

COMPLETE THE RIVER  
IMPROVEMENTS  
SURVEY—SEE PAGE 6

# a living river

CHARTING SANTA CRUZ RIVER CONDITIONS  
NORTHWEST TUCSON TO MARANA—2019 WATER YEAR



WHERE COMMUNITY AND NATURE MEET



SONORAN  
INSTITUTE



PIMA COUNTY



Great blue heron (*Ardea herodias*)

# THE SANTA CRUZ RIVER CELEBRATE AND PROTECT

There have been many improvements along the Santa Cruz River near Tucson since the *Living River* report series began in 2013. Cleaner water now supports increased diversity of aquatic wildlife, including the endangered Gila topminnow. River flows are shorter and more variable as more water is now replenishing the aquifer. Projects all along the river have enhanced natural areas, improved recreation opportunities, connected people to their river heritage, and even created a new stretch of flowing river downtown.

From northwest Tucson to Marana, the Santa Cruz River is Pima County's longest flowing river corridor, with flows sustained year-round by the release of effluent, or highly treated wastewater. Pima County has released this recycled water into the river since the 1970s, but river conditions have dramatically improved since the county's investment of more than \$600 million on upgrades to the wastewater treatment process were completed in December 2013. Improved water quality has resulted in a thriving aquatic environment, enhanced river parks, and the creation of new river flows in our community's birthplace.

To build on these improvements, the Pima County Regional Flood Control District is developing a management plan for the Santa Cruz River. Over the last year they have listened to community concerns and ideas for the river and identified a suite of potential projects with multiple benefits.

**Now we need your help in choosing the projects to include in the management plan.** What types of improvements should be prioritized in this important corridor and where can benefits be maximized? By adding your voice, you can help shape the future of this living river!



Creeping water primrose (*Ludwigia pepeloides*)



Coyote (*Canis latrans*)

## TRACKING RIVER CONDITIONS

Included here are Santa Cruz River conditions from northwest Tucson to Marana during the 2019 water year (October 1, 2018 to September 30, 2019). Current comparisons are made to baseline conditions from 2013, prior to the wastewater treatment upgrades. To explore more data, download a supplementary report from the Sonoran Institute website at [www.tiny.cc/tlr19](http://www.tiny.cc/tlr19).

Sonoran Institute launched annual *Living River* reports in 2008 to track river conditions in Santa Cruz County. In 2012, the effort expanded in partnership with Pima County to assess conditions in the flowing reach in Tucson. All *Living River* reports can be found on the Sonoran Institute website: [www.sonoraninstitute.org](http://www.sonoraninstitute.org).



Ammonia levels lower than 2018

A full moon night  
four coyotes  
with the Llorona in the river  
below the mountain  
near a tree.

—Abelardo Mario Amezcuita  
Age 6

## 2019 NOTABLE FINDINGS



Aquatic invertebrate diversity may be stabilizing



In June, flows from Agua Nueva do not reach Tres Ríos

**LEGEND**

- River reaches with seasonal flows
- River reaches dominated by effluent
- Direction of river flow
- Water reclamation facility (treatment plant)
- Santa Cruz River Heritage Project

5 Miles



# TREND OF IMPROVED RIVER HEALTH CONTINUES IN 2019



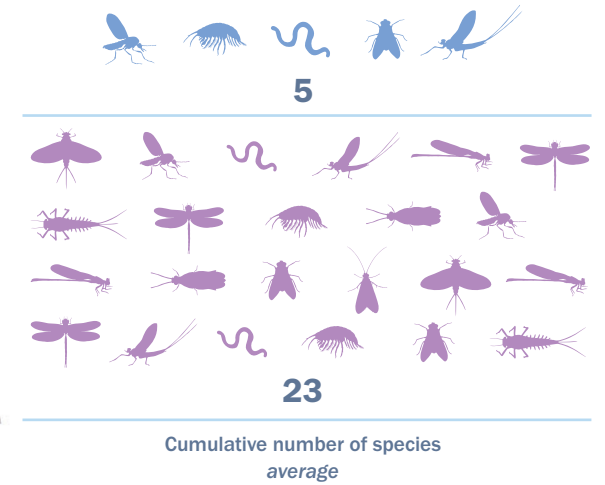
Common green darner (*Anax junia*)



## AQUATIC INVERTEBRATES THRIVE IN CLEANER WATER

Aquatic invertebrates are sampled at four river locations, and the data reflect an average of all sites combined. Diversity has increased: the average number of species found doubled from 5 in 2013 to 10 in 2019. The cumulative number of unique species has also increased: 2019 had 23 species on average, nearly five times more than the 2013 average of 5 species. Increasing diversity trends may be stabilizing, as no new species were found in 2019.

