

Riparian Health Assessment Summary

Monitoring Year 2023-24: Surface Flows Persist Amidst Long-Term Drought and Local Weather Extremes

Cienega Creek is one of the few remaining perennial lowland streams in the region. Cienega Creek and Davidson Canyon are stunning examples of what many desert streambeds could look like if similar preservation efforts were employed. These shallow groundwater-dependent systems and Outstanding Arizona Waters (OAW) support wildlife habitats and human activity alike. Cienega Creek and Davidson Canyon are among the priority waterbodies identified in Pima Association of Governments' Areawide Water Quality Management (208) Plan for monitoring and protection.

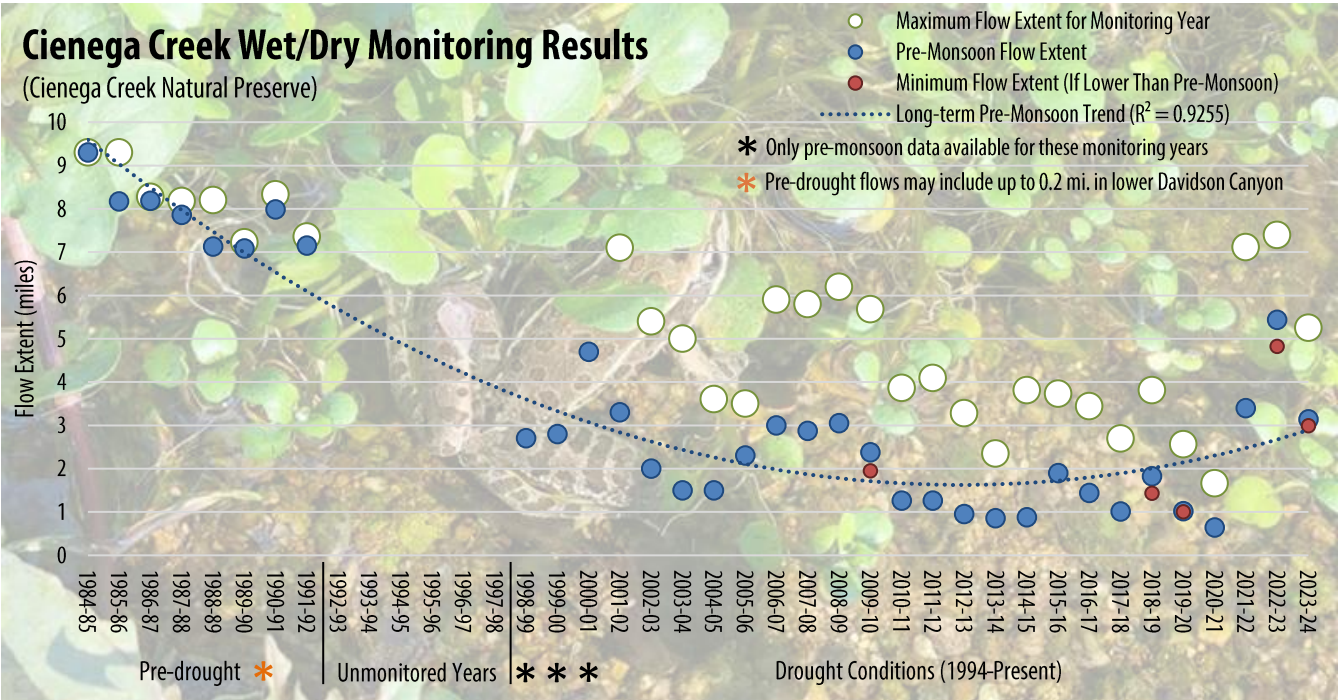
PAG has monitored hydrologic conditions in Pima County's Cienega Creek Natural Preserve (CCNP) since 1989. The CCNP is in the lower part of the Cienega Creek Watershed. Every quarter, PAG maps baseflow in the reaches of Cienega Creek and Davidson Canyon within the CCNP and Pima County's Bar V Ranch. Baseflows are groundwater-based surface flows without the influence of stormwater runoff. The graphs display the time of year that is usually driest (May/June, pre-monsoon) to reflect the minimal perennial (year-round) extent of surface water. The annual maximum baseflow extents reflect the greater aquatic habitat present in wetter seasons.

Pre-Monsoon Flows

In monitoring year (MY) 2023-24 (July 2023 through June 2024), flows were lower than in the past two monitoring years within the CCNP. However, PAG continued to observe higher baseflows in both Cienega Creek and Davidson Canyon than had been observed between approximately 2010 and June 2021. The June 2024 flow extent was 3.13 miles, or 34% of the Cienega Creek monitoring area. In June 2024, no baseflow was observed in Davidson Canyon, marking the first quarter that Davidson Canyon was observed to be dry since year-round flows returned in MY 2021-22.

