



COLORADO RIVER DELTA RESTORATION PROJECT

A PLAN OF ACTION



Shaping the Future of the West

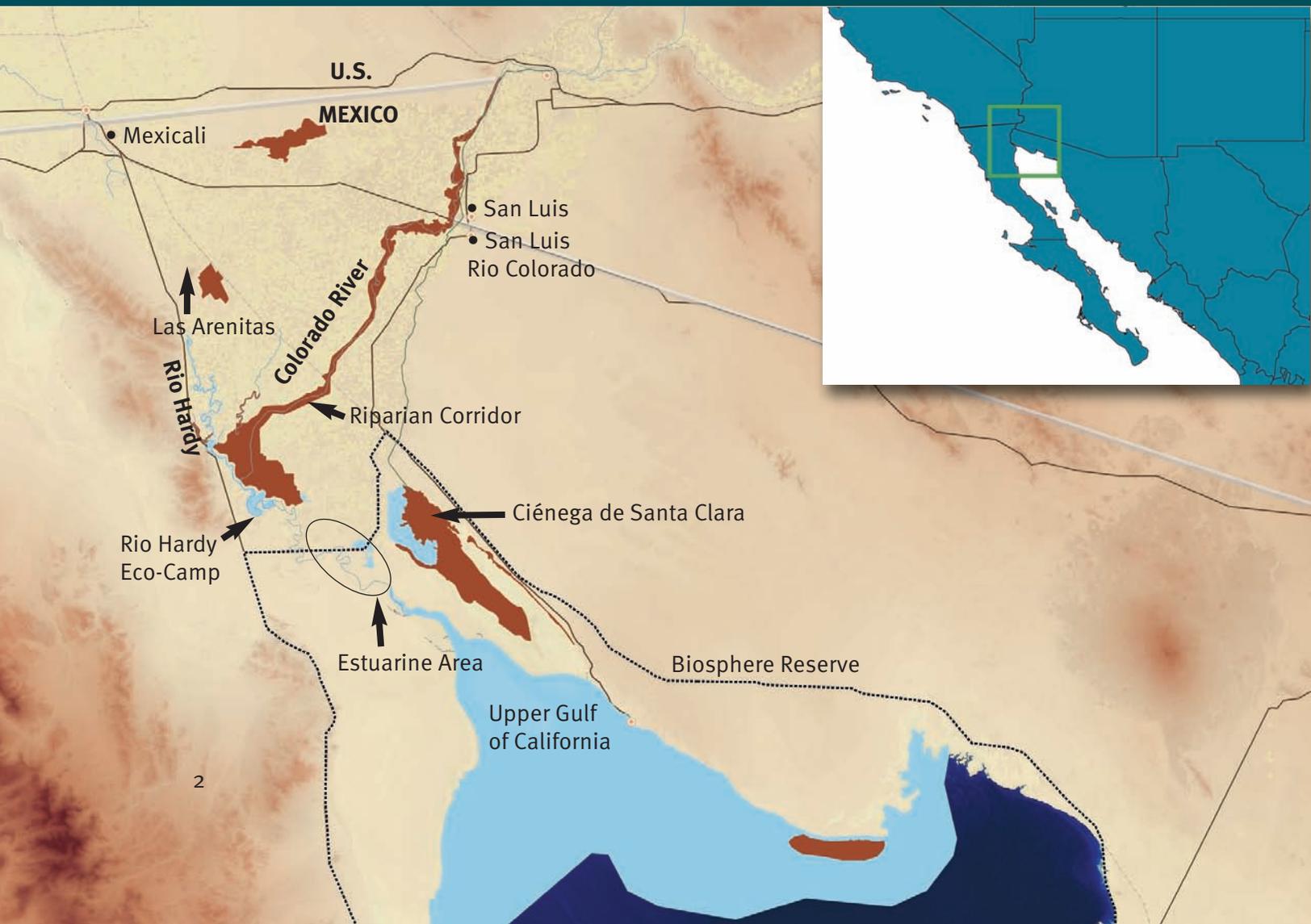
One hundred years ago, the mighty Colorado River formed a lush delta as it flowed into the Gulf of California. Covering more than 3,000 square miles of riparian, freshwater, and tidal wetlands, the Colorado River Delta supported a vast population of plant, bird, and marine life.