2013  
2013-2019



Blue-eyed damer (*Rhionaeschna multicolor*)

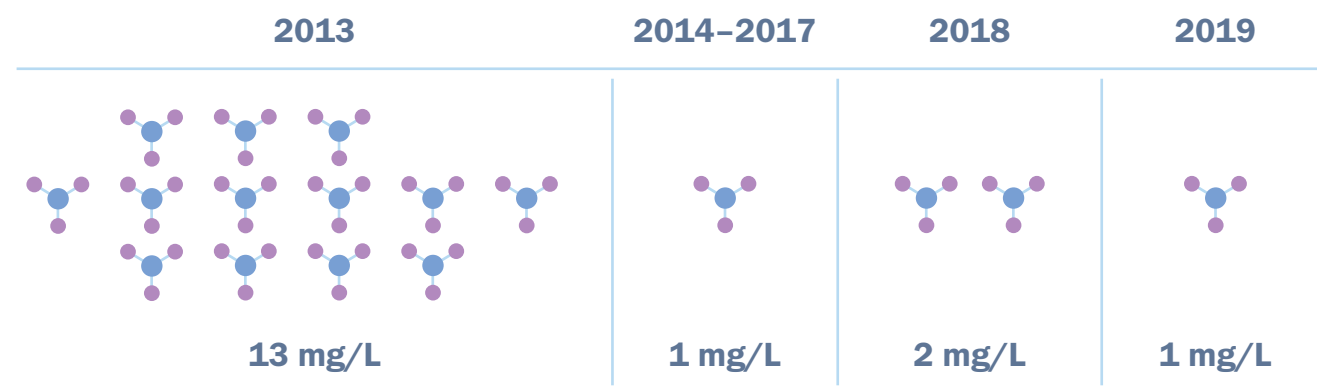
Blue-eyed damer (*Rhionaeschna multicolor*)



## RIVER'S WATER QUALITY IMPROVED SINCE 2018

Many metrics demonstrate the river's improved water quality since the wastewater treatment upgrades. Most significant is the reduction in ammonia, a form of nitrogen common in effluent and toxic to fish at high concentration. Measured at four locations, average ammonia concentrations declined from a toxic 13 mg/L in 2013 to 1 mg/L in 2014-2017. For unknown reasons, in 2018, average ammonia levels increased to 2 mg/L, mostly in samples taken between the Agua Nueva and Tres Ríos facilities. Notably, average ammonia levels returned to 1 mg/L in 2019.

Removing ammonia is a complex process. The Agua Nueva and Tres Ríos Water Reclamation Facilities both use a five-stage process that features alternating oxygenated and oxygen-free zones. Pima County has optimized processes to better maintain the delicate balance of oxygen needed for maximum ammonia removal. They aim to remove additional ammonia during treatment of biosolids at the Tres Ríos Facility when new technology is installed in 2020 and 2021.



Average ammonia concentrations by water year

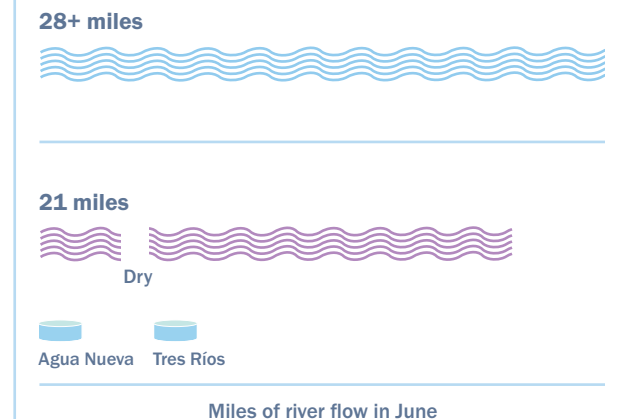
Review all data in supplementary report at [www.tiny.cc/tlr19](http://www.tiny.cc/tlr19)



## CLEANER WATER REDUCES THE RIVER'S FLOW EXTENT

Since the wastewater treatment upgrades, river flow extent is shorter and more variable, especially in June, the driest time of year when miles of flow are lowest. In June 2013, the river flowed uninterrupted for over 28 miles. In June 2019, flow decreased to 21 miles and was dry for a 1.3 mile stretch between the Agua Nueva and Tres Ríos facilities. Now occurring every June since 2014, this dry stretch has ranged from 0.3 to nearly 2 miles in length. Variability in flow extent is complex and impacted by many factors. Cleaner water infiltrates the riverbed more easily to replenish the aquifer. Infiltration also increases after seasonal floods scour the riverbed. Indeed, the longest dry stretches were in years with larger and more recent peak floods.

