

Flow365 Annual Report

2024 Water Year



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What is a Water Year?

We're pleased to publicly share highlights from the data our Flow365 monitors have collected for the 2024 water year, which starts October 1st, 2023 and ends September 30th, 2024. Looking at the water year is a better way to analyze river flow than the calendar year, because it takes into account how the seasonal fluctuations of our winter precipitation and summer monsoons impact flow.



Less flow days overall compared to 2023, most of the rain in the first 6 months of the calendar year

This year's flow data shows fewer total flow days compared to the 2023 water year. However, with much of the rain falling in the first half of the 2024 calendar year, many of our rivers still experienced some level of flow. Several sites in this report showed decreased flow during the monsoon season, despite average monsoon rainfall. Notably, some intermittent sites—like the Wentworth Bosque along Tanque Verde Creek—began flowing with winter rains in early February 2024 and continued through the rest of the water year, a rare occurrence linked to deeper groundwater connections.

In 2024, the Tucson metro area received 11.52" of rain (NOAA), slightly above the 10.61" annual average. Of this, 9.77" fell between January 1 and July 31, while only 1.75" fell in the second half of the year. The

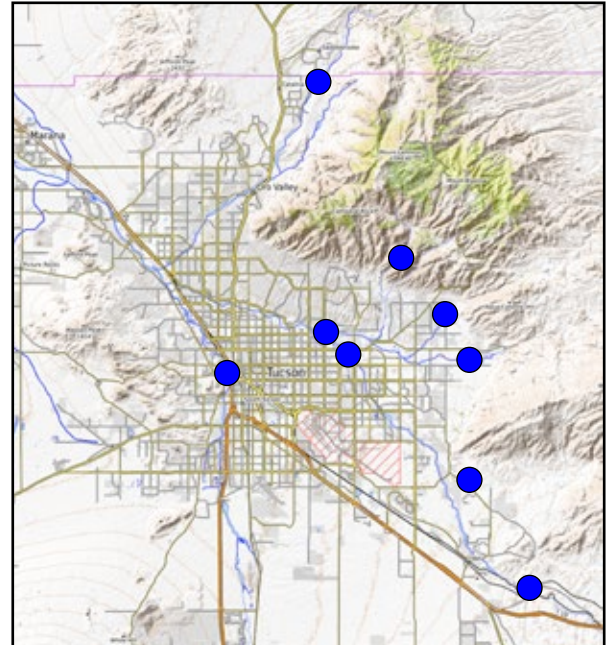
monsoon season, though the third hottest on record, brought 5.80" of rain—above average. Interestingly, Mount Lemmon received below-average rainfall, which likely contributed to reduced summer streamflow in creeks and rivers that rely on mountain runoff.

Throughout the year, 92 trained community scientists with our Flow365 Monitoring Program collected data at 46 sites across the Tucson basin. These volunteers, part of our River Run Network, play a vital role in restoring Tucson's heritage of flowing creeks and rivers.

While agencies like Pima County Flood Control and the U.S. Geological Survey track high-flow events with gauges, our monitors capture low-flow and intermittent flow data that fills important gaps. This monitoring reveals when and where flow starts and stops, offering a clearer picture of how desert rivers respond to rain, snow, and groundwater fluctuations.

Flow365 Monitors visit sites at least monthly—often weekly or daily during changing conditions. Thanks to this consistent data collection, we can correlate creek and river flow patterns with local precipitation and snowfall, helping us better understand our watershed's health.

Over time, this data informs drought triggers, climate resilience strategies, and tracks the impact of collective conservation actions. It also contributes to major regional efforts like the Santa Cruz Watershed Collaborative's Restoration Plan, the 2100 One Water Plan, and Tucson's Climate Resilience Plan.



This map highlights the Flow365 site locations featured in this 2024 Water Year Report, showcasing key areas where community scientists documented streamflow across the Tucson basin.



Sabino Creek

Our Monitors observe several sites at the base of the Catalina Mountains. On the east side of Tucson, they capture data from Bear Creek and Lower Sabino Creek. These creeks start in the mountains, with rain and snowmelt feeding surface flows. When the creeks move into the valley, there are some places where shallow groundwater aquifers also support surface flow in addition to rain and snowmelt, however, we are concerned about reduction in flow at the particular site mentioned in this report.

Wes Miller Park

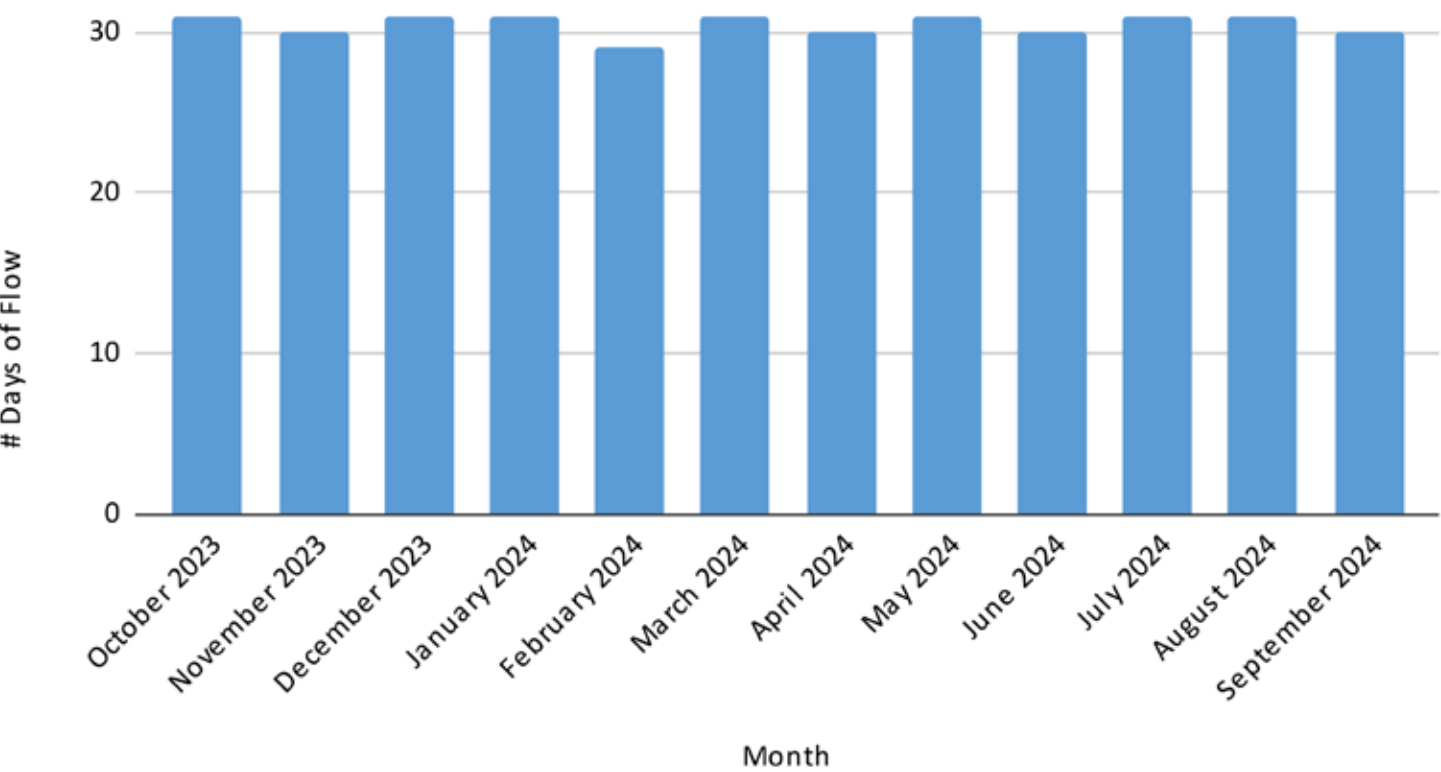
Most of Lower Sabino Creek is privately owned by residential landowners. We have captured data since the start of our program with permission from the surrounding private landowners and the homeowners associations who use and preserve this area. The restored perennial flow that we observed from 2016 to 2022 is likely the result of a reduction in groundwater pumping at several nearby groundwater wells.