Impacts of Drought and Weather Variation

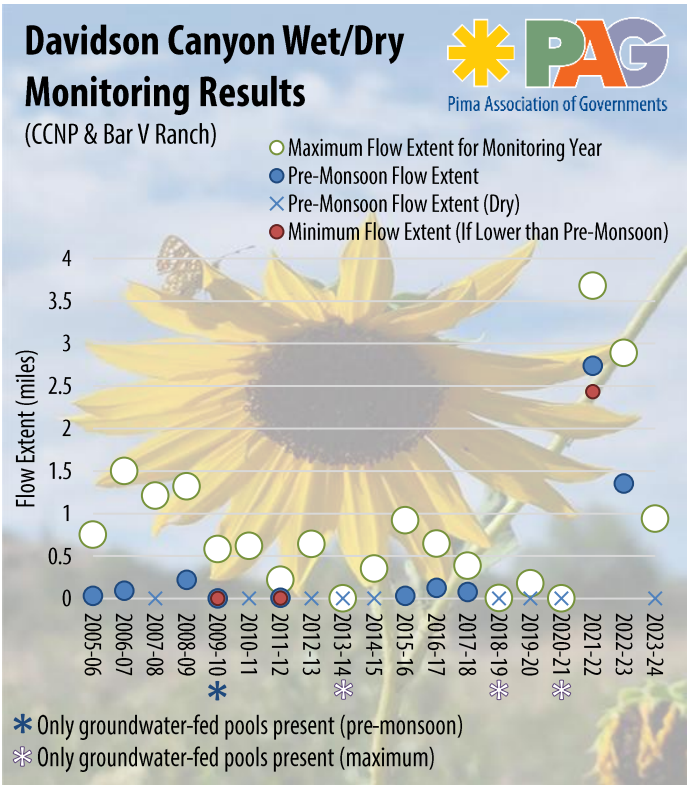
Since the mid-1990s, the Tucson region has experienced sustained, long-term drought. In many local waterways, including portions of the CCNP, this has resulted in the loss of mesquite bosques and cottonwood stands, along with increased erosion and sediment movement.



During this time, the impacts of weather variability have also been apparent, leading to shifts in seasonal patterns of flow in both Cienega Creek and Davidson Canyon. As shown in the graph above, in the past six MYs there have been four times when the minimum flow extent was lower than the pre-monsoon (June) flow extent. This was previously a rare occurrence. In all four instances, the minimum flows were observed in September.

Recent years have also seen a swing from the lowest baseflows on record in MY 2020-21 up to the highest baseflows observed in two decades in MY 2021-22 and MY 2022-23. While baseflows were lower this MY, the increased moisture and aquifer recharge in the previous two years continues to support improvements to critical habitat within the CCNP. Native fish, frog, and turtle populations persist, and new cottonwood trees are sprouting in stretches of Cienega Creek.

This continues to show that shallow groundwater areas have dynamic flow regimes. The speed with which flow extents and habitat conditions rebounded in Cienega Creek in recent wet years also demonstrates that with protections and increased in-stream and mountain front recharge, our waterways can be restored and sustained despite increased heat and changes in rainfall patterns.



Cienega Creek

Pre-Monsoon Flow Extent Figure 1999 to 2024



Legend

- Pool locations (2024)
- Flowing segment
 - 2024
 - odd year
 - even year
- Dry segment
 - 2024
 - past years
- Cienega Creek Natural Preserve

