

— 2018 —  
WATER YEAR

ENVISIONING  
BINATIONAL  
COLLABORATION

# a living river

CHARTING SANTA CRUZ RIVER CONDITIONS  
NOGALES WASH TO AMADO



SONORAN  
INSTITUTE



# THE SANTA CRUZ RIVER A LIVING ECOSYSTEM

The Santa Cruz River from the Nogales area to Amado remains a flowing river thanks to effluent, highly treated wastewater, released into the river from the Nogales International Wastewater Treatment Plant (NIWTP). The effluent provides rare habitat for wildlife, supports the cottonwood and mesquite forests that shade hiking trails, and helps recharge aquifers that have sustained communities for thousands of years.

Located in Rio Rico, the NIWTP treats wastewater from Nogales, Arizona, and Nogales, Sonora (collectively *Ambos Nogales*), and contributes a significant amount of water to the river—between 2008 and 2018, an average of 14 million gallons daily. In 2009, an upgrade to the NIWTP dramatically improved water quality, prompting a resurgence of aquatic wildlife and enhancing the river's ability to recharge aquifers. However, ongoing water quality challenges, such as contamination from sewage breaches and stormwater runoff, continue to impact aquatic wildlife as well as human health and safety.

Keeping this stretch of the river flowing is critical to the viability of this ecologically and culturally significant area. Unfortunately, this important source of water is not assured. Over 80% of the effluent going into the river comes from Sonora, thus is legally controlled by Mexico and could be diverted to other uses in the future. Any effort to permanently dedicate water to the river will require a binational solution that benefits both countries.

## A RIVER TRANSFORMED

The Santa Cruz River has been the lifeblood of the region for over 12,000 years. Many reaches of the river historically flowed year-round, providing water to communities from Mexico, northward.



Since the mid-20<sup>th</sup> century, groundwater pumping to support growing populations has dried most stretches of the river. Three flowing stretches, including from Rio Rico to Amado, are supported almost entirely by treated wastewater.

Just over a decade ago, the Santa Cruz River near Rio Rico had little life in its contaminated waters. Fish were largely absent. Cottonwood trees were dying because a layer of muck clogged the riverbed and prevented water that would feed tree roots from filtering into the water table.

Fast forward to the present and we see clear water supporting diverse aquatic life, including the endangered Gila topminnow. Water can once again percolate through the riverbed to recharge the aquifer that supports both trees and people. How was this transformation possible, you might wonder?

## CHARTING THE SANTA CRUZ'S RENEWAL

The river's improved health is the result of a binational agreement between the U.S. and Mexico that led to a \$64 million upgrade of the Nogales International Wastewater Treatment Plant in 2009.

The Sonoran Institute has tracked river conditions and published results through *Living River* reports since 2008. This year, we include conditions in Nogales Wash, an important corridor linking Ambos Nogales to the NIWTP and to the Santa Cruz. The International Outfall Interceptor (IOI)—a pipe that transports the wastewater from Mexico to the NIWTP—is buried beneath the wash. In addition, Nogales Wash is the principal waterway transporting stormwater runoff from Ambos Nogales to the river. Large, uncontrolled flows of stormwater, together with accidental sewage discharges from the IOI, have raised flood safety and water quality concerns from communities on both sides of the border.

This report highlights results from the 2018 water year (October 1, 2017–September 30, 2018). Comparisons are made to conditions in 2008, before the NIWTP upgrade. To explore all the data, download a supplementary report from the Sonoran Institute website at [www.tiny.cc/nlr18](http://www.tiny.cc/nlr18). All *Living River* reports can be found on the Sonoran Institute website: [www.sonoraninstitute.org](http://www.sonoraninstitute.org).



An endangered fish is thriving



Ammonia concentrations no longer toxic

## 2018 NOTABLE FINDINGS

Length of river flow in June decreases



Unfortunately, *E. coli* levels still high during rainy season



# HIGHLIGHTS OF RIVER CONDITIONS IN 2018 WATER YEAR

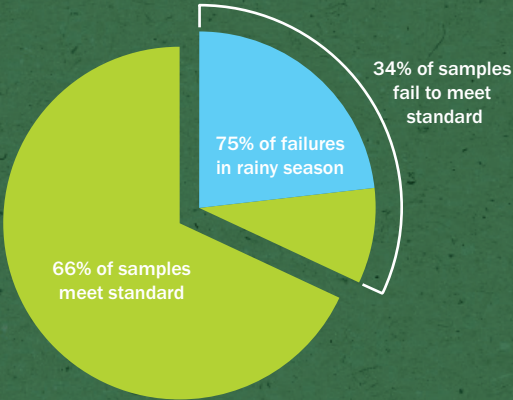


American Rubyspot damselfly (*Hetaerina americana*)



