

## DNREC Menu

(<http://delaware.gov>)

# Navigating Delaware's Drought History: Insights into Water Management Challenges and Solutions



(</outdoor-delaware-magazine/>)

(</outdoor-delaware-magazine/>)

(</outdoor-delaware-magazine/>)

(</outdoor-delaware-magazine/>) **≡ Categories**

Animals (<https://dnrec.delaware.gov/outdoor-delaware/animals/>)

Adventure (<https://dnrec.delaware.gov/outdoor-delaware/adventure/>)

Boating, Fishing and Hunting (<https://dnrec.delaware.gov/outdoor-delaware/boating-fishing-and-hunting/>)

Conservation (<https://dnrec.delaware.gov/outdoor-delaware/conservation/>)

Fun and Education (<https://dnrec.delaware.gov/outdoor-delaware/fun-and-education/>)

Health and Science (<https://dnrec.delaware.gov/outdoor-delaware/health-and-science/>)

Nature (<https://dnrec.delaware.gov/outdoor-delaware/nature/>)

People (<https://dnrec.delaware.gov/outdoor-delaware/people/>)

In 2002, Delaware faced its worst drought (<https://dnrec.delaware.gov/water/commercial-government/water-allocation/conservation/>) since becoming a state more than 200 years earlier.

With conditions exacerbated by droughts in 1995 and 1999, indicators like rainfall and stream flow were at record lows. On March 5, Gov. Ruth Ann Minner officially declared a drought warning, urging Delawareans to conserve water. Though June saw more rain than normal, the state remained in a dry spell, and on Aug. 2, the governor issued an executive order putting in place a drought emergency.

Residents north of the Chesapeake and Delaware Canal that is so often used as the dividing line between northern and urban New Castle County and its more rural southern half were placed under water-use restrictions. Because groundwater supplies did not decline to critical levels in most of Delaware, all the state south of the canal — containing roughly 7/8 of Delaware's land area but around half the population — was under a drought warning with voluntary water-use limits.

On Oct. 11, Minner lifted the emergency, meaning the entire state was now under a warning, with water conservation suggested but not required. Finally, on Jan. 29, at the recommendation of the Governor's Drought Advisory Council, the warning was canceled entirely, ending a period of more than 10 months that saw increased pressure on water systems, especially up north.

In all, Delaware was in a drought emergency for 70 days, less than a quarter of the time Cecil County, Md., Chester County, Pa., and Salem County, N.J., spent in such a state.

As it turns out, that was the last full-scale drought emergency the First State has seen. But what exactly does it mean for a drought to be in effect, and are we likely to see any droughts in the near future?

Put simply, drought stems from receiving less rainfall than normal over a period of time. How it manifests, however, varies greatly based on circumstances.

"There's drought, which is lack of rain, and then there are the ramifications of that, and that's really dependent on the land uses and the need for the water supplies in those areas," said Steve Smailer, the director of the Delaware Department of Natural Resources and Environmental Control's Division of Water.



