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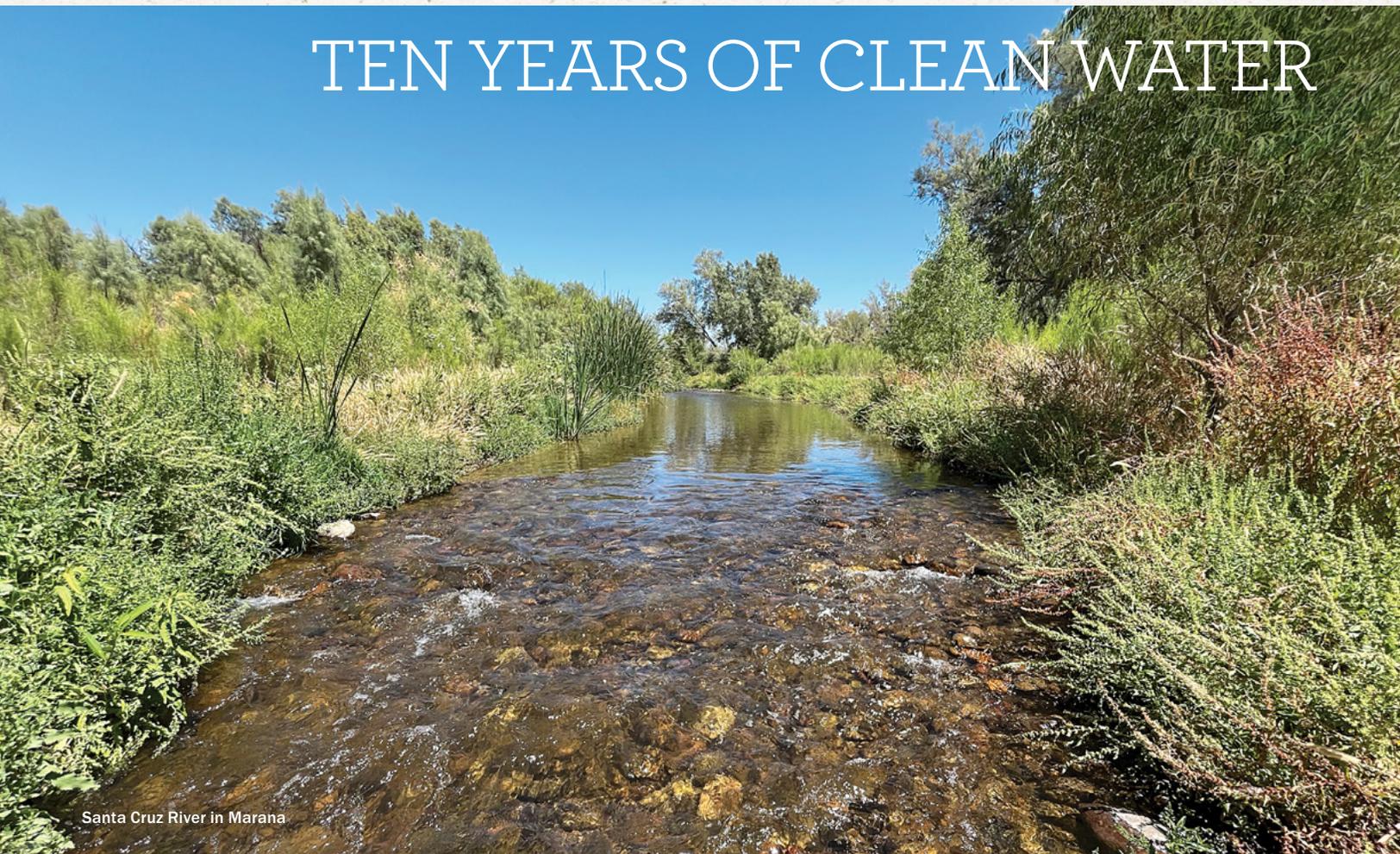
VISITE

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a living river

SANTA CRUZ RIVER 2024 DOWNTOWN TUCSON TO MARANA

TEN YEARS OF CLEAN WATER



Santa Cruz River in Marana



SONORAN
INSTITUTE



PIMA COUNTY



CITY OF
TUCSON



TUCSON
WATER



We respectfully acknowledge that the Santa Cruz River flows through the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with the Santa Cruz Watershed being home to the O’odham and the Yaqui, whose relationships with the land and river continue to this day. Learn more about the San Xavier District of the Tohono O’odham Nation at www.waknet.org and the Yaqui Tribe at www.pascuayaqui-nsn.gov

