



Pima County Local Drought Impact Group

Office of Sustainability and Conservation

2020 Annual Report

Introduction

This report summarizes drought conditions in Pima County for the water year 2020. The water year is from October 2019 through September 2020.

The Pima County Local Drought Impact Group (LDIG) has been an active component of County operations since 2006 when the Board of Supervisors adopted the Drought Response Plan and Water Wasting Ordinance (Pima County Code Chapter 8.70). LDIG consists of water providers, local, state and federal agencies and citizen groups that have an interest in the cause and effect of drought conditions in Pima County.

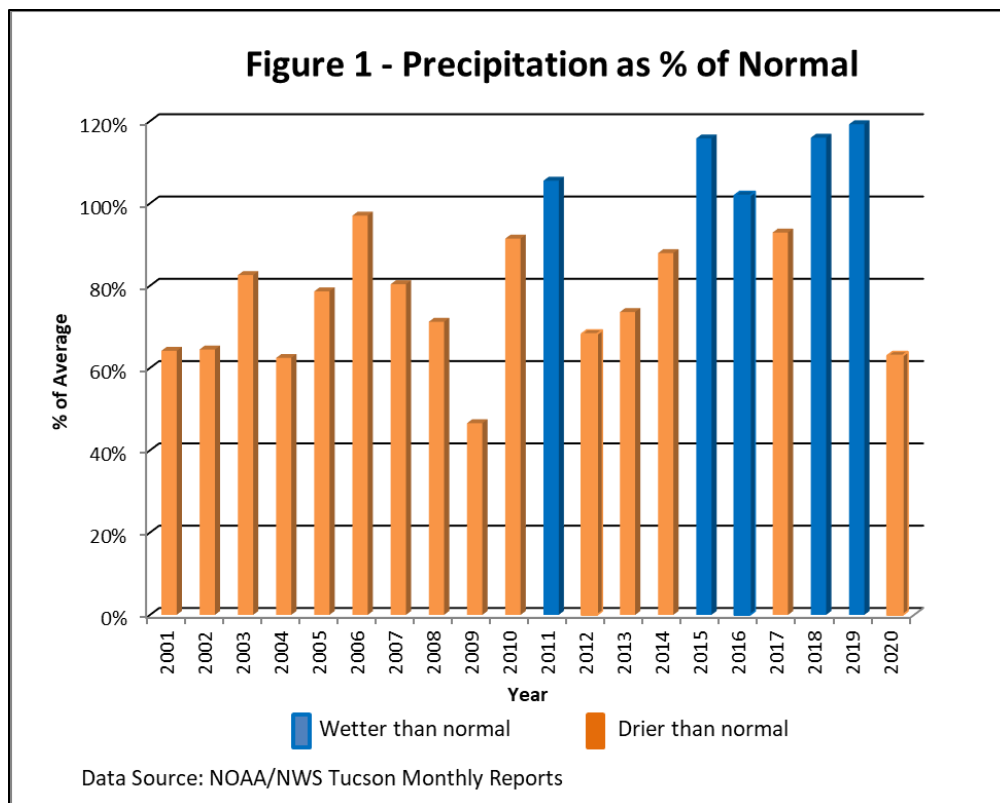
LDIG explores the impacts of drought on various sectors in Pima County including agricultural water use, ranching, wildfire, hydrology, and flooding. Because many water providers depend on Central Arizona Project water, LDIG also monitors the status of the Colorado River, the El Niño Southern Oscillation (ENSO) and other climate weather patterns in relation to their effect on drought conditions and climate variability in the southwest. LDIG also monitors the status of the summer monsoon season and convenes roundtable discussions of drought and water conservation outreach programs. For a list of presentations and agendas, please visit [Pima County's LDIG website](#).

This report is submitted to the Arizona Department of Water Resources (ADWR) to be included in the 2020 Arizona Drought Preparedness Annual Report. It will also be provided to the Pima County Administrator's Office.

