



The Flow

November 2023

Friends of the Santa Cruz River Newsletter

President's Message:

Unity in Action to Protect the River

By Ben Lomeli

Our Upper Santa Cruz River watershed is unique. The Santa Cruz is the only river that crosses the US border twice. We also share a binational groundwater aquifer with Mexico. The Santa Cruz Valley National Heritage Area was designated by Congress in March 2019 in recognition of the region's distinctive natural and cultural character and to support regional partnerships in its conservation, preservation, and enhancement.

Our watershed is also our airshed which is predominately downstream from Mexico, and which continues to face many rapid and increasing challenges.

Past and present environmental and public health threats and impacts to our Upper Santa Cruz River communities include cancer and lupus clusters, International Outfall Interceptor sewer pipe partial rupture in July of 2017, (which resulted in elevated E-coli contamination reaching San Xavier), other transboundary sewage flows in 4-5 locations, flooding, heavy metals, fecal snow, PFAs & PFOAs (manmade forever chemicals), microplastics, and the Border Wall.

Several other "Present and Reasonably Foreseeable Impacts" threaten our Upper Santa Cruz River communities.

Trash in our streets, roads and waterways that degrades our environ-

ment, presents an economic deterrent, and ends up in the river creating obstructions and many other adverse environmental and public health threats. Thanks to all who have taken up the challenge and help with clean-ups.

Transboundary sewage flows in 4-5 locations, if not adequately mitigated/treated, can be expected to increase with population growth and development in upstream Mexico. FOSCR is working with ADEQ and IBWC who are coordinating with Mexican counterparts to help resolve this ongoing concern.

Climate change continued megadrought, and increased groundwater pumpage to meet growth demands cause concerns regarding sustainable

potable water supplies and flooding due to increasing storm intensities.

Proposed El Pilar mine upstream in Mexico, and South32 mine in the Patagonia Mountains also cause concerns regarding increased flooding risks and sustainable water supplies in the Patagonia area, as well as



Trash collected at Ron Morris Park, Tubac. (1/14/2023)



President's Message, con't.

concerns about potential wide-spread water and air contaminations.

South32 needs to dewater up to 6.5 million gallons per day to mine lead, zinc, silver, and manganese. That is almost 2 million gallons per day more than Rio Rico's and Nogales's combined potable use.

The dewatering discharged waters will likely build a groundwater mound that would increase flooding risks in Harshaw Creek, Sonoita Creek, and through Patagonia. South32 has also indicated targeting Rio Rico for their Manganese processing plant but has

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The Flow is published by Friends of the Santa Cruz River (FOSCR), a nonprofit, volunteer organization dedicated to ensuring the continued flow of the Santa Cruz River, the life-sustaining quality of its waters, and the protection of the riparian biological community that it supports.

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not yet committed to any specific location after much public opposition to the well documented risks of this highly neurotoxic mineral dust that can contaminate our air, water, soil, and food. (See Magnanese Road by Carte Blanche on YouTube: <https://www.youtube.com/watch?v=OVQEUSF-Nu8&t=12s>.)

Additionally, USA TODAY recently reported exceedances of PFAs in Rio Rico and Tubac drinking water.

All these past, present, and reasonably foreseeable public health and environmental impacts constitute Cumulative Impacts that raise concerns about Environmental Justice. We have much to protect as we face new and continuing challenges.

Thank you, all who care about our watershed and our Public Health and

Safety. A very special thanks to all those who attend and speak at the Santa Cruz County Board of Supervisors meetings, virtually or in-person. You are making a difference on what really matters regarding our environmental and our Public Health and Safety. Public opposition renewed interest by agencies, stopping a poorly planned rezoning proposal that included mining activities in Rio Rico. Our united voices and written comments should also be directed loud and clear at the State and Federal levels too.

Please consider applying as Friends of the Santa Cruz River board members. Thanks for caring and being involved! "If you are neutral in situations of injustice, you have chosen the side of the oppressor." Rev. Desmond Tutu.