However, Wendy Beall, the Flow365 Monitor in the area, started to observe lower level flows (mostly ponding) in mid-August 2023 (last Water Year). This is highly unusual for this site as we have not seen this since the Flow365 Monitoring Program began in 2016. These lower levels continued until our winter rains picked back up in December 2023 (this Water Year), and we have continued to see consistent water movement at low flow (level 3) since then.

Water Year Flow Days

Sabino Creek at Wes Miller Park 2024

Monitor:
Wendy Beall



2024 Water Year Flow:	365 Days
2023 Water Year Flow:	365 Days
2016 - 2022 Water Years Flow:	365 Days

Monthly Photos

Sabino Creek at Wes Miller Park

Our monitors collect data weekly, sometimes even daily, along our creeks and rivers. The photos below are monthly snapshots of what this site looked like throughout the 2024 Water Year.

October 2023



November 2023



December 2023



January 2024



February 2024



March 2024



April 2024



May 2024



June 2024



July 2024



August 2024



September 2024





Agua Caliente Creek

North of Tanque Verde Creek, at the foot of the Catalina Mountains, Agua Caliente Creek runs just west of Agua Caliente Park and eventually meets up with Tanque Verde Creek. Our Flow Monitors have revealed that flow in this area is dependent on rain and snowmelt. Though it does not flow year round, data shows short intermittent flows throughout our winter season are sustained by mountain snowmelt runoff. The creek is able to meander freely in much of its floodplain and has more natural flow, unlike some of the channelized rivers in the metro area.

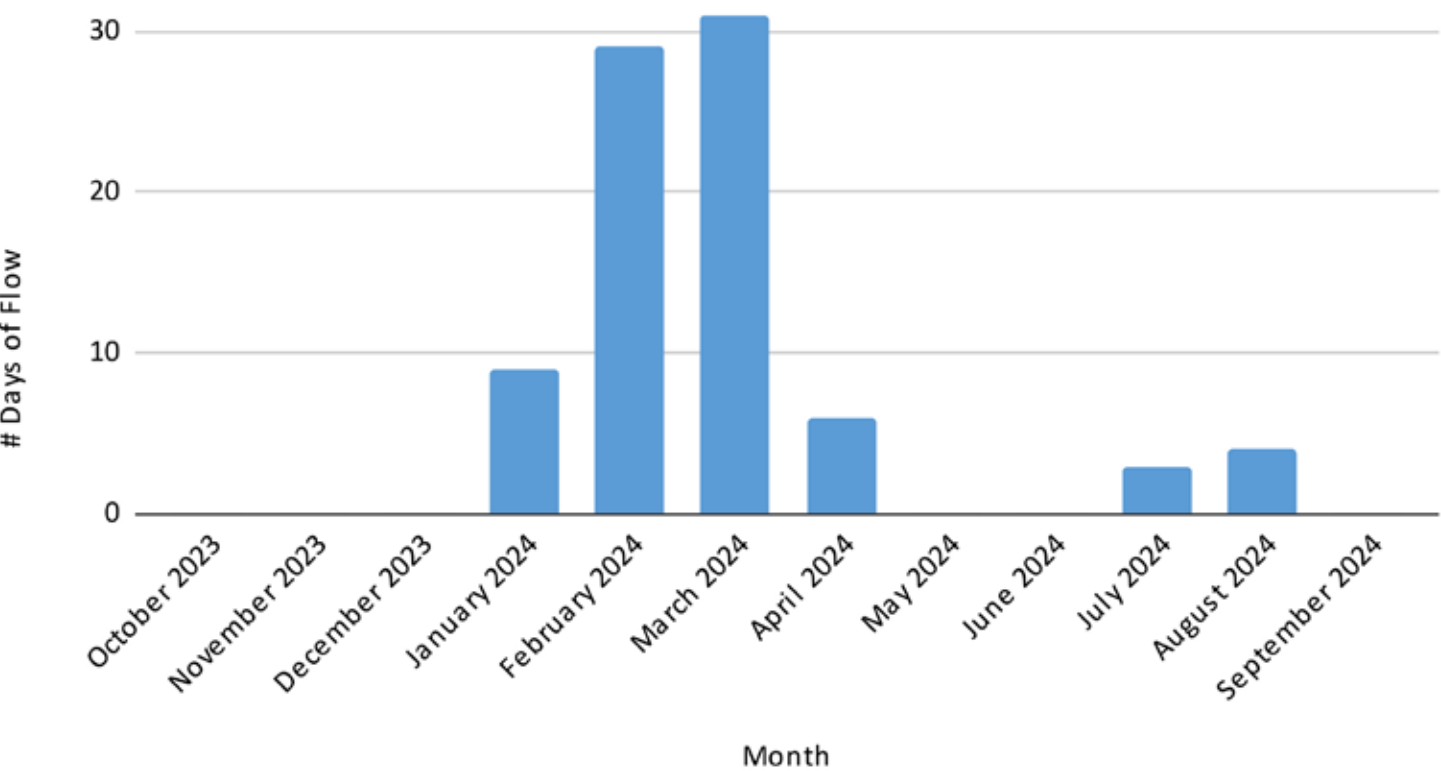
Milagrosa Lane

We continue to see this area flourish, experiencing extensive flow during the winter rain season of the 2024 Water Year, a total of 82 days with 75 of them being consecutive, flowing from January 23rd, 2024 to April 6th, 2024. Last year, all of the flow that was observed was due to winter rains, with no flow observed during our monsoon season, due to a decrease in rainfall in that season. This year, however, Flow Monitors recorded 7 days of flow during this monsoon season, even though we only experienced 1.75" in the last half of the year. So, even though we recorded less flow days overall, we recorded flow over a longer span of time in this area, which may mean more groundwater recharge overall.

Water Year Flow Days

Agua Caliente Creek at Milagrosa Lane

Monitors:
Bethany DeRango, Andrea Martin



2024 Water Year Flow	82 Days
Consecutive Days of Flow	75 Days
2023 Water Year Flow	100 Days
Consecutive Days of Flow	100 Days
2022 Water Years Flow	82 Days
Consecutive Days of Flow	46 Days

Monthly Photos

Agua Caliente Creek at Milagrosa Lane

Our monitors collect data weekly, sometimes even daily, along our creeks and rivers. The photos below are monthly snapshots of what this site looked like throughout the 2024 Water Year.