THE SANTA CRUZ RIVER TEN YEARS OF CLEAN WATER

As we reflect on the last 10 years of clean water releases into the Santa Cruz River, let us celebrate the mutual environmental and social benefits of the work Pima County does. Ten years ago, the Regional Wastewater Reclamation Department (RWRD) concluded a regional overhaul and expansion of the wastewater reclamation system, which continues to produce high-quality effluent. This effluent and the Regional Flood Control District’s (RFCD) multi-objective strategy to manage the river has resulted in a flourishing and vibrant riparian corridor. Today, we remain focused on maintaining an excellent trend in water quality while continuing to actively manage the river, enhance recreational opportunities, and find ways to operate our facilities more efficiently. Looking ahead, RWRD is making

great strides in furthering the reuse of the decommissioned Roger Road Wastewater Reclamation Facility, including creating the Agua Nueva Park on part of the land. Meanwhile, the RFCD will soon begin work on a pedestrian bridge to improve connectivity for Loop users in the vicinity. There is much to celebrate, and much work ahead of us. We look forward to your continued support for all the things that clean water makes possible in our community.

ERIC SHEPP Director of Pima County Regional Flood Control District

JACKSON JENKINS Director of Pima County Regional Wastewater Reclamation Department



TRACKING RIVER CONDITIONS

Annual *Living River* reports share conditions along the flowing reaches of the Santa Cruz River. Included here are conditions from downtown Tucson to Marana for the 2023 water year (October 1, 2022, to September 30, 2023). Scan the QR code and learn more in the supplemental report. www.tiny.cc/tlr24

NOTABLE ACHIEVEMENTS

-  Achieved national recognition, ranking #4 on “America’s Most Endangered Rivers® of 2024” list
-  Released a rare native fish, the Gila chub, into Canoa Pond
-  Reduced energy used to produce clean water by more than 25% across the last 10 years
-  Received EPA Cleanup Grant for decommissioned Roger Road facility
-  Successfully established endangered wetland plant, Arizona eryngo, at Sweetwater Wetlands and Canoa Pond
-  Completed 27 river cleanups, removing 14 tons of trash



MANAGING FOR DIVERSE NEEDS

In addition to providing water, rivers perform many important services for people and wildlife. They move nutrients and sediments, recharge aquifers, sustain cooling trees and plants, and connect living organisms across habitats. In a river's natural state, even flooding provides benefits. As floodwater spills out of a river's channel and onto its adjacent floodplain,

riparian vegetation on the banks and in the floodplain slows flood flows, reduces erosion, filters water as it percolates into the ground, and provides habitat for wildlife.

The Santa Cruz River provides these benefits, but like many urban rivers, its natural state has been altered by development. As communities have grown and constructed buildings, parks,

and other infrastructure close to the river channel, its historically wide floodplain in the Tucson area has shrunk. Therefore, preserving the river's important resources while also protecting humans and property requires careful management and stewardship.

Releasing effluent into the river provides habitat and helps replenish the aquifer. These flows are monitored to prevent contact with historic landfills and gravel pits adjacent to the

river. Trees, thick vegetation, and accumulated sediment can impede flows and cause floodwaters to spill out of the channel, especially in narrow stretches. To maintain flow capacity, these impediments are occasionally removed.

