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a living river

CHARTING SANTA CRUZ RIVER CONDITIONS
DOWNTOWN TUCSON TO MARANA—2020 WATER YEAR

WATER FOR THE RIVER





Greater yellowlegs (*Tringa melanoleuca*)

THE SANTA CRUZ RIVER CELEBRATE AND PROTECT

When the Sobaipuri O’odham, ancestors of the Tohono O’odham Nation’s San Xavier District, arrived here over 12,000 years ago, the Santa Cruz River provided the essential water to live in this hot, arid region. The river has since changed and groundwater pumping dried many stretches, but we celebrate more than 24 miles of thriving river, a new flowing stretch, and the first-ever dedication of water specifically for river health.

In Pima County, two reaches flow year-round thanks to the release of effluent, or highly treated wastewater, from two water reclamation facilities treating wastewater from homes and businesses in our urban areas. In the 1970s, releasing effluent in the river in northwest Tucson was an easy way to dispose of wastewater. Over time, effluent’s role in raising the water table and giving life to native plants and wildlife through river flows has become apparent.

In 2019, Tucson Water’s Santa Cruz River Heritage Project brought water back to the river near downtown Tucson by piping effluent to a new outfall, or release point. Today, the river in downtown Tucson and from northwest Tucson to Marana flourishes with willows, cattails, water birds, fish, and other wildlife. Parks all along the river are increasingly vibrant as more people connect with nature and explore our river heritage.

The Santa Cruz and other waterbodies are the lifeblood of the desert. Recognizing this, elected officials created the Conservation Effluent Pool 20 years ago to apportion some effluent for river conservation projects. With the first applications finally approved in 2021, some of this water will be used to sustain river flows specifically to benefit plants and aquatic wildlife in the downtown Tucson reach and downstream of the Agua Nueva reclamation facility. This important decision can serve as a model for other sections of the river. Join us to celebrate and protect this living river!

NOTABLE ACHIEVEMENTS







-  Water is designated for the river’s fish and plants
-  Gila topminnow found in more reaches of the river
-  Aquatic invertebrate diversity increases
-  Broad support for proposed improvement projects
-  River popular for recreation and wildlife viewing

