

Riparian Health Assessment Summary

Monitoring Year 2022-23: Natural groundwater recharge continues to sustain strong flows in Cienega Creek

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.

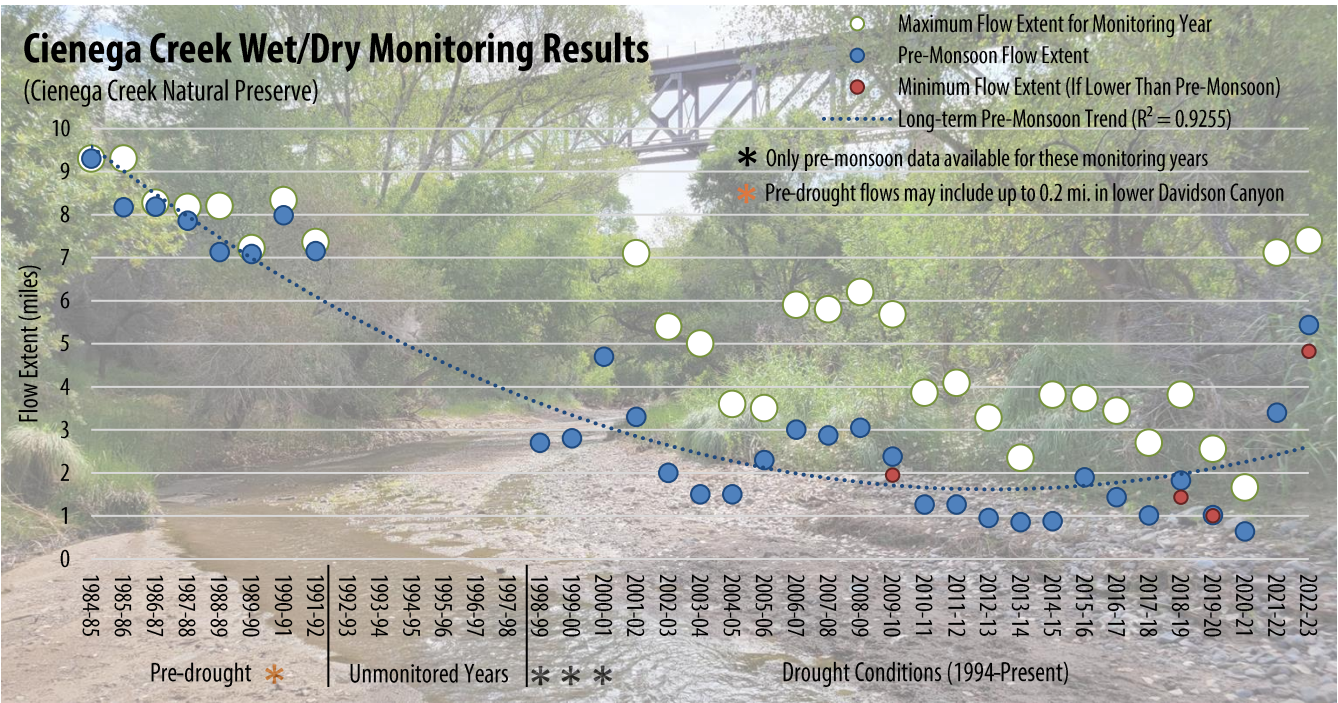
PAG has monitored hydrologic conditions in Pima County's Cienega Creek Natural Preserve (CCNP) since 1989. The CCNP is in the lower part of the Cienega Creek Watershed. Every quarter, PAG maps baseflow in the reaches of Cienega Creek and Davidson Canyon within the CCNP and Pima County's Bar V Ranch. 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) 2022-23 (July 2022 through June 2023), increased groundwater recharge resulting from back-to-back years with wet monsoons contributed to strong flows within the CCNP. PAG continued to observe higher baseflows in both Cienega Creek and Davidson Canyon than had been observed in recent years. With a June 2023 flow extent of 5.44 miles, or 58% of the Cienega Creek monitoring area, PAG observed the highest June baseflow since PAG reinitiated monitoring in 1999. In June 2023, PAG observed 1.35 miles of baseflow in Davidson Canyon, the second highest pre-monsoon flows recorded by PAG in this stream reach.