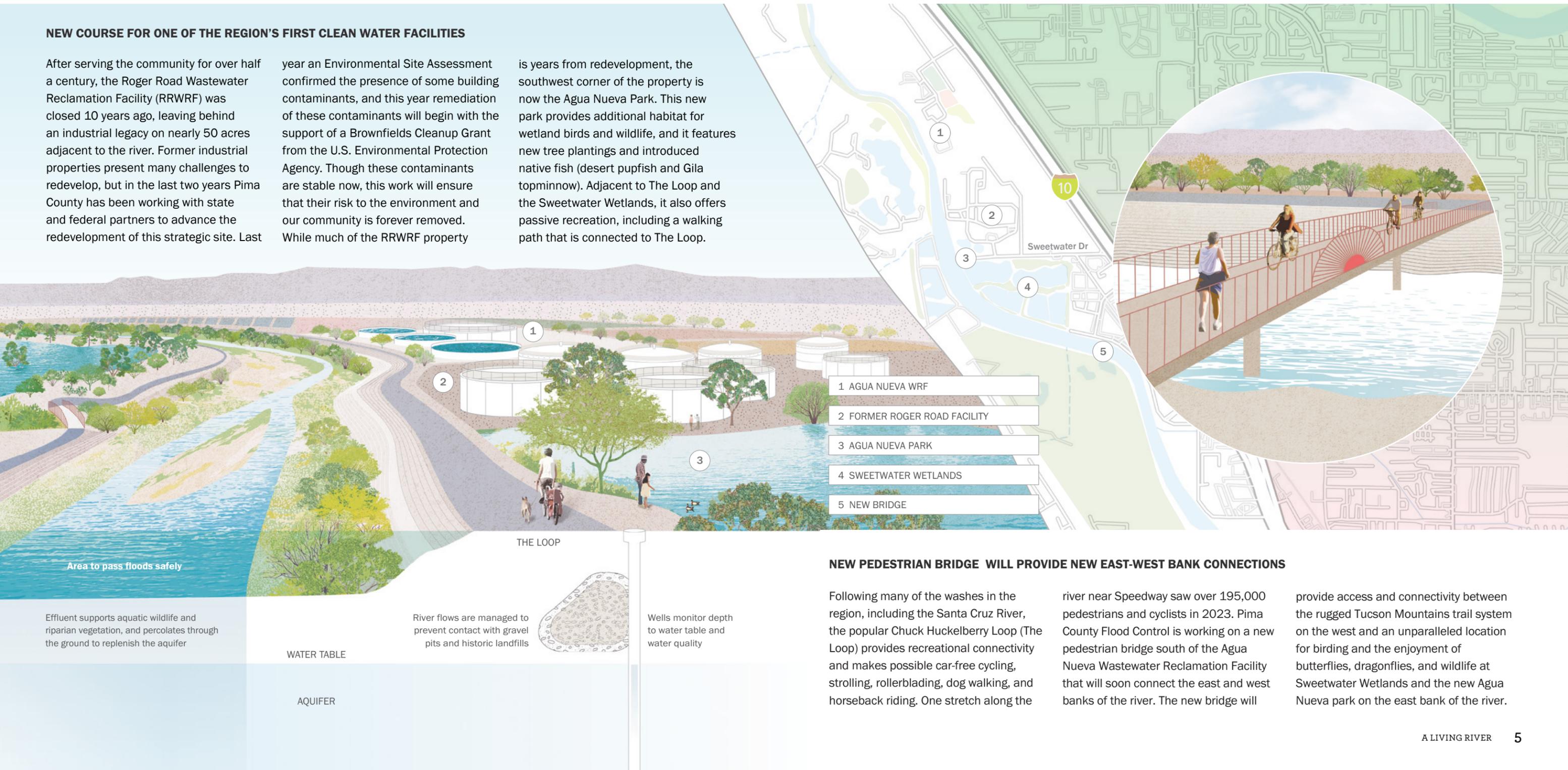
Finally, the river provides open space and an opportunity to connect with nature in the middle of the urban area. New parks and improvements to existing infrastructure further enhance the Santa Cruz as a community amenity.

NEW COURSE FOR ONE OF THE REGION'S FIRST CLEAN WATER FACILITIES

After serving the community for over half a century, the Roger Road Wastewater Reclamation Facility (RRWRF) was closed 10 years ago, leaving behind an industrial legacy on nearly 50 acres adjacent to the river. Former industrial properties present many challenges to redevelop, but in the last two years Pima County has been working with state and federal partners to advance the redevelopment of this strategic site. Last

year an Environmental Site Assessment confirmed the presence of some building contaminants, and this year remediation of these contaminants will begin with the support of a Brownfields Cleanup Grant from the U.S. Environmental Protection Agency. Though these contaminants are stable now, this work will ensure that their risk to the environment and our community is forever removed. While much of the RRWRF property

is years from redevelopment, the southwest corner of the property is now the Agua Nueva Park. This new park provides additional habitat for wetland birds and wildlife, and it features new tree plantings and introduced native fish (desert pupfish and Gila topminnow). Adjacent to The Loop and the Sweetwater Wetlands, it also offers passive recreation, including a walking path that is connected to The Loop.