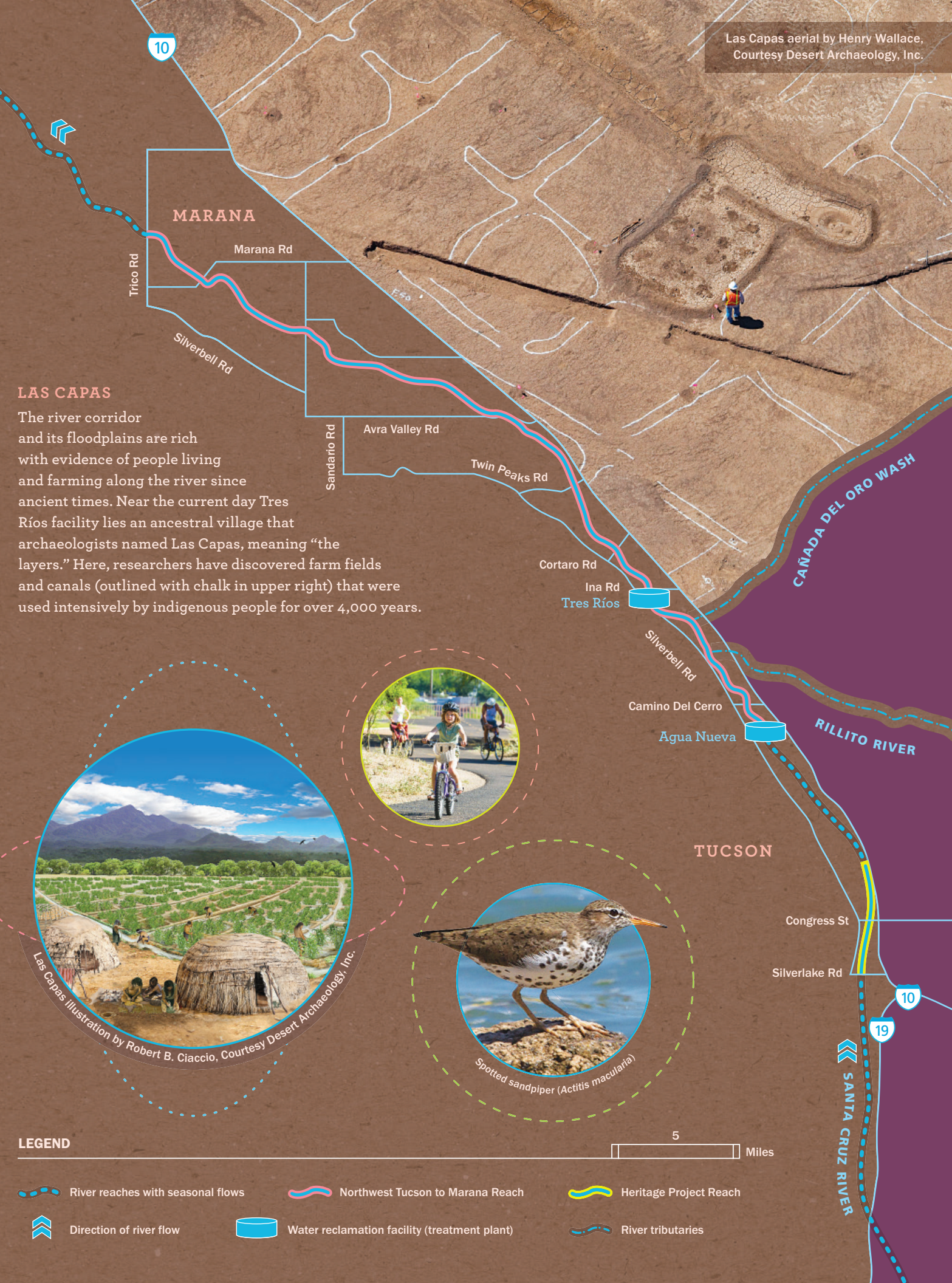
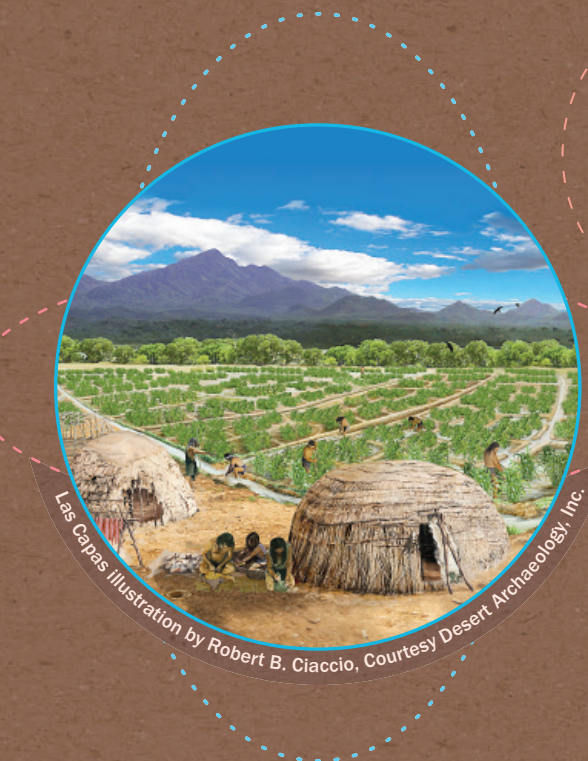
TRACKING RIVER CONDITIONS

Included here are Santa Cruz River conditions in the flowing reaches of the Heritage Project and northwest Tucson to Marana during the 2020 water year (October 1, 2019 to September 30, 2020). To explore more information, download a supplementary report from the Sonoran Institute website at www.tiny.cc/tlr20.

Sonoran Institute launched the annual *Living River* reports in 2008 to track river conditions in Santa Cruz County. The effort expanded in partnership with Pima County in 2012 and the City of Tucson in 2020 to report on conditions in the flowing reaches in Pima County. All *Living River* reports can be found on the Sonoran Institute website: www.sonoraninstitute.org.

LEGEND

-  River reaches with seasonal flows
-  Northwest Tucson to Marana Reach
-  Heritage Project Reach
-  Direction of river flow
-  Water reclamation facility (treatment plant)
-  River tributaries



Las Capas aerial by Henry Wallace, Courtesy Desert Archaeology, Inc.

LAS CAPAS
The river corridor and its floodplains are rich with evidence of people living and farming along the river since ancient times. Near the current day Tres Ríos facility lies an ancestral village that archaeologists named Las Capas, meaning “the layers.” Here, researchers have discovered farm fields and canals (outlined with chalk in upper right) that were used intensively by indigenous people for over 4,000 years.

