hughes’ ditch

1890s

Groundwater pumping begins for agriculture and settlements far from the river

1891

University of Arizona begins holding classes in Old Main

1900s

Heavy rains and wide-spread overgrazing damage valley grasslands

1909

Rail line completed to Nogales, Arizona and Nogales, Sonora

MODERN PERIOD

Early in the twentieth century it would have been impossible to predict the enormous changes that were soon to occur in the Santa Cruz River Valley. There were booms and busts in markets across the economic spectrum, from farming to mining. Pumping of groundwater allowed water to be moved to areas where there was none before, and thus settlement could spread far from the river. The arrival of highways and cars further changed the shape of settlement patterns. From a small town with big dreams, Tucson grew into a large metropolitan area. Nogales, Arizona and Nogales, Sonora, experienced rapid growth as well. With the

Cotton fields



population numbers surging, the rate of groundwater pumping escalated. The Santa Cruz River soon dried up and flowed only with seasonal rains. The need for more water became apparent and eventually, water was imported from as far away as the Colorado River.

WORLD AT WAR AND BOOM TIMES AT HOME

In the buildup to World War I, farming in the valley boomed. Cotton prices spiked and farms across the valley rushed to cash in, planting enormous fields. This marked the beginning of a shift towards major agriculture along the northern *reach* (section of river)

as opposed to the southern and middle reaches as had previously been the case. The increase in water use for irrigation of the water hungry crop led to large expansions of groundwater pumping. Cotton is still grown in and around Marana to this day.

War also led to a near doubling in the price for copper, and mining in the watershed boomed. Though mining operations never reached the scale they did in Nevada and California, southern Arizona led the world in copper production by 1907.

However, with the end of WWI, commodity prices dropped rapidly. Copper and cotton prices were hit

hard and many farmers and miners lost everything. A rapid decrease in demand for copper led to abandonment of many mines, leaving a string of ghost towns. By 1933, the country had fallen deep into the Great Depression. Prices for commodities produced in the region continued to drop and unemployment across the country rose to twenty-five percent.

With Second World War II, copper prices rose once again and mining operations profited. Ranchers also experienced a major increase in demand. Investment and innovation in technologies that made use of springs, wells, concrete dams, and large earthen tanks to supply water for cattle ensured success of ranches in the watershed.

The 1940s and 50s also saw a new era in urban development with the institution of the Government Issue Bill (GI Bill) allowing veterans to purchase homes with no down payment. The national economy boomed in response to world demand for products that could no longer be produced in the decimated cities and factories of Europe. Passage of the 1956 Highway Act was a pivotal event by supporting the transition to car-oriented development. Interstate 10 was built from 1956 to 1958, cutting across the watershed from east to west and spurring growth in cities and towns along the highway.

1880 street scene, prior to the arrival of the automobile



Meyer Street, 1880



Workers pave street east of Scott Avenue, c. 1920



Santa Cruz River and valley looking south from "A" Mountain towards Martinez Hill: May 1927



MILITARY

While military presence in the watershed dates to Spanish colonial times, the first American military establishment in the region was Fort Lowell in Tucson. The engineers at the fort were the first to have a real understanding of the promise of groundwater, collecting extensive data on water supply and using steam pumps to supply their water. Their early leadership in groundwater exploitation would greatly influence the state of the river, as pumping groundwater made it possible for municipalities to ensure water supplies for growing populations.

The region hosted many military facilities during the Cold War. Davis-Monthan Air Force Base was home to two B-29 Bomber Groups of the Strategic Air Command, charged with supplying worldwide long-range bombing capabilities. The establishment of 18 Titan II missile sites near Tucson solidified the region's role in Cold War readiness. One site in Sahuarita is now a museum and the only missile site open to the public. There was also a boom in private investments in the defense industry. In 1951, the Hughes Missile Systems Company built the facilities that would later be consolidated into Raytheon Missile Systems, introducing an industry that remains an economic driver in the region.

