

Monitoring Climate and Water at Tumacácori National Historical Park

Tumacácori National Historical Park (/tuma/)

Overview and Importance

Many National Park Service units in the U.S. Southwest were established to protect precious cultural resources. In most cases, however, the surrounding natural environment is an equally significant part of the story.

When Padre Eusebio Kino and his fellow missionaries visited the Tucson Basin in 1694, the Santa Cruz River valley was controlled by the Sobaipuri, an O'odham group. Their villages were situated along streams, near concentrations of plants and animals, including freshwater fish. Father Kino also founded his mission near the banks of the Santa Cruz. River water allowed the mission to grow grapes, grain, vegetables, medicinal plants, and maintain livestock.

Tumacácori National Historical Park preserves Kino's mission sites and a segment of the Santa Cruz River. Since 1951, the river has received a steady flow of treated effluent from the Nogales International Wastewater Treatment Plant (NIWTP), 10 miles upstream of the park. As a result, the park segment now supports a rare



The Santa Cruz River at Tumacácori National Historical Park supports a rare cottonwood-willow southwestern riparian environment.

southwest cottonwood–willow riparian environment, one of the most endangered ecosystems in the U.S. Recent changes to effluent inputs have **reduced the river's flow**, (<https://www.nps.gov/articles/vanishingsantacruzr.htm>) however.

Streamflow is just one of the parameters the **Sonoran Desert Network** (<https://science.nature.nps.gov/im/units/sodn/>) is monitoring at Tumacácori and three other National Park Service units. The goal of the program is to detect broad-scale changes in stream health by observing certain measures over time—and to give park managers early warning of any issues they may need to address. The network measures water quality, water quantity (streamflow), channel morphology (the shape and composition of the streambed), riparian vegetation, and macroinvertebrate communities.

Stream conditions ([/im/sodn/streams.htm](https://science.nature.nps.gov/im/units/sodn/streams.htm)) are closely related to climate conditions. Because the two are better understood together, the network reports on climate in conjunction with water resources. Reporting is done by water year (WY), which begins in October and ends the following September.



Climate monitoring station at Tumacácori National Historical Park.

Recent Findings

Climate

In WY2016, overall annual precipitation was 108% of normal for Tumacácori National Historical Park. Precipitation was slightly below normal for the fall and winter. However, precipitation in September was 278% of normal, resulting in an extended monsoon season for the second year in a row. The reconnaissance drought index (a measure of soil dryness) reflected the extended regional drought that began in 2000, but results suggest the last three years have helped to remedy the multi-year precipitation deficit. Extremely cold days ($<26^{\circ}\text{F}$) occurred about 80% more often than normal (24 days vs. 13.3 ± 2.3 days) in WY2016. The overall number of days with extreme precipitation events was approximately normal—but almost three inches of rain fell in an event on September 7. Additional information can be found at [climateanalyzer.org](http://www.climateanalyzer.org) (http://www.climateanalyzer.org/sonoran_desert/sagtuma).

Water Resources

Streamflow

Streamflow data for this report were recorded at U.S. Geological Survey gauge 09481740, five kilometers downstream from Tumacácori NHP. Streamflow during WY2016 was generally at or slightly below average, with average annual flow calculated to be 12.7 cubic feet per second. Peak flow occurred on August 9.

Water Quality

Water quality monitoring occurred ~150 meters downstream from the southern boundary of the park, at the Santa Gertrudis index site. There was one exceedance of state water quality standards for *E. coli* during WY2016, resulting in an average of 99% overall compliance with state standards. However, it is likely that *E. coli* estimates exceeded the state standards on more than this single occasion, especially during and after precipitation events.



Sonoran Desert Network staff display water quality samples (foreground) and monitor streamflow (background).

Macroinvertebrates and Fish

Macroinvertebrate and fish sampling occurred on the Santa Gertrudis index reach, a 460-meter length of the Santa Cruz River directly downstream of the southern boundary of the main unit at Tumacácori NHP. Values for the Arizona Index of Biological Integrity (an index used to measure wetland health) have placed the park segment of the Santa Cruz River at or below impaired status since WY2012 (although there is not an established index threshold for effluent-dominated streams in Arizona). However, two taxa of fish were collected during collaborative sampling at the Santa Gertrudis index reach in WY2016: longfin dace (*Agosia chryogaster*) and Gila topminnow (*Poeciliopsis occidentalis*). This was the first documentation of the federally endangered Gila topminnow in the index reach since 2002.

For more detailed information, see the most recent **full report**
(<https://irma.nps.gov/DataStore/DownloadFile/588077>).