Central Indiana
September 2023 Climate Summary

***33rd Warmest September on record at Indianapolis** (Tied)*

39th Driest September on record at Indianapolis

Temperatures

September 2023's milder than normal start to fall contrasted the year's near to slightly below normal summer while continuing the recent trend of warmer than normal Septembers (now 8 of the last 9). The month's variable, yet seldom amplified, pattern ranged from a broad, warm upper ridge during the early month, a couple passing troughs and otherwise zonal pattern through the cooler mid-month, and finally the southern portions of a disorganized blocking-ridge pattern that attempted to set-up over interior North America through much of September's latter half. Intensifying drought conditions promoted broad diurnal ranges, with most 1st-order airports rising 30 or more degrees on seven days. Stations recorded lowest maximums across seven separate days, indicative of the overall variable large-scale pattern.

September started above normal with very warm to marginally hot afternoons on the **2nd**-**5th**, with warmer mornings following each day. Lower humidity allowed a greater diurnal spread on the **2nd**, with most sites exhibiting a 30+ degree increase, with **90F** reached across the region's far southwest as well as the Columbus (Bartholomew Co.) and North Vernon 2 ESE (Jennings Co.) COOP stations. The **3rd** brought readings as high as **91F** at the Shoals 8 S (Martin Co.), Tipton 5 SW (Tipton Co.), and Vincennes 5 NE (Knox Co.) COOP stations, with Tipton 5 SW leading the region through further moderation – peaking at **94F** and **95F** on the **4th** and **5th**, respectively. Highest morning lows ranged from 64F at Indianapolis on the **2nd**, to Muncie's 72F and Eagle Creek Airpark's 71F on the **3rd**, and 69F at Muncie on the **4th**; warmest mornings followed Muncie's lead of 74F on the **5th** and 73F on the **6th**, with many western sites only dropping to the low 70s on the **5th**. Indianapolis' recorded 88F, 89F, 90F, and 90F again during the **2nd**-**5th**, with daily lows of 69F, 68F, and 72F over the **3rd**-**5th**.

The **7th**-**12th** followed with overall near normal readings, although with modest diurnal spreads through the **7th**-**9th**. The **7th** saw the steadiest temperatures as most stations rose only 10 degrees or less, with Bloomington and the Oolitic Purdue Ex Farm (Lawrence Co.) COOP station both only gaining 6 degrees to a high of 72F; on the **8th** Terre Haute climbed only 12 degrees.

The **11th** was a warmer day with **86F** reported at Shoals 8S, Tipton 5 SW, and Vincennes 5 NE, while Indianapolis peaked at 82F.

September's mid-month readings were slightly below normal, consistently ranging from lows around 50F to highs in the 70s. On the **13th**, several western and north-central COOP stations recorded their coolest morning of the month, including **42F** at West Lafayette 6 NW (Tippecanoe Co.) and 45F at Frankfort Disposal (Clinton Co.); same was the case early on the **14th** for several northern sites, with Tipton 5 SW and the Crawfordsville 6 SE (Montgomery Co.) COOP station both touching **42F**; Indianapolis dropped to 50F and 52F, respectively. Lowest maximums for Marion County were observed on the **16th**, with 70F at Castleton 2 S and 72F at Indianapolis. A few more sites observed their lowest high on the **17th**, with 69F at Lafayette. The month's coolest 24-hr period followed, from several central and southern locations reporting their lowest maximum on the **18th**, with 70F at Frankfort Disposal and 71F at Rushville (Rush Co.), to the coolest morning for almost half of central Indiana's stations on the **19th** when the New Castle 3 SW (Henry Co.) and North Vernon 2 ESE COOP stations dropped to **43F** and 44F, respectively. The **19th** was then a day of transition, with most locations recovering 30-35 degrees and an impressive +39 spread at Tipton 5 SW (from 43F to 82F).

