

Water Supply Outlook

July 5, 2023

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Interstate Commission on the Potomac River Basin (ICPRB)

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The ICPRB, through its Section for Cooperative Water Supply Operations on the Potomac (CO-OP), coordinates water supply operations during times of drought and recommends releases of stored water. These operations ensure adequate water supplies for Washington metropolitan area water users and for environmental flow levels. The water supply outlooks are published by CO-OP on a monthly basis between April and October. They are meant to provide an update on the possibility of low-flow conditions in the Potomac basin.

Summary/Conclusions

There is an above-normal probability of releases from the backup water supply reservoirs in the Washington metropolitan area for the summer and fall of 2023. These releases are typically prompted by low flows resulting from a combination of insufficient summer precipitation and groundwater levels. The Potomac basin has experienced unusual dryness, despite recent heavy rains bringing some relief and improving stream flows. Challenges persist as the Middle Atlantic River Forecast Center warns about persistently low stream flows and soil moisture content, especially with the approach of the hottest month on record (July 4 marked the hottest day ever recorded on Earth). In June, the Potomac basin received 3.4 inches of rain, slightly below the normal amount by 0.4 inches, but an improvement from the previous month's deficit of 2.4 inches. However, the cumulative deficit over the past 12 months is 6.1 inches. Groundwater levels in monitoring wells remain below average, with ongoing decline in many wells. The ICPRB staff will closely monitor water supply conditions in the basin, focusing on USGS Gage stream flows at Point of Rocks, Maryland, which has a daily water supply monitoring threshold. Currently, the water flow in the Potomac River meets the water demands of the Washington metropolitan area, eliminating the need for releases from the reservoirs. Overall, the region has robust hydrological drought-contingency plans to prevent water supply shortages in case of low-flow conditions.

ICPRB's Low-Flow Outlook

There is a 27 to 45 percent conditional probability that natural Potomac flow will drop below 600 to 700 million gallons per day (MGD) at Little Falls through December 31 of this year; at these flow levels, water supply releases from Jennings Randolph and Little Seneca reservoirs may occur. Releases occur when the predicted flow is less than demand plus a required environmental flow-by. Drinking water demand ranges from 400 to 700 MGD during the summer months, and the minimum flow-by at Little Falls is 100 MGD. Natural flow is defined as observed flow at the Little Falls gage plus total Washington metropolitan Potomac withdrawals, with an adjustment made to remove the effect of North Branch reservoir releases on stream flow.

The conditional probability is estimated by analyzing the historical stream flow records and considering recent stream flow values, precipitation totals for the prior 12 months, current groundwater levels, and the current Palmer Drought Index. Past years in which watershed conditions most closely resemble current conditions are weighted more heavily in determining conditional probability. The historical, or unconditional, probability is based on analyzing the historical record without weighing for current conditions. The 27 to 45 percent conditional probability compares to the 8 to 15 percent historical probability and is considered the more reliable indicator.