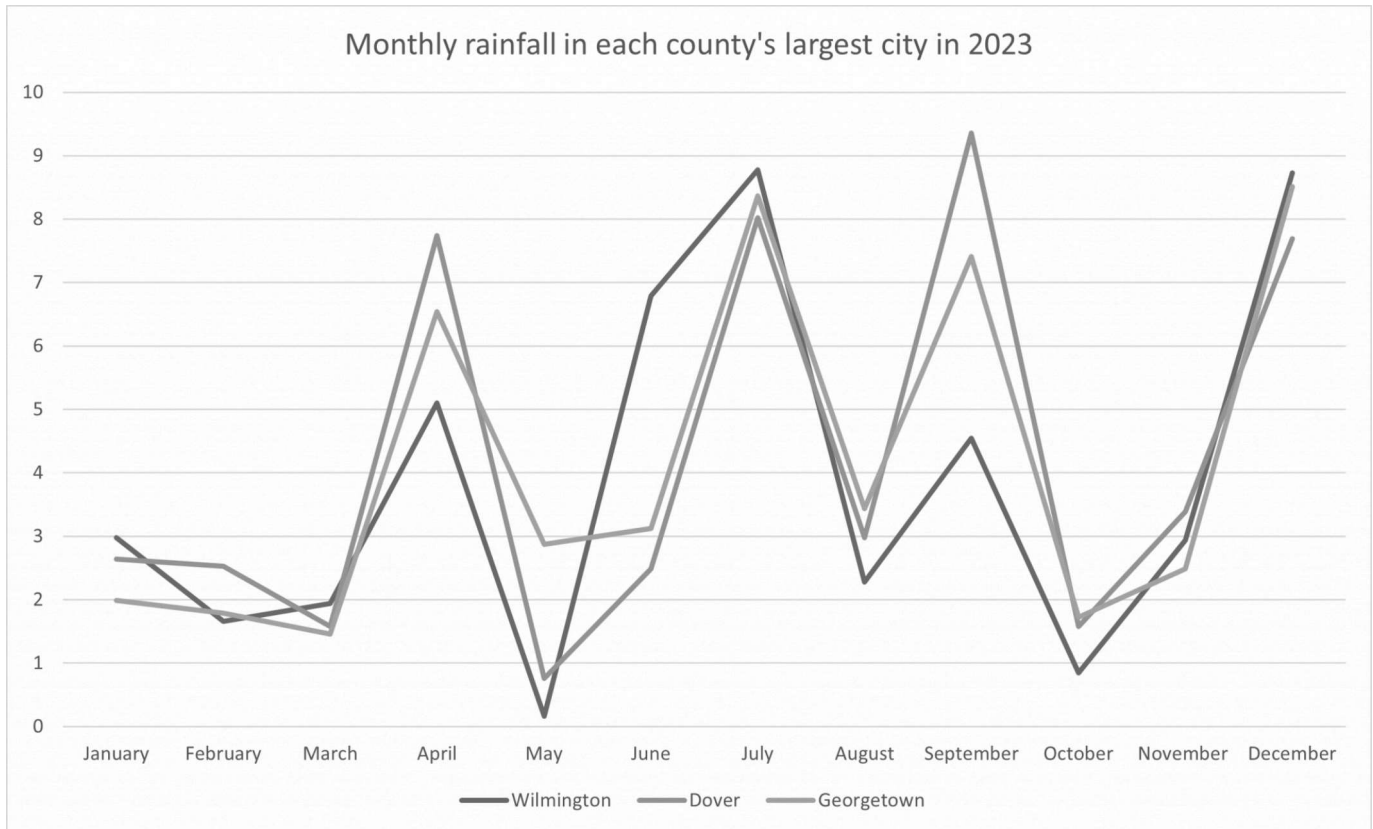
Droughts result from a lack of rain, resulting in plants like this one dying. Delaware has not had a drought emergency since 2002, with its most recent official drought watch in 2007. (Delaware DNREC/Errol Ebanks)

In other words, what sort of usage pressures are placed on water systems as a result of low precipitation levels? Wilmington receiving substantially less rain than is typical is different than Maryland seeing a decrease in rainfall. Up north, most of the water supplies utilized by Delawareans go to homes and businesses, while a substantial portion below the canal is used instead for farming.

According to state climatologist Daniel Leathers, generally months of low rainfall are necessary before a drought watch would be declared in northern New Castle, while agriculture can face a drought after just a week and a half of atypical rain and high temperatures. Due to the fact that comparatively so few people live in the more rural portions of the state, however, drought declarations here are driven by the urban north.

While 2002 was Delaware's last full-fledged drought emergency, the last drought watch was declared in October 2007 and lifted six months later. The state has been very close to entering into a drought watch since then, including in 2012, 2016 and on multiple occasions in 2023. In fact, just a few days before Thanksgiving last year, the Water Supply Coordinating Council (<https://dnrec.delaware.gov/water/boards/water-supply-coordination/>) met to consider recommending an official drought watch. With the prospect of rain on the horizon, the group decided against doing so, and ultimately an influx of precipitation removed the need. It was the second time in five months officials were within days of calling for a drought watch, only for rain to alleviate the issue.

Currently, the Water Supply Coordinating Council, which was created by the governor and General Assembly after the drought of 1999 and consists of experts from DNREC, the Delaware Geological Society, local governments, water utilities, businesses and more, is responsible for making a recommendation to the DNREC secretary, who then gives advice to the governor on declaring a drought watch. Once a watch is in place, it's up to the Governor's Drought Advisory Council to recommend whether it should be raised to a warning or the still more serious emergency. The Governor's Drought Advisory Council is also responsible for suggesting downgrading drought classifications.



But exactly what criteria do the bodies use to advise the secretary and the governor?

After the drought of 2002 — referred to as the “drought of record” by Delaware experts — formal categories such as six- and 12-month precipitation at Wilmington Airport, stream flow at Brandywine Creek and White Clay Creek, water chloride levels and reservoir capacity were developed as indicators for drought in northern New Castle.

For instance, guidelines state 12-month rainfall of 6 to 9 inches less than normal at Wilmington Airport, a 30-day moving average of between 70 and 85 million gallons per day of stream flow at Brandywine Creek and a 32% drop in Wilmington's Hoopes Reservoir supply, among other factors, could trigger a drought watch. A yearlong rainfall decrease of at least a foot, no more than 48 million gallons per day moving through Brandywine Creek and a 43% fall in Hoopes Reservoir's capacity could lead to a drought emergency with mandatory water-use restrictions under these indicators.