Native Fish Return to Davidson Canyon

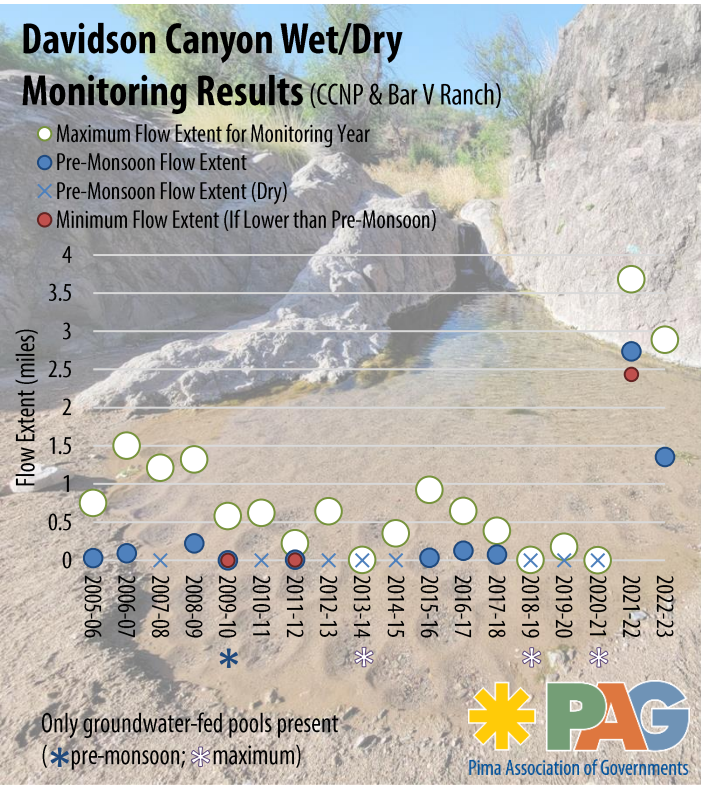
In Dec. 2021, PAG staff observed longfin dace in Davidson Canyon, just upstream of its confluence with Cienega Creek. The return of this native fish was made possible by a direct connection between surface flows in