MODERN TIMELINE

1914

World War I creates boom in cotton and copper production

1933

Saguaro National Monument established

1934

Civilian Conservation Corps works to protect natural resources in the valley

1940s

Population boom increases groundwater pumping and urban expansion

1940s

End of year round flows in Santa Cruz near Tucson

1968

Construction begins on Central Arizona Project to bring water to the valley

1970s

Effluent discharges into the Santa Cruz create sections with year round flow

1980

Arizona Groundwater Management Act passes to improve management of water resources

1993

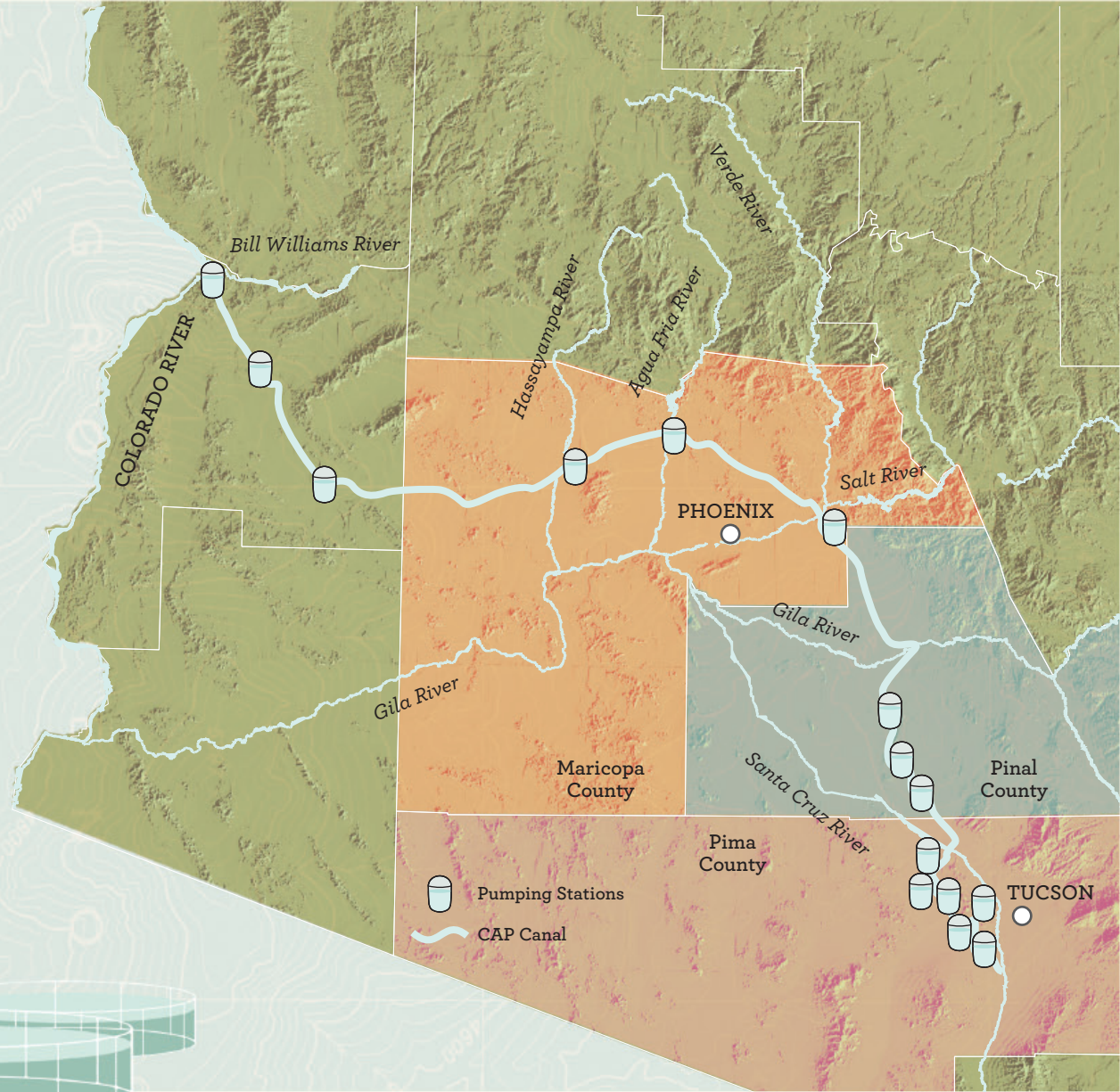
Central Arizona Project canal reaches Tucson

DEPENDENCE ONLY ON LOCAL RESOURCES ENDS WITH IMPORTATION OF WATER

The population continued to increase and with it, the need to find additional sources of water to supply a region that was completely dependent on local groundwater. Thus, Arizona sought and received federal approval to bring Colorado River water to central Arizona. Construction of the \$4 billion Central Arizona Project (CAP) canal, that would eventually bring water to Tucson, began in 1968. Though originally designated for agricultural use, at the time of completion in 1993 the water was needed to augment urban needs for a growing population. The CAP canal lifts water almost 3,000 feet through fourteen pumping stations and carries it over 300 miles from the Colorado River to Tucson.