In 2016, with the state experiencing the warmest August to that point since the 1800s and creek flows down, some of the criteria qualified for a drought watch, though others were above it, influencing the Water Supply Coordinating Council's decision not to seek an official declaration.

Elsewhere in the state, the guidelines are more general. While still based on precipitation, streamflow and groundwater supply at key locations in Kent and Sussex counties, determining a drought becomes a bit more subjective.

Regardless of the criteria, the state is currently doing better than average in the indicators, which is certainly a good sign.

During the 2002 drought, water usage levels fell by nearly a quarter in the first few weeks after the restrictions were instituted by the governor, a sign of compliance that ultimately helped the state respond to the crisis. Individuals were (with some exceptions) barred from washing their cars, filling swimming pools and watering their lawns, and restaurants were instructed not to serve water to customers unless they requested it.

Police were empowered to issue civil penalties to violators, an unpopular but necessary part of a drought emergency.

According to Gerald Kauffman, director of the University of Delaware's Water Resources Center and a member of the Water Supply Coordinating Council, tree-ring width research shows the 2002 drought was the worst here since 1635 — right around the time Europeans began settling along the Delaware Bay and lower Delaware River. This research from a tree-ring database that spans four centuries indicates droughts tend to occur in 10-, 20- or 30-year cycles.

The drought of 2002 was preceded by severe droughts in 1999 and 1995, which made the state extra vulnerable.

Despite Delaware being the second-smallest state by area, there is still a fair amount of variation in temperature and especially in precipitation. For instance, in August 2020, Georgetown received 5.7 inches of rain, according to the Delaware Environmental Observing System. In Dover, barely 30 miles to the north, 11.7 inches of rain fell.

Another factor is that most of the state relies on groundwater. Aside from the systems of Wilmington, Newark and Veolia in northern New Castle, every public water system in the state is dependent on groundwater for drinking. A lack of rain causes levels in bodies of waters to drop, which requires residents and entities to tap into groundwater sources more.

Despite the fact the state has flirted with drought warnings on several occasions in recent years, experts believe there is little chance we hit a full-fledged water emergency anytime soon.

"I'd say there was a transformation in the way water supply management is conducted in Delaware out of necessity" after the 2002 drought, Kauffman said.

Those changes include new and larger reservoirs, the creation of the Water Supply Coordinating Council, drought contingency plans for large users of water and links between water suppliers.



While counties in Pennsylvania, New Jersey and New York entered into a drought watch in 2023, Delaware did not, although it was potentially only days away. (Delaware DNREC/Errol Ebanks)

In fact, according to Douglas Rambo, a hydrologist in the Division of Water, most of the counties within the Delaware River Basin, which also includes New York, New Jersey and Pennsylvania, were in a drought status of some kind last November. Our state is more “resilient” than it was a quarter-century ago, he opined.

That’s definitely a good thing, because water management could become more of a challenge in the future. While nowhere near the magnitude of the problem the Southwest is facing, Delaware could see drier conditions as time passes due to climate change. Additionally, Kauffman noted, the state has been in a long-term wet cycle that should end at some point.

At the same time, climate change could also lead to heavier storms. In short, weather patterns are expected to become more extreme, and while more rain may sound like a good thing from a supply point of view, that’s not necessarily the case.

“Just because you’re that wet doesn’t mean that it’s recharging everything,” Smailer said. “If you get too much water at one time, it runs off. If it runs off to the ocean here, you’re not able to capture it.”

This is called climatic whiplash and has already been seen in Delaware, with the state going from a period of dryness last year — .22 inches of rain in a four-week period from mid-October to mid-November — to almost record levels of precipitation in the ensuing months.

With Delaware facing typical summer heat, residents are advised to be smart with water usage — advice that is frankly evergreen.

“I think a lot of time when people know it’s dry or hear that it’s dry, they think, oh well, my little bit isn’t going to make any difference one way or the other, but it really does make a difference,” Leathers said.

### **Be Prepared for Heat and Drought**

July is Delaware’s hottest month of the year. With temperatures only expected to grow in the future due to climate change, what can Delawareans do to prepare for excessive heat, both now and in summers to come?

Fortunately, the Federal Emergency Management Agency offers tips that can be of use to all when it comes to staying safe in the summer sun.



During drought warnings, Delawareans are urged to conserve water, which can include not washing your car. The last drought warning here came in 2003. (Adobe stock photo)

One important thing folks can do is to learn the signs of heat-related illnesses. High body temperatures (above 103 degrees F), red and hot skin with no sweat, a rapid and strong pulse, dizziness, confusion and unconsciousness can all spell heat stroke. If you suspect someone is suffering from heat stroke, call 911 or take the person to a hospital. Cool them down as soon as possible but do not give them anything to drink.