September's final 11 days were persistently warm as a more-humid flow held most mornings to around 60F, while generally boosting afternoons to near 80F. Warmer conditions not seen since the month's first week did occur on the **20th**, **22nd**, **25th**, **26th**, and **30th**. The **20th** saw mid-80s at several western sites, including the Shakamak State Park (Sullivan Co.) COOP station; **86F** was recorded on the **22nd** at most 1st-order airports as well as the Martinsville 2 SW (Morgan Co.) and Seymour 1 WSW (Jackson Co.) COOP stations; Bloomington reached 86F again on the **25th** while Vincennes 5 NE peaked at **89F**; while the **26th** found the Washington 1 W (Daviess Co.) COOP station also reaching **89F** mark while Terre Haute recorded 87F; and the **30th** was the warmest of the late-month days at Frankfort Disposal and Lafayette 8 S – 82F and 83F, respectively; Indianapolis' maximums for these five **selected dates** were 83F, 83F, 84F, 81F, and 83F, and all amid a 7-day streak of 80F+. Warmer mornings on the **21st** and **27th**, with 64F and 63F, respectively, at Indianapolis, were bisected by a cooler start on the **24th** when most locations dropped to around 50F, except for **43F** at the Kokomo 3 WSW (Howard Co.) COOP site. Greater diurnal changes were observed on the **20th** (as great as +38 degrees at both Martinsville 2 SW and Tipton 5 SW), and the **24th** (the overall greatest of the month, with +38 degrees at the Perrysville 4 WNW (Vermillion Co.) COOP station and Terre Haute, and +29 at Indianapolis); before clouds and more humid and rainy conditions that allowed only a 13 degree change at Muncie on the **27th** and Indianapolis on the **28th**.

September 2023's temperatures displayed a prevailing, yet non-anomalous warmer pattern through the early and late month, which more than offset a cooler and slightly below average mid-month. Deviations above normal at 1st-order airports ranged from modest (+0.5F) at Muncie to more consistent warmth (+2.0 to +2.5) from Lafayette to Indianapolis and Shelbyville. Intensifying drought conditions promoted several days with large temperature spreads, greatest on the **24th** at most locales, and led by Terre Haute which rose 35+ degrees on 3 occasions. Several days reached the 80s (but not quite 90s), resuming the trend that had been seen across the region through much of the spring and early summer; even though a majority of stations hit 90F+ in early September, only a few spots reached this level on more than 3 days.

Year-to-date 90F-day days at 1st-order sites are now generally near to slightly below normal, ranging from 12 at Eagle Creek Airpark to 23 at Terre Haute, yet only 15 hot days at Indianapolis and Bloomington is only 75% of normal for both stations; most airports have observed the fewest 90+ days through September since 2017, with the fewest since 2015 at both Bloomington and Eagle Creek Airpark. Indianapolis' average temperature through 2023's first 9 months is the 2nd highest since 2012, yet the last 6 months (that is, omitting this year's anomalously mild January-February) are the 2nd coolest since 2015.

Site	Sept 2023 Avg Temp	Sept 2023 Dep from Nml	Highest Temperature	Lowest Temperature
Indianapolis Int'l Airport	69.9	+2.1	90 on 4th, 5th	50 on 13th
Lafayette	67.5	+2.0	91 on 5th	**44** on 13th
Muncie	67.7	+0.5	**92** on 5th	**44** on 14th
Terre Haute	68.3	+1.7	91 on 4th	46 on 19th, 24th
Bloomington	68.2	+1.7	89 on 4th	46 on 13th, 19th
Shelbyville	70.0	+2.5	**92** on 4th	46 on 19th
Eagle Creek Airpark	68.9	+1.3	90 on 4th	50 on 19th

At Indianapolis, September 2023's daily average temperatures were above normal on 18 days, below normal on 11 days and at normal on 1 days; however, 19 days were within 2 degrees of normal. September 2023 tied for the Indianapolis Area's 33rd warmest September since weather records began in 1871, placing it in the 78th percentile.

Precipitation

September 2023's very low precipitation intensified the dry trend that had begun during the latter half of August. September normals are around three inches, yet this year brought overall about one-third as much. A rainier period over the **5th-9th** provided light to moderate rainfall to nearly all of the region. Thunderstorms on the **26th-27th**, focused along a west-northwest to east-southeast band through the region's center, did boost monthly totals closer to normal over several counties. Nevertheless early-month near drought-free conditions deteriorated, along a north to south progression, to widespread moderate drought (**D1**) intensity by month's end. Between the month's more organized rainfall episodes, mid-September featured several days with most of the region observing very light rainfall, especially to the north and west of downtown Indianapolis, where several daily totals of 0.01-0.05" were common. This trend was also noticeable over all 1st-order airports, where monthly totals displayed a composite average at 35% of normal, with 6+ days of measureable precipitation (66% of normal), yet frequency of 0.10"+ reports averaged under 2 days (38% of normal).