The building of the CAP brings us to a natural stopping point in the chronology. This marks the start of a new chapter in the river's story, as the region became dependent on the flows of the great Colorado River rather than solely upon local water resources—either from the Santa Cruz River or from groundwater aquifers. At the same time that efforts were taken to import water, a growing understanding emerged about the importance of protecting watershed health. Over time, local policy and management actions would aim to protect water quality and reduce the risk of overdraft of groundwater supplies (the pumping of water faster than it is replenished), and some stretches of the river would see perennial flows restored with treated municipal wastewater, or *effluent*.

The story of the Santa Cruz River demonstrates the strong ties between the region's natural and cultural history. Though the river has ebbed, flowed, and changed over time, the Santa Cruz remains an important ribbon connecting space and time, a powerful reminder of our heritage. Understanding this story, we may now turn our focus to the numerous efforts underway to protect and restore the river's rich natural and cultural resources.



CONSERVATION EFFORTS ALONG THE SANTA CRUZ RIVER

The Sonoran Institute is deeply committed to the Santa Cruz River. We take a moment now to share some of the projects we have undertaken over the years. This publication builds not only on our work, but also on the work of many. We are proud to join other dedicated individuals and organizations in protecting this region’s water, wildlife, artifacts, and cultural heritage. In recognition of this passion and the critical work of the broader community, we are releasing a companion document entitled *The State of the Santa Cruz River—Conservation Inventory* (available at <http://tiny.cc/scrci>). We hope this will foster collaborative efforts and increase collective impact. While we save most of the detail for the companion document, the following pages briefly describe the evolution of the inventory and illustrate the breadth of conservation in the region by highlighting the work of three organizations.



SONORAN INSTITUTE’S HISTORY IN THE SANTA CRUZ RIVER WATERSHED

The impetus behind the Sonoran Institute began along a Santa Cruz River tributary, Rincon Creek, located within Saguaro National Park (see map on page 7). In the 1980s, the Park became concerned about accelerating urban development in surrounding lands and requested help from the World Wildlife Fund (WWF). Luther Propst, then an attorney with WWF, helped negotiate an agreement with a major housing developer in the area. Upon concluding the agreement, Mr. Propst and several local partners from across the political spectrum founded the Rincon Institute to protect and steward the natural resources of the Rincon Valley as the housing development moved forward. In 1990, Mr. Propst founded the Sonoran Institute to apply this collaborative approach to conservation efforts throughout the West.

One of Sonoran Institute’s first initiatives was to convene residents of the San Rafael Valley to discuss shared values and create a vision for the future of an

area that includes some of the Southwest’s best remaining desert grasslands and the headwaters, or origin, of the Santa Cruz River. One outcome of this process was the establishment of a conservation easement to protect the large San Rafael Ranch from subdivision and development. A portion of the ranch was also sold to Arizona State Parks to become a State Natural Area.

In the mid-1990s, Sonoran Institute embarked on several efforts to protect Cienega Creek, another major Santa Cruz River tributary. Working with diverse partners, we shepherded legislation through Congress that established Las Cienegas National Conservation Area, thus protecting an incredibly rare stream system with year-round, flowing water. Sonoran Institute also helped launch the Cienega Watershed Partnership, a group of scientists, ranchers, residents, artists, educators, and other community leaders committed to the long-term protection of the area.



The Sonoran Institute began restoration efforts along the Santa Cruz River in the late 1990s. Working with ranchers near the rural town of San Lázaro, Mexico, we helped construct over 1,000 simple rock structures, or gabions. Also known as “check-dams”, these gabions check or slow the flow of water, build up soil, and help re-establish the “sponge” that captures and slowly releases the run-off, helping to restore degraded grazing lands. This is one of the many techniques used throughout the region to combat erosion and the formation of gullies (see

downcutting on page 14 to learn about the importance of the soil “sponge”). Other collaborations with the community in San Lázaro included the creation of a youth birding club, Los Halcones (the Falcons).

Currently, the Sonoran Institute focuses on the Santa Cruz as it flows from Nogales, Sonora through Tucson. We work with partners to monitor river conditions and have developed an important outreach tool, the *Living River* series.

