

Climate and Water Monitoring at Gila Cliff Dwellings National Monument, Water Year 2018

Gila Cliff Dwellings National Monument (/gicl/)



Climate, groundwater, and surface water are closely related. At Gila Cliff Dwellings National Monument, the Sonoran Desert Network monitors all three to track broad-scale change and provide early warning of potential problems.

At Gila Cliff Dwellings National Monument and three other National Park Service units, the **Sonoran Desert Network** (<https://science.nature.nps.gov/im/units/sodn/>) monitors stream health. The program is designed to detect broad-scale ecological changes by observing certain parameters over time. This helps us 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.

The West Fork Gila River, which crosses the northeastern portion of Gila Cliff Dwellings National Monument (NM), is a mountainous stream located in the Gila Wilderness. There is almost no upstream land use and little visitor impact in its small watershed.

Natural stressors include drought, flooding, and fire. Since 2001, drought has decreased flow in the stream, which sometimes runs dry near the park's eastern boundary. This area is also prone to flooding. Inside the park, the floodplain is bounded by canyon walls that act as a bottleneck, increasing the destructive force of high flood

waters. In 2008, a large rain-on-snow event carved a new stream channel and washed out camping facilities and a bridge, resulting in necessary repairs and reduced visitation.

Two major fires have burned in the watershed in recent years: the 2011 **Miller Fire**

(<https://www.nps.gov/fire/wildland-fire/connect/fire-stories/2011-parks/gila-cliff-dwellings-national-monument.cfm>) and the Whitewater–Baldy Fire, in 2012. Impacts from these fires have included degraded aquatic habitat, exotic-plant establishment, and potential future flooding and channel change.

Stream conditions are closely related to climate conditions. Because the two are better understood together, the Sonoran Desert 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.

Recent Findings

Climate

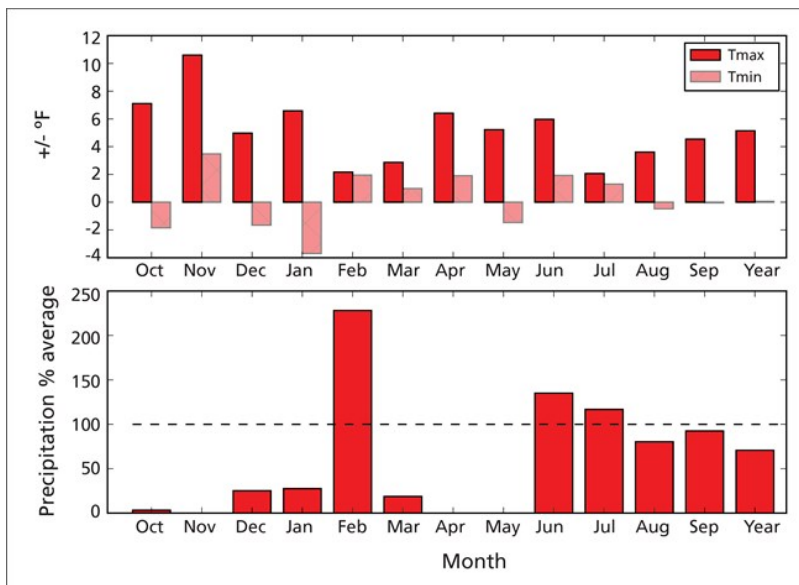
Water year 2018 was hotter and drier than normal at Gila Cliff Dwellings National Monument. Overall annual precipitation was 70.7% of normal, based on a 30-year record (1981–2010). In the fall and winter, all months except February received only 0–28% of normal rainfall. The park received 88% of normal precipitation in spring and summer.

Mean monthly maximum temperatures were all higher than normal—especially November, which averaged 10.6°F higher than normal.

Mean monthly minimum temperatures were more variable. The reconnaissance drought index indicates that WY2018 returned to drier conditions after three

wetter-than-average years. Additional information is available at **The Climate Analyzer**

(http://www.climateanalyzer.us/sonoran_desert/giclsansev).



Departures from 30-year (1981–2010) normal minimum and maximum air temperature and precipitation for water year 2018, Gila Cliff Dwellings National Monument.

Springs

Two springs are monitored at the monument. Both had surface water present and flowing when visited in WY2018 and showed little sign of change or disturbance.



Cliff Dweller Canyon Spring looking upstream from orifice, Gila Cliff Dwellings National Monument, May 2011 (left) and June 2018 (right).

Streams

This was the second water year of data for USGS stream gage 09430010. The U.S. Geological Survey maintains the equipment for this gage, and also collects and manages its data. The hydrograph for WY2018 was typical of the Upper Gila Basin, with peak streamflow occurring from February to early April. The largest flow event occurred in late February. Snowmelt and late winter storms made crucial contributions to the hydrologic season. The median value for the winter season (48.7 cfs) was about 60% greater than the spring median value (30.2 cfs) and more than 10 times the summer value (4.49 cfs).

There were 248 discrete analyses of water samples collected from the West Fork Gila River index site in WY2018. Of these samples, 94 were associated with New Mexico surface-water criteria. There were no exceedances of New Mexico state water-quality standards noted in these samples, for a compliance rate of 100%.

Macroinvertebrates were collected to provide data for compliance with the New Mexico biological standards. In WY2018, the index reach scored 50.14 on the New Mexico integrated biological index, putting it in the “fair” category. This index reach has been sampled with the same methods since WY2012. The index value has been near the upper 25th percentile each year—even after major fires in the monument watershed (2011–2012). These results show the resilience of the macroinvertebrate community, and the ability of the stream reach to recover after postfire flows of debris and ash.

Information found here was summarized from E. L. Gwilliam, L. Palacios, and K. Raymond, Status of climate and water resources at Gila Cliff Dwellings National Monument: Water year 2018
 (https://irma.nps.gov/DataStore/DownloadFile/629190).

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