2013  
2019





## MANAGING FOR A MORE NATURAL RIVER

Allowed to run naturally, rivers often flow in slow, winding routes and flood with seasonal rains. When flooding, water spills out of the river's channel and onto the adjacent land called the floodplain. Riparian vegetation growing on the banks and in the floodplain works to slow flooding, reduce erosion, filter water as it percolates into the groundwater, and provide habitat for wildlife.

Historically, the Santa Cruz River winding through the Tucson area had a wide floodplain. As our communities grew, however, buildings, parks, and other infrastructure were built very close to the river. Through much of Tucson, this development has confined the river and floodplain to a narrower and straighter corridor. As a result, the river requires significant management for flood safety, including regular removal of accumulated sediment and vegetation that displace water in the corridor and create other hazards to people and property.

North of the Agua Nueva and Tres Ríos facilities, however, the Santa Cruz River corridor is wide enough to allow for more flexible management and less physical constraint of the river channel. Here, the river can meander a bit, water levels can more safely rise, and native riparian vegetation can grow with fewer concerns. Through strategic action, we can also encourage more wildlife species to call the river home.

The Pima County Regional Flood Control District, which has operational and maintenance control within the Santa Cruz River, is preparing a management plan for the river corridor. The reach from Grant Road north to the Pinal County line is currently in the "alternatives development phase," where collaboration with key stakeholders aims to manage flood risk while also taking into consideration drainage infrastructure protection, water recharge, recreation opportunities, public safety, and riparian habitat preservation.



### Learn about the potential projects along the Santa Cruz and tell us what you think.

Complete a survey by December 31, 2020 at: [www.tiny.cc/scrprojects](http://www.tiny.cc/scrprojects)

Over the last year, the Flood Control District and stakeholders have identified a wide-ranging set of improvements that have the potential to be implemented along the river. Now we need your help. Please join the conversation so we can develop a plan for the Santa Cruz River that reflects the needs, desires, and values of the community.

#### HOW TO GET INVOLVED

- Follow the Flood Control District's progress on the Santa Cruz River management plan for the river between Grant Road and the Pinal County line at: [www.pima.gov/SantaCruzRiverPlan](http://www.pima.gov/SantaCruzRiverPlan)
- Stay informed! Join the Sonoran Institute mailing list for the latest Santa Cruz news and events: [www.tiny.cc/scrsignup](http://www.tiny.cc/scrsignup)
- Follow the Sonoran Institute's social media accounts for information and updates on the river management plan and other Santa Cruz River news.

#### YOUTH EXPLORE THE RIVER THROUGH SCIENCE AND ART

Living River of Words is a Pima County program that encourages young people to explore how water moves through the landscape and learn about the connections between plants, animals, people, and water. Students visit the Santa Cruz River and create art or poetry entries for the Living River of Words Youth Poetry and Art contest. Finalists are displayed in a traveling exhibit throughout Pima County and are then submitted to the international River of Words contest. Some of the 2020 selections for the traveling exhibit are shown in this report. Learn more at: [www.pima.gov/nrpr](http://www.pima.gov/nrpr).