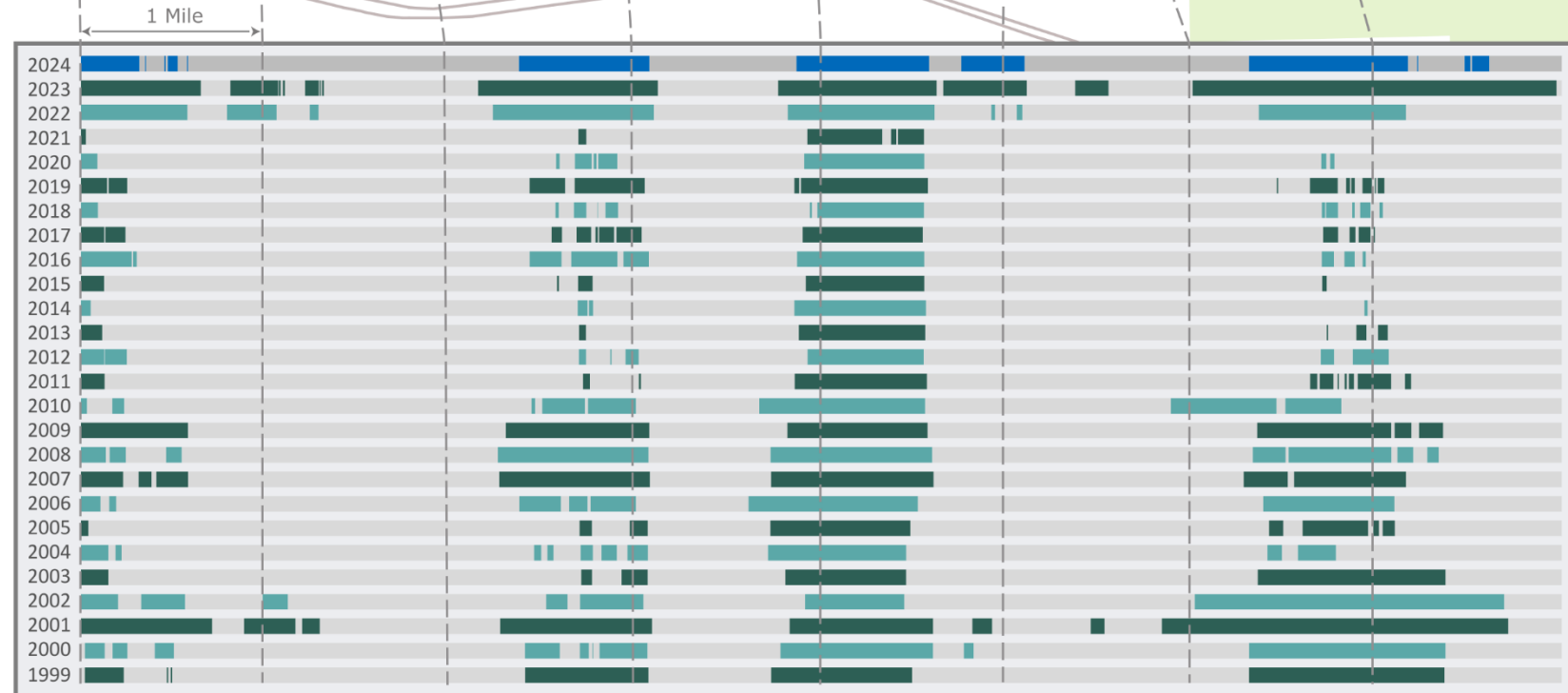


The chart below displays changes in June pre-monsoon baseflows for Cienega Creek within the CCNP since 1999. As the creek's flow extent decreases due to sedimentation, drought and/or groundwater pumping, the increasingly segmented flows are limited to reaches where shallow confining geologic layers keep the water table close to the surface. Wetter years elevate the water table, allowing segments to connect and flow to a greater extent.

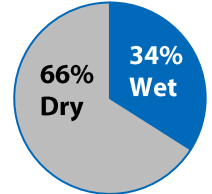
Results from 2024 are shown on the map. The map displays eight of the 9.3 miles of Cienega Creek that are monitored quarterly. PAG does not monitor the upper 1.3 miles of Cienega Creek, as this area has been presumed dry since PAG resumed monitoring in 1999. The bar chart shows conditions from previous years, translated to-scale into linear bars, allowing easy comparison of flow length and location from year to year. Colors alternate for visual aid. The pie charts were generated based on pre-monsoon flow extents within the full 9.3-mile monitoring area. See page 3 for Davidson Canyon results.

PAG's consistent and long-term monitoring is necessary to provide reliable trend analysis. Results are reported to the Arizona Department of Water Resources, where they are compiled into state drought records for natural areas, and to the Arizona Department of Environmental Quality to support flow regime data. Pima County also uses these data to inform land management decisions and water planning. Groundwater data are also available.