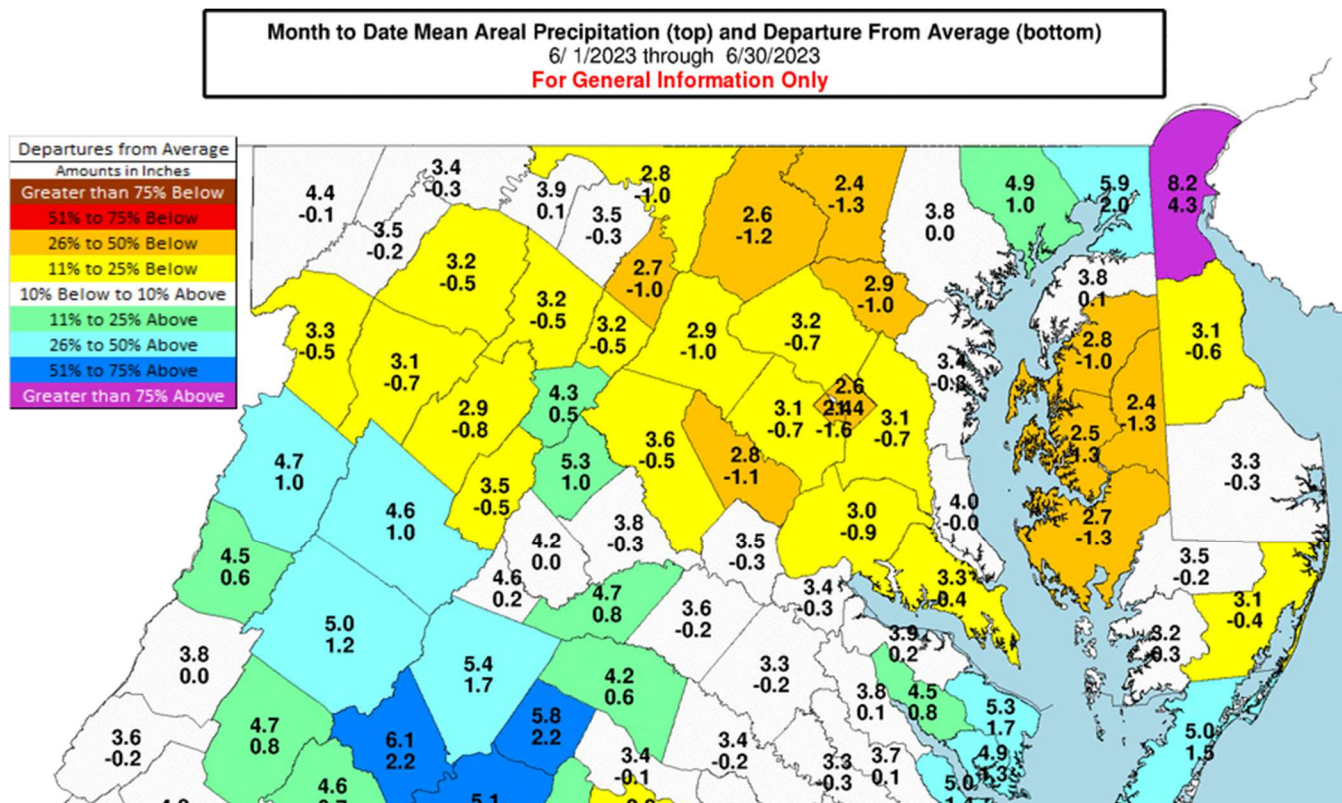
Outlook for natural Potomac River flow at Little Falls – Watershed conditions as of July 3, 2023

| <i>Low flow threshold (MGD)</i> | <i>Low flow threshold (cfs)</i> | <i>Historical probability of lower flow July 1 through December 31</i> | <i>Conditional probability of lower flow July 1 through December 31</i> |
|-------------------------------------|-------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1200 | 1858 | 68% | 93% |
| 1000 | 1548 | 49% | 86% |
| 800 | 1238 | 25% | 65% |
| 700 | 1084 | 15% | 45% |
| 600 | 929 | 8% | 27% |