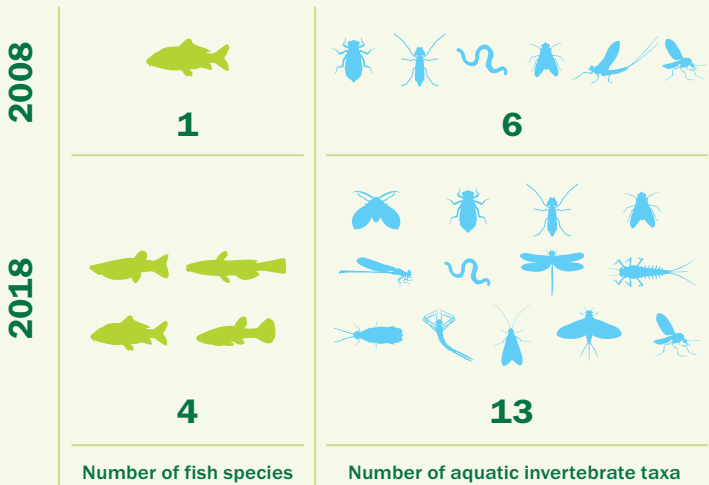
## HIGH FECAL CONTAMINATION RISK DURING RAINY SEASON

*Escherichia coli* (*E. coli*) is a species of bacteria living in the intestines of animals, and its presence in water is an indication of fecal contamination. Of more than 400 samples tested from Nogales Wash and the Santa Cruz River since 2008, 34% failed to meet the Arizona Department of Environmental Quality's *E. coli* standard. High levels were found at all survey sites and about 75% of failures occurred during the rainy seasons, suggesting that rain washes fecal material into the river from many points in the watershed.



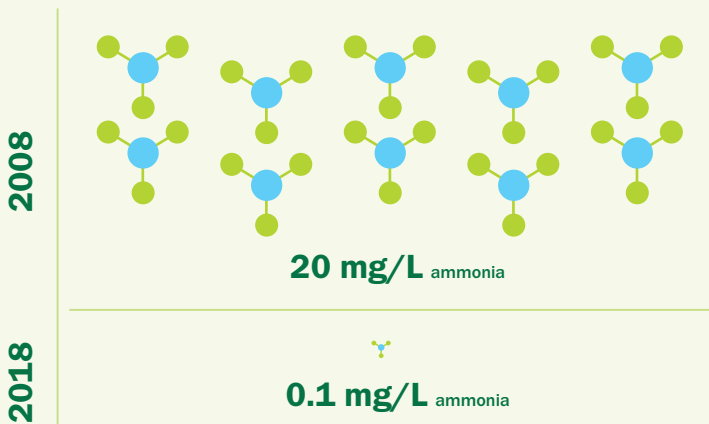
## AQUATIC WILDLIFE DIVERSITY INCREASED

In 2008, only native longfin dace were found, and in very low numbers (two individual fish). In 2018, four species were found, most notably the endangered Gila topminnow, a native fish caught in Nogales Wash for the first time in 16 years. The ease of capturing hundreds of longfin dace and Gila topminnow suggests these species are thriving. Diversity of aquatic invertebrates is another indicator of water quality. Though data are limited, results suggest diversity has doubled.



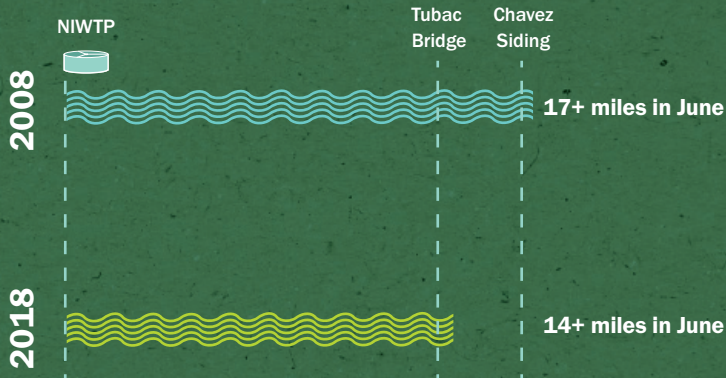
## WATER QUALITY IMPROVED

Renewed river vitality is due to improved water quality following the 2009 NIWTP upgrade. Among the many water chemistry changes, perhaps most significant is decreased ammonia (a form of nitrogen toxic to fish at high concentration and more common in rivers dominated by effluent). Between 2008–2018, average ammonia concentrations dropped from a toxic 20 mg/L to less than 0.1 mg/L. The upgrade did not impact conditions in Nogales Wash, where ammonia levels were already low, averaging 1.4 mg/L from 2008–2013.