#### ACKNOWLEDGEMENTS

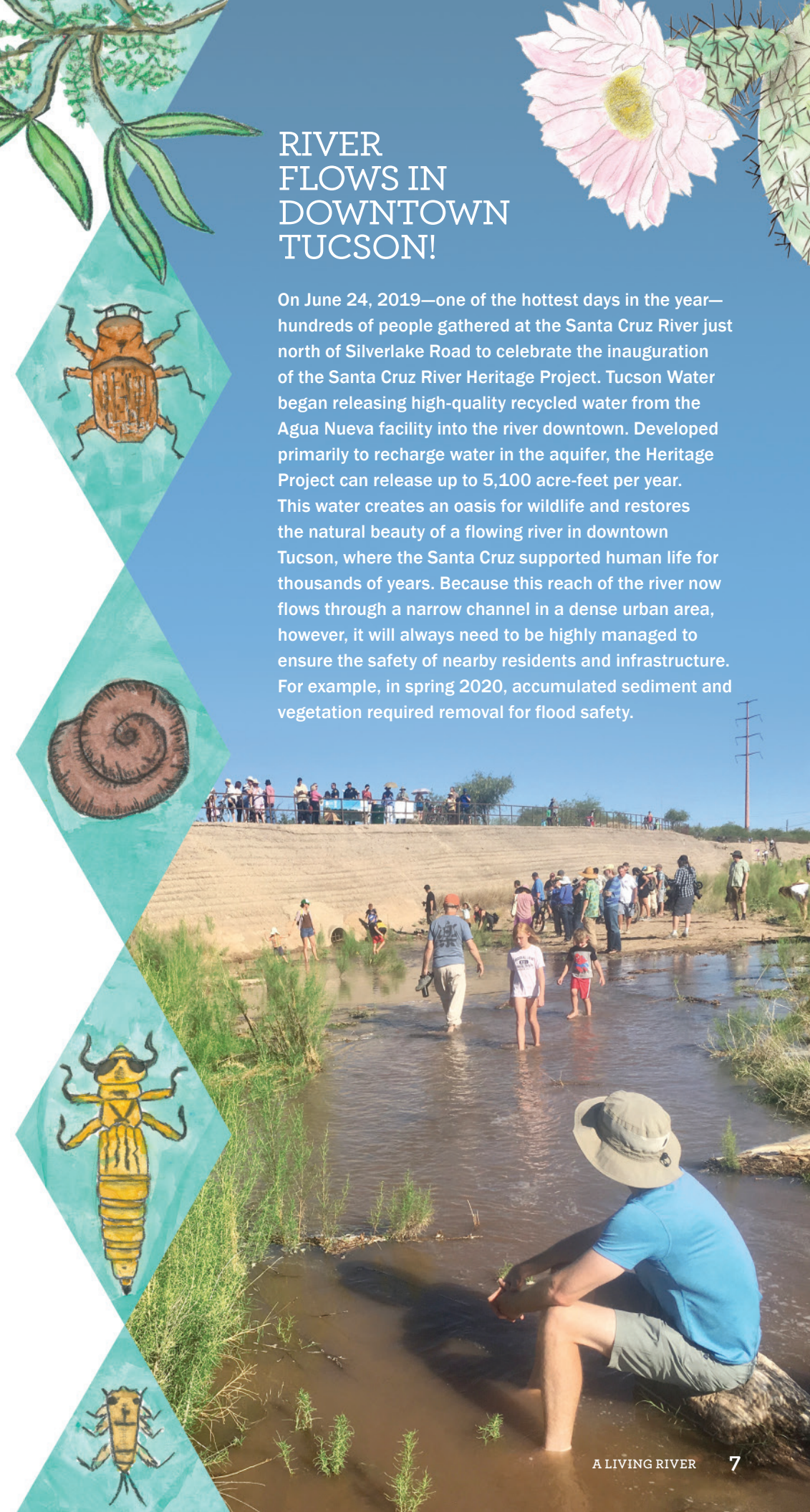
Sonoran Institute and Pima County developed and prepared this report with funding from Pima County Regional Wastewater Reclamation Department, Pima County Regional Flood Control District, and community stakeholders.

#### IMAGE CREDITS

**Cover photos** left: Santa Cruz River, and right: Great egret, by Charlie Alolkoy: [www.alolkoyphotography.com](http://www.alolkoyphotography.com)  
**2:** Great blue heron by Shutterstock (#375710713); Creeping water primrose by Claire Zugmeyer/Sonoran Institute; Coyote by Charlie Alolkoy **3:** Santa Cruz River by Charlie Alolkoy **4-5:** Santa Cruz River photos by Charlie Alolkoy; Dragonfly and damselfly photos by Michael T. Bogan **6:** left: Duck by Maia Garcia, age 15, Tucson High Magnet School — Marea Jenness; right: *A Night in the Desert* by Evelyn Allen, age 11, Mesquite Elementary School — Janice Mortensen & Paula Maxwell **7:** Invertebrate art by Alyssa Joseph, Age 16, and Cactus flower art by Gillian Jones, age 15, Tucson High Magnet School — Marea Jenness; Santa Cruz River Heritage Project photo by Michael T. Bogan

## RIVER FLOWS IN DOWNTOWN TUCSON!

On June 24, 2019—one of the hottest days in the year—hundreds of people gathered at the Santa Cruz River just north of Silverlake Road to celebrate the inauguration of the Santa Cruz River Heritage Project. Tucson Water began releasing high-quality recycled water from the Agua Nueva facility into the river downtown. Developed primarily to recharge water in the aquifer, the Heritage Project can release up to 5,100 acre-feet per year. This water creates an oasis for wildlife and restores the natural beauty of a flowing river in downtown Tucson, where the Santa Cruz supported human life for thousands of years. Because this reach of the river now flows through a narrow channel in a dense urban area, however, it will always need to be highly managed to ensure the safety of nearby residents and infrastructure. For example, in spring 2020, accumulated sediment and vegetation required removal for flood safety.