September opened with dry conditions continuing across central Indiana, without a trace of rainfall reported anywhere through the **4th**. The September **5th** U.S. Drought Monitor update

(released on September 7th) showed an increase in **D0** (Abnormally Dry) conditions from what had been a rather small patch between Covington (Fountain Co.) and Rockville (Parke Co.), to most of the Wabash Valley from Sullivan County to Tippecanoe County, as well as most of Delaware, Hamilton, Madison and Rush Counties, and considerable portions of Henry, Randolph and Tipton Counties.

The **5th**-**9th** followed with several days of scattered showers, and also thunderstorms on the **5th** across central and southern zones, when mainly late-day and evening rains produced rather narrow bands of greater precipitation from the Bloomington area to western portions of the Indianapolis Metro, as well as along the Illinois border, with **1.13"** south of Unionville (Monroe Co.), and as much as **1.20"** in Plainfield (Hendricks Co.) while only 0.06" was picked up not 7 miles east at the NWS office (Marion Co.), meanwhile the Graysville 5 WNW COOP site (Sullivan Co.) recorded 0.62". Two rounds of additional showers on the **6th** brought mainly light totals with small embedded areas over 0.50" – both in the morning along the northern Wabash Valley, with as much as 0.77" in the Lafayette area, and then through the evening over several southern counties with up to 0.93" reported near Guthrie (Lawrence Co.). Light showers persisted, from northern to generally central zones throughout the **7th**; and then through the **8th**'s mainly PM hours and overnight over north-central counties, although essentially all sites reported less than 0.30" both days; drizzle and light showers even lingered into the **9th**, focused near the Indianapolis Metro. Resultant 5-day precipitation was lackluster with 0.05-0.40" common across the region; while isolated heavier amounts included **1.56"** near Guthrie, and **1.30"** both south of Unionville and over the Avon and Plainfield areas (Hendricks Co.).

The September **12th** U.S. Drought Monitor update indicated further expansion of **D0**, especially across northern portions of the region, including all of Montgomery, Boone and Hamilton Counties and all points north; while also expanding westward into much of Hancock and Shelby Counties, as well as all of Jennings County and much of Jackson and Decatur Counties. Widespread very light rains occurred again from late on the **11th** through the afternoon of the **12th** before isolated showers fell late on the **16th**; a combined 0.05-0.15" was common for the 6-day period over central and northern counties. The **17th**'s afternoon showers and thunderstorms that tracked north of Interstate 70 dropped 0.10-0.50" over several northern zones, while limiting greater rainfall to southeastern portions of Boone County and the far southwestern corner of Hamilton County, with **1.02"** in Zionsville.