STEWARDING A LIVING RIVER

Rivers provide water for people and wildlife, move nutrients and sediments, recharge aquifers, and sustain cooling trees and plants. When flooding, water spills out of the river's channel and onto the adjacent land—the floodplain. Riparian vegetation on the banks and in the floodplain works to slow flood flows, reduce erosion, filter water as it percolates into the ground, and provide habitat for wildlife.

While the river serves multiple purposes, a top priority is that it is capable of safely letting floods pass through urban areas. Historically, the Santa Cruz River winding through the Tucson area had a very wide floodplain. But as our communities grew and buildings, parks, and other infrastructure were built close to the river, the floodplain narrowed. This is especially true near the Heritage Project, where development confines the river and floodplain to a narrow corridor near downtown Tucson.

In this reach, preventing flooding of adjacent neighborhoods is critical. Thick, tall vegetation and accumulated sediment can impede flows and cause floodwaters to rise out of the channel and into neighborhoods. Therefore, trees and excess sand and dirt are occasionally removed to encourage growth of grasses or small shrubs instead. North of the Agua Nueva and Tres Ríos facilities, the river corridor is wider. Here, the river can meander a bit, floodwaters can more safely rise, and flood flows can easily pass regardless of dense or tall trees.

Stewarding this important resource is complex. The Pima County Regional Flood Control District is leading a process to engage the community in the development of a management plan for the river from Grant Road to the Pinal County line. In the downtown reach, the Flood Control District is working closely with City of Tucson to manage the Heritage Project.

MANAGING FOR DIVERSE NEEDS

Flood safety—accumulated sediment and vegetation was removed from the downtown reach in May 2020 to increase the volume of floodwaters that can safely pass and reduce risk of flooding adjacent neighborhoods.

Wildlife habitat—the Conservation Effluent Pool was created 20 years ago to set aside water for riparian projects. In 2021, Pima County and Tucson Water were the first applicants granted portions of this supply to ensure there is water to support Gila topminnow near the Agua Nueva facility and riparian vegetation near downtown.

Groundwater quality—effluent put in the river naturally seeps into the ground and raises the water table. Near downtown,

the water table is carefully monitored to prevent water from reaching historic landfills and from the possibility of leaching contaminants into the groundwater.

River access and recreation—the Flood Control District is considering wide-ranging improvements to enhance visitor experience of this community amenity, including increased access to the river and to The Chuck Huckleberry Loop trail.

Non-native species removal—community members are removing invasive buffelgrass in the downtown reach. Tucson Audubon and Northwest Fire District are removing salt cedar which poses a fire risk along the river north of Agua Nueva.

Heritage Project Reach

The floodplain along the Heritage Project is a narrow corridor near downtown Tucson. Trees and excess sand are occasionally removed to prevent flooding of adjacent neighborhoods.

Total Volume of Water Released In 2020 Water Year

2,000 ACRE-FEET

Northwest Tucson to Marana Reach

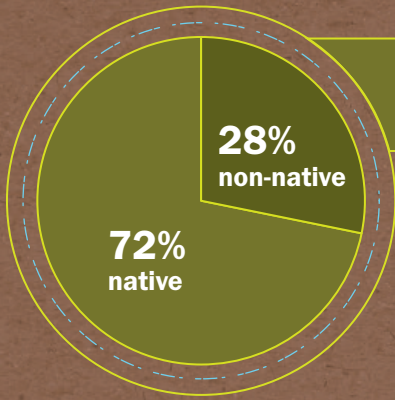
The floodplain north of the Agua Nueva and Tres Ríos facilities is wider. Floodwaters can safely rise and spread out, even with the presence of dense trees along the flowing water.

Total Volume of Water Released In 2020 Water Year

44,400 ACRE-FEET

Tres Ríos: 32,300 acre-feet
 Agua Nueva: 12,100 acre-feet





149 plant species
214 plant species in both reaches combined

HERITAGE PROJECT REACH

Beginning north of Silverlake Road, this reach historically flowed year-round until 1914. As groundwater levels declined with increased pumping, it has typically been dry since the 1940s. Flows returned in June 2019, when Tucson Water launched the Santa Cruz River Heritage Project. Using the reclaimed water system, the project transports effluent from the Agua Nueva facility and may release up to 3,150 acre-feet annually into the river downtown. Though developed primarily to recharge water in the aquifer, the Heritage Project is also creating riparian habitat, establishing community cultural connections, and enhancing development opportunities.