- 1 AGUA NUEVA WRF
- 2 FORMER ROGER ROAD FACILITY
- 3 AGUA NUEVA PARK
- 4 SWEETWATER WETLANDS
- 5 NEW BRIDGE

Area to pass floods safely

Effluent supports aquatic wildlife and riparian vegetation, and percolates through the ground to replenish the aquifer

WATER TABLE

AQUIFER

River flows are managed to prevent contact with gravel pits and historic landfills



Wells monitor depth to water table and water quality

NEW PEDESTRIAN BRIDGE WILL PROVIDE NEW EAST-WEST BANK CONNECTIONS

Following many of the washes in the region, including the Santa Cruz River, the popular Chuck Huckelberry Loop (The Loop) provides recreational connectivity and makes possible car-free cycling, strolling, rollerblading, dog walking, and horseback riding. One stretch along the

river near Speedway saw over 195,000 pedestrians and cyclists in 2023. Pima County Flood Control is working on a new pedestrian bridge south of the Agua Nueva Wastewater Reclamation Facility that will soon connect the east and west banks of the river. The new bridge will

provide access and connectivity between the rugged Tucson Mountains trail system on the west and an unparalleled location for birding and the enjoyment of butterflies, dragonflies, and wildlife at Sweetwater Wetlands and the new Agua Nueva park on the east bank of the river.

HERITAGE PROJECT REACH

Beginning north of Silverlake Road, this reach flowed year-round until 1914 and was inhabited by several species of native fishes, lowland leopard frogs, and other aquatic species. Groundwater pumping caused water levels to decline, and the reach has typically been dry since the 1940s. Flows returned in June 2019, when Tucson Water launched the Santa Cruz River Heritage Project. The project uses the

reclaimed water system to transport effluent from the Agua Nueva facility and releases up to 3,150 acre-feet annually into the river downtown. Developed primarily to store water in the aquifer for future use, the Heritage Project is also creating riparian habitat, supporting community cultural connections, providing educational opportunities, and improving the quality of life in downtown neighborhoods.



LEARN MORE
www.tiny.cc/tr24

A NOTE FROM TUCSON WATER

Water is Life. Once a river that sang year-round beneath the gaze of Sentinel Peak, the Santa Cruz has rested in silence for nearly a century. Now, Tucson Water celebrates five years of restored perennial flow thanks to the Santa Cruz Heritage Project. Introducing reclaimed water to this stretch of river has fostered a new cienega ecosystem, a project made possible by Tucson Water's expansive reclaimed water infrastructure that has been developed over the last 40 years throughout our community.

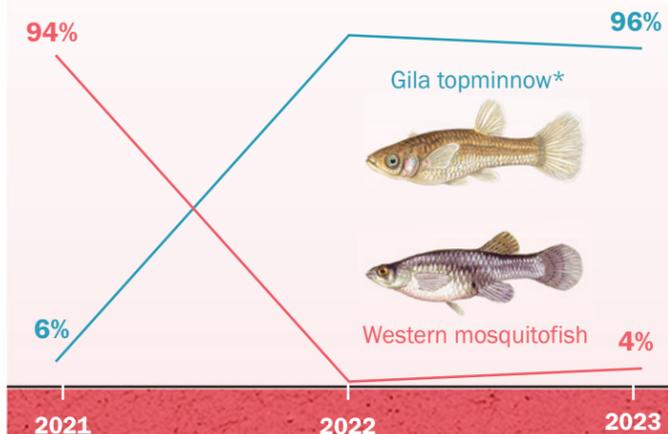
As we look ahead, the Tucson Water One Water 2100 Plan promises continued diversification of Tucson's water portfolio and investment in the Sonoran landscapes we call home. Now, we can see a new stretch of the river blooming with the introduction of remediated water to the river at our Irvington outfall. Our vision embraces the creation of stronger biodiversity at the Sweetwater Wetlands and a clear pathway at the Santa Cruz River Heritage Park to welcome the local public, students, and visitors to listen and learn to what this Sonoran Desert river has to teach.

JOHN P. KMIEC MPA, Director of Tucson Water, City of Tucson



WETLAND NEAR THE OUTFALL SUPPORTS WILDLIFE

River conditions in this reach have been variable. Since February 2023, a small wetland pond formed near the outfall. It withstood the 2023 monsoon season and is sustained by the steady release of water at 240 gallons/minute. Cattails and other vegetation are well established, and the wetland is now home to six reintroduced Sonora mud turtles. The turtles are happily staying in their new home, according to a University of Arizona study tracking their locations. This site appears to be teeming with Gila topminnow that were released in 2020. Annual fish surveys suggest that topminnow are doing better than non-native Western mosquitofish. However, it is not known how many of the topminnow are the all-female/non-native hybrid with the headwater livebearer fish species (see fish surveys discussion on page 8).