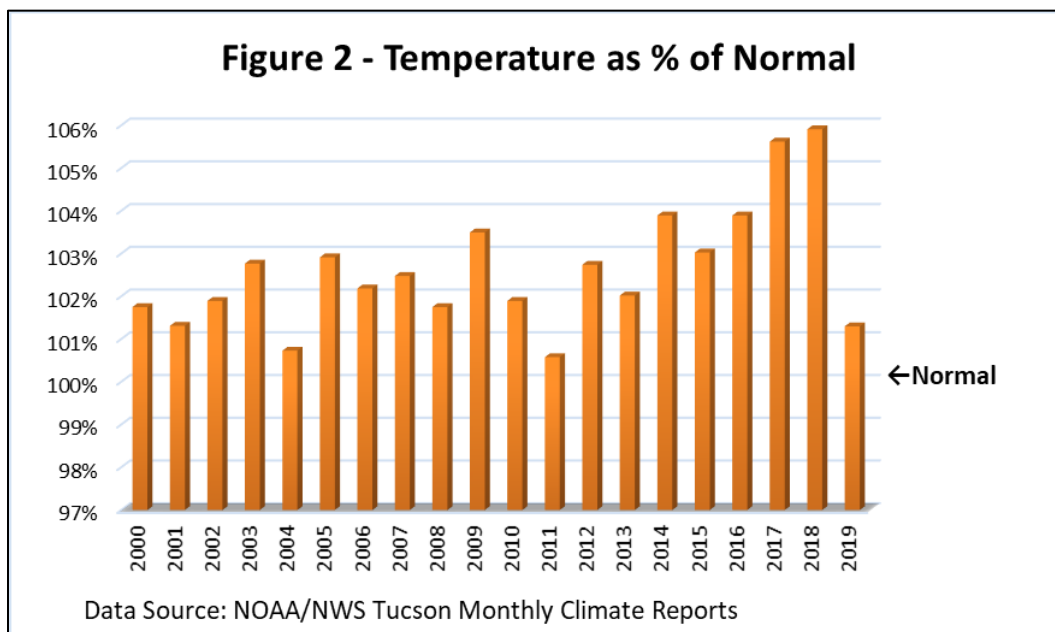
Status of Drought in Pima County

Drought is typically characterized by a lack of precipitation. Long term drought conditions were evident in Pima County starting in the early 21st century. In 2006 Pima County approved a Drought Response Plan and Water Wasting Ordinance to have a framework in place, should drought persist and worsen. Drought has persisted in Pima County, but some years have been cooler and others have been wetter than normal.

The National Oceanic and Atmospheric Administration's National Weather Service has maintained official records of temperature and precipitation at the Tucson International Airport since 1895. Although three of the last five years have been wetter than normal, only five of the last 20 years have experienced above normal precipitation as seen in Figure 1.



Temperature also exacerbates drought impacts by increasing water demand and evapotranspiration in natural vegetation, landscape plantings, turf and agricultural crops. Average annual temperatures have been above normal in each year since 2000, as depicted in Figure 2. The years 2017 and 2018 have been the hottest on record, except for 2020 which is on track to be the hottest.



In 2007 Pima County and surrounding communities declared a Stage One Drought. In spite of persistent drought over the last 14 years, many sectors have endured and adapted to drought conditions, as described in this report.

Pima County uses ADWR’s Monthly Drought Status Summary and Quarterly Drought Status Update to define drought conditions. The monthly summary is produced by ADWR’s Monitoring Technical Committee and is based on the U.S Drought Monitor’s maps for the previous four weeks. The quarterly summary, also produced by the Monitoring Technical Committee, assesses drought status for each watershed determined by comparing precipitation and streamflow percentiles for the past 24, 36 and 48 months to a 40-year historical record. Short-Term and Long-Term drought conditions in Pima County are described below and summarized in Table 1.

Short-Term Drought Status: The Water Year began with a mix of moderate to abnormally dry conditions in central Pima County. Drought intensity improved during the winter and spring due to near-normal precipitation. Above normal temperatures and below normal precipitation in summer resulted in worsening short term drought ranging from moderate in western Pima County to extreme in northeast Pima County.

Long-Term Drought Status: From October to December 2019, drought intensity in western Pima County was moderate, improving eastward with receding intensity of abnormally dry or no drought. By January 2020, moderate drought had receded in western Pima County with isolated areas of abnormally dry conditions and no drought in eastern Pima County. Drought intensity continued to recede through Spring with drought recovery in eastern Pima County and some areas of moderate drought in the northeastern Pima County. However, record heat and below average precipitation in summer 2020 worsened long-term drought.

Table 1. Pima County Drought Intensity*

WY19-20	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Short-Term	D0, D1	D0	No Drought							D1, D2	D1, D2, D3	D1, D2, D3
Long-Term	D0, D1		D0			D0, D1			D0, D1, D2, D3			

*D0-Abnormally Dry, D1-Moderate, D2-Severe, D3-Extreme, D4-Exceptional

LDIG Activities

LDIG typically meets six times during the year. However, the May meeting was cancelled due to Covid-19 pandemic and beginning in July the group has met on an online meeting platform. Meeting agendas, summaries and presentation materials are posted to the [LDIG website](#).