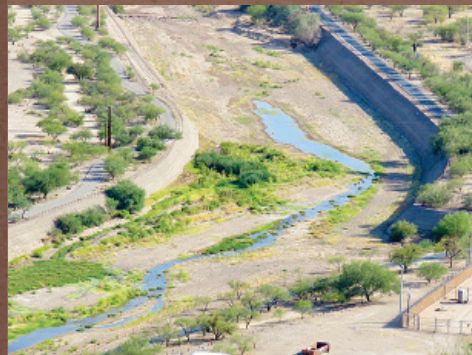
June 24th, 2019 view of the outfall when water began flowing



April 2020 view of the outfall with cattails and wetland plants



June 1, 2020 View of preserved wetland area near outfall after sediment removal



October 10, 2020 view of wetland plants that quickly returned near the preserved wetland

RIBBON OF GREEN VEGETATION APPEARS

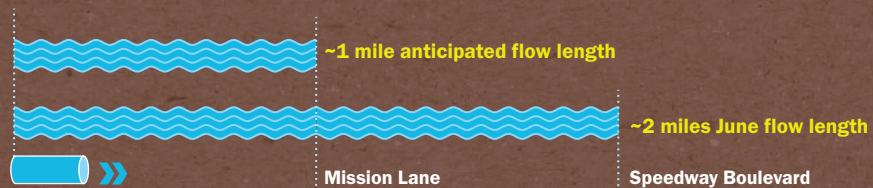


The Heritage Project has created a new ribbon of green vegetation. A wetland with cattails and other riparian vegetation quickly formed near the outfall where the water pours into the riverbed. In spring 2020, a project to remove accumulated sediment and vegetation temporarily halted flow, but the wetland area that was preserved near the outfall allowed plants to quickly rebound over the summer with the return of water.

FLOW GOES FARTHER THAN ANTICIPATED



Overall, the flow extent of the Heritage Project is farther than anticipated. Expected to only reach Mission Lane, in June 2020 flows traveled twice as far—over two miles—to Speedway. The project is still new, and the volume of water being released is a key factor influencing how far the river flows. However, natural factors like soil type, vegetation density, and scouring floods also play a role. Tucson Water adjusts the flow rate to maximize recharge while keeping rising groundwater levels away from historic landfills.



Sonoran Desert toad (*Bufo alvarius*)

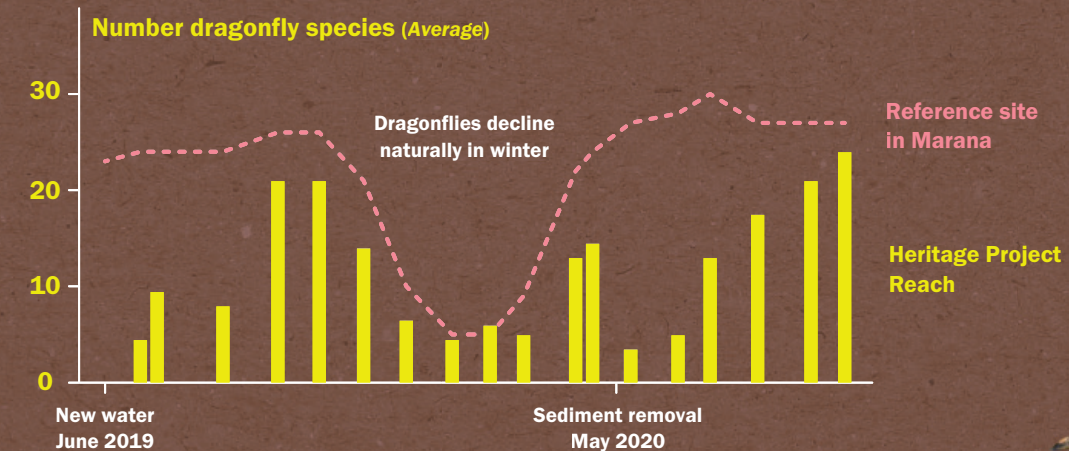
WILDLIFE QUICKLY FIND THE WATER



Wildlife diversity increased with the new water in the river, and University of Arizona research documented the quick arrival of dragonflies. Only days after flows began, two sites had an average of five dragonfly species. By late summer, this average was up to 21, comparable to the number of species found at a reference site in Marana. A similar pattern of colonization occurred after the return of flow following sediment removal in spring 2020.



Mated pair (*Ischnura ramburii*)



Number Bird Species

Tucson Audubon documented increased bird diversity after the water started flowing, including more observations of water birds like killdeer and green herons. In 2020, community scientists observed 134 species, representing 58% of the total bird species observed along both flowing reaches of the river.