Percent of randomly collected fish

* Percent of Gila topminnow that are hybrids with the headwater livebearer is unknown

BOBCATS ARE USING THE RIVER

The "Bobcats in Tucson" study has found that radio-collared bobcats that spent a lot of time in areas just west of the Heritage Project Reach, including on Tumamoc Hill, were also found along the river. Water releases are still relatively new, but as vegetation becomes more established, bobcats may be able to find more food and other resources in this reach of the river.

- Bobcat "Val"
- Bobcat "Margaret"
- Heritage Project Reach outfall

Radio-collared bobcat locations near Tumamoc Hill



2023 SPECIES OBSERVATION HIGHLIGHT: SONORA MUD TURTLE



Radio-tagged mud turtles in the pond that formed near the Heritage Reach outfall (arrow) in 2023.



February 2023



June 2023



September 2023

NORTHWEST TUCSON TO MARANA REACH

Beginning near El Camino del Cerro, this reach historically had only seasonal flows but is now Pima County's longest continually flowing section. Since the 1970s, Pima County's water reclamation facilities have released effluent into the river here year-round, creating a ribbon of green vegetation. Upgrades to the treatment process in 2013 resulted in higher-quality water to support a thriving and more diverse

aquatic community, including native and non-native fish species. Pima County and the Regional Flood Control District have identified projects to further improve this stretch of the river, such as creating a more winding flow path to encourage wildlife and plant diversity and increasing connections to the river corridor for people and wildlife through new parks, bridges, and wildlife ramps.



LEARN MORE
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WATER IN THE RIVER IS CLEANER THAN TEN YEARS AGO

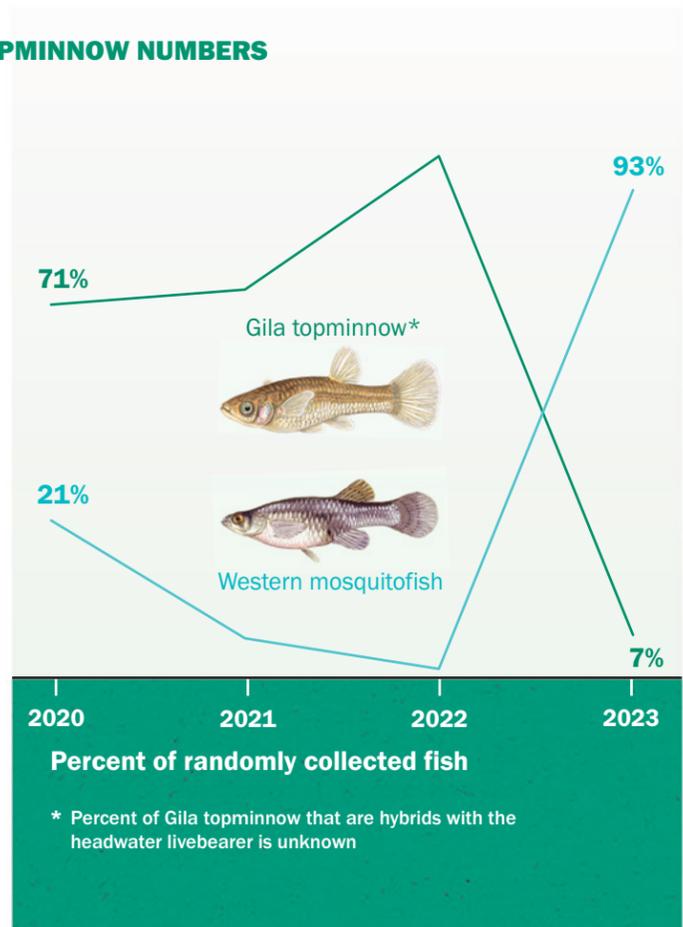
The river's improved water quality is best illustrated by levels of ammonia. Ammonia is a form of nitrogen that is common in effluent but toxic to fish and other aquatic organisms in high concentrations. Safe levels of ammonia are generally less than

2 mg/L, though the state standard to protect aquatic life varies with the water's pH and temperature. Before treatment process upgrades, the river's ammonia concentration averaged 13 mg/L, and most water samples were well above the

standard (75% exceeded the standard by an average of 14 mg/L). In 2023, the average concentration was only 1 mg/L, and most water samples met the standard (20% of water samples exceeded the standard by an average 0.9 mg/L).