Additionally, muscle pains or spasms in the stomach, arms or legs can be a sign of heat cramps, and heavy sweating, muscle cramps, dizziness, nausea, fainting, headache, paleness, fatigue and fast or weak pulse can indicate someone is facing heat exhaustion. Anyone with these symptoms should get to a cooler location, such as indoors or at least in the shade, remove excess clothing if possible and drink fluids. If symptoms worsen or persist for more than an hour, call a health care provider.

Individuals can take cool baths or showers to beat the heat. Wearing loose and light-colored clothing can help, as can wearing a hat. People should take extra precautions when engaging in physical activity in extreme heat and drink plenty of water. Also keep in mind folks who are especially vulnerable, such as the elderly.

Even if no drought status is in place, Delawareans and visitors are still urged to be mindful of their water usage. They should reuse water when possible, not leave faucets running and repair leaks. Individuals can also benefit from picking energy-efficient appliances and planting foliage that needs less water.

**Related Topics:** [climate \(https://dnrec.delaware.gov/tag/climate/\)](https://dnrec.delaware.gov/tag/climate/), [conservation \(https://dnrec.delaware.gov/tag/conservation/\)](https://dnrec.delaware.gov/tag/conservation/), [drought \(https://dnrec.delaware.gov/tag/drought/\)](https://dnrec.delaware.gov/tag/drought/), [heat \(https://dnrec.delaware.gov/tag/heat/\)](https://dnrec.delaware.gov/tag/heat/), [nature \(https://dnrec.delaware.gov/tag/nature/\)](https://dnrec.delaware.gov/tag/nature/), [outdoor delaware \(https://dnrec.delaware.gov/tag/outdoor-delaware/\)](https://dnrec.delaware.gov/tag/outdoor-delaware/), [rainfall \(https://dnrec.delaware.gov/tag/rainfall/\)](https://dnrec.delaware.gov/tag/rainfall/), [water \(https://dnrec.delaware.gov/tag/water/\)](https://dnrec.delaware.gov/tag/water/)



(/)

[Office of the Secretary \(https://dnrec.delaware.gov/office-of-the-secretary/\)](https://dnrec.delaware.gov/office-of-the-secretary/)

[Environmental Finance \(https://dnrec.delaware.gov/environmental-finance/\)](https://dnrec.delaware.gov/environmental-finance/)

[Division of Community Affairs \(https://dnrec.delaware.gov/community-services/\)](https://dnrec.delaware.gov/community-services/)

[Division of Climate, Coastal and Energy \(https://dnrec.delaware.gov/climate-coastal-energy/\)](https://dnrec.delaware.gov/climate-coastal-energy/)

[Division of Air Quality \(https://dnrec.delaware.gov/air/\)](https://dnrec.delaware.gov/air/)

[Division of Water \(/water/\)](/water/)

[Division of Waste and Hazardous Substances \(/waste-hazardous/\)](/waste-hazardous/)

[Environmental Justice at DNREC \(https://dnrec.delaware.gov/environmental-justice/\)](https://dnrec.delaware.gov/environmental-justice/)

[Division of Fish and Wildlife \(/fish-wildlife/\)](/fish-wildlife/)

[Division of Parks and Recreation \(/parks/\)](/parks/)

[Division of Watershed Stewardship \(/watershed-stewardship/\)](/watershed-stewardship/)





(<https://www.facebook.com/DelawareDNREC/>)



(<https://twitter.com/DelawareDNREC>)



(<https://www.youtube.com/user/DelawareDNREC>)

Topics of Interest (<https://dnrec.delaware.gov/topics-of-interest/>)

Contact Us (<https://dnrec.delaware.gov/contacts/>)

DNREC Newsroom (<https://dnrec.delaware.gov/newsroom/>)

Public Meetings (<https://dnrec.delaware.gov/public-meeting-calendars/>)

About DNREC (<https://dnrec.delaware.gov/mission/>)

Work for DNREC! (<https://dnrec.delaware.gov/work-here/>)

DNREC Divisions (<https://dnrec.delaware.gov/divisions/>)

Regulations (<https://dnrec.delaware.gov/dnrec-regulations/>)

Non-Discrimination Notice (<https://dnrec.delaware.gov/environmental-justice/title-vi-dnrec/>)

Public Notices (<https://dnrec.delaware.gov/dnrec-public-notices/>)

DNREC Open Data (<https://dnrec.delaware.gov/dnrec-open-data/>)

FOIA Requests (<https://dnrec.delaware.gov/foia/>)