*nearly 7 times more bird surveys than in 2018

Citizen scientists reporting data to eBird.org

Gila topminnow (*Poeciliopsis occidentalis*)

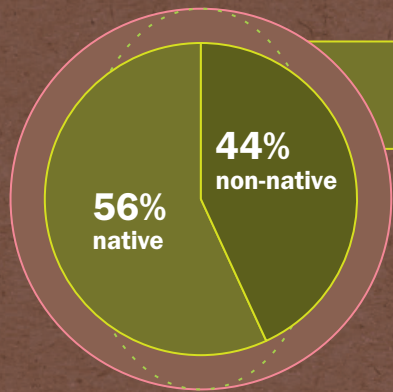


Gila Topminnow

As of October 2020, the endangered Gila topminnow also lives here. Although this native fish is in other reaches of the river and may have eventually appeared without help, wildlife managers sped up its arrival by introducing over 500 individuals. To give the topminnow and all native wildlife the best chance, signage reminds people of state law prohibiting the release of pets, plants, or wildlife into the river.



Killdeer (*Charadrius vociferans*)



111 plant species
214 plant species in both reaches combined



Blue-eyed damer (*Rhionaeschna multicolor*)

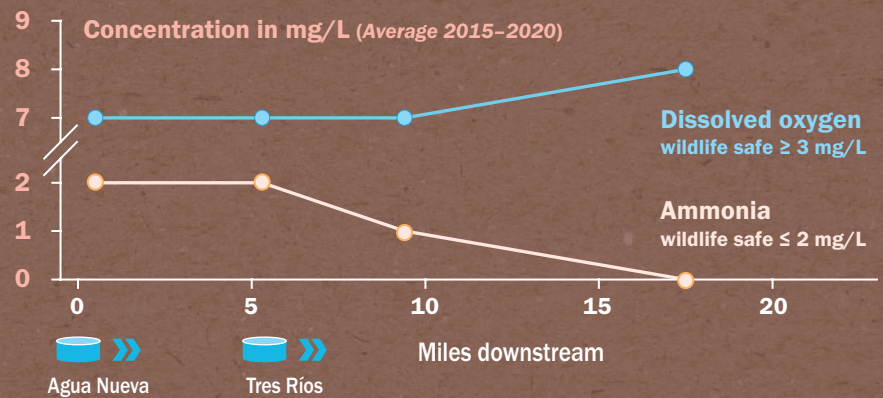
NORTHWEST TUCSON TO MARANA REACH

Beginning near El Camino Del Cerro, this reach historically had only seasonal flows but is now Pima County's longest section of flowing river. Since the 1970s, Pima County water reclamation facilities have released effluent into the river year-round, creating a lush ribbon of green vegetation. Following upgrades to the treatment process in 2013, this much higher-quality water supports a thriving and more diverse aquatic community, including native and non-native fish species. Now the Flood Control District has identified 20 projects to further improve this stretch of the river, such as creating a more winding flow path to foster more wildlife diversity.

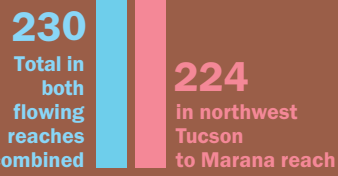
NATURAL PROCESSES IMPROVE WATER QUALITY



Pima County facilities release high-quality water into the river that is both low in ammonia (a common component of effluent that is toxic to aquatic wildlife) and high in dissolved oxygen. As the water flows downstream and away from the facilities, natural processes further clean the water and improve conditions for aquatic wildlife. Ammonia breaks down and decreases in concentration while oxygen increases.



Number Bird Species



Citizen scientists reporting data to eBird.org



Green heron (*Butorides virescens*)