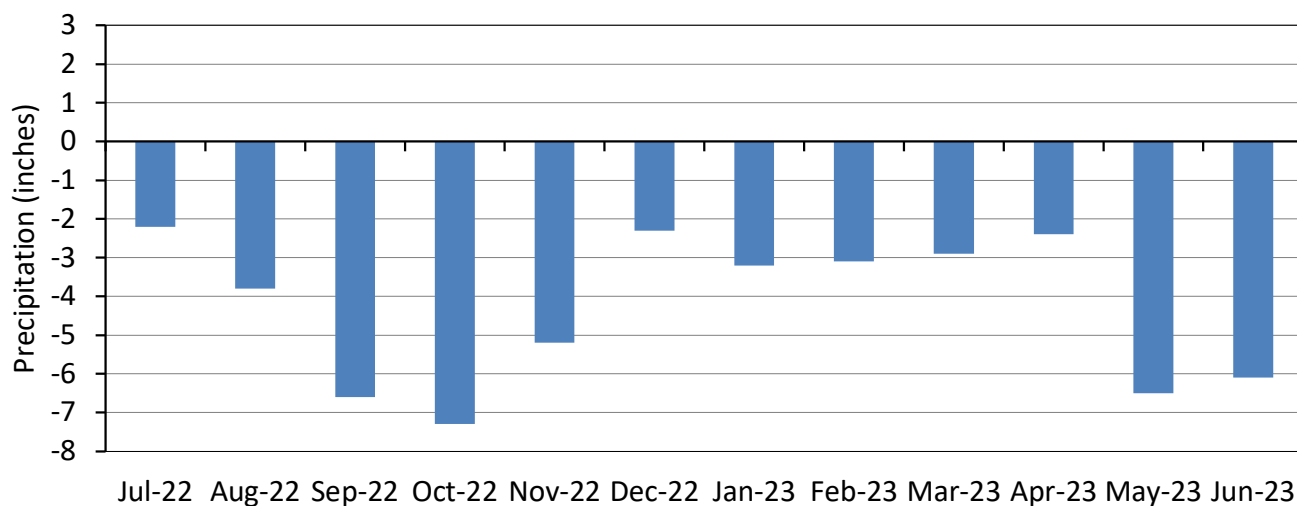
Past Precipitation

According to the National Weather Service's Middle Atlantic River Forecast Center (MARFC), the Potomac basin upstream of Washington, D.C., received 3.4 inches of precipitation in June, 0.4 inches below the normal amount. As of June 30, the 12-month cumulative basin precipitation is 6.1 inches below normal (see graph).

Source: https://www.weather.gov/marfc/Precipitation_Departures



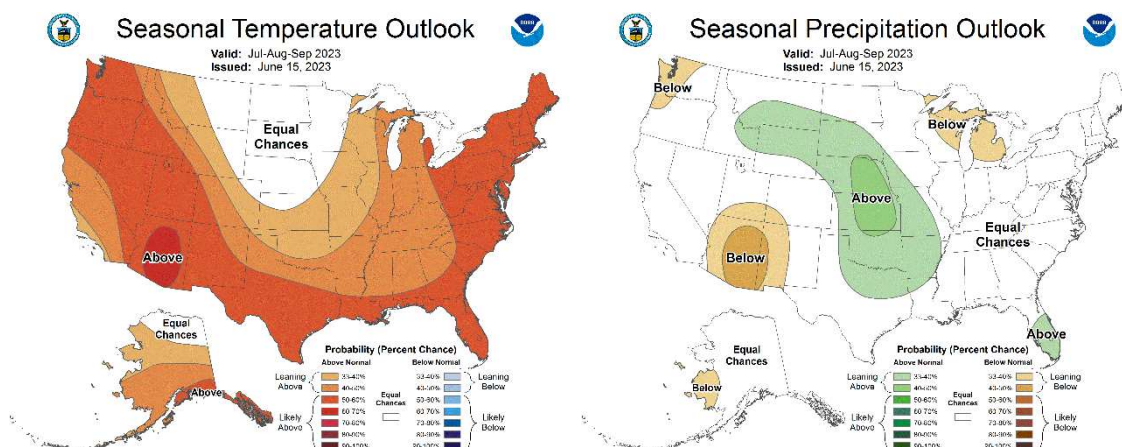
12-month cumulative departure from normal, through June 2023