100 N. Stone Ave., Suite 1001  
Tucson, Arizona 85701

NON PROFIT  
U.S. Postage  
PAID  
Permit #1454  
Tucson, AZ 85701

**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. We envision resilient communities living in harmony with the natural world, where flowing rivers and healthy landscapes enable all people and nature to thrive. Our work transcends borders, bringing together diverse communities to promote civil dialogue about complex conservation issues that know no boundaries. All aspects of our work are guided by inclusivity and collaboration to create positive environmental change in the western United States and northwestern Mexico.



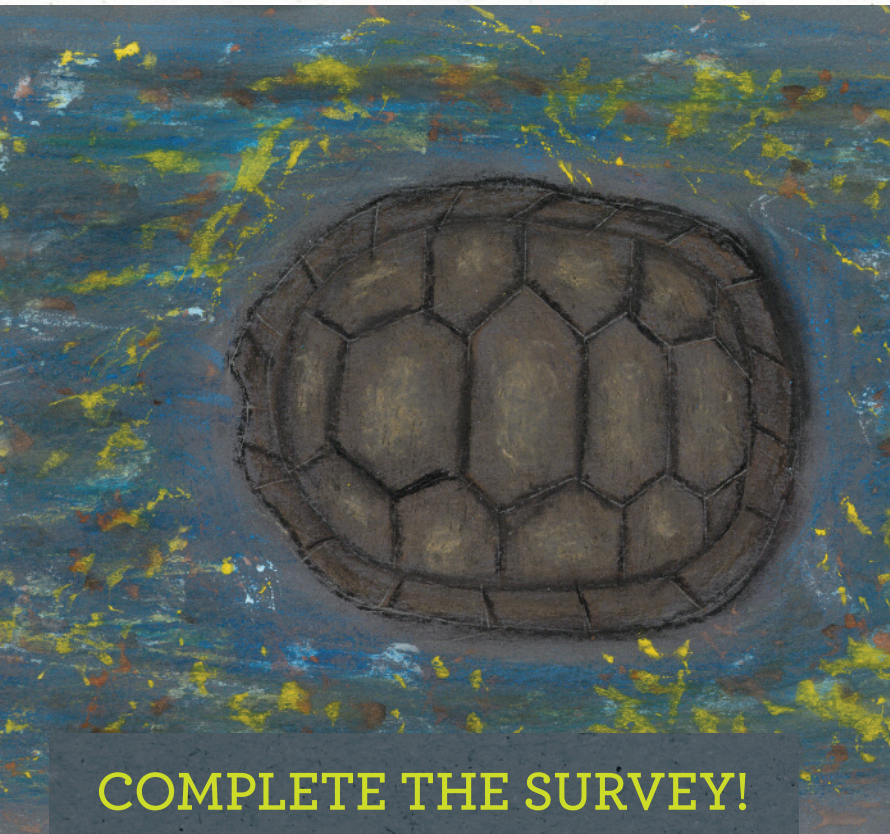
Sonoran Institute



@sonoraninst



SonoranInstitute



Rey Compos, age 18, Tucson High Magnet School — Marea Jenness  
Beautiful Desert by Serenity Phillips, age 6, Roadrunner Elementary — Liz Gary



## COMPLETE THE SURVEY!

We want your thoughts on proposed river projects.  
Complete the survey at: [www.tiny.cc/scrprojects](http://www.tiny.cc/scrprojects)

### PIMA COUNTY

Pima County Regional Flood Control District  
Pima County Regional Wastewater Reclamation Department  
Pima County Office of Sustainability and Conservation  
Pima County Natural Resources, Parks and Recreation

[www.pima.gov](http://www.pima.gov)

### PIMA COUNTY BOARD OF SUPERVISORS

Ramón Valadez, Chairman, District 2  
Ally Miller, District 1  
Sharon Bronson, District 3  
Steve Christy, District 4  
Betty Villegas, District 5

### COUNTY ADMINISTRATOR

Chuck Huckelberry



CleanWatts



Energy  
CERTIFIED

Printed with 100% New Wind Energy

Printed by  
Arizona Lithographers  
9/2020/8000 copies