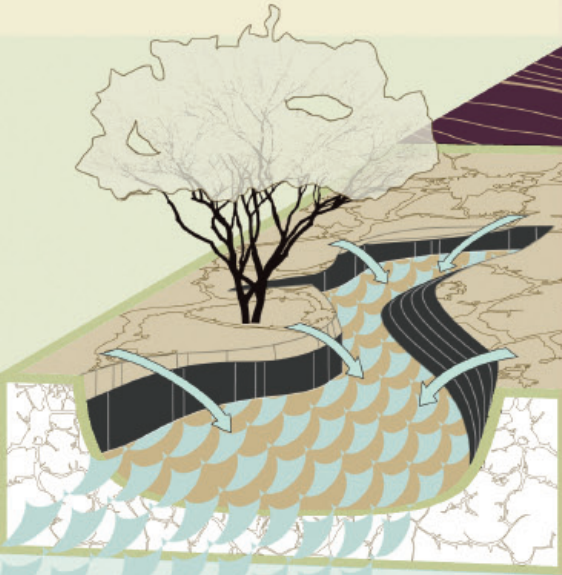
The *Living River* reports track conditions on the river to inform management decisions, and demonstrate how healthy rivers benefit people. Additionally, we lead the nation’s first Conserve to Enhance (C2E) program in Tucson, in partnership with the University of Arizona Water Resources Research Center, Tucson Water, and Watershed Management Group. C2E participants reduce water consumption and donate the value of their water savings to help restore local waterways.

Lastly, Sonoran Institute provides leadership for a growing annual event, Santa Cruz River “Research Days,” which has become a valuable forum for those interested in conservation efforts. While the event initially focused on river-based natural resources in Santa Cruz County, Research Days quickly grew in scope. The 5th annual event in 2013 spanned two days with content addressing both natural and cultural resources along the entire river corridor, from its headwaters all the way through Tucson.

One-Rock Gabion

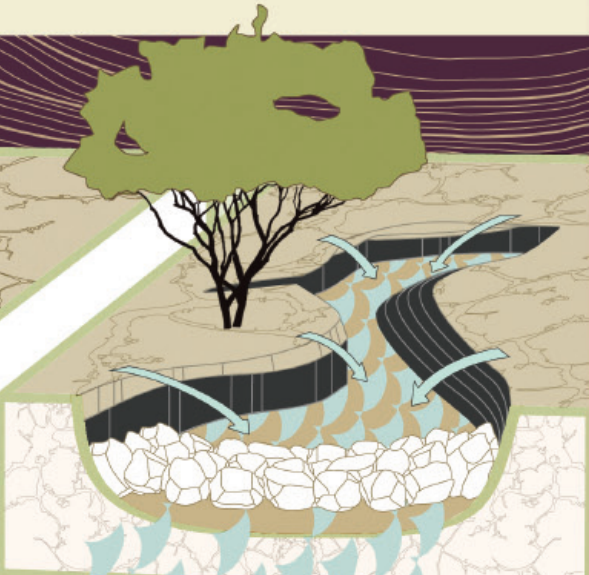
Degraded land with gully

The soil “sponge” that soaks up rainwater and makes it available to plants, is lost or damaged. This leads to greater water runoff and accelerated rates of erosion, which can create headcuts, or gullies. Once gullies form, they tend to erode more of the sponge, drain soil moisture, and encourage more water to run faster off the land. A one-rock gabion is an effective way to harvest rainwater and reduce erosion, which prevents further degradation and slowly restores the soil sponge.



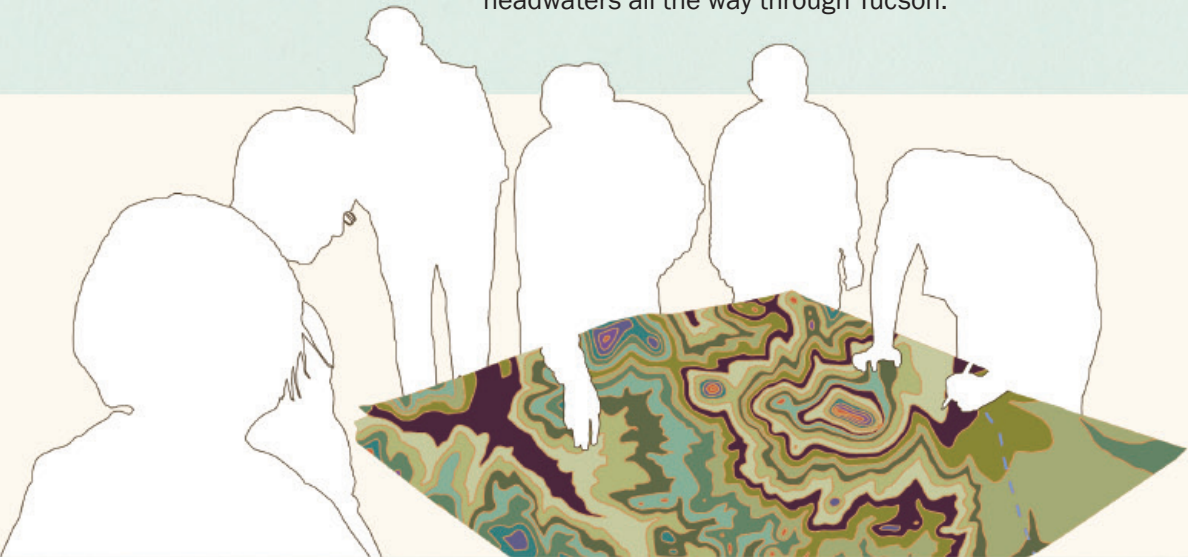
Stage 1 Gabion

A one-rock gabion typically includes several rows of similarly sized rocks that are one rock deep. Building this simple structure slows runoff flowing in the gully, thereby reducing the water’s erosive power and allowing more to soak into the ground. Water stored in the soil becomes available to plants, evaporates more slowly, and flows gradually downhill towards larger waterways and wetlands. Reduced runoff also prevents downcutting in larger waterways, nurturing overall watershed health (see downcutting page 14).



Stage 2 Gabion

Sand, sediments, and organic materials build up between the rocks and behind the gabion, strengthening the structure and creating a good seedbed for new plants to grow. Soil moisture accumulates and is available to plants whose roots eventually bind the rocks together. The plants provide greater resistance to flood forces and thus further slow runoff. Over time, the natural rate of erosion is reestablished and the healthy sponge-like soil slowly develops, allowing soil life and plants to flourish.



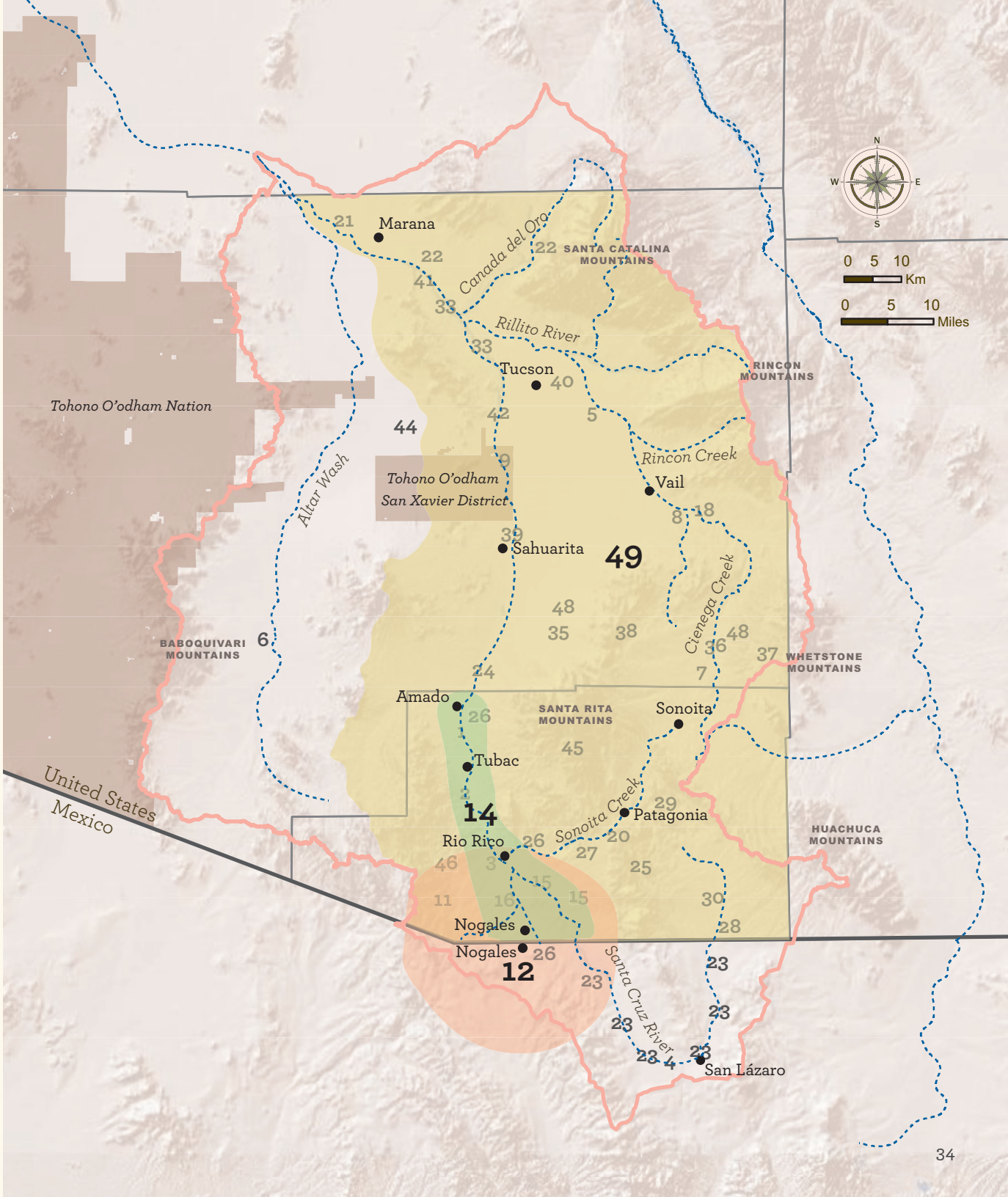
EVOLUTION OF THE CONSERVATION INVENTORY

By working throughout the watershed and with many different people over two decades, Sonoran Institute has developed a growing knowledge of Santa Cruz River conservation efforts. However, the creation of a formal conservation inventory grew out of feedback from Santa Cruz River Research Days. Several years ago, attendees of this annual event expressed interest in expanding partnerships and sharing lessons learned throughout the watershed. To help guide this growing desire for large scale, binational collaboration, the Sonoran Institute facilitated a conservation mapping effort for the Santa Cruz during the 2012 Madrean Archipelago Conference (see Santa Cruz River Conservation Symposium at <http://tiny.cc/scrci>). The foundation of the inventory began with this community input.

The *State of the Santa Cruz River—Conservation Inventory* is a companion document to this publication that records of the incredible number of conservation programs throughout the watershed. The objective of the inventory is to identify the organizations working tirelessly to protect the cultural and natural heritage of the Santa Cruz River, and provide a quick overview of the location and type of effort. We also present an initial inventory of collectively identified conservation priorities—areas that are of high conservation value. Identifying the “who”, “what”, and “where” will help foster collaboration, identify synergies, and maximize collective impact. The inventory is available online at <http://tiny.cc/scrci>.

NUMEROUS CONSERVATION EFFORTS

We invite you to explore the *State of the Santa Cruz River—Conservation Inventory* to learn more about specific groups and activities and weigh in on conservation priorities. To illustrate the breadth and depth of conservation efforts showcased in the inventory, on the following pages we highlight three groups leading diverse work in different, yet overlapping, parts of the watershed.



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Friends of the Santa Cruz River
www.friendsofsantacruzriver.org

Friends of the Santa Cruz River (FOSCR) is a non-profit, volunteer organization focused on keeping the river flowing, the banks clean and green, and the environment bountiful to both wildlife and people in the upper part of the watershed. FOSCR was founded in 1991 by a group of residents concerned about river health. Activities center on water quality monitoring and community awareness. In partnership with Arizona Department of Environmental Quality, FOSCR members have collected samples of river water monthly since 1992. These samples are analyzed by a laboratory and generate a critical set of data to improve our understanding of the river's health over time. Every October, FOSCR organizes an event called *Celebrate the River* to encourage local community members and families to learn about and experience the river. Geared toward local elementary and middle school children and their families, *Celebrate the River* spotlights student artistic expression through art contests and theater. River walks and exploration of riparian areas adjacent to the river are also included. The over-arching purpose of the event is to “re-connect” people to the river, and foment a culture of respect and appreciation for natural spaces.

Volunteer to assist with various activities including water quality monitoring, river-clean ups, guided tours, public dissemination of information, and more. Visit the website to learn more: www.friendsofsantacruzriver.org

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Santa Cruz Valley Heritage Alliance
www.santacruzheritage.org

The Mission of the Santa Cruz Valley Heritage Alliance, a non-profit organization, is to connect people to the cultural, historic, and natural treasures of the Santa Cruz Valley through education, preservation, and promotion of its unique resources and living traditions. To help carry out this mission, the Heritage Alliance has developed a concept and completed a *Feasibility Study for a Santa Cruz Valley National Heritage Area*, with public input and support from a broad coalition of stakeholder groups including governments, tribes, and residents. The Heritage Alliance is working with Arizona's legislators in Washington, D. C. to pass a bill to designate the region as a National Heritage Area. National Heritage Areas are non-regulatory designations that provide access to federal dollars and lead to opportunities for expanded ecotourism and heritage tourism without infringing on private property rights. With representation of these diverse local interests, the Heritage Alliance will promote the National Heritage Area and assist with voluntary efforts to preserve and celebrate the cultural traditions, historic places, and natural and working landscapes of the Santa Cruz Valley.

Write to Arizona's legislators and encourage them to support the bill for the National Heritage Area designation. Visit www.santacruzheritage.org to become a member of the Heritage Alliance and learn about heritage tours and events.

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Asociación de Reforestación en Ambos Nogales
www.arannogales.net

The Asociación de Reforestación en Ambos Nogales (Association of Reforestation for Ambos Nogales, ARAN) is a dynamic group of individuals and diverse organizations who collaborate to address environmental challenges facing Nogales, Sonora and Nogales, Arizona (Ambos Nogales). ARAN began in 2001 when a binational group of representatives from Nogales and Tucson organized pilot projects to explore ways to increase the planting and maintenance of native vegetation. ARAN quickly grew, and by 2005 expanded to include activities relating to the protection of air and water, promotion of environmental stewardship, strengthening of ties between U.S. and Mexican schools and communities, and encouragement of leadership development. Water quality initiatives include the development of facilities to convert waste vegetable oil to biodiesel, as well as the installation and evaluation of water harvesting facilities and composting toilets in neighborhoods lacking water and sewer systems. In October 2012, ARAN celebrated the opening of an EcoCasa, located on the campus of the Centro de Capacitación para el Trabajo Industrial 118 (CECATI 118, a training center for industrial work in Nogales, Sonora), as an education and demonstration center incorporating rainwater and graywater harvesting, water filters, a composting toilet, and more.

Visitors are always welcome! You can start by attending a meeting. To get involved, send your name and contact information to Kevin Bullets bullets@email.arizona.edu

Conclusion

We hope you have enjoyed this journey through time traveling to various locations along the Santa Cruz River. We find the story essential for appreciating the hard work of so many in protecting this rich heritage.

If you are inspired to learn more and experience the river first hand, you will find the Heritage Map developed by the Santa Cruz Valley Heritage Alliance to be invaluable in identifying exciting places to see (Heritage Map at: <http://www.santacruzheritage.org/tourismmap>). If you want to volunteer or support current efforts, the *State of the Santa Cruz River—Conservation Inventory* will help you find projects of interest and determine whom to contact (this companion document is available at: <http://tiny.cc/scrci>). One thing is certain—everyone, regardless of age or experience level, can get involved

and become a passionate river steward. Finally, community support through philanthropy is a vital component to the long-term success of all conservation efforts, and all those listed would gratefully accept donations.

For the practitioners leading the cause, we recognize that the *The State of the Santa Cruz River—Conservation Inventory* is only a starting place and in no way represents an exhaustive list of everything happening on-the-ground. Designed to accommodate updates easily, we invite you to improve this resource by sharing your stories. We hope this will prove a useful tool to recognize your great work, foster opportunities for collaboration, and distinguish overarching priorities, all of which are essential ingredients for sustained conservation success.

References

The National Park Service Desert Southwest Cooperative Ecosystems Studies Unit commissioned a much longer historical study, which informed the historical section of this publication. Two University of Arizona graduate students wrote the bulk of that document—Karilyn Roach (School of Planning and Landscape Architecture) and Matthew Pailes (School of Anthropology). We are indebted to them and to those who graciously reviewed the National Park Service document: Dr. Patrick O’Brien and Dr. Larry Norris (retired), U.S. National Park Service Desert Southwest Cooperative Ecosystems Studies Unit; Dr. Paul Fish and Dr. Suzanne Fish, Arizona State Museum; Dr. Thomas Sheridan, University of Arizona Southwest Center; and Dr. Raymond Turner, U.S. Geological Survey (retired).

Below is a partial list of references that informed the condensed history found in the *State of the Santa Cruz River*. For a complete reference list for this longer document, please visit the Sonoran Institute website.

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Page 18: *Illustration of Church facade of San Jose de Tumacácori.* HABS ARIZ,12-TUBA.V,1- (sheet 30 of 33)

Page 19, bottom middle: *Mission San Cosme del Tucson, Menlo Park, Tucson, Pima County.* Photo by ‘The Campbell Studios’. c. 1881. Copied for Survey through courtesy of Harry Drachman. AZ HABS ARIZ,10-TUCSO,3—3; **bottom right:** *San Xavier Mission, Tucson, Arizona* c. 1913.

Page 27, top left: *1880 street scene, prior to the arrival of the automobile.* HABS ARIZ,10-TUCSO,30—8; **bottom left:** *Irrigated Cotton Field,* May, 1937. Dorothea Lange, photographer. LC-USF34-016587-C

Page 28: *CCC (Civilian Conservation Corps) workers.* Carl Mydans, photographer. LC-USF33-T01-000067-M1

EDWARD S. CURTIS COLLECTION

Page 6: *Tohono O’Odham woman cleaning wheat,* c. 1907. LC-USZ62-123312

Page 12: *Portrait of Luzi, a Tohono O’Odham woman, with basket tray on her head,* c. 1907. LC-USZ62-105389

Page 13: *Saguaro gatherers,* c. 1907. LC-USZ62-106799

Page 16: *Woman picking cactus fruit with wooden stick,* c. 1907. LC-USZ62-111283

Page 16: *Woman seated by doorway of structure made of arrowbrush and earth,* c. 1907. LC-USZ62-101255

FREDERICK D. NICHOLS, PHOTOGRAPHER

Page 17, left: *San Jose de Tumacácori Mission Ruins, Tubac, Santa Cruz County, AZ,* 1937. HABS ARIZ,12-TUBA.V,1—1; **right:** *Detail of Belfry Opening, San Jose de Tumacácori Mission Ruins,* 1937. HABS ARIZ,12-TUBA.V,1—10

Page 22, right: *Mexican House, Tubac, Santa Cruz County, AZ.* HABS ARIZ,12-TUBA,2—1

Page 25: *University of Arizona,* c. 1909.

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Page 20-21: *Section from Mapa de los Estados Unidos de Méjico* by John Disturnell, 1801–1877.

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Page 24, left: *Santa Cruz River flood at the Congress Street Bridge,* 1902. 54763; **right:** *Workers paving track for railway on Mainstreet,* c. 1920, 74365;

Page 25: *Early 1900’s near Mission San Xavier, Santa Cruz River.* 14503–3

Page 26, left: *Cotton Fields in Santa Cruz River Valley.* 29061

Page 27, top middle: *South Meyer Avenue looking South.* 1880s; **top right:** *Workers pave street east of Scott Avenue,* c. 1920, B32475; **bottom right:** *Santa Cruz River and valley looking south from “A” Mountain towards Martinez Hill,* May 1927. 1801f.2621

OTHER

Page 18: *Illustration altered from etching of Fort Tubac, Arizona presidio,* by Ross Browne

Page 22: *Geronimo, Chiricahua Apache leader,* 1898. Photograph by Frank A. Rinehart

Page 23: *Empire Ranch Foundation photo,* courtesy of Dusty Vail Ingram

Page 28: *B-29 Bombers (Lucky Lady II front quarter).* Photograph courtesy of Davis Monthan Air Force Base, Historic Image Collection

SONORAN INSTITUTE OFFICES

44 E. Broadway Blvd., Suite 350
Tucson, AZ 85701
Tel: 520-290-0828
Fax: 520-290-0969

201 S. Wallace Ave., Suite B3C
Bozeman, MT 59715
Tel: 406-587-7331
Fax: 406-587-2027

817 Colorado Ave., Suite 200
Glenwood Springs, CO 81601
Tel: 970-384-4364
Fax: 970-384-4370

11010 N. Tatum Blvd., Suite D101
Phoenix, AZ 85028
Tel: 602-393-4310
Fax: 602-393-4319

Magisterio #627
Col. Profesores Federales
Mexicali, Baja California
C.P. 21370, MX
Tel: 011-52-686-582-54-31