FISH SURVEYS DETECT POSSIBLE DECLINE IN GILA TOPMINNOW NUMBERS

Three fish species from the Poeciliidae family live in the river: Gila topminnow, Western mosquitofish, and *Poeciliopsis occidentalis-monacha*, an all-female hybrid of the Gila topminnow and the headwater livebearer, a closely related fish species found in Sonora, Mexico. To minimize stress and handling time of the endangered Gila topminnow during the annual fish survey, a random subset of fish from this family is collected and identified in the lab. In 2023, the percent of the randomly collected fish that were topminnow decreased sharply to 7%, while mosquitofish increased to 93%. Unfortunately, the proportion of the 7% of topminnow that might be the non-native hybrid is unknown at this time, which means that there may be fewer Gila topminnow present in the collected samples. The hybrids can be identified only with a genetic study or careful examination of teeth structure under a microscope, and these tests have not been done. Fish populations can fluctuate, and continued monitoring, including assessing additional techniques to identify the hybrid fish, will help determine if topminnow are declining in this reach, or if 2023 was simply a temporary drop.



RIVER CORRIDOR IS PROVIDING HABITAT FOR BOBCATS

New data from the "Bobcats in Tucson" study has found that some bobcats appear to be true river cats that spend nearly all of their time within the river corridor. These initial data suggest that all habitat needs (food, shelter, places to raise kittens) are being provided in this stretch of the river, where the vegetation is well established.



Average ammonia concentration

Average amount above standard

Standard ~2 mg/L or less, varies with pH and temperature

Before Upgrades

13 mg/L

+14 mg/L

2023

1 mg/L

+0.9 mg/L

2023 SPECIES OBSERVATION HIGHLIGHTS

39 DRAGONFLY SPECIES

235 BIRD SPECIES



IT'S YOUR RIVER.

VISIT THE RIVER The river is a popular recreation area, and there are many parks to choose from. A recent addition is northeast of Grant and Silverbell—Meander Bend Park. The “bend” refers to a bend in the river where a natural pit had formed after floods eroded the riverbed. When the pit was disconnected from the river channel after the development of the Silver Creek neighborhood, it was a natural location to place sediment removed from the river in 2020. Fast forward to 2024: Pima County Regional Flood Control District turned a scour pit into a nature park.

CREATE ART ABOUT THE RIVER Kids can enter the Living River of Words Youth Poetry and Art contest. This Pima County program helps young people learn about water in the desert through science and art. View some of the 2024 finalists in this report. www.pima.gov/RiverofWords

GET INVOLVED WITH SONORAN INSTITUTE Follow us on social media and join our mailing list. Learn about Santa Cruz River events and get updates on all Sonoran Institute programs. Sign up at: www.tiny.cc/scrnews

GET INVOLVED!

JOIN A RIVER BEAUTIFICATION EFFORT Thank you to the 533 volunteers who donated over 1,300 hours to pull more than 14 tons of trash out of the Santa Cruz River in 2023. Are you interested in Tucson-area cleanups? Contact AdoptaSite@tucsoncleanandbeautiful.org

Ayden Luke Abelseth, age 7, Marshall Elementary School — Ms. Gayheart



ACKNOWLEDGEMENTS

Sonoran Institute, Pima County, and Tucson Water developed and prepared this report with funding from the Pima County Regional Wastewater Reclamation Department, Pima County Regional Flood Control District, Tucson Water, and community stakeholders. We thank all who contribute to the data collection and conservation efforts along the river. We especially thank the University of Arizona and Michael T. Bogan for his expertise, public education, and diverse research efforts along the Santa Cruz River.

Summer Thirst, Victoria Ashton, age 12 — Independent Entry

HELP CREATE THE SANTA CRUZ RIVER URBAN NATIONAL WILDLIFE REFUGE The Santa Cruz River Refuge Coalition is a community-led conservation effort seeking to protect the river in perpetuity by creating an urban wildlife refuge to preserve crucial green space, improve and maintain wildlife habitat connectivity, ensure equitable community access to the river, and honor the rich cultural and historical connections to the revitalized river. Sign on to support the creation of this new refuge at: www.santacruzriver.org



SEND US YOUR SANTA CRUZ RIVER PICTURES We love to share community pictures of the river, like the one featured at left. Where is your favorite spot? What do you do and see along the river? Send photos to scrphoto@sonoraninstitute.org. Or post your photos on social media with [#scrphoto](https://twitter.com/scrphoto).