"Water is the soul of the Earth."
W.H. Auden



Board member Laurinda Oswald waving at the FOSCR drone at the 2023 members meeting held at Santa Rita Ranch.

The Cottonwood-Willow Gallery Forest of the Santa Cruz River

By Blue Evening Star

(a team effort with help from Skye Leone, FOSCR Board Member; Ben Lomeli, FOSCR President; Mike Medrano, Superintendent, Tumacacori National Historical Park)

For more than 10,000 years, the Santa Cruz River has supplied water, good soils, food, fuel, building materials, natural flood control, and water quality protection to Indigenous Peoples, Spanish colonists, Mexican settlers, and United States communities.

The riparian forest that winds its green magic along the heart of the Santa Cruz Valley—sustained by ground and surface water—represents one of the last vestiges of southwest Cottonwood-Willow Gallery Forest in the world. It is the artery of life in this arid region.

A gallery forest is one formed as a corridor along rivers or wetlands, projecting into landscapes that are otherwise only sparsely treed—such as savannas, grasslands, or deserts. The gallery forest maintains a more temperate microclimate above the river.

In times past, gallery forests of Fremont's Cottonwood (*Populus fremontii*) and Goodding Willow (*Salix gooddingii*) were one of the most abundant riparian ecosystems in the southwestern United States and

northern Mexico. This species-rich ecosystem covered hundreds of kilometers along the low-elevation reaches of rivers such as the Rio Sonora, Rio de Magdalena, Colorado, Gila, Rio Grande, Rio Yaqui, Salt, Miguel, San Pedro, and Santa Cruz. Now, the southwestern Cottonwood-Willow Gallery Forest is one of the rarest forest types in North America.

This threatened plant community, found only on frequently flooded land with shallow groundwater levels, is among the forest types that supports the greatest number of bird species in the world.



Cottonwood-Willow

Today, these once biologically rich areas are in the worst shape in history, the result of being clogged, grazed and trampled by cattle for a century or more,

drought, and destructive flooding. In Arizona, the southwest Cottonwood-Willow Gallery Forest has declined by an estimated ninety-five percent from pre-settlement times. Despite making up only one percent of the arid Southwest, river forests continue to provide clean water and critical wildlife habitat.

The good news is that Cottonwood-Willow Gallery Forests have a high resilience because they contain rapidly growing species. A degraded forest can recover when critical hydrological processes are restored, nearby plant colonization sources are present, and unnatural factors (like cattle) are removed.

The two tree species dominating this habitat type both require wet, cleared sand and point bars in spring to germinate their wind-born cottony seeds—and their roots must touch water. Only natural flood patterns provide both the "nursery" bars and the slow retreat of groundwater—so baby roots can grow to catch it—needed for survival. As the water recedes after flooding, the bars stay wet and the seeds germinate. This wet,

bare, mineral substrate is necessary for cottonwood regeneration.

Cottonwood seedlings require these precise and frag-



Cottonwood-Willow Gallery, con't.

ile conditions to germinate, and they only have a successful germination when they are met. Unfortunately, after overcoming those odds, they are often eaten up by cattle who find them a juicy treat. Or they are scoured away by a dramatic flood before they get can grow tall enough to withstand flooding. But even the adults cannot withstand prolonged flooding.

Our Riparian Community

In the past, the Santa Cruz was sometimes known as "the lessening stream," as its flow has historically varied widely with changes in natural conditions and human use. Since the 1970's, however, the sometimes dry Santa Cruz has been bolstered by a steady flow of treated effluent from the Nogales International Wastewater Treatment Plant (NI-WTP), located in Rio Rico.