Precipitation and Drought Outlook for July, August, and September 2023

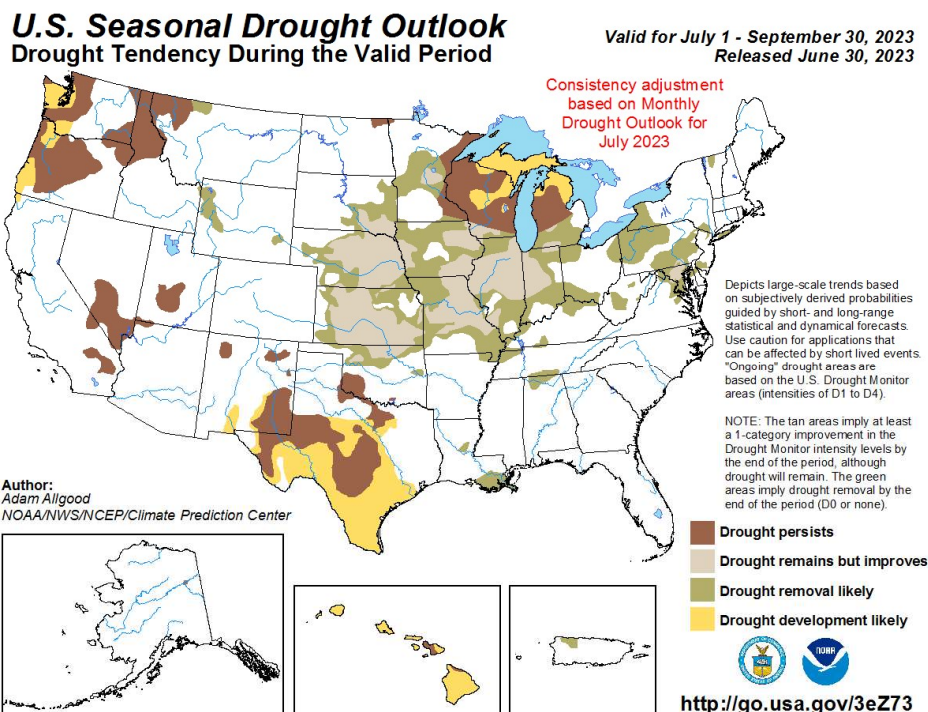
The Middle Atlantic River Forecast Center (MARFC) predicts "fair" water resources and supplies. July's outlook indicates a tendency towards above-normal temperatures and precipitation in the Potomac basin. Looking ahead to the next 90 days (Jul-Aug-Sep), MARFC predicts above-normal temperatures and normal precipitation levels.

Sources: https://www.cpc.ncep.noaa.gov/products/predictions/long_range/seasonal.php?lead=1



According to the Climate Prediction Center's U.S. Seasonal Drought Outlook released on June 30, there is a likelihood of "drought removal" and "improvement" in the Potomac basin. However, the latest seasonal assessment indicates low forecast confidence for the mid-Atlantic and Northeast regions. Although periods of rainfall may help prevent further deterioration, the existing low stream flows and soil moisture content pose challenges that may be difficult to fully overcome, especially considering the upcoming climatologically hottest month of the year.

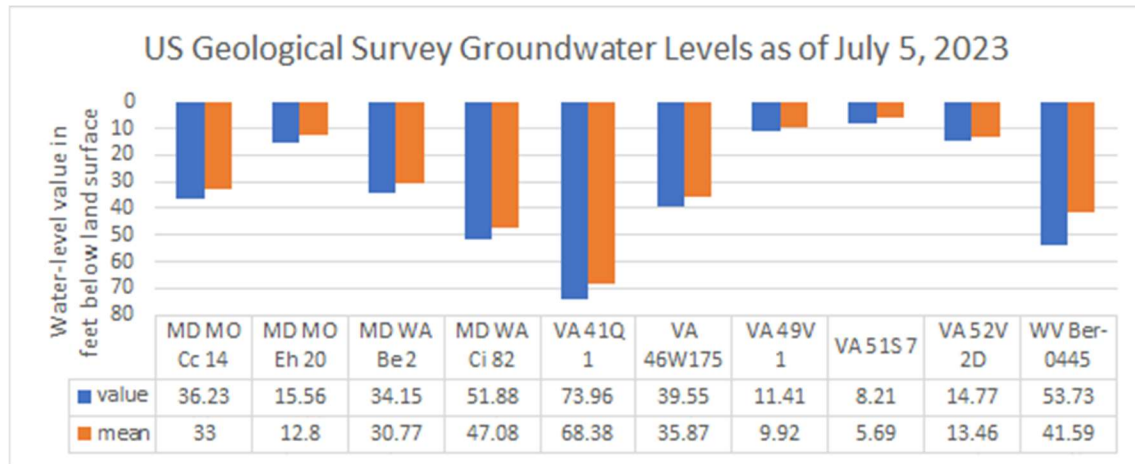
Source: https://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php