October 2023



November 2023



December 2023



January 2024



February 2024



March 2024



April 2024



May 2024



June 2024



July 2024



August 2024



September 2024





Tanque Verde Creek

Historically, stretches of the Tanque Verde Creek were often flowing, either seasonally or year-round with marshy cienegas sustained by beaver. But since the mid-1900s, this creek has been drying up with the loss of seasonal and year-round flows due to depleted groundwater levels from over pumping groundwater. This area has one of the few remaining riparian forests with floodplain connection in the Tucson basin, including Fremont cottonwood, Goodding's willow, Mexican elderberry, and velvet mesquite, as well as many other riparian plants native to the Sonoran Desert. Unfortunately, it has more recently become home to an invasive species called *Arundo donax*, a giant cane reed. This highly flammable reed crowds out native plants, and uses up to 3-4 times the amount of water as native plants, diminishing flow. Through the River Run Network, we are working to remove this species along the Tanque Verde Creek. To date, we have removed invasive *Arundo* from over 60 acres of the creek. Learn more about our *Arundo* removal efforts and how to get involved here. watershedmg.org/river-run-network/arundo-restoration-project

Wentworth Bosque

WMG has observed seasonal flows in this area since 2019. Between the 2021 and 2022 Water Years, our Flow Monitors recorded 288

days of consecutive flow (July 23, 2021 - May 6th 2022), a record number that still has not been beaten. The area started flowing on February 3rd, 2024 lasting through the end of the 2024 Water Year (September 30, 2024).

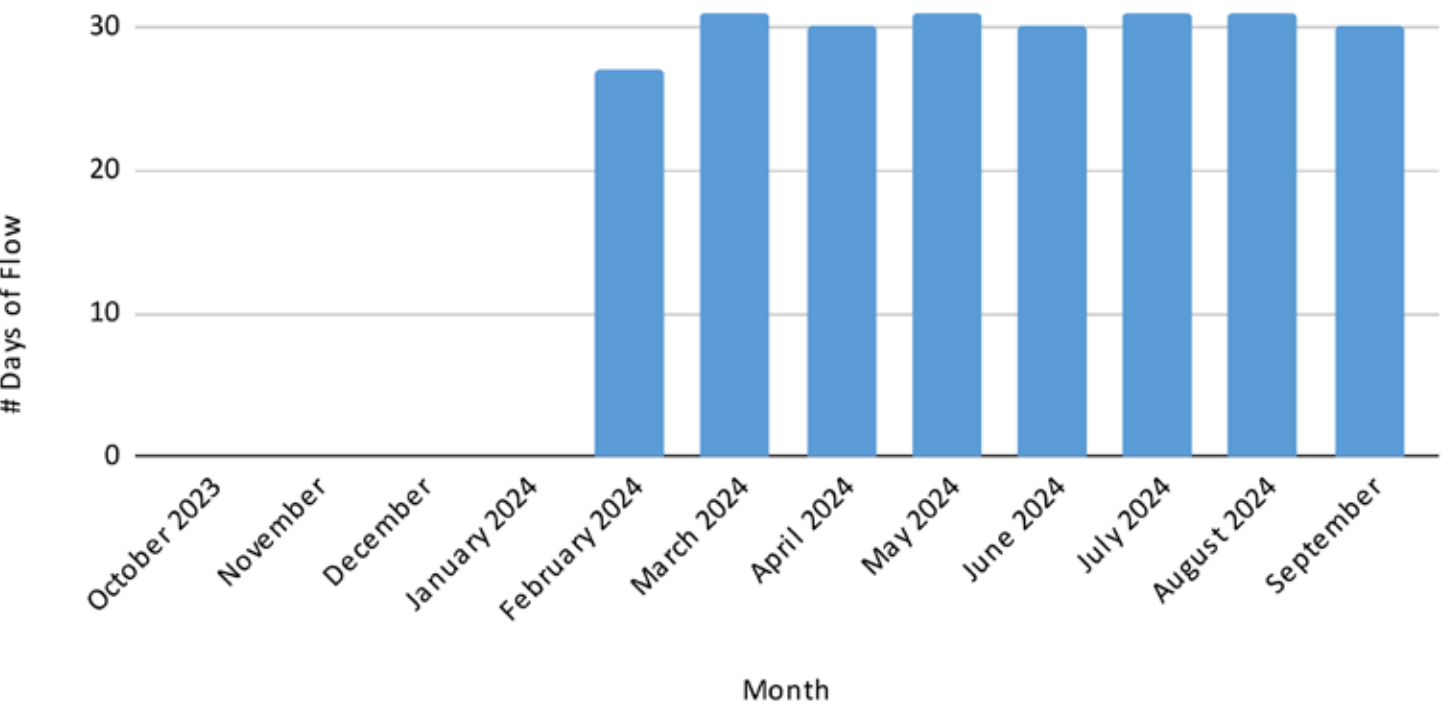
Even with much less rainfall, this area experienced more flow days than in the last Water Year. This tells us that the area has substantial opportunity to continue to see flow days and flow amounts increase over time, even with potentially drier years and less mountain snowmelt runoff due to climate change. More local groundwater recharge efforts, reduced groundwater pumping, and the removal of *Arundo donax* can continue to enhance flow in this area, as observed by the change in flow between this year and last.

This middle stretch of the Tanque Verde Creek tells an amazing story of resilience and the potential for humans' impact on restoring flow and shallow groundwater areas. The nearby golf course that was pumping groundwater switched to reclaimed water in 2005, and since then the aquifer and riparian forest has been steadily recovering with seasonal flows emerging. This groundwater recovery has occurred during a time of multi-decadal drought, with many years of less than average rainfall.

Water Year Flow Days

Tanque Verde Creek at Wentworth Bosque

Monitors:
Richard Pello, Lee Pello, Heidi Shewel, Jim Washburne, Mary Caldwell



2024 Water Year Flow	241 Days
2023 Water Year Flow	139 Days
2022 Water Years Flow	276 Days
Most Consecutive Days of Flow	288 Days
2021 Water Years Flow	70 Days

Monthly Photos

Tanque Verde Creek at Wentworth Bosque

Our monitors collect data weekly, sometimes even daily, along our creeks and rivers. The photos below are monthly snapshots of what this site looked like throughout the 2024 Water Year.

October 2023



November 2023



December 2023



January 2024



February 2024



March 2024



April 2024



May 2024



June 2024



July 2024



August 2024



September 2024





Rillito River

Because of The Loop path and many parks along its banks, the Rillito River is popular with the Tucson community as a corridor to walk, run, bike, and picnic. The Rillito River is fed by the Tanque Verde and Pantano Creeks, flowing from east to west, eventually connecting with the Santa Cruz River. The Rillito River is also known for a large bat population, the Mexican free-tailed bats, which live in large colonies under several bridges that cross the river.

Craycroft Road

The flow monitors in this area observed a decrease in flow in the 2024 water year, going from 113 days to 76 days and only 25 days of consecutive flow in the early part of the water year. This is most likely due to the lack of rain in the last half of the 2024 calendar year.