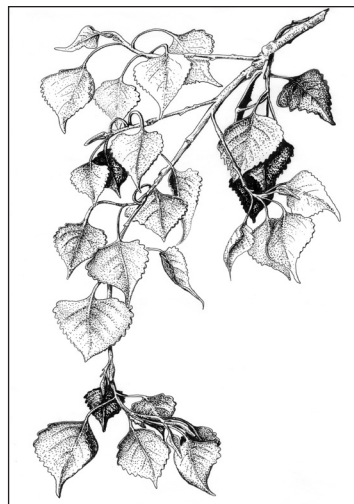
Our riparian ecosystem is mostly confined within a ½ mile band flanking the river's surface flow. This rich ribbon of riparian forest winding through the otherwise dry desert region is thriving with many trees and wildlife species. The plant life that brings green vitality to our region includes: Fremont's Cottonwood, Goodding Willow, Velvet Mesquite, Mexican Elder, Netleaf Hackberry, Arizona Black Walnut, Velvet Ash, Catclaw Acacia, Desert Honeysuckle, Graythorn, Mexican Passion flower Vine, Western Virgin's Bower and Wild Cotton.

For an in-depth look at all the plants and wildlife along the Santa Cruz River, see the Ramblers Guide at friendsofsantacruzriver.org/the-flow-2/ramblers-guide-2/.

A healthy Cottonwood-Willow Gallery Forest has a new generation of Cottonwood trees growing approximately every five (or more) years. Since successful seedling establishment occurs

sporadically, a healthy forest will have arc-shaped bands of even-aged trees parallel to the river channel. Each band contains trees similar in height and size because a large number of seedlings tend to become established at the same time and then thin as the band of trees matures.

If new generations of seedlings do not take root and thrive, when the Cottonwoods reach the end of their life and die off, no established waves of younger cottonwoods will take their place. This is what is happening now on the Santa Cruz River.



The life expectancy of Fremont Cottonwoods trees is 120 - 130 years (depending on local conditions). Most of the Cottonwood trees along the Santa Cruz River riparian corridor in The Santa Cruz River Valley originated after the major flood of 1983 that carried away most of the trees. What we have now are predominantly trees of the same approximate height and same generation (about 40 years old).

Fremont's Cottonwood trees are fast growers and can reach a height of 90' tall. Each tree drinks up to 100 gallons of water per day in the summer. Their roots trap sediment and help build soil. They provide nest sites for many birds from grey hawks to rare rose-throated becards. Look for soft yellow or orange catkin flowers on the trees in January, bright green leaves soon after. They are often festooned with tent caterpillar nests in summer: messy web enclosures protecting hundreds of caterpillars that only predatory specialists like yellow-billed cuckoos can penetrate.



Threats to Regeneration

The current threats to the establishment of new generations of Fremont's Cottonwoods along the Santa Cruz River include: cattle grazing, reduced base flow, drought and climate change, trash, contaminants, and Mexico possibly retaining water rights above 9.9 mgd (million gallons per day).

The reduction of water levels in the river and its adjoining soils has put stress on riparian trees and plants. In order to thrive, the dominant trees of the riparian gallery forest, Fremont's Cottonwoods, need groundwater to remain at a level around 15 feet below the surface. If groundwater falls below the roots of the cottonwoods and other vegetation, then the plants begin to get stressed and, in response, drop their leaves to conserve water. If the plants continue to have limited access to groundwater, extensive mortality can result.

In and along the Santa Cruz River, water levels are decreasing due to years of drought. In addition, the amount of water discharged by the NI-WTP could be further reduced.

Ecologists can't predict exactly what those changes will look like, but with any reduction in river flow, the system may eventually transform—with new animal and plant communities responding to the less-reliable availability of surface and groundwater. Intermittent flow, dependent on precipitation events, may create microhabitats for a number of fish and other taxa. The Cottonwood-Willow Gallery forest may become interspersed with mesquite woodland or vegetation communities more typical of the drier adjoining uplands.

Restoration Solutions

When natural ecosystem conditions are present (such as low soil salinity, relatively stable water tables, and timely periodic flooding that match's seed production) active restoration



Cottonwood-Willow Gallery, con't.

measures for Cottonwood-Willow Gallery Forests have proven successful.