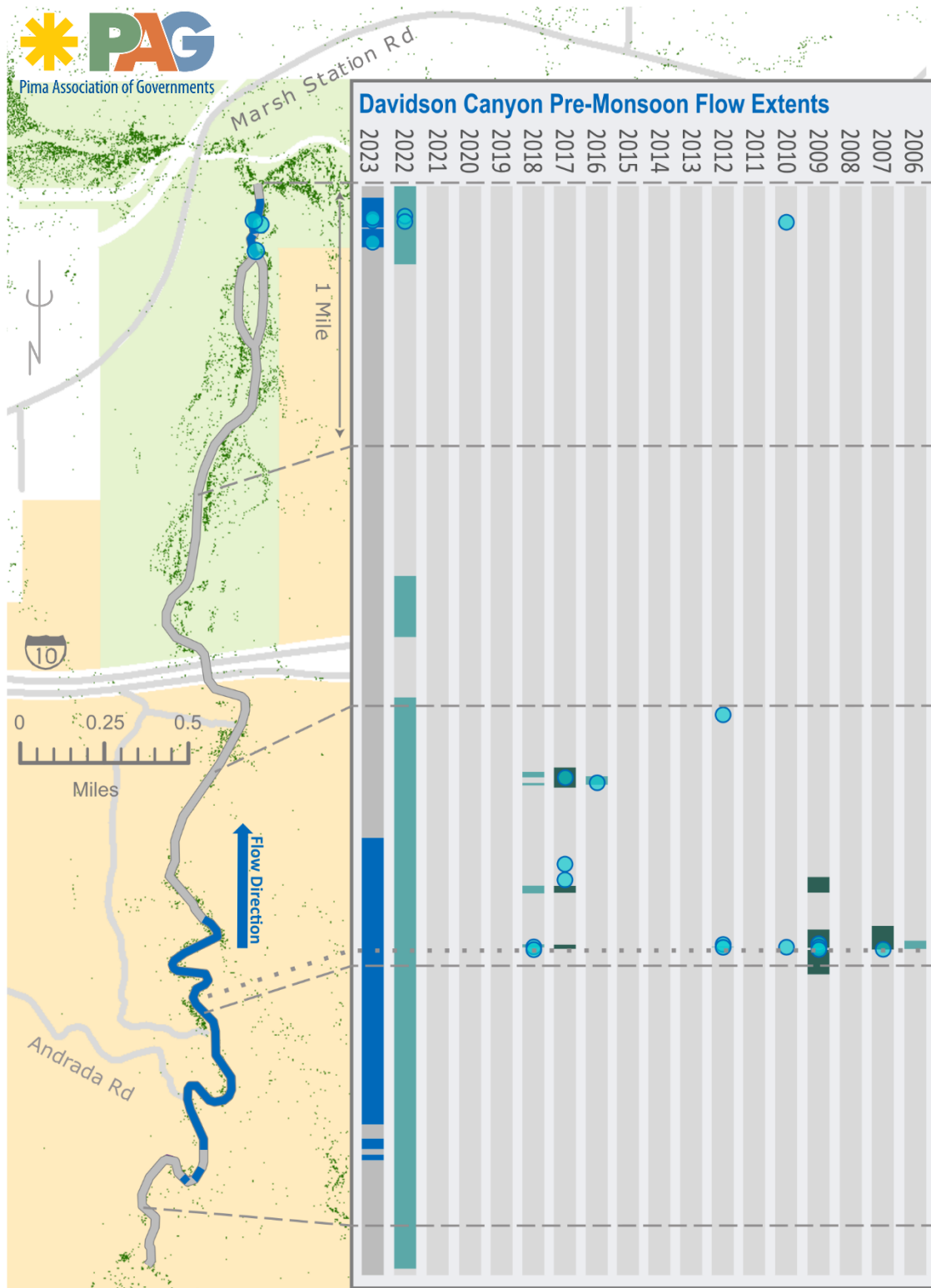


Davidson Canyon and Cienega Creek that PAG observed each quarter from Sept. 2021 through March 2023. PAG had not observed fish in Davidson Canyon since Sept. 2011. In Sept. 2022, PAG staff were excited to observe the endangered Gila topminnow, another native species of fish, for the first time in Davidson Canyon. It is presumed that the fish species was present in the canyon prior to the drought, when Davidson Canyon's baseflows more regularly connected to Cienega Creek at the surface. Male topminnow in breeding colors and adult females were observed, along with fry. Longfin dace were also observed to be breeding in the canyon. PAG staff continued to observe Gila topminnow in Davidson Canyon through March 2023 and longfin dace through June 2023, when a reach of the canyon at the confluence with Cienega Creek became dry.

Conclusions

In recent years, the maximum baseflow extent in Cienega Creek nearly reached pre-drought levels, while the minimum extent recovered to a lesser degree. This demonstrates how shallow groundwater areas have dynamic flow regimes. While some native aquatic species returned to the creek and canyon, the long-lived surface vegetation may take longer to recover.





Pre-Monsoon Flow Legend

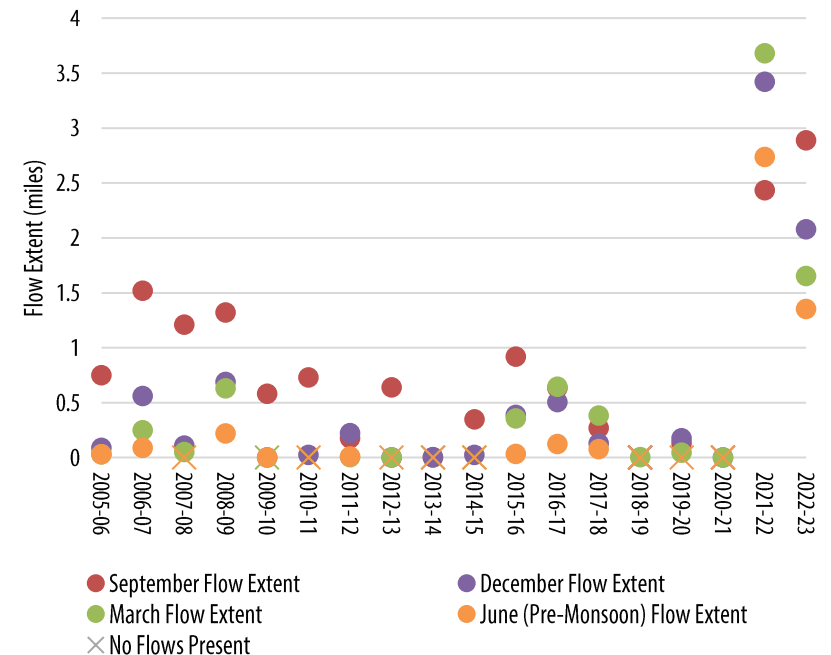
- Pool locations
- Flowing segment (2023)
- Flowing segment (even year)
- Flowing segment (odd year)
- Dry stretch (2023)
- Dry stretch (past years)
- 6+ Foot Tree Canopy (2015)
- Mile Indicator
- - - Davidson OAW Upstream Limit
- Cienega Creek Natural Preserve
- Pima County's Bar V Ranch

The chart at left displays changes in June pre-monsoon baseflows for Davidson Canyon within the CCNP since 2006. Results from 2023 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)

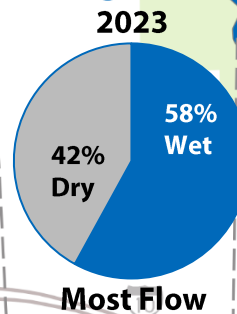
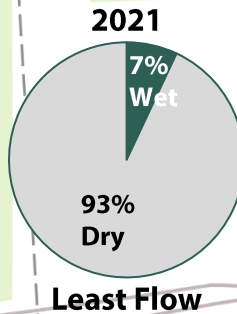
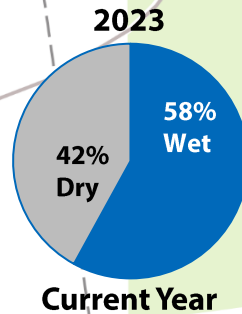
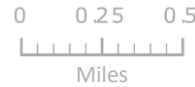


Cienega Creek

Pre-Monsoon Flow Extent Figure 2004 to 2023

Legend

- Pool locations (2023)
- Flowing segment (2023)
- Flowing segment (even year)
- Flowing segment (odd year)
- Dry stretch (2023)
- Dry stretch (past years)
- Cienega Creek Natural Preserve



The chart below displays changes in June pre-monsoon baseflows for Cienega Creek within the CCNP since 2004. 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 2023 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/>