This site is the confluence of the Tanque Verde Creek and Pantano Creek and is considered a shallow groundwater area, with water within 50 feet of the surface. The shallow groundwater still supports some cottonwood trees from a historically much larger cottonwood forest, as well as a Mexican elderberry grove upstream of the confluence. Historically, this area had year-round flow through a large

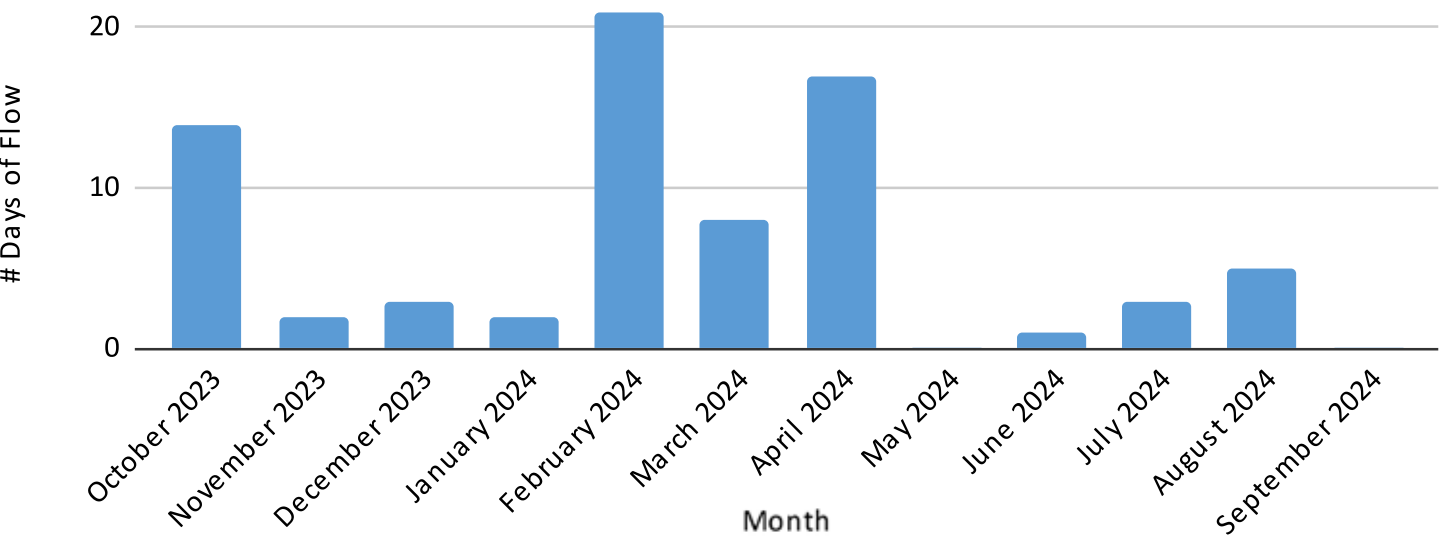
ciénega (marsh) with a large mesquite bosque (forest) that supported Indigenous communities.

The presence of cottonwood trees, which need water within 30 feet of the surface to survive, indicates perched aquifers and/or the presence of springs. A rheocrene spring has been documented just upstream of the confluence in the Tanque Verde Creek. These features and suspected groundwater levels continued to be sustained throughout the 2024 Water Year even with a decrease in flow days and rainfall.

Water Year Flow Days

Rillito River at Craycroft Rd

Monitors:
Catlow Shipek, Kerry Murphy, Susan Swartz, Oliver Wilson, Ken Lubinski, Katie Belk-Arenas, Paul Hammond, Heather McClaren



2024 Water Year Flow	76 Days
Consecutive Days of Flow	25 Days
2023 Water Year Flow	113 Days
Consecutive Days of Flow	107 Days
2022 Water Years Flow	62 Days
Consecutive Days of Flow	27 Days
2021 Water Years Flow	85 Days
Consecutive Days of Flow	56 Days

Monthly Photos

Rillito River at Craycroft Rd

Our monitors collect data weekly, sometimes even daily, along our creeks and rivers. The photos below are monthly snapshots of what this site looked like throughout the 2024 Water Year.

October 2023



November 2023



December 2023



January 2024



February 2024



March 2024



April 2024



May 2024



June 2024



July 2024



August 2024



September 2024





Cañada del Oro River

The Cañada del Oro River originates in a remote portion of the Catalina Mountains north of Tucson. Fed by rainfall and melted snow, it flows north toward the town of Oracle and then turns south toward Oro Valley where it is usually seen as a dry riverbed. The Cañada del Oro ultimately feeds into the Santa Cruz River just northwest of the city.

Historically, the Cañada del Oro River was largely intermittent and ephemeral, this means that even without groundwater pumping and floodplain channelization, it only had above ground flow during rainy seasons. However, there are reports that some areas were plentiful with water close to the surface, like at the Steam Pump Ranch in Oro Valley. This means that even though there was no surface flow, much of the Cañada del Oro River could have been considered a shallow groundwater area.

Edwin Road

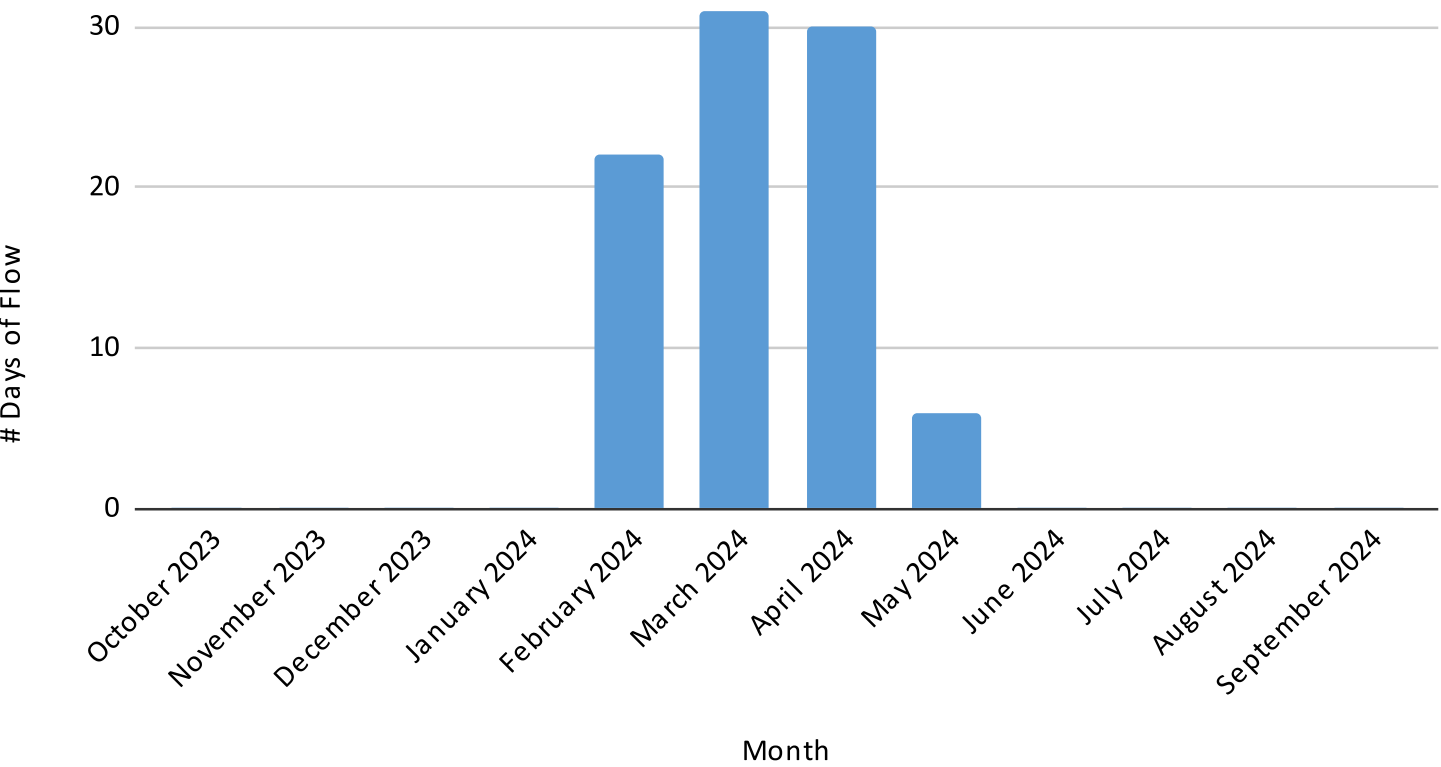
This is the most upstream site we have along the Cañada del Oro River, it is located just miles from the base of the Catalina Mountains in an open range area where we have occasionally seen cattle, deer, and other wildlife roaming and making use of the flow when it is present.