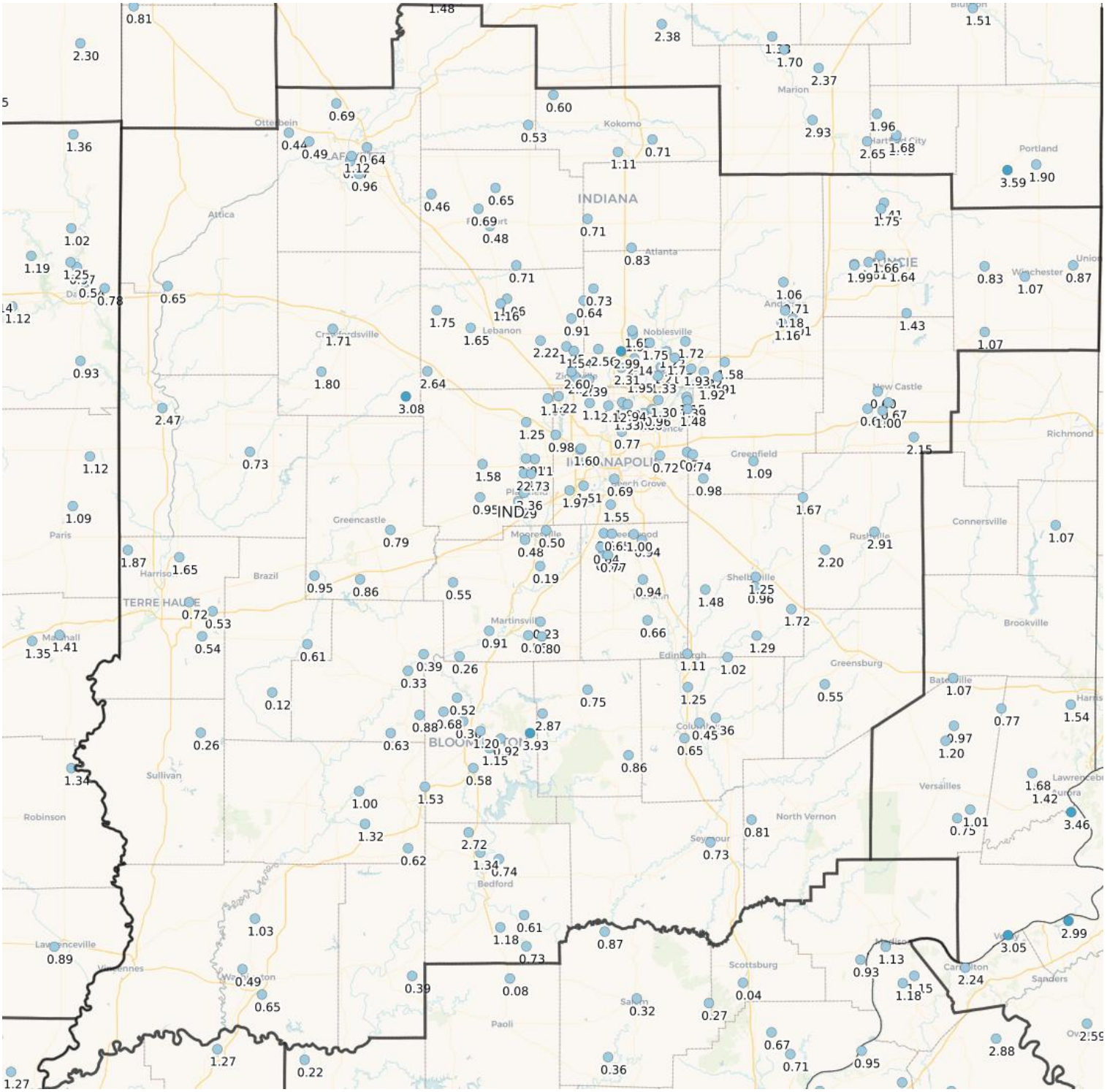
The September **19th** U.S. Drought Monitor update brought the month's greatest increase in drought intensity to date, with **D1** (Moderate Drought) introduced over the same broad patch spanning Montgomery County to Delaware County and all zones to the north; with **D0** meanwhile enveloping all remaining central Indiana counties, excepting a rather small patch between Bloomington and Greencastle (Putnam Co.). On the **21st**, despite areas along and west of the Wabash River receiving the eastern periphery of eastern Illinois' broad soaking rains, no more than 0.41" was reported, at Graysville 5 WNW. The September **26th** U.S. Drought Monitor update saw yet another broad increase in drought intensity with widespread **D1** spreading over a solid majority of the state and ~90% of central Indiana: the only areas that maintained **D0** status were portions of Sullivan and Warren Counties, while the patch that had avoided any drought intensity between Bloomington and Greencastle was upgraded to **D0**.