The County’s Drought Response Plan and Water Wasting Ordinance establishes four stages and corresponding drought actions or measures: Stage 1-Water Alert, Stage 2-Water Warning, Stage 3-Water Emergency and Stage 4-Water Crisis. Each stage declaration prompts increased drought response actions.

2020 Weather Conditions

Using data from the National Weather Service Tucson Office, Pima County weather conditions began the Water Year warmer and drier than normal on average, but with periods of cool winter storms with fair precipitation. October 2019 was slightly above average temperature with below average low temperatures. Isolated light storm systems brought below normal precipitation. November was warm and dry, but active winter storms systems from tropical moisture altered the pattern to wetter than average precipitation. However, above average monthly temperatures continued. In all, Fall was wetter and warmer than average. Several winter weather systems resulted in a slightly wetter and warmer than average conditions in December.

January 2020 had no significant storm systems and produced below average precipitation with slightly warmer than average high temperatures and below average low temperatures. Winter was slightly warmer than average and lack of storm systems resulted in below normal precipitation. February ended warm and dry and those conditions continued into March.

April temperatures increased and below average precipitation continued. May experienced record hot temperatures; 4.7°F above normal, ten days in excess of 100°F and four days with highs of 105°F or warmer. On June 5, a storm system ignited the Bighorn wildfire north of Tucson and warm, dry conditions along with wind patterns impeded containment, burning 119,978 acres in the Santa Catalina Mountains. Full containment was achieved on July 23. Four smaller but serious lightning-caused wildfires occurred in the Tortolita Mountains during the summer 2020.

July was the hottest on record with 25 days exceeding 100°F, 16 days exceeding 105°F and three days with highs of 110°F or warmer. There were 16 days in which the low temperature was 80°F or warmer. The monsoon pattern failed to materialize resulting in precipitation well below average. August was even hotter, breaking additional temperature records and continued below average precipitation. There were 23 days with temperatures exceeding 100°F, 22 days with temperatures exceeding 105°F and four days with temperatures in excess of 110°F. Sixteen days had low temperatures of 80°F or warmer. September was the third consecutive month with record warm temperature. There were 14 days with temperatures exceeding 100°F, 3 days exceeding 105°F and one day in excess of 110°F. There was no precipitation in September. Smoke from wildfires in the West produced many days of hazy skies.

The Summer Monsoon 2020 season was the hottest on record and second driest. There were 100 days with temperatures exceeding 100°F and 57 days exceeding 105°F; both are the highest summer totals on record. The monsoon season was dominated by a strong high pressure pattern resulting in below average precipitation. The water year ended with 7.30 inches of rainfall, the 15th driest. Table 2 summarizes monthly precipitation and departure from normal. Table 3 lists average monthly temperature and departure from normal monthly temperature.

The National Weather Service uses a 30-year period to calculate normal temperature and precipitation. Starting in 2021, new normal temperature and precipitation will be recalculated using data from 1991 through 2020. Preliminary new normal data indicate temperatures increasing and precipitation decreasing compared to the previous 30-year period, 1981 through 2010.

Table 2. Precipitation (in inches, recorded at Tucson International Airport)

WY19-20	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PRECIPITATION	0.01	2.32	1.20	0.65	0.67	0.70	0.07	0.01	0.05	0.46	1.16	0.00
NORMAL MONTHLY PRECIPITATION	0.89	0.57	0.93	0.94	0.86	0.73	0.31	.23	0.2	2.25	2.39	1.29
DEPARTURE FROM NORMAL	-0.88	+1.75	+0.27	-0.29	-0.19	-0.03	-0.24	-0.22	-0.15	-1.79	-1.23	-1.29
CUMULATIVE	0.01	2.33	3.53	4.18	4.85	5.55	5.62	5.63	5.68	6.14	7.30	7.30
RANK	28 th Dry	7 th Wet	37 th Wet	62 nd Dry	56 th Wet	40 th Wet	47 th Dry	47 th Dry	50 th Dry	10 th Dry	30 th Dry	Dry

Table 3. Average Temperature (in °F, recorded at Tucson International Airport)

WY19-20	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
AVERAGE TEMPERATURE	71.5	63.8	53.6	53.4	55.0	60.9	69.6	80.7	86.4	91.5	92.0	85.7
NORMAL MONTHLY TEMPERATURE	71.0	59.8	51.9	52.6	55.3	60.1	67.0	46.0	84.6	87	85.3	81.6
DEPARTURE FROM NORMAL	+0.5	+4.0	+1.7	+0.08	-0.3	+0.8	+2.6	+4.7	+1.6	+4.5	+6.7	+4.1
RANK	38 th Hot	9 th Hot	29 th Hot	30 th Hot	51 st Hot	32 nd Hot	16 th Hot	Hot	17 th Hot	Hot	Hot	Hot