Surrounded by private property and dirt roads, this area is also home to a beautiful mesquite bosque on either side of the creek and close to the Charloux Gap Trail in Catalina, AZ. One monitor has been collecting data on this site for the past two years and has seen the area go from a dusty and dry sandy bed to flowing bank to bank for weeks, supporting this bosque and the wildlife mentioned above.

Water Year Flow Days

Cañada Del Oro at Edwin Rd

Monitor:
Kathleen Bober



2024 Water Year Flow	89 Days
2023 Water Year Flow	100 Days

Monthly Photos

Cañada Del Oro: Edwin Rd

Our monitors collect data weekly, sometimes even daily, along our creeks and rivers. The photos below are monthly snapshots of what this site looked like throughout the 2024 Water Year.

October 2023



November 2023



December 2023



January 2024



February 2024



March 2024



April 2024



May 2024



June 2024



July 2024



August 2024



September 2024





Pantano Creek

Pantano Creek originates at the confluence of Ciénega Creek and Agua Verde Creek, southeast of Tucson near Vail. Flow is primarily contributed from Ciénega Creek and secondarily through Rincon Creek, which originates east of Tucson near Rincon Peak. Pantano Creek flows north to join with Tanque Verde Creek at Craycroft Rd, becoming the Rillito River. Although it is fed from two creeks with seasonal and perennial flow stretches, this creek rarely flows as the water quickly sinks into the deeper aquifer. Though there is not much flow observed from this creek and it is largely disconnected from its historic floodplain due to concrete bank stabilization, the creek has a beautiful meandering pattern when it does flow, emulating the natural course a desert river takes.

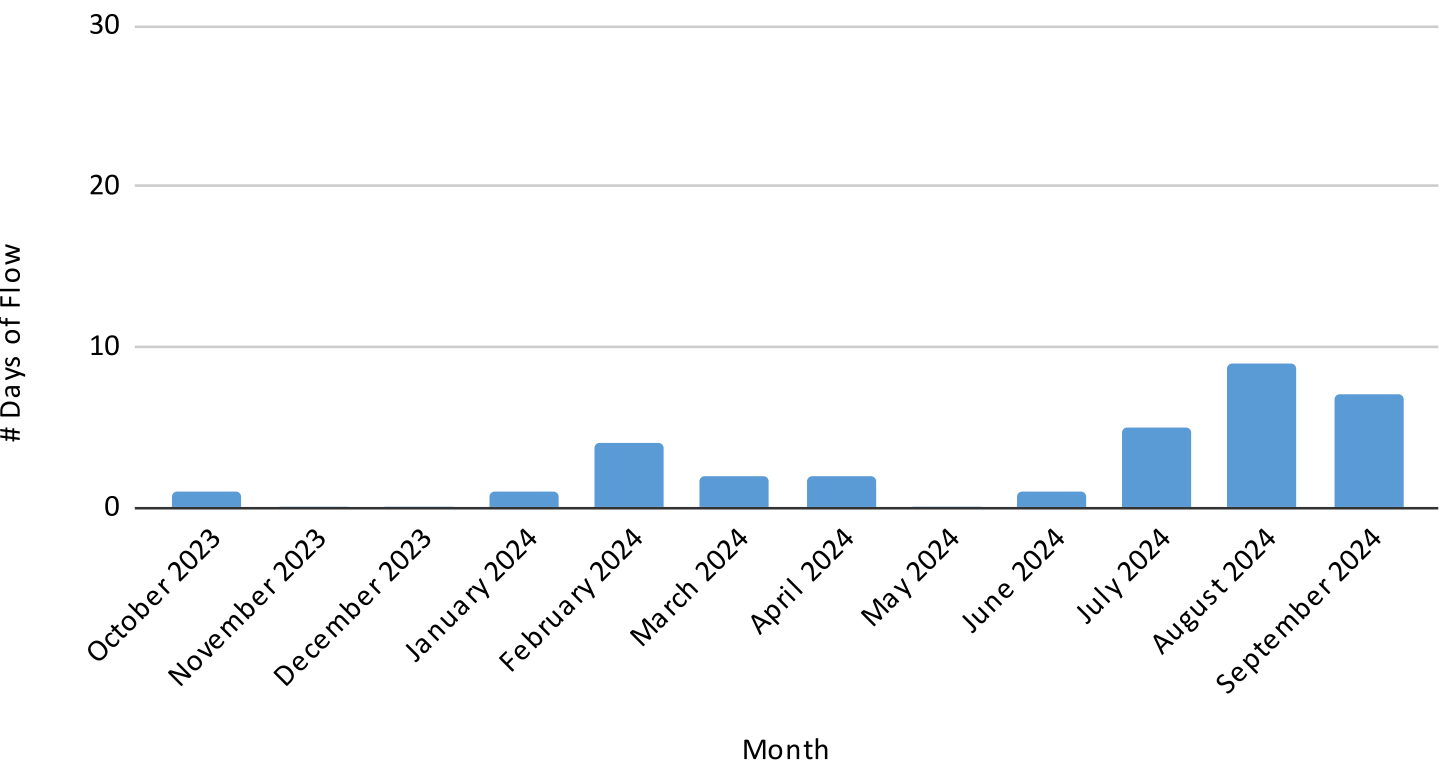
Tanque Verde Road

This site is the farthest downstream area we are collecting data along the Pantano Creek, which means it is closest to where the Pantano Creek merges with the Tanque Verde Creek to form the Rillito. Historically, this creek was a marshy wetland area supported by shallow groundwater. Currently, this site sees flow ephemerally and the water table is over 200 feet deep, meaning it flows only in response to precipitation, and rarely even then. This urban site contains a grade control structure similar to the one along the Santa Cruz River and St. Mary's Rd. This structure also typically creates a long-lasting pond at the base of the structure after a flow event, and is where much of our data on the presence of water comes from for this area.

Water Year Flow Days

Pantano Creek at Tanque Verde Rd

Monitors:
Carol Bauer, Susan Syracuse, Greg Mishaga



2024 Water Year Flow	32 Days
Consecutive Days of Flow	16 Days
2023 Water Year Flow	35 Days
Consecutive Days of Flow	13 Days

Monthly Photos

Pantano Creek at Tanque Verde Rd

Our monitors collect data weekly, sometimes even daily, along our creeks and rivers. The photos below are monthly snapshots of what this site looked like throughout the 2024 Water Year.