Appreciable rains finally reached most of the region over the **26th**-**28th** with numerous showers and scattered downpours in mainly PM thunderstorms. The **26th**'s afternoon cells formed quickly over western counties, dropping isolated small hail, before trending to numerous organized showers over east-central zones through the overnight; rainfall through dawn totaled **2.48"** at Crawfordsville 6 SE, **2.61"** south of Unionville, as much as **1.43"** in Carmel (Hamilton Co.) and **1.57"** northeast of McCordsville (Marion Co.) and as much as **1.41"** in Rushville. Showers continued into the **27th**, with late day/overnight thunderstorms bringing more much-needed heavy rains along the Interstate 74 corridor; and when coupled with additional precipitation into early afternoon on the **28th**, totaled as much as another **1.39"** just west of Crawfordsville, **1.78"** at the NWS office (and **1.42"** 1.1 miles to the north at Indianapolis Int'l), with **1.94"** more in Rushville, and up to **1.54"** around Muncie. While areas near both Lafayette and Spencer (Owen Co.) received less than 0.25" over this combined 58-hour period, a solid majority of central Indiana picked up a long-awaited 0.50-**1.75"**, led by **3.87"** at Crawfordsville 6 SE, **2.92"** in Rushville, **2.61"** south of Unionville, **2.08"** at Lewisville (Henry Co.), **2.05"** in Carmel, and up to **1.67"** in Muncie; while Indianapolis officially picked-up **1.43"**. Brief minor ponding on roadways occurred in the **27th**'s early evening storm over poorly-drained areas of southwestern Marion County; Indianapolis meanwhile went from having the Area's 2nd driest September in the 153-year record (0.19") to being only 39th driest (1.60"), in less than 2 hours.

September 2023's at times frequent, yet typically very light, rainfall episodes resulted in unseasonably to anomalously low monthly precipitation totals of mainly 0.50 to 1.50" across central Indiana, which were a mere 10-50 percent of normal. Greater precipitation was focused along the Interstate 74 corridor from the Crawfordsville area through Rush County, with small areas recording at least ~3.00"; this maximum band separated scattered areas of totals 2-3" below normal to the north, from a more widespread 2-3" deficit to the south, with several isolated pockets totaling less than 0.25" south/west of Indianapolis. Extremes ranged from only 0.12" in Clay City (Clay Co.) to **3.93"** south of Unionville and **4.30"** at Crawfordsville 6 SE. Most 1st-order/COOP sites recorded their driest September since the near-record September 2020; although it was the driest September since 1979 at West Lafayette 6 NW whose 0.47" total was a ~60-year return, while Perrysville 4 WNW's 0.50" made for the driest September in the station's record (since 1982). Comparable anomalies were observed at Shoals 8 S (whose mere 0.30" produced the 2nd-driest September in the station's 112-year record) and Bowling Green 1 W in Clay Co. (where a measly 0.17" was the site's 2nd driest September and a ~40-year return). Also noteworthy was a greater than 20-year return at Washington 1 W (0.36"), and the 1.16" at Young America which was surprisingly the station's driest September since 1994. Indianapolis' precipitation over the last 12 months (October 2022–September 2023, equivalent to the Water Year 2023) decreased slightly to 35.19", a 8.44" deficit (or only 81% of normal). This is Indianapolis' **driest Water Year in 28 seasons** (33.94", 1994-95), having just undercut the corresponding 12-month totals from both 1998-99 and 2009-10. The 2023 year-to-date total at Indianapolis (led by the very wet March and active summer) rose to **29.72"** (**–4.32"** from normal). Drought Monitor levels intensified through September from essentially no intensity to widespread **D1** by month's end. No river/creek flooding was observed during the month.

September 2023 Total Precipitation, From Early 9/1/2023 Through Early 10/1/2023

As Reported by Central Indiana CoCoRaHS Observers



For the period 700 AM EDT 9/1/2023 -to- 700 AM EDT 10/1/2023, data is unofficial**

Totals were mainly 1-3" below normal ... generally ranging from 0.50 to **1.50"**, with greater rainfall (~**1.50** to **3.25"**) found along a line from Crawfordsville to Rush County, as well as locally south/east of Bloomington and around Muncie.