Table 4. 2019-2020 Season Ranking (NWS-Tucson)

WY19-20	FALL	WINTER	SPRING	SUMMER	MONSOON
PRECIPITATION RANK	15 th Wet	50 th Wet	58 th Dry	7 th Dry	2 nd Dry
TEMPERATURE RANK	15 th Hot	26 th Hot	5 th Hot	Hottest	Hottest

Colorado River Basin & Central Arizona Project

Nine water providers in Pima County hold municipal and industrial entitlements to almost 183,000 acre-feet of Central Arizona Project (CAP) water. Agricultural users, the Tohono O’Odham Nation and Pascua Yaqui Tribe also have access and use CAP water. Consequently, the drought status of the Colorado River and potential for a shortage declaration is of interest to these sectors. With the Colorado River in a Tier

Zero shortage, several local water providers are contributing to Arizona's 192,000 acre-feet reduction in CAP deliveries to comply with the Drought Contingency Plan. Water providers, community members and agricultural interests in Pima County are also actively involved in the Arizona Reconsultation Committee for the Colorado River Interim Guidelines.

Drought Impacts in Pima County

Drought affects many sectors. Below is a review of drought impacts observed in Pima County during the year.

Wildfire: On June 5, a lightning strike started the Bighorn Fire in the Santa Catalina Mountains affecting almost 120,000 acres. Several years of drought conditions, combined with above normal temperatures in May contributed to the wildfire's extent and severity, starting in the western, steep, rugged terrain in the Pusch Ridge Wilderness and burning east across the mountain range to Redington Road. Hot, dry, windy conditions made containment difficult, threatening communities in Oro Valley, Redington and the Catalina Foothills and forcing evacuations. Full containment was attained on July 23. The Pima County Regional Flood Control District has prepared a flood assessment identifying the Cañada del Oro Watershed at highest risk for downstream flooding and sediment and debris flow runoff.

Also in June, the Tortolita Fire, started by a lightning strike, burned 3,140 acres of high dry grass and brush in rugged land east of Dove Mountain in Marana. In August, three additional wildfires (started by lightning strike) occurred in the Tortolita Mountains. The Westridge Fire (480 acres), Dove Fire (942 acres) and Edwin Fire (137 acres) were all contained by the end of August.

Air Quality: In June, Pima County's Department of Environmental Quality issued an air pollution health watch for particulates due to fire smoke from the Bighorn and Tortolita Mountain fires. In September, wildfires in California caused smoke and hazy skies, but it was high enough to avoid detection at Pima County's air quality monitoring locations.

Groundwater: ADWR maintains groundwater index wells throughout the State, including two in Pima County; one along the Pantano Wash and one at the confluence of Fragueta Wash and Arivaca Creek, both within Pima County.

Pima County Regional Flood Control District monitors groundwater levels within various watersheds to help assess the effects of climate and land use changes on the overall health of floodplains in Pima County. There are a few areas of shallow groundwater in the region along Cienega Creek, Davidson Canyon, and Tanque Verde Creek. Groundwater levels have recovered in many of the areas since 2014 though there is an established long-term downward trend in groundwater levels for most of the areas. RFCD will continue to monitor to ascertain whether the more recent recoveries are just a temporary delay in a downward trend.

Tucson Water provides maps of annual water level monitoring programs in the Tucson basin and in Avra Valley. Groundwater levels in available City of Tucson wells are periodically measured to maintain long term records to assist in management of local groundwater resources.

Water Demand: Pima County is served by several water providers, the largest of which is Tucson Water. Metropolitan Domestic Water Improvement District, the Town of Oro Valley and the Town of Marana along with other water providers deliver municipal water to Pima County residents. As required by ADWR,

each has approved Drought Response Plans in place and implement water conservations measures per the Fourth Management Plan of the Tucson Active Management Area. Tucson Water and the Town of Marana are updating their drought response plans.

Riparian Resources: Pima County has established several environmental restoration projects that provide drought relief using drought adaptive strategies.

Agua Caliente: Agua Caliente Park, located northeast of Tucson, has historic and cultural significance. The park's focal point is a natural artesian spring that feeds a creek and pond sustaining an abundant variety of oasis vegetation and habitat for native species. Varying flow rate from the spring necessitated augmenting the pond with well water. This year the pond was lined and refilled completing a key restoration project. Endangered Gila topminnow were released into the newly restored pond and are thriving in their new home.