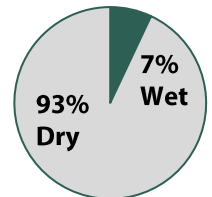
PAG's reports and resources are available here:
<https://maps.PAGregion.com/PAGLibrary/>



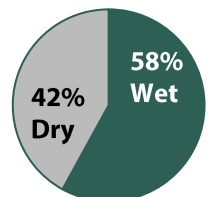
This Year (2024)

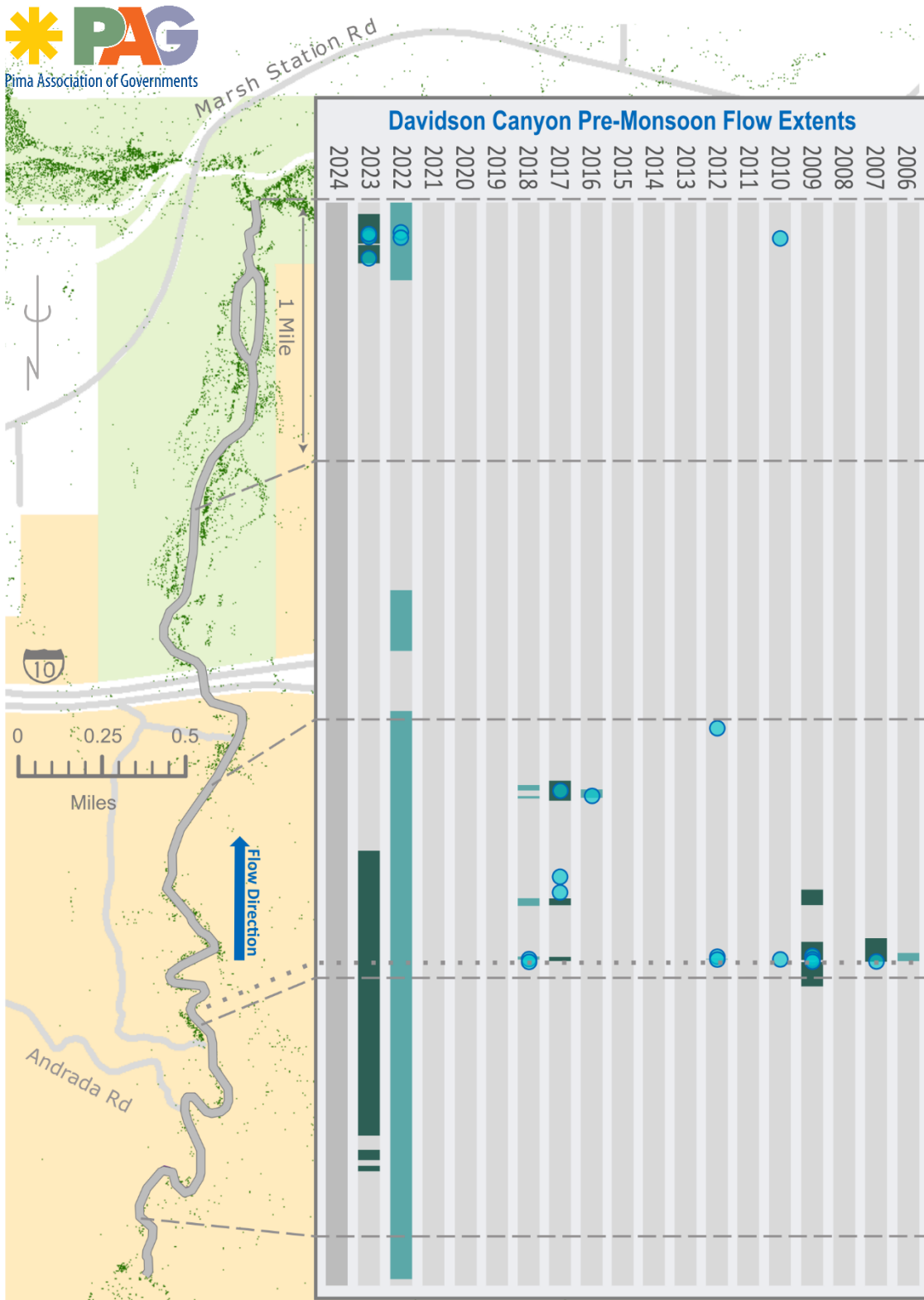


Least Flow (2021)



Most Flow (2023)





Davidson Canyon

Flow Extent Figures, 2005 to 2024

The chart at left displays changes in June pre-monsoon baseflows for Davidson Canyon within the CCNP since 2006. Results from 2024 are shown on the map. The map displays over four miles of Davidson Canyon, which PAG has monitored quarterly since 2006 and includes the OAW reaches. Cienega Creek flow data is not pictured on this map. Tree canopy data and riparian health assessment data show that riparian vegetation in the canyon has persisted over time, supported by shallow groundwater.

The graph below shows quarterly flow observations. Within this stretch of Davidson Canyon, the total length of flow includes isolated pools that are not adjacent to flow.

Davidson Canyon Quarterly Flow Extents

(CCNP & Bar V Ranch)