Restorations measures pertaining specifically to the Santa Cruz River include:

- Working with our partners in Mexico to insure adequate effluent continues to flow into Arizona to support the Santa Cruz River.
- NADBANK recently started a study of potential effects on Santa Cruz River flows from the proposed Los Alisos Waste Water Treatment Plant expansion (in Nogales, Sonora). Currently we receive almost twice the effluent mgd than allotted from the Los Alisos groundwater basin, which creates a deficit for that basin and a surplus for the Santa Cruz.
- Fence off tree regeneration areas for protection from browsing game and livestock
- This was successfully done on the Santa Cruz River in Sonora Mexico in the 1990's, and in many places in USA and Mexico since then.)

Additional measures that could be



ADEQ Voluntary Environmental Stewardship Program Copper Award presented to Friends of the Santa Cruz River River-Watch Team. (9/23/2023)

taken:

- Promote cottonwood regeneration by cutting down one healthy cottonwood tree. The intact root system will sprout suckers (Dying or dead cottonwoods will not have the healthy root systems to sprout new trees)
- Planting poles or rooted cuttings of cottonwood and/or willow
- Restoring non-invasive understory flora
- Increasing soil biota which includes spores of the fungi which form symbiotic, ectomycorrhizal relationships with the riparian trees
- Restoration of invertebrates and other organisms important to nutrient cycling
- Restore channel and bank conditions by introducing beavers
- Placement of instream structures such as small check dams, induced meanders and deflectors
- Remove dense pockets of trees and shrubs near bridges or other critical infrastructure, as they pose wildfire concerns

- Create or retain occasional small brush piles for wildlife habitat. These also will encourage seedling regeneration

When livestock are present in a riparian area, it can help to create a controlled grazing plan, which includes providing resting areas in order to allow adequate regeneration of tree seedlings. Also, offering an alternative drinking water system for the livestock can be beneficial.

Call to Action

Supporting (and becoming involved with) Friends of the Santa Cruz River is one way to act upon concerns for the continuation of the precious Cottonwood-Willow Gallery Forest. Contact us to find out the many ways you can help us as we pursue our Mission Statement to:

"Insure a continued flow of the river's surface waters, promote the highest river water quality achievable, and to protect and restore the riparian ecosystem and diversity of life supported by the river's waters."

The Tumacácori National Historical Park is actively engaged in stewardship of a large area of the Cottonwood-Willow Gallery Forest on their stretch of river. They are an excellent local source of information on local ecosystem restoration projects as well.

Both Fremont's Cottonwoods and Goodding Willow trees are in the Willow Family. The Willow Family is known for withstanding floods by bending with the flow and profusely sprouting from the surviving roots and trunk. Indigenous cultures recognize this quality as an inspiration for humans to become strengthened by adversity. They say these trees have strong hearts, and will help us to become strong when we face challenges. Our human community plays a vital role in meeting the challenges of insuring that the ecosystem of our beautiful and precious bioregion not only survives — but thrives.

The Sierrita Mine Green Valley, Arizona

By Laurinda Oswald
FOSCR Board Member

There are three large, open pit copper mines in Green Valley with the Sierrita Mine being the southernmost one and the only one using water from the Upper Santa Cruz Aquifer. The other two use water from the Central Arizona Project (which comes from the Colorado River) as well as water from the Tucson basin.

Ore was first discovered there in the late 1800's, then rediscovered in 1960, and it opened as a pit mine in 1970. It has the largest Copper reserves in the country and possibly the world as well as reserves of Lead and Molybdenum, and produces fifty million pounds of Copper per year. It

moves 100,000 metric tons of ore and 140,000 metric tons of waste a day, 365 days a year with 1150 workers working in shifts. Today the Sierrita Mine is owned by Freeport-McMoran who purchased it in 2007.