Groundwater – Current Conditions

Based on data from the U.S. Geological Survey (USGS), the depth to groundwater level (measured in feet) for ten wells used in the ICPRB water supply outlook probability of low flows indicate below normal depths, as can be seen in the comparison plot (graph shown below) of current values and estimated monthly means for June. The National Water Dashboard provides a larger data set of 42 stations within the geographic extent (37.8834, -79.7103), (40.2445, -76.1955). Of these, 21.4% of wells are considered "Normal," with water levels falling between the 25th and 75th percentiles of historical records; 4.8% of wells are categorized as "Below Normal," with water levels between the 10th and 24th percentiles; 11.9% of wells are classified as "Much Below Normal," with water levels below the 10th percentile; and 2.4% are at an all-time low for this day-of-year. Additionally, about 19.0% of wells are experiencing an increase in water levels, while 50.0% are experiencing a decrease in water levels.

Source: <https://dashboard.waterdata.usgs.gov/>



Reservoir Storage – Current Conditions

The CO-OP shared system has not released any water supply storage this year. Due to ongoing sediment removal efforts, the Patuxent reservoirs' combined storage level is below normal. On Sunday, July 2, 2023, the second whitewater recreational release for 2023 occurred at the Savage River Dam, with a scheduled release of 1,000 cubic feet per second (cfs) from 10 AM to 4 PM. The public website, <https://www.nab-wc.usace.army.mil/nab/northBranch.html>, displays the 2023 release schedule for Jennings Randolph Lake and Savage River Dam and three-day projections for release rates.

Reservoir storage as of July 3, 2023

| Facility | Percent Full | Current usable storage, BG | Total usable capacity, BG |
|-------------------------------------------------|--------------|----------------------------|---------------------------|
| WSSC Water's Patuxent reservoirs ¹ | 25 | 2.66 | 10.5 |
| Fairfax Water's Occoquan Reservoir ² | 100 | 8.05 | 8.05 |
| Little Seneca Reservoir ³ | 100 | 3.86 | 3.87 |
| Jennings Randolph water supply ⁴ | 100 | 13.1 | 13.1 |
| Jennings Randolph water quality ⁴ | 85 | 13.9 | 16.3 |
| Savage Reservoir ⁵ | 76 | 4.8 | 6.3 |

¹ Bathymetric study conducted December 2015 with revisions in December 2016, and unusable storage corrected June 2017. Note that 1.37 BG is not considered usable capacity because it is reserved for storm inflow (T. Supply, personal communication, August 3, 2018).

² Bathymetric study conducted in 2020.

³ Usable capacity consistent with Ortt, *et al.* (2011).