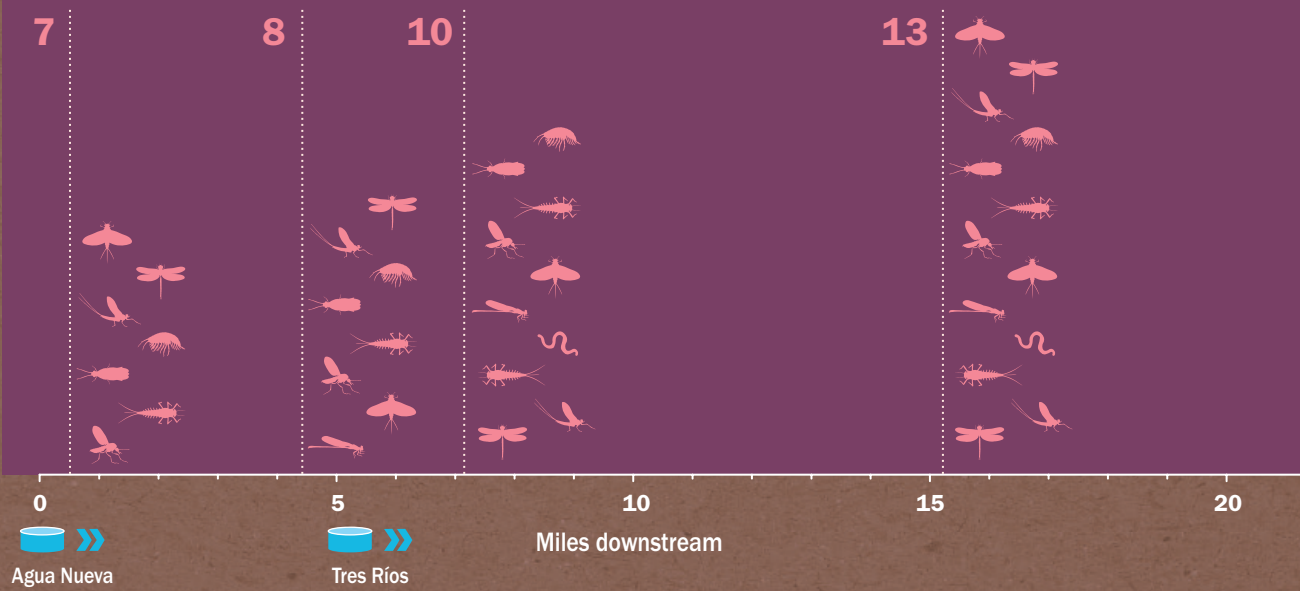
Review more information in the supplementary report at www.tiny.cc/tlr20

AQUATIC WILDLIFE DIVERSITY INCREASING



The high-quality water in the river is allowing aquatic invertebrates to thrive, as indicated at four monitoring locations in the river. In 2020, the number of aquatic invertebrate species observed reached a new annual high with an average of 14 species. Distance from the reclamation facilities may also influence diversity. From 2015 to 2020, average number of aquatic invertebrate species in the river increases with increased distance from the facilities.

Number of aquatic invertebrate species (Average 2015-2020)

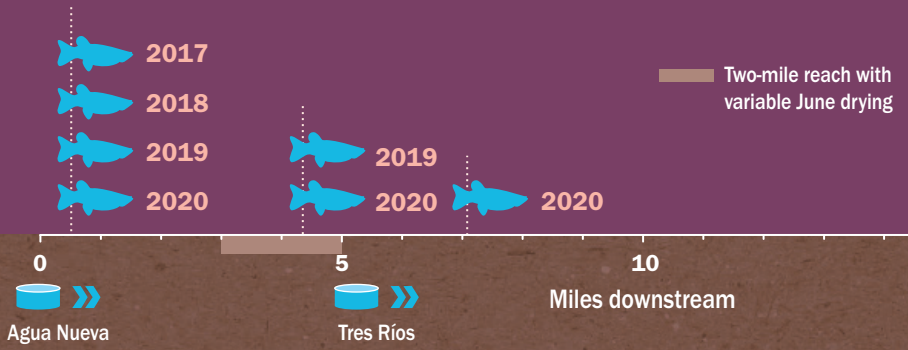


FLOWS GUARANTEED AS TOPMINNOW EXPAND RANGE



Returning to the river in 2017, the endangered Gila topminnow appears to be thriving and possibly expanding their presence downstream. In fall 2020, this native species was found for the first time at three locations in the river. However, the river's variable flow extent and occasional drying in summer remain concerns for the topminnow, as water from Agua Nueva does not always reach Tres Ríos in June. Approved in 2021, water from the Conservation Effluent Pool will now guarantee minimum flows be released for topminnow and other aquatic life even during the driest months downstream of Agua Nueva.