In 1973, three years after the mine started operations, the discovery of elevated sulfates in drinking and irrigation wells East of the tailings meant

the mine had to do some major mitigation work. It was around this time that the Duval Corporation, who owned the mine at the time, started to purchase area ranches for their water rights, including the Canoa and the Agua Linda.

Between 1978 and 1981 a series of interceptor wells were drilled to the East of the tailings which draw water from the Tucson basin. A short time

From 1995 to 2011 the groundwater level under the Canoa Ranch Headquarters dropped four feet a year because the Sierrita Mine was pumping 12,000 gallons per minute every day, all day. However, between 2010 and 2013 it cut its demand down to 1800 gallons per minute.

Since 2014 it has been pumping 3450 gallons per minute, which is still better than 12,000 gallons! A report from 1990 shows that the water table under the Canoa Headquarters was at 50 feet, but in the last few years it was measured at 90 feet.

Until the 1970's, before the Canoa was purchased by the mine, there was a natural pond because of the much higher water table in the area, and long before that it was considered the

last watering stop on the ride from the Tumacacori Mission to the San Xavier Mission and Tucson. La Canoa refers to a large hollowed out tree (like a canoe) that was used as a water trough for humans, wildlife and livestock in the mid and late 1800s

After all of that sobering information there is some posi-



©Glen E Goodwin

Photo of Sierrita Mine by Glen E. Goodwin from www.patagoniaalliance.org.
Reprinted with permission from PARA.

later six wells on the Canoa started moving water to the mitigation site as well, and those wells are drawing from the Upper Santa Cruz aquifer with the most visible well being on the north side of Elephant Head Rd. For thirty years 22,000 acre feet of water was being pulled out of the ground and evaporating into the air.

Sierrita Mine, con't.

tive news: one to two years after the large water flows of 1983-84 and 1993 the water levels in the aquifer rose anywhere from 16 to 40 feet because of the rapid recharge that this system is capable of.

The Sierrita Mine is visible from my house and for the last 40 years I have watched the tailings pile grow as the Cottonwoods and Willows have gradually, then rapidly, died off, moving from north to south.

In 1982 the tailings were barely visible between two outcroppings of the Sierrita Mountains. Now the tailings are almost level with those same outcroppings.

In the mid 2000s all of the big old trees died a slow and painful death

after the water-table dropped out from under them. However since the pumping has slowed down the trees that survived continue to hang on. It was painful to watch the die-off and I knew that the mine was sucking us dry. At the same time we had to lower some of our irrigation wells and I realized that all of our conservation efforts were not for the benefit of the river but for the benefit of the mine. In researching this article I now know that the mine is pumping much less than it used to, which is encouraging.

A few years ago I heard that Freeport-McMoran was interested in doing some green infrastructure projects and was looking for ways to keep more water in the watershed. Since the aquifer that they get a lot of their water from is

a fast-recharge basin it is very exciting to think that they may help the river.

FOSCR is in a good position because of its deep knowledge of the river and its tributaries to help identify areas in both the Santa Cruz and Soporí watersheds that could slow the flow and capture more storm runoff which would bring the water-table up. What if the perennial flows of decades and centuries past were to return and the Santa Cruz Valley would have guaranteed water into the future all thanks to an enemy of the river changing course and becoming its savior?

After years of deficit pumping I hope that Freeport-McMoran is serious about helping fund projects up and down the basin that would guarantee them, and the river, water in the future.

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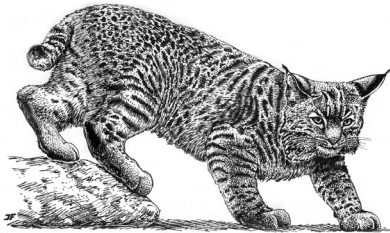
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Have you received "A Rambler's Guide to the Santa Cruz River?"
(Free with membership!) Yes ____ No ____



P.O. Box 4275, Tubac, AZ 85646



Bobcat