Canoa Ranch: The Raúl M. Grijalva Canoa Ranch Conservation Park, located on the site of the original San Ignacio de la Canoa Grant, is a historic ranch listed in the National Registrar of Historic Places. In February, Pima County completed an ephemeral wetland to augment the reestablishment of the ranch's original pond. The wetland and pond are attracting wildlife and waterfowl. This is a first phase of a larger project to restore riparian habitat in the Santa Cruz River Floodplain.

Cienega Creek: Located in eastern Pima County, Cienega Creek continues to show the impacts of sustained drought and shifts to seasonal patterns of flow. Pima Association of Governments' (PAG) reporting depicts the localized drought impacts on a shallow groundwater-dependent system and designated Outstanding Arizona Water, representing drought conditions for local wildlife habitat and human activities dependent on shallow groundwater. It is valuable for drought reporting to represent areas that do not benefit from artificial recharge and CAP.

PAG has monitored the Cienega Creek Natural Preserve since the mid-1990s to provide reliable trend analysis for the riparian area for water quality, groundwater and streamflow. Hot and dry June conditions typically represent the minimum extent of perennial flow within a year. In June 2020, PAG recorded 1.018 miles of flow in the monitored stretch of Cienega Creek, about 44% less flow than was recorded in June 2019, demonstrating an increased drought impact. This is only 11% of the 9.5-mile monitoring area which flowed perennially in 1985, revealing severe long-term impacts. In addition, even lower flow extent for the monitoring year (July 2019 - June 2020) occurred in September 2019. PAG has only observed this pattern three times, all likely the results of poor monsoon seasons or below average winter rains. With two of the three events occurring in the last two years, it will be valuable to observe any shifting trends in seasonal patterns. These patterns also highlight the importance of consistent seasonal monitoring.

There was no baseflow in the monitored stretches of Davidson Canyon, a major tributary to Cienega Creek, in June 2020, following sustained flows in September, December and March. This was an improvement on the previous monitoring year, during which flows were only observed in March 2019. Different precipitation regimes impact Davidson Canyon and Cienega Creek, contributing to a balance of sustained flows in Cienega Creek.

Kino Environmental Restoration Project (KERP): KERP harvests urban stormwater and controls flooding in Tucson. KERP covers 141 acres with 28 acres of open water and riparian habitat. A central pond captures stormwater and stores it for irrigation within the KERP basin and Kino Park. Although

less stormwater was harvested this year, it is still being directed through the steam courses. Reclaimed water is available to this site, as a contingency measure.

Santa Rita Experimental Range:

The University of Arizona's School of Natural Resources reports very dry conditions at the Experimental Range, where rainfall is closely monitored. Most rain gages were 35-45% of the long-term average for the period of June through August. This, coupled with extraordinarily hot July and August temperatures has reduced grass production to about 10% of the average for the monsoon growing season. While there is a large amount of standing grass from summer 2019 for livestock to eat, there is also concern for fire through the winter season.

Drought Response Actions

Pima County continues to adhere to its policy framework on water resources and drought management. The framework includes goals and recommendations from several planning documents that are available on Pima County's Drought Management webpage; among these are:

- Drought Response Plan and Water Wasting Ordinance
- Sustainable Action Plan for County Operations
- Water & Wastewater Infrastructure, Supply and Planning Study, Action Plan and Post Action Plan Annual Report

As of now, the region's water providers and other entities with established drought plans are at Drought Stage One or its equivalent and are implementing voluntary reductions and engaging in water conservation education.

Ongoing regional collaboration to improve drought resiliency includes:

- The Lower Santa Cruz River Management Plan (LSCRMP) will develop a management strategy to balance flood risk management, drainage infrastructure protection, water recharge, recreation opportunities and riparian habitat preservation for the Santa Cruz River from Grant Road to Trico Road. This multi-benefit project will maximize recharge of effluent within the channel. Stakeholder comments have been received and responsible parties are collaborating on a task list.
- Lower Santa Cruz River Basin (LSCRB), a 50/50 local share in-kind study with the Bureau of Reclamation that applies climate change models to water supply and demand scenarios, charting the potential range of water imbalance in the region and developing adaptive management strategies to address water supply and demand imbalances in the Tucson Active Management Area.
- City of Tucson Climate Emergency Declaration calling for acceleration of adaptation and resilience strategies, development of a climate action and adaptation plan, update of the city's greenhouse gas inventory and pursuit of strategies and actions to transition out of fossil fuel production, power generation and use within City operations.

Summary

Pima County's above normal temperatures and below normal monsoon activity are in contrast to last year's conditions. Dry conditions and lightning resulted in five wildfires in the region during the summer months. Drought continues to persist in Pima County.

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