Years Gila topminnow found in fall surveys

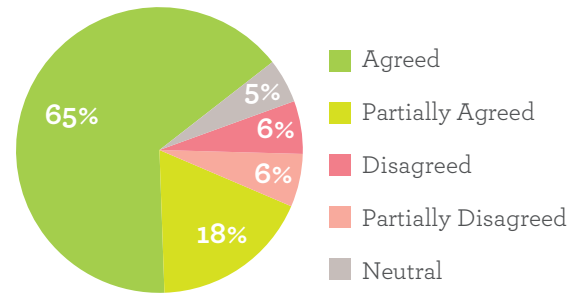


Gila topminnow (*Poeciliopsis occidentalis*)

IT'S YOUR RIVER

WE HEARD YOU Last year we asked for your feedback on proposed projects for the river north of Grant Road. Thank you for all your responses! We received over 1,400 project reviews from 358 people. While all 20 proposed projects received support, the five most favored included: litter traps, stream restoration near the outfall where water is added to the river, wildlife connectivity under I-10, trash clean-up events, and creation of a new wetland in a former gravel pit. This new wetland is already underway with removal of non-native salt cedar a key first step. Review all the feedback at: www.tiny.cc/surveyresponse

1,400 TOTAL PROJECT REVIEWS



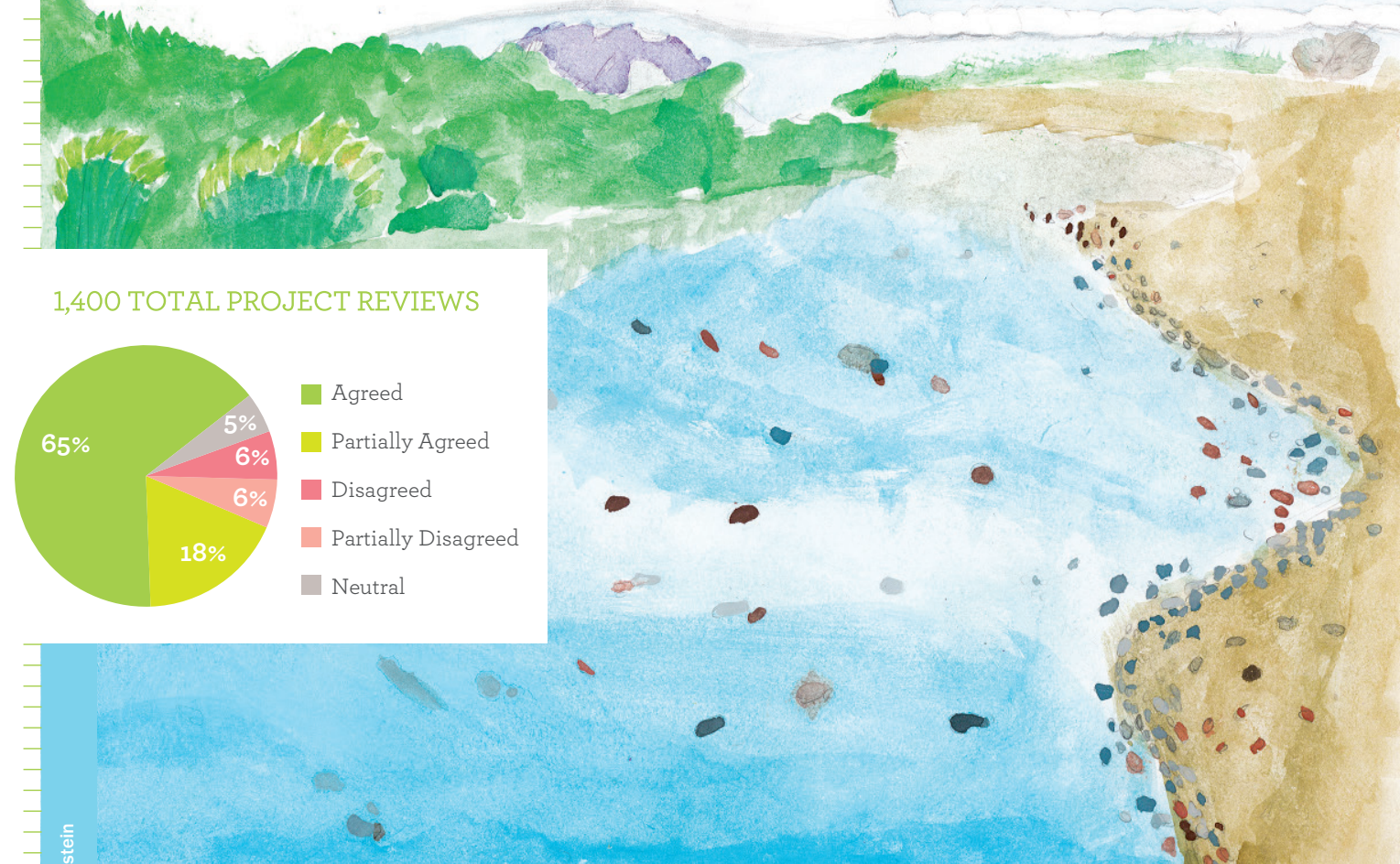
GET INVOLVED!