Today, due to dams and diversions upstream, the Colorado River no longer reaches the sea, and the Delta is less than 10% of its original size. The lack of water has greatly stressed the Delta's riparian and estuarine areas and the wildlife that depends on them.

Yet, the resiliency of this endangered ecosystem offers great reason for hope. It has been shown that even modest flows of fresh and brackish water can lead to immense accomplishments in the Delta. **This potential for ecological recovery spurred the Sonoran Institute and our partners in Mexico and the U.S. to set an ambitious goal to double the Delta's existing wetlands and ultimately reconnect the river to the sea.**

Please join us in our efforts to restore this ecological treasure.

INTRODUCTION





Dendrites form in a barren landscape as tidal flows seek out the long-lost connection with the old channel of the Colorado River.

THE COLORADO RIVER: A VITAL BUT DEPLETED RESOURCE

The greatest desert river in the Western Hemisphere, the Colorado River has often been called “the Nile” of North America. Arising along the continental divide in the Rocky Mountains, the Colorado gives life to diverse plant, animal, and human populations as it meanders through the western United States and Mexico toward its final coalescence with the sea.

The Colorado once delivered its entire annual discharge of approximately 14 million acre-feet of fresh water to the upper Gulf of California, creating one of the largest and most productive estuaries in the world. The Delta then was an immense patchwork of roughly two million acres of riparian, freshwater, and tidal wetlands, supporting incredibly diverse and bountiful populations of bird, plant, and marine life. It also provided cultural and economic value to the indigenous people, fishermen, and local populations.

Over the last century, the Colorado has been asked to do much more. Since 1905, more than 100 dams have been constructed on the river and its tributaries, diverting flows to serve the agricultural, industrial, and municipal needs in the arid West. The Colorado River today provides water to 30 million people across seven U.S. states and two Mexican states. The cities of Denver, Salt Lake City, Albuquerque, Las Vegas, Phoenix, Tucson, Los Angeles, San Diego, and Mexicali all rely on the river for survival and growth. In regions such as California’s Imperial Valley, where annual crop production is over \$1 billion and annual rainfall less than three inches, agriculture would not be possible without irrigation supplied from the Colorado River.

With more than 100 dams diverting its flow to serve agricultural, industrial, and municipal needs in the arid West, the Colorado River no longer reaches the sea, and the Delta is 10% of its original size.

Migrating pelicans over La Ciénega de Santa Clara wetlands. Pelicans are just one of the more than 385 bird species that depend on the Delta.



THE DELTA: A TREASURE WORTH SAVING

“This area has seen drastic changes in the last 100 years. But at the same time it still maintains some of the most important environmental values in the region and the continent. It provides wintering habitat for nearly half a million migratory birds every winter. It’s a mosaic of different wetland ecosystems...that diversity of habitat types brings a richness to the region.”

**Osvel Hinojosa, Pronatura Noroeste,
Director of Water and Wetlands Program**

Despite being drastically reduced by extensive upstream diversions, the trickle of water that still reaches the Delta nonetheless supports important remaining habitat and wildlife in the region.

As one of North America’s most unique and valuable ecosystems, today’s Colorado River Delta serves as habitat for more than 385 bird species, several of which are endangered or threatened. Located along the Pacific Flyway, the major north-south migratory bird route that extends from Alaska to the tip of South America, the Delta is a critical oasis of remaining wetland habitat in hundreds of miles of barren desert.

The Upper Gulf of California sustains populations of commercially important species of crabs, blue clams, shrimp and fish, particularly the Gulf corvina. The Upper Gulf also supports a high number of endemic species such as the critically endangered *vaquita* porpoise and endangered *totoaba* fish. Furthermore, the Delta remains crucial to the cultural survival of indigenous communities on both sides of the border, particularly the Kwapa Tribe (Cucapá in Mexico and Cocopah in the U.S.) and communities from the Mexicali Valley down to the Gulf.

However, the demand for water on both sides of the border continues to escalate with rapid population growth, prolonged droughts, and the historic over-allocation of the river. That means even this small trickle of water that sustains the people, economies, and wildlife of the Delta is in danger of being diverted.

“There’s a dramatic change in the system and our subsistence has changed, and we as a people have to change in order to survive. [Now there] is an awakening of a lot of people that are trying and working hard to revive parts of the river. That’s what I’ve dedicated the rest of my life to.”

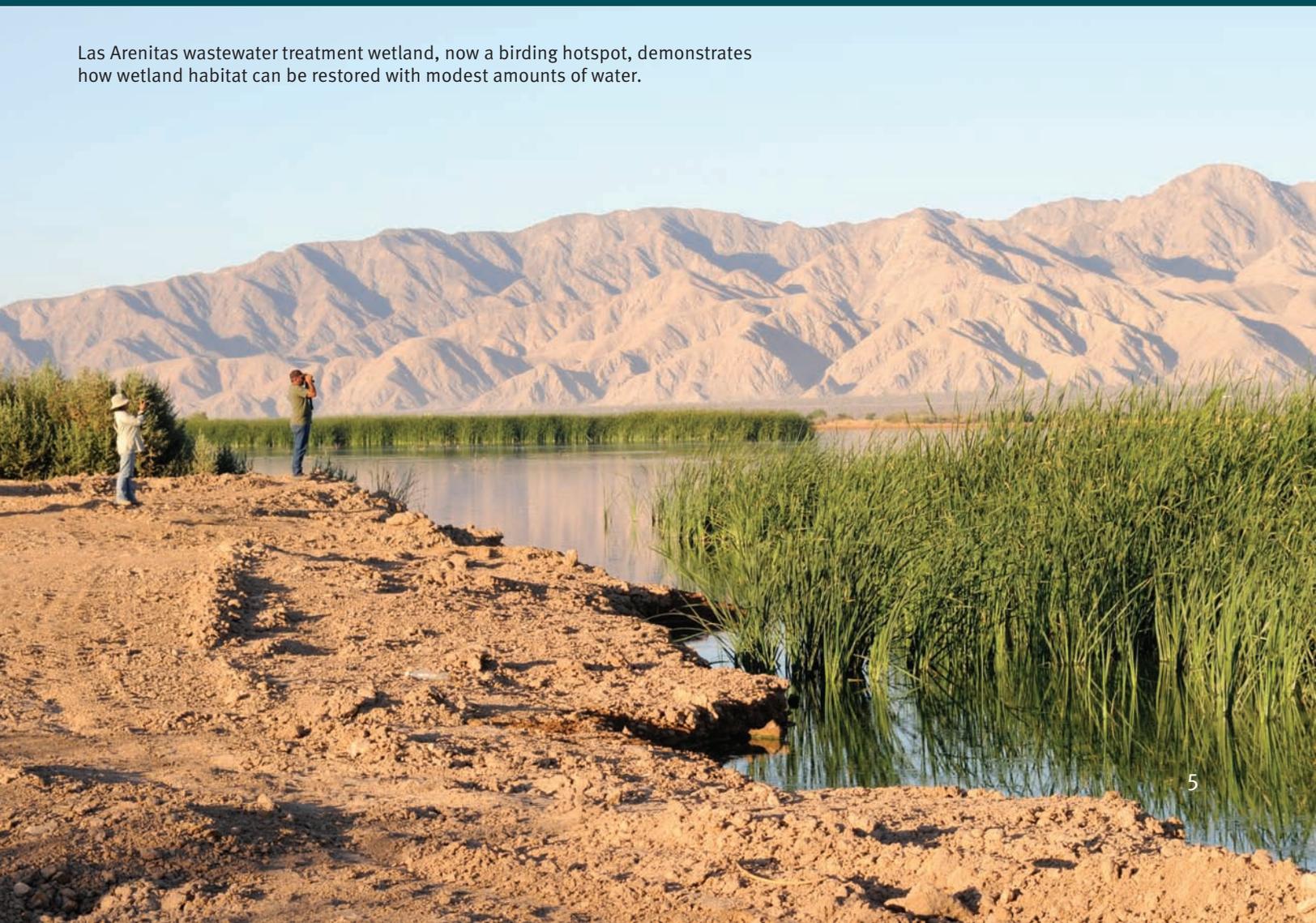
**Colin Soto,
Elder of Cocopah tribe**



It is time to recognize the Colorado River Delta as an integral component of the Colorado River System and take bolder strides toward its protection and restoration.

Research and restoration efforts by the Sonoran Institute and our partners have demonstrated that the Colorado River Delta is a remarkably resilient system. With modest amounts of water and meaningful community involvement, the riparian, wetland, and estuarine systems of the Delta can be revived.

Las Arenitas wastewater treatment wetland, now a birding hotspot, demonstrates how wetland habitat can be restored with modest amounts of water.



Sonoran Institute restoration specialists look out across an estuarine lagoon. Sonoran Institute and partners are implementing a project to improve connectivity between the river and the sea to create better spawning and nursing habitat for marine species.



A NEW VISION FOR THE DELTA

Our goal is to double the Delta's riparian, wetland, and estuarine habitats and ensure regular connectivity between the river and the sea by 2022.

Along with our principal partner, Pronatura Noroeste, one of the largest and most respected conservation organizations in Mexico, we are carrying out our bold vision to not only protect the water that now trickles to the Delta, but also to return water to the Delta. The key to our large-scale, long-term restoration strategy is to secure more water for the Delta in order to allow a minimum base flow of fresh water and periodic pulse flows to mimic spring flooding.

Our goal is to double the Delta's riparian, wetland, and estuarine habitats and ensure regular connectivity between the river and the sea by 2022.

To accomplish this goal, we are working to:

- Protect and restore 160,000 acres of riparian, wetland, and estuarine habitat for the benefit of people and wildlife.
- Secure at least 50,000 acre-feet of water per year as a minimum instream flow and a pulse flow of 250,000 acre-feet every four years.

In 2005, we and our partners outlined our conservation and restoration recommendations in the *Conservation Priorities for the Colorado River Delta* report. The U.S. and Mexican governments, through an international working group, adopted the report in 2006 as the official plan for protecting the Delta. Eighteen projects have been identified to meet recommendations in the report, and many of those projects are underway.

THE COLORADO RIVER DELTA: PAST, PRESENT, AND FUTURE WATER FLOWS AND HABITAT ACREAGE

	100 years ago	Today	Goal for 2022
Freshwater designated to environmental flows (acre-feet per year)	14 million a.f. average	Freshwater - 3,000 a.f. Effluent - 12,000 a.f.	Base flow: 50,000 a.f. per year Pulse flow: 250,000 a.f. every four years Effluent: 24,000 a.f.
Riparian, marsh wetland, and estuarine habitat	2 million acres	80,000 acres of mostly unconnected and degraded habitat	160,000 acres of a network of healthy habitat

The Sonoran Institute and our partners are positioned to turn this vision into reality. With 14 years of experience in the Delta, we have developed a comprehensive conservation strategy based on results and adaptation. Our strategy to protect and enhance the ecological systems of the Delta consists of several key components: 1) economic assessment of the Delta; 2) policy reform in both the U.S. and Mexico; 3) sound ecological research; 4) community engagement; and 5) on-the-ground restoration demonstration projects.

Dr. Osel Hinojosa
Pronatura Noroeste
Director, Water and
Wetlands Program



Florentino Flores
AEURHYC member,
Fisherman

Dr. Karl Flessa
University of Arizona
Professor and Head of
Dept. of Geosciences



Dr. Jorge Ramírez
University of
Baja California
Hydrologist

Dr. Jaqueline García
CIAD
Head of Environmental
Sciences Lab



SPOTLIGHT – Partnerships in the Delta

The Sonoran Institute has been working with Pronatura Noroeste for 14 years. We not only share the same vision and goals for the region, but also work closely together on projects to see that vision realized.

In addition to Pronatura, the Sonoran Institute is working closely with the Asociación Ecológica de Usuarios del Río Hardy y Colorado (AEURHYC), or the Ecological Association of Users of the Colorado and Hardy Rivers. This local organization includes community members representing the tourism, agricultural, and fishing sectors as well as the Cucapá (Kwapa) Indigenous Tribe. The University of Arizona, the Centro de Investigaciones en Alimentación y Desarrollo (CIAD), or the Research Center for Nutrition and Development, and the Autonomous University of Baja California provide a strong research component to the effort, while the Sonoran Institute's principal role is to bring key players and information together and jointly design and implement projects.

These partnerships serve as a global model for participatory water management across international borders.



OUR CONSERVATION STRATEGY

“It can’t be done by one person, not by one organization, not even by one country. The future is that we have to work not just throughout borders, but throughout the ecosystems themselves. We are at a point now where we can say, yes this can be done, this will be done.

The structures are in place, the work is in progress.”

Gaston Luken, Pronatura Honorary Board Member

1) ECONOMIC VALUATION

A critical requirement for restoring the Colorado River Delta ecosystem is securing water for the environment. Making the case for increasing the amount of water for the Delta requires an understanding of the economic values of the ecosystem and what the future benefits and tradeoffs might be as additional water is dedicated to restoration of the Delta. The Sonoran Institute is leading a three-year study in collaboration with seven partners from the U.S. and Mexico to determine the economic values associated with ecosystem services currently generated in the Delta and how those values might change in a scenario of a restored, healthy Delta ecosystem. Furthermore, we will propose and initiate implementation of specific market mechanisms and regulatory policies to secure these flows.

2) A TOOL OF POLICY REFORM: THE WATER TRUST

In 2008, Pronatura Noroeste, the Sonoran Institute, and other partners from both sides of the border established the Colorado River Delta Water Trust. The first of its kind in Mexico, the Trust provides a formal mechanism, recognized under law by the Mexican government, through which water can be secured and dedicated in perpetuity to the Delta.

The Colorado River Delta Water Trust is already functioning. Thus far, the Trust has spearheaded the purchase and protection in perpetuity of 3,000 acre-feet of water. This water is currently used to maintain 12,000 acres of marsh wetlands and to enhance over 100 acres of riparian habitat in several restoration areas along the riparian corridor of the Colorado River mainstem. These restoration projects have been successful well beyond our dreams and have demonstrated that the Delta is a remarkably resilient system.

THE WATER TRUST AT WORK IN LA CIÉNEGA DE SANTA CLARA WETLAND

As the largest marsh wetland in the entire Sonoran Desert, the Ciénega de Santa Clara supports 75% of the world's population of the endangered Yuma clapper rail and is a major stopover for migratory birds along the Pacific Flyway. In 2010, an historic bi-national agreement was made between Mexico, the United States, and a coalition of non-governmental organizations (NGOs) to dedicate 10,000 acre-feet each to the Ciénega in order to maintain its ecological integrity during the pilot run of the nearby Yuma Desalting Plant (YDP). The Water Trust provided a critical mechanism through which the NGOs could negotiate equal water allocation to the wetland by all parties. Led by the University of Arizona, the Sonoran Institute and other partners are participating in bi-national monitoring efforts of the wetland's water quality and quantity, flora, and fauna to understand how this dynamic wetland is being affected by changes in input flows. We and our partners seek to continue monitoring efforts in the future and to define bi-national agreements that would guarantee water flows to the Ciénega for the long term.

Images of La Ciénega de Santa Clara: Below left – Juan Butron, a local expert on La Ciénega leads a group on a tour of the expansive wetland.





The baseline data produced through our research has enabled us to identify conservation priority areas and measure the progress of our efforts.

OUR CONSERVATION STRATEGY

Our conservation strategy for the Colorado River Delta is based on results and adaptation.

3) ECOLOGICAL RESEARCH

The Sonoran Institute, Pronatura Noroeste, the University of Arizona, CIAD, the Autonomous University of Baja California, and other institutions have developed an international research effort to evaluate the current ecological situation in the Colorado River Delta. The wealth of baseline data produced through this research has enabled us to establish conservation priority areas and to measure the progress of our restoration efforts.

4) ENGAGING LOCAL COMMUNITIES

The Sonoran Institute was founded on a conservation model that depends on meaningful community participation. Utilizing this model in the Delta, Sonoran Institute staff have spearheaded a bi-national collaborative partnership involving local indigenous groups, local leaders from nearby communities, federal and state agencies on both sides of the border, and researchers who work together to implement on-the-ground restoration efforts.

Adopt-the-River Program

Local peoples' hands-on experience and education on Delta ecosystems and restoration promotes long-lasting results that collectively will alter the future of the Delta. The Sonoran Institute strives to empower local populations to develop their own vision, create and implement their own restoration goals, enjoy the benefits of a healthy Delta ecosystem, and advocate for policies that support restoration

initiatives. With this in mind, we are continuously expanding our Adopt-the-River program, the outreach component of our work in the Delta.

PROGRAM HIGHLIGHTS:

- Eighteen groups are currently participating in the Adopt-the-River program, including governmental organizations, high school and university students, members of the Cucapá Tribe, and various community organizations.
- Local “citizen scientists” have been trained in the monitoring of flora and fauna.
- Outreach has engaged 5,480 people, including local populations, students and international visitors.
- Local groups have improved recreational areas, developed exhibits and interpretive trails, and restored 35 acres of riparian habitat through riverbank revegetation and removal of nonnative species.

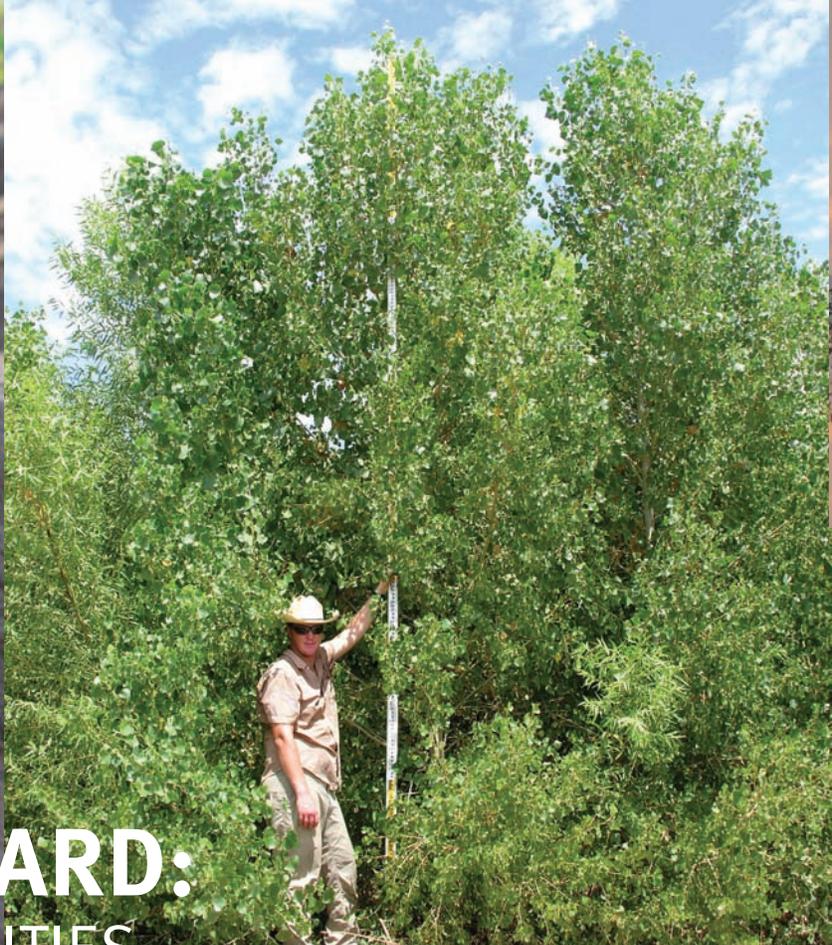
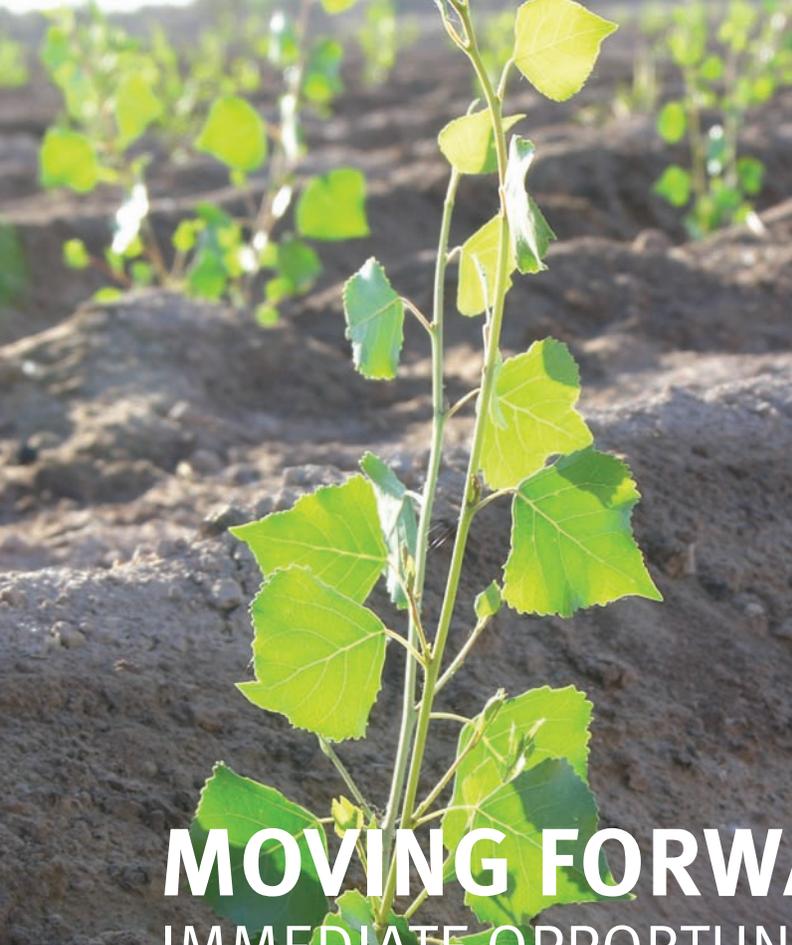
Our outreach efforts have engaged 5,480 people and resulted in the restoration of 35 acres of riparian habitat.