## INCREASED RECHARGE REDUCES MILES OF FLOWING RIVER

In June 2008, the river flowed north over 17 miles, past Chavez Siding Road. Since the 2009 upgrade, flow extent in June has retreated. Many factors impact flow extent, but this reduction is likely a positive sign of increased aquifer recharge. Cleaner water promotes infiltration through the riverbed by breaking down old clogging layers and preventing new layers from forming. In June 2018, the river flowed over 14 miles, ending between Tubac Bridge and Chavez Siding Road. Flow miles were not tracked in Nogales Wash.





# BINATIONAL SOLUTIONS NECESSARY TO PROTECT THE SANTA CRUZ RIVER

Flowing water, fish habitat, iconic cottonwood gallery forests, additional recharge of the local groundwater supply, a lush green corridor to hike and recreate along—all this is supported by the release of effluent from the Nogales International Wastewater Treatment Plant (NIWTP).

In 2016, a conceptual water budget comparing water supply with water demands along the Santa Cruz River demonstrated that effluent is a critical source of water, particularly during the hot, dry season when fish, wildlife, and plants are under the greatest stress.

Although released into the river in the U.S., over 80% of the effluent from the NIWTP comes from Nogales, Sonora, and is thus owned by Mexico. Therefore, any effort to permanently dedicate water to the river to protect the river's flow and associated habitat must be part of a solution with benefits for both sides of the border. Given the local history of binational

collaboration, Sonoran Institute is optimistic that our communities can work together to find such a solution.

The Santa Cruz River and watershed face additional management challenges, including aging wastewater infrastructure, the potential for a catastrophic sewage breach, and severe flooding and erosion from urban stormwater runoff. Most recently, sewage spills into the Nogales Wash from breaches in the International Outfall Interceptor (IOI) have increased concerns around public health and safety.

River and water resource management is complex, but support from both sides of the border could protect this important river and surrounding communities from water quality threats and ensure a lasting, permanently flowing river. In the meantime, there is a lot to celebrate. The Santa Cruz River today is alive and significantly healthier!

## GET INVOLVED

- Stay informed! Join the Sonoran Institute mailing list to make sure you hear the latest Santa Cruz news. Sign up at: [www.tiny.cc/scrsignup](http://www.tiny.cc/scrsignup)
- Help us map high-valued areas along the river by telling us where you visit the river. Survey at: [www.tiny.cc/scrmap](http://www.tiny.cc/scrmap)
- Join Friends of the Santa Cruz River for a river clean-up: [www.friendsofsantacruzriver.org](http://www.friendsofsantacruzriver.org)
- Visit the new Tubac Nature Center: [www.tubacnaturecenter.com](http://www.tubacnaturecenter.com)

## RIVER VALUED FOR WILDLIFE, WATER, AND TOURISM

What do people value about the Santa Cruz? What challenges does the river face? Understanding the answers to these questions is essential to achieving our vision for the river to be the living, flowing foundation of our communities. When we asked, these simple questions generated a long list of diverse responses, suggesting people living along the Santa Cruz have a complex and holistic view of the river. The top two challenges stated were littering/dumping and the lowering of the water table. The most commonly reported values involved three themes: ecological (like migratory corridors and cottonwood trees); water (like availability and quality); and tourism (like public access points and historic or cultural history sites).

## COMMUNITY LEADERS IDENTIFY RESEARCH NEEDS

What research questions should be explored to best manage the river? In October 2018, in honor of the 10th anniversary of Santa Cruz River Research Days, Sonoran Institute asked community leaders to identify their research priorities. Top priorities for the Nogales reach of the river included conducting a comprehensive analysis to relocate or repair the aging IOI pipeline bringing wastewater to the Nogales International Wastewater Treatment Plant, how to slow the flow of stormwater in Nogales, Sonora, and how to reduce trash accumulation in the river.

## ACKNOWLEDGEMENTS

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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. We work at the nexus of commerce, community, and conservation to help people in the North American West build the communities they want to live in while preserving the values which brought them here. We envision a West where civil dialogue and collaboration are hallmarks of decision making, where people and wildlife live in harmony, and where clean water, air, and energy are assured.



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#### IMAGE CREDITS

All photos ©Bill Hatcher/Sonoran Institute, 2019, with the exception of: **page 3:** Gila topminnow by Bruce D. Taubert; **page 4:** Damselfly by Michael T. Bogan; **page 7:** Snowy egret by John Shasky; Historical photo of the Santa Cruz River: *Megariz Kids on Tubac Footbridge*, courtesy of The Tubac Historical Society

#### WE WANT TO HEAR FROM YOU!

Help us map high-valued areas along the river by telling us where you visit the river: [www.tiny.cc/scrmap](http://www.tiny.cc/scrmap)

Learn more: [SonoranInstitute.org](http://SonoranInstitute.org)

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