EXPLORE THE RIVER Whether flowing or dry, the river and the nearby parks have much to explore. An easy way to discover the river is to travel along The Chuck Huckelberry Loop. This path, which includes about 25 miles of multi-use trail along the river, was voted best recreational trail in 2021 by USA Today. Pima County started collecting daily counts of pedestrians and cyclists along the path near St. Mary's Road in June 2020. By September 2020, about 22,300 pedestrians and 45,500 cyclists used this stretch of the path.

The river is a great place to see wildlife, dragonflies, and birds. During the 2020 water year, 1,090 individuals participating in the eBird citizen science program went to the river and contributed nearly 118,000 observations of 230 different bird species (learn more at www.eBird.org).

Learn about the region's diverse cultural groups and rich, layered history at the Los Morteros Conservation Area. Walk the Los Morteros Heritage Trail, complete with interpretive signage, and be sure to visit "the mortars" that inspired the name archaeologists gave the area. Inhabitants living here over 1,000 years ago, between the years 850 and 1300 CE, used these ancient grinding stones to grind mesquite pods.

JOIN A TRASH CLEAN-UP While visiting the river, you may have seen a coyote trotting across the channel, a roadrunner darting through the bushes, or dragonflies flitting over the water. Unfortunately, you were certain to also notice a lot of trash. The good news is that people are starting to tackle this problem. Volunteers help the Sonoran Institute to quantify and categorize the kinds of trash found in the river. This will help identify the different trash sources to better engineer long-term solutions. In addition, Tucson Clean and Beautiful regularly organizes cleanups with community partners. But you can also pick up trash right near your home and make a difference. With all washes ultimately leading to the river, trash can come from anywhere in the community. Help spread the word! Document your efforts to pick up trash with a post on social media and add: **#NotInMyRiver**



One Lonely River: The Santa Cruz by Mary Appel, age 10, Independent Entry



A Visit to Saguaro National Park by Ileana Valentina Borquez-Rojas, age 7, Academy of Math and Science — Delanie OrNSTein

ADDITIONAL RESOURCES

- 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 2021 finalists in this report. Learn more at: www.pima.gov/RiverofWords
- Request a free water audit from Tucson Water to learn how you can best conserve water at your home. Learn more at: www.tucsonaz.gov/water/request-audit
- Follow the Pima County Regional Flood Control District's progress on the management plan for the Santa Cruz River between Grant Road and Trico Road at: www.pima.gov/SantaCruzRiverPlan
- Stay informed! Join the Sonoran Institute mailing list for the latest Santa Cruz news and events: www.tiny.cc/scrnews
- Follow the Sonoran Institute on social media for information and updates on the river management plan and other Santa Cruz River news.

ACKNOWLEDGEMENTS

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IMAGE CREDITS

Cover photo: Santa Cruz River by [Charlie Alolkoy](http://www.alolkoyphotography.com); **2:** Greater Yellowlegs by [Michael T. Bogan](http://www.alolkoyphotography.com); **3:** Spotted Sandpiper by [Lois Manowitz](http://www.alolkoyphotography.com), courtesy of Tucson Audubon; **4-5:** River cross section by [Terry Moody](http://www.alolkoyphotography.com)/Sonoran Institute; **6:** Before and after river photos, and Sonoran Desert toads laying eggs in the new water by [Michael T. Bogan](http://www.alolkoyphotography.com); **7:** Dragonflies by [Michael T. Bogan](http://www.alolkoyphotography.com); **8:** Killdeer by [Martin Molina](http://www.alolkoyphotography.com), courtesy of Tucson Audubon; **9:** Gila topminnow by [George Andrejko](http://www.alolkoyphotography.com), courtesy of Arizona Game and Fish Department; **8:** Dragonfly by [Michael T. Bogan](http://www.alolkoyphotography.com); **Green heron** by [Doris Evans](http://www.alolkoyphotography.com), courtesy of Tucson Audubon; **9:** Gila topminnow by [Claire Zugmeyer](http://www.alolkoyphotography.com)/Sonoran Institute



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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 CLEAN UP THE RIVER!
Join the #NotInMyRiver campaign



Sunset Reflection by Zahra Rafiyath, age 7, Independent Entry

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