5) ON-THE-GROUND RESTORATION PROJECTS

Restoring priority areas in the Colorado River Delta will not only improve habitat for birds, fish, and other wildlife, but it will also improve the quality of life in nearby communities by creating recreation areas and providing cleaner water and additional economic opportunities in terms of ecotourism, hunting, and fishing. Along the Colorado River and its tributary, the Rio Hardy, we have already restored 190 acres of riparian habitat and 500 acres of marsh wetlands. At Las Arenitas wastewater treatment plant located outside of Mexicali, we have restored 100 acres of marsh habitat through the construction of a treatment wetland. We are currently working in the estuary to reconnect the river to the sea, which will enhance estuarine habitat and provide access to spawning and nursing grounds for marine species.

Local people have been inspired to initiate restoration efforts of their own.



MOVING FORWARD: IMMEDIATE OPPORTUNITIES

Much of the groundwork for restoration has been done. We are now positioned to turn our vision for the Delta into reality.

With the solid foundation provided by the water trust, scientific and economic research, more than 10 successful restoration projects, and local engagement, the Sonoran Institute and our partners are ready to take critical steps toward realizing our vision for the Colorado River Delta. There are two very exciting and immediate opportunities to significantly advance our work in the area:

Secure Water for the Rio Hardy

- 1) Secure an additional 12,000 acre-feet of treated effluent water from Las Arenitas wastewater treatment plant for the Rio Hardy and the estuary of the Colorado River in exchange for the construction of a new treatment wetland.

Establish a Nature Preserve

- 2) Initiate the first large-scale restoration effort in the Delta that, when complete, will reestablish and protect as a designated nature preserve 1,200 acres of riparian and wetland habitat along the mainstem of the Colorado River.



ALLOCATION OF LAS ARENITAS EFFLUENT TO THE RIO HARDY

We have developed a particularly exciting and time-sensitive opportunity to secure approximately 12,000 acre-feet of water for the Colorado River Delta at a cost significantly below the market price in the region. This additional water would come from Las Arenitas wastewater treatment plant south of Mexicali in the state of Baja California, which plans to double its treatment capacity over the next few years. Preliminary discussions have indicated that in exchange for the cost of designing and constructing a new wastewater treatment wetland at the plant, the state will allocate an additional 12,000 acre-feet of waste water effluent to the Rio Hardy, a tributary of the Colorado River.

The Rio Hardy once flooded with Colorado River water during annual floods. Today, the natural channel carries agricultural runoff and never receives the flooded Colorado River pulse flows that are needed to flush out sediments, toxins, and salt concentrations. The agricultural wastewater has such a high salinity that native cottonwood and willow riparian species are rarely able to survive along the river. And yet, amidst the arid and desolate surroundings, where there is water there is life—the Rio Hardy remains a critical habitat corridor for water birds and songbirds and serves as a source of food, income, and recreation for local communities.