October 2023



November 2023



December 2023



January 2024



February 2024



March 2024



April 2024



May 2024



June 2024



July 2024



August 2024



September 2024





Ciénega Creek

This creek is perennial in many stretches, and reaches from the base of Mount Wrightson to eventually connect to Pantano Creek. The River Run Network spends quite a bit of time in Ciénega Creek. From restoration workshops in Empire Ranch where we are planting native plants and moving rocks to slow spread and sink flow into the ground, to fence line surveys in the National Conservation Area in the upper reaches to support the reintroduction of beavers, we are always in awe of Ciénega Creek.

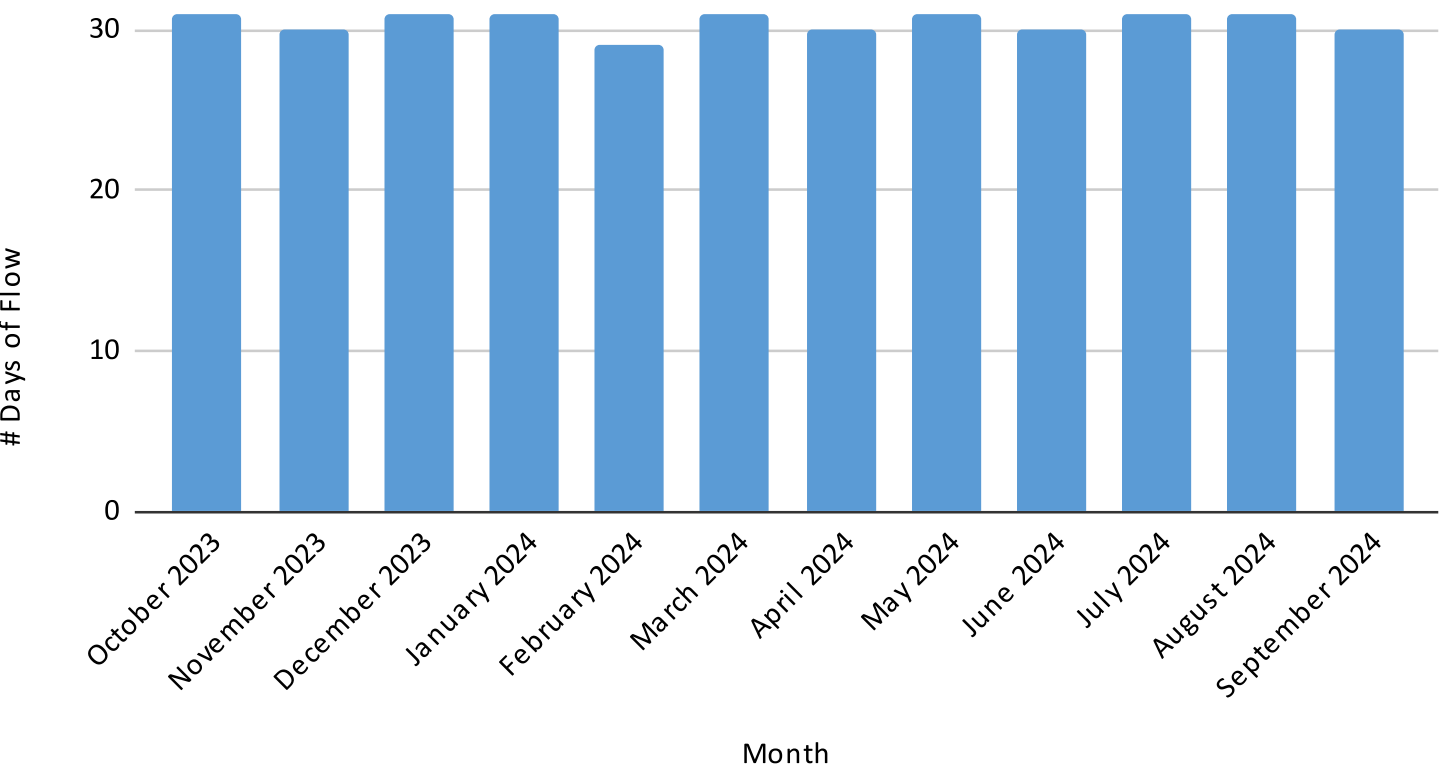
Marsh Station Road

We added another Flow365 Monitor here at the beginning of the 2024 calendar year, so with the collaboration of this team of two volunteers, we continue to see that Ciénega Creek is still flowing year round! It is quite a hike to get to this monitoring spot, the typical visit may take 40 minutes to an hour depending on how quickly one wants to hike. As you make the journey you will experience the transition from upland desert plants like ocotillo and prickly pear cactus, down into the canyon with the cover of riparian plants like large cottonwoods and willows, then to seeing and plants like duckweed floating in the water. This site is an incredible oasis, supporting the idea and possibilities of what many of our other creeks and rivers could look like with consistent flow.

Water Year Flow Days

Ciénega Creek at Marsh Station Rd

Monitors:
Savannah Sanchez, Hunter Williams



2024 Water Year Flow	365 Days
2023 Water Year Flow	365 Days

Monthly Photos

Ciénega Creek at Marsh Station Rd

Our monitors collect data weekly, sometimes even daily, along our creeks and rivers. The photos below are monthly snapshots of what this site looked like throughout the 2024 Water Year.

October 2023



November 2023



December 2023



January 2024



February 2024



March 2024



April 2024



May 2024



June 2024



July 2024

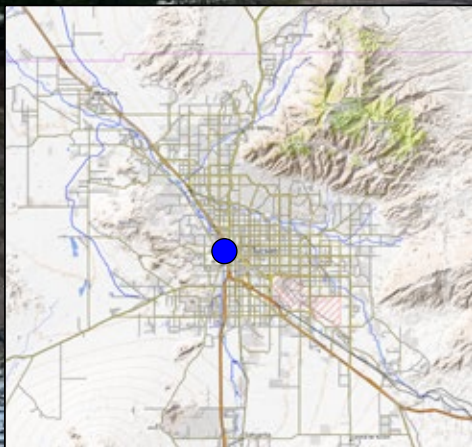


August 2024



September 2024





Santa Cruz River

The Santa Cruz River historically flowed year-round until 1914 and was home to many species of native fish, frogs, and other aquatic species. Over time, groundwater pumping caused water levels to decline, changing the flow to ephemeral (flowing only with rainfall) in the 1940s. At present, stretches of the Santa Cruz River flow perennially in Tucson with the input of treated effluent. Many of these projects were developed to recharge water in the aquifer to store for future use. However, having consistent flow in the river has also created a riparian habitat throughout different stretches that can support native fish and provide a necessary resource to other wildlife as well as an amenity that is attractive to surrounding neighborhoods, cyclists, and pedestrians on the Tucson Loop path.

St. Mary's Road

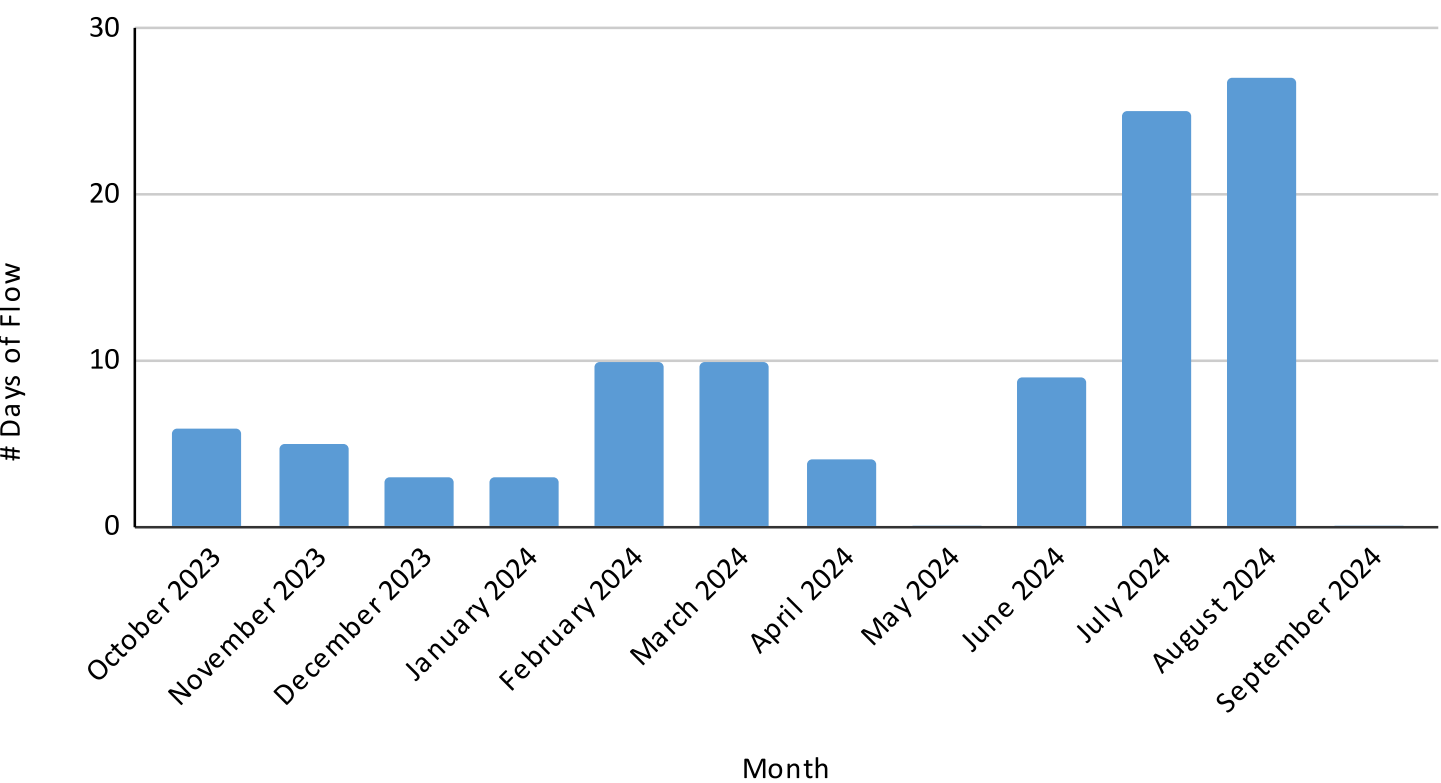
A few streets north, or downstream of the Santa Cruz River Heritage Project, Flow365 Monitors have been collecting data along St. Mary's Rd, a site that occasionally experiences flow and connection to the release of effluent flow from that project, but not year-round.

The monitoring location is at the bridge over the river overlooking a grade-control structure, which is a large slab of concrete under the bridge that ensures its safety and stability even with large flows that move sediment in the creek bed. This structure, seen in many of the monitoring photos, has a deep scour hole on the north side of the bridge. Water ponding in this scour hole persists for days or weeks after flow has dissipated. This additional water supports many local trees and wildlife.

Water Year Flow Days

Santa Cruz River at St. Mary's Rd

Monitors:
Jason Seow, Sharon Oliver, Lindsey Bell



2024 Water Year Flow	102 Days
2023 Water Year Flow	185 Days

Monthly Photos

Santa Cruz River at St. Mary's Rd

Our monitors collect data weekly, sometimes even daily, along our creeks and rivers. The photos below are monthly snapshots of what this site looked like throughout the 2024 Water Year.

October 2023



November 2023



December 2023



January 2024



February 2024



March 2024



April 2024



May 2024



June 2024



July 2024



August 2024



September 2024





Flow365 Underground Well Data

The Flow365 Monitoring Program has been able to record well water data in a few key areas thanks to private well owners. Pairing surface flows and nearby groundwater level data helps to gain a working knowledge of this dynamic hydrologic relationship. Even if many of our creeks and rivers are not flowing on the surface, there is still water flow underground that can be measured through wells. With this data as you'll see below, we are able to understand just how quickly these areas can respond to slower, gentler flows like snow melt and winter rains and the seasonal and annual trends which support these riparian forests. Currently we have well data from areas along Sabino Creek and Rincon Creek, and we look forward to expanding this portion of the program and collecting more well data thanks to our partnership and sponsorship with Pima County Regional Flood Control District.

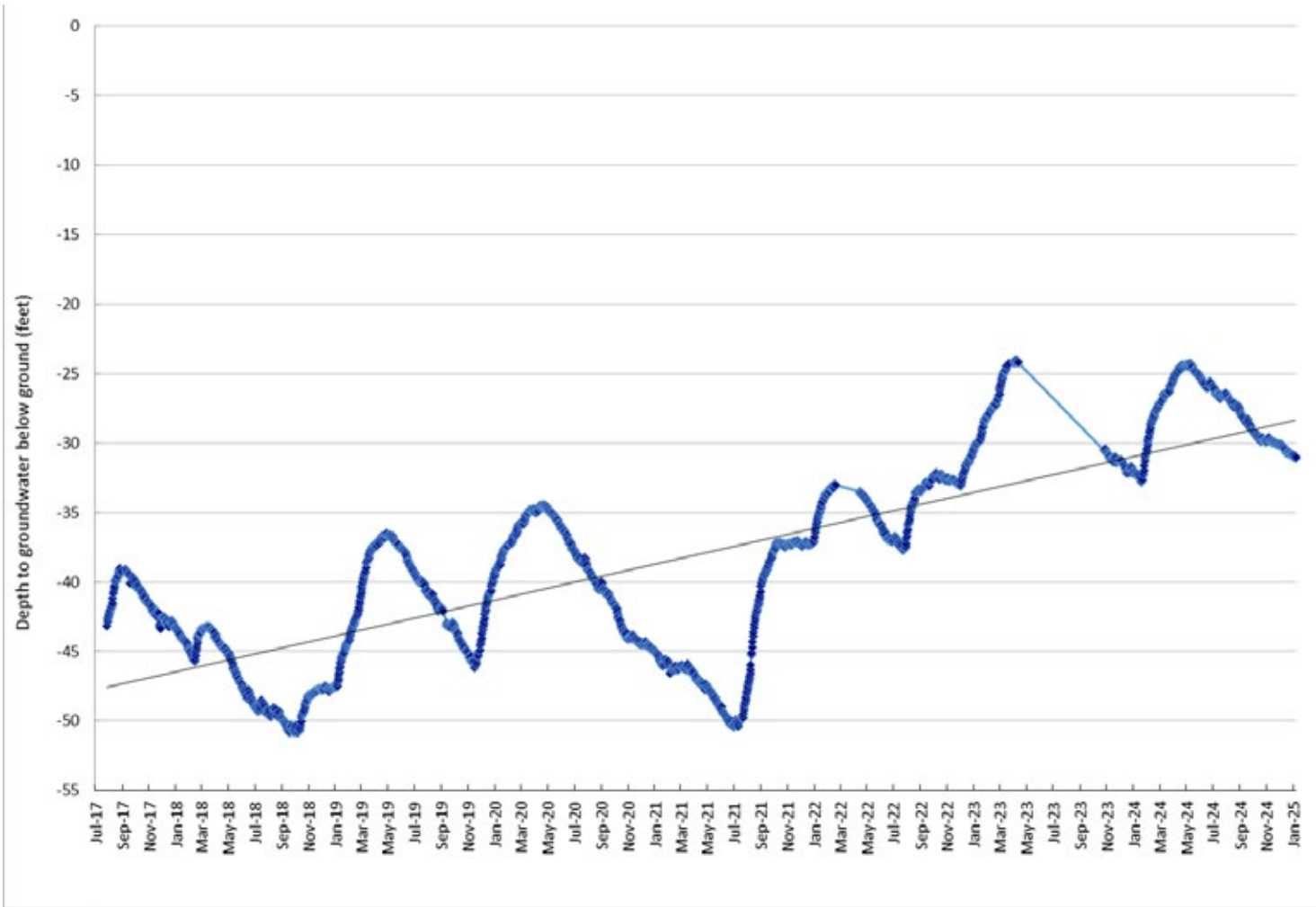
The graphs which follow show depth to groundwater, so the top of the vertical axis of these graphs is labeled with a zero. This is the ground surface at the well site. Note that these wells are near the creek and elevated topographically, so it does not state the depth to water below the channel. These negative numbers represent how far below the ground surface the water level is. In both of these wells' historical data, you can see that there is a general upward trend over the years of water levels being closer to the surface. This may indicate that these wells are recording a gradual recovery of the aquifer in these areas over many years.



Groundwater Well Sabino Creek Near Cloud Rd

This area is considered a shallow groundwater area, which means water is within 50 feet of the surface, and based on this graph and the data collected in this area, the water levels range from 33 feet below the surface to as shallow as 24 feet or so. With little to no rain at the beginning of the 2024 Water Year, you can see the water levels are slowly depleting (going farther below the surface), but once the rains return in late January 2024, the water levels almost immediately begin to rise closer to the surface, essentially replenishing the aquifer in the area. However, with the lack of rain in the latter half of the 2024 calendar year, the water levels begin to decrease again. What this shows is an incredible correlation between the rainfall we have and the groundwater recharge we see in our rivers.

Depth to Groundwater Sabino Creek Near Cloud Rd

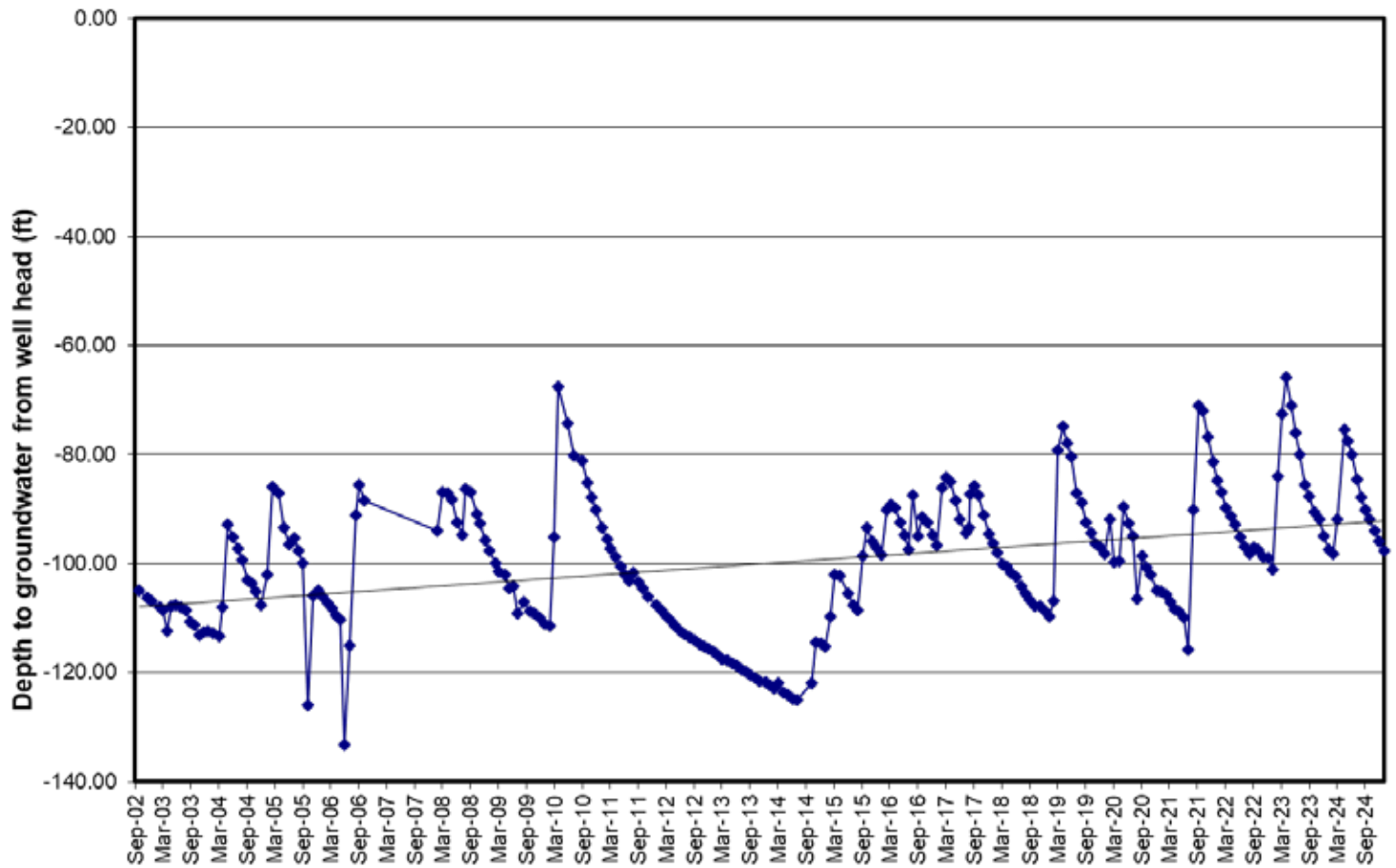




Groundwater Well Rincon Creek Near Camino Loma Alta

This well is located near the base of the Rincon Mountains near lower Rincon Creek. Groundwater depth is measured from the top of the well, which sits higher than the bottom of the channel. The landowner has been collecting monthly data since September 2002, which coincides with our multi-decadal drought. The general trend over this period has been a gradual rise in water levels which shows promise for continued recovery of this important shallow groundwater area. Spring snowmelt runoff is the primary contributor to recharging this aquifer, however, wetter summer monsoon seasons can also help. The drier 2024 water year compared to the 2023 water year shows a slight decline in groundwater levels.

Depth to Groundwater Sabino Creek Near Cloud Rd





**Thank you for reading our 2024 Water Year Flow365
Annual Report, we look forward to gathering more data
and presenting reports in the years to come.**