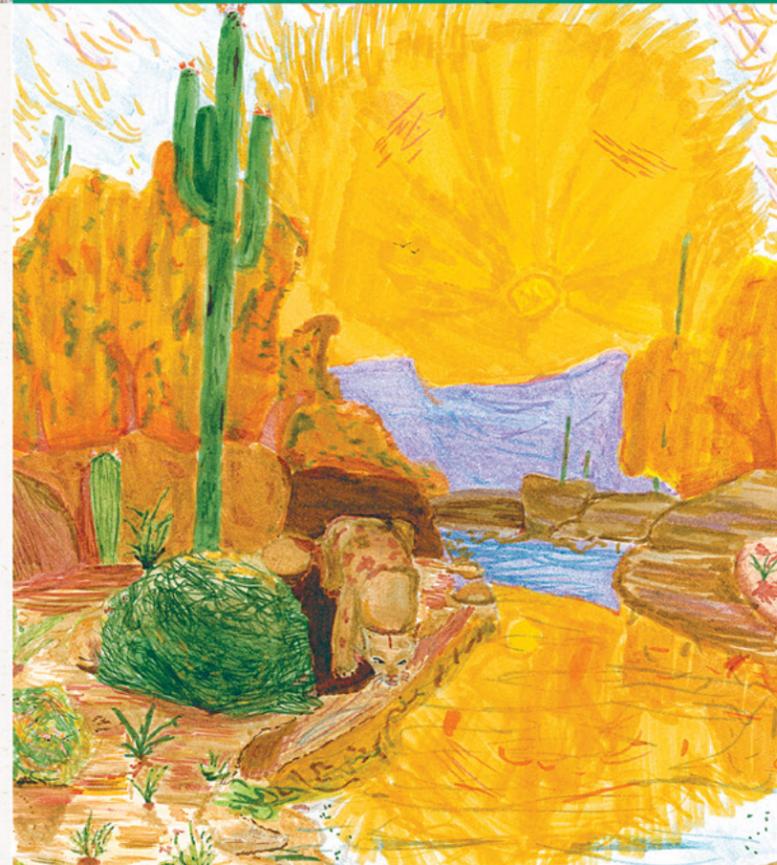


IMAGE CREDITS

Cover photo: Santa Cruz River by Michael T. Bogan **2:** Bobcat by Catherine Bartlett; Male wood ducks (also on page 9) by John Gentile; Great blue heron by Charlie Alolkoy; www.alolkoyphotography.com **3:** Santa Cruz River by Pima County; Blue dasher by Thomas Brown **4–5:** Cyclist with dog, and runner by Pima County; Three cyclists ©Bill Hatcher/Sonoran Institute, 2024 **6:** Sonora mud turtle by Michael T. Bogan **6, 8:** Gila topminnow ©Rachel Ivanyi 2017; Western mosquito fish @Fish and Wildlife Service **7:** Bobcat by Marie McGhee; Sonora mud turtles by Michael T. Bogan; Heritage reach outfall photos by Claire Zugmeyer **9:** Juvenile bobcat by Jill Tierney; Blue dasher by Fred Hood **10:** Dragonfly silhouette with cloud by Courtney Mack **11:** Cleanup by Julius Schlosburg

Tochi Vincent Ndubuisi, age 10, Walker Elementary School — Ms. Banales

Park

The sound of dead leaves getting stepped on
Crisp wind blowing against the current
Birds chirping in the trees
Insects buzzing in the air
The voices of people walking in the park.

Sophia Damianakos, age 12
Satori Charter School — Ms. Love

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SONORAN INSTITUTE has worked since our founding in 1990 to realize our vision that the Santa Cruz River, from Mexico to Marana, is a living, flowing river and the foundation of community health and prosperity. The Sonoran Institute's mission is to connect people and communities with the natural resources that nourish and sustain them.



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HELP CREATE THE SANTA CRUZ RIVER URBAN NATIONAL WILDLIFE REFUGE

Learn more on page 10.



Bella Hughes, age 9, Safford K-8 School — Dr. Chuc

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