Increased flows to Rio Hardy would provide significant benefits extending all the way down to the lower Colorado River and its estuary, including increased marsh and riparian habitat, expanded economic and recreational opportunities for local communities, and improved estuarine habitat for fish and shrimp populations in the Gulf of California.

The proposed expansion of the wastewater treatment plant represents an immediate, one-time, and fleeting opportunity to secure additional water for the Rio Hardy, lower Colorado River, and Upper Gulf of California estuary.



The expanding Las Arenitas treatment wetland will provide additional habitat for birds and other wildlife.



THE COLORADO RIVER DELTA PRESERVE, MEXICO

Our pilot project located along the Colorado River has had very positive impacts on habitat, wildlife, and local communities, providing us with the foundation and incentive to scale up our efforts.

The nature preserve would be located in the Colorado River floodplain in the heart of the riparian corridor, a 70-mile-long stretch of remnant riparian habitat that still survives on the drastically reduced flows of the Colorado River. Through a 30-year land concession agreement with the Mexican government, the Sonoran Institute and Pronatura Noroeste have secured a total of 1,200 acres within the riparian corridor dedicated to restoration.

After working in this area for over five years, we have significant data on the area's topography, depth-to-groundwater, soil chemistry and texture, and water infiltration rates. The area has favorable depth-to-groundwater levels for establishing native tree species. Furthermore, our 100-acre restoration pilot project located within the concession area has had very positive impacts on the habitat, wildlife and the local communities in the region, providing us with the foundation and incentive to scale up our efforts.

The nature preserve's restoration will simulate the original riparian and wetland habitat of the Delta, increasing the acreage of prime habitat for both resident and migratory birds, small mammals, reptiles, and other wildlife. In addition to enhancing river habitat and recreational activities, the proposed preserve would also improve the quality of life for local residents by producing jobs and economic development opportunities for nearby communities.

The next decade offers the opportunity to greatly expand on current achievements and to realize the ambitious vision of a renewed Delta with healthy and vibrant communities.

Our field projects and research have demonstrated not only the feasibility of restoration but also the willingness of local communities to join our efforts. International recognition of the Delta's ecological and socioeconomic importance has never been higher, and people across all levels of society in both Mexico and the U.S. are deepening their commitment to protect and restore it.

The Colorado River Delta can be brought back to life, but we need your help. What little water now reaching the Delta will disappear without determined efforts to secure it for the environment and the communities that depend on it for their livelihoods.

The Las Arenitas effluent and Colorado River Delta Preserve projects represent exciting but fleeting opportunities to secure additional water at cost-effective rates. Your donation will support these immediate projects as well as our long-term restoration efforts in the Delta.

Please help us save this precious resource.

WE NEED YOUR HELP

When you donate to the Delta, your gift will enable us to:

- Purchase acre-feet of water
- Sponsor students to participate in restoration activities
- Support revegetation of native tree species

To make a donation, visit our website:

www.sonoraninstitute.org
and click the water drop



Or contact Jessica Ristow:
jristow@sonoraninstitute.org

Your gift makes a difference.

TIME FOR BOLD ACTION

A diverse group of people involved in various restoration projects across the U.S. and Mexico visit the Sonoran Institute's restoration sites in the Delta. The group represents the collaborative effort of organizations, universities, government agencies, and community members to secure a better future.





La Ciénega de Santa Clara wetland demonstrates that there is hope
for restoration of the Colorado River Delta.



Shaping the Future of the West

Sonoran Institute

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The Sonoran Institute inspires and enables community decisions and public policies that respect the land and people of western North America. Founded in 1990, the Sonoran Institute is a nonprofit organization with offices in Tucson and Phoenix, Arizona; Bozeman, Montana; Glenwood Springs, Colorado; Sheridan, Wyoming; and Mexicali, Baja California. For more information, visit www.sonoraninstitute.org

For more information, contact Francisco Zamora at fzamora@sonoraninstitute.org

A special thank you to all of those who have contributed to restoring the Delta.