Site	Sept 2023 Precipitation	Sept 2023 Dep from Nml	Wettest Day	Longest Dry Stretch
Indianapolis Intl AP	1.60	−1.54	1.42 on 27th	8 days, 18th-25th
Lafayette	**0.59**	−2.00	0.30 on 6th	4 days, 1st-4th, 13-16th 22nd-25th
Muncie	1.46	−1.63	0.95 on 27th	8 days, 18th-25th
Terre Haute	0.74	−2.19	0.43 on 5th	4 days, 1st-4th, 22nd-25th
Bloomington	**0.49**	**−3.11**	0.21 on 26th	8 days, 18th-25th
Shelbyville	1.68	−1.46	1.50 on 27th	13 days, 13-25th
Eagle Creek Airpark	1.03	−1.54	0.50 on 5th	8 days, 18th-25th

September 2023 was the **39th driest** September in the Indianapolis Area since weather records began in 1871, placing it in the **25th percentile** for precipitation of all recorded Septembers. This continued the slightly below normal rainfall trend seen in August 2023, as well as the below normal trend from September 2022. Four of the last five, and eight of the last eleven Septembers at Indianapolis have recorded below normal precipitation.

Severe Weather

Despite the **26th**'s afternoon strong thunderstorms across western counties, no severe weather was reported in central Indiana in September 2023. This was the region's first severe-free September since 2018.

For info on severe weather in other areas during September, visit the Storm Prediction Center "Severe Weather Event Summaries" website at spc.noaa.gov/climo/online

Miscellaneous – Winds, Thunder, Fog & More

Peak wind gusts at 1st-order airports ranged between a mere 25 mph at Bloomington and the rather modest 36 mph at Eagle Creek Airpark, with the majority of these seven sites not reaching 30 mph - a far cry from the generally breezy conditions that lasted from late 2022 through July 2023, and the region's most quiescent month **in at least the last 15 years**. Breezier days included the **5th**, **6th**, and **26th** when most locations gusted to 25 mph or greater; while Indianapolis was the only site with this distinction on the **27th** when recording the airport's monthly max gust of **29 mph**. The month's second week was marked by generally low peak wind gusts, including a 10-day period (**7th**-**16th**) at both Bloomington and Terre Haute

where gusts never reached 20 mph. The final three days of September exhibited the most tranquil wind trends, when the average peak gust across all 1st-order sites was only 15 mph, with the lowest daily reading being 11 mph at Shelbyville on the **29th**.

Fog was, despite the overall lack of appreciable rainfall, common, especially through the month's second and third weeks: Indianapolis was an outlier with only 9 days of fog in September, with other 1st-order sites ranging from 14 days at Shelbyville to 21 days at Bloomington. Fog was observed at all sites on the **7th**, **10th**, **13th**, **27th**, **28th**, **29th**, and **30th**; and at most airports on the **3rd**, **9th**, **11th**, **12th**, **16th**-**18th**, and **25th**. Fog was reported on 11 of 13 days at both Lafayette (through the **6th**-**18th**) and Bloomington (**1st**-**13th**), while Terre Haute observed fog on the month's final 6 days. Dense fog was prevalent during both mid-month and September's final days, ranging from 3 days at Indianapolis to 7 days at Muncie, and being tallied on 4 days at most sites. Dense fog was recorded at most 1st-order airports on the **13th**, **28th**, **29th**, and **30th**, and on the **27th**-**29th** at Indianapolis. This was the first three-peat of days with visibility observed to a 1/4 mile or less in fog at Indianapolis Int'l Airport **since February 2019**.

Thunder's infrequence followed the overall dry pattern, ranging from 1 day at Muncie to 4 days at both Lafayette and Eagle Creek Airpark, with all other 1st-order sites reporting thunder on 3 occasions. Thunder occurred at all central and southern airports on the **5th**, and essentially all sites on both the **26th** and **27th**.

Despite limited precipitation, September was marked by noticeable humidity, from the **2nd**-**6th**'s unseasonably high dewpoints into the low 70s each day, and readings as high as 74F at Terre Haute on the **4th**; to low-moderate humidity through the **24th**-**30th**. More autumnal air did reach the region on the **23rd** when dewpoints finally fell below 45F, bringing relative humidity values as low as 24% at Muncie.

October 2023 Outlook

The official outlook for October 2023 from the Climate Prediction Center indicates chances leaning to above normal temperatures for central Indiana, especially across the northern tier. The normal September temperature at Indianapolis is **55.5** degrees.

The outlook also indicates chances leaning to below normal precipitation for the region. The normal October precipitation at Indianapolis is **3.22"**.

Data prepared by the Indianapolis Weather Forecast Office's State Climate Team
Questions should be referred to nws.indianapolis@noaa.gov