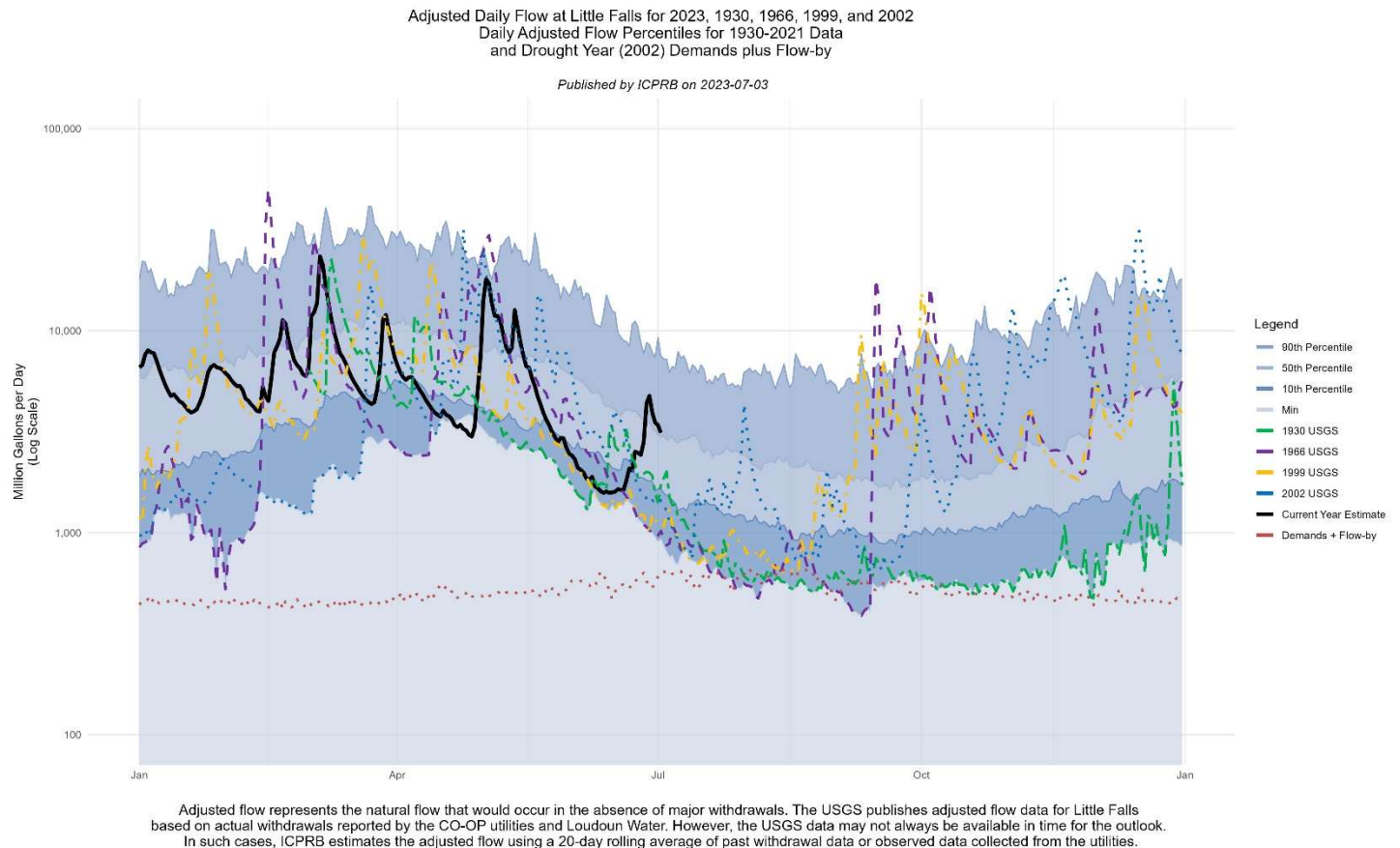
⁴ 2013 revised stage-storage curve provided by Bill Haines, US Army Corps of Engineers, Baltimore District.

⁵ 1998 revised stage-storage curve provided by Bill Haines, US Army Corps of Engineers, Baltimore District.

Potomac River Flow

The estimated adjusted Potomac flow at Little Falls on July 1 was 3.41 billion gallons per day (BGD). For this day of the year, this value was above the 50th percentile flow value of 3.06 BGD and below the 90th percentile flow value of 9.24 BGD. Adjusted flow, shown in the figure below, is the flow that would occur in the absence of major Washington metropolitan area withdrawals but includes releases from upstream reservoirs. Adjusted flow averaged 5.93 BGD for the past six months and 2.23 BGD in June.

Source: https://waterdata.usgs.gov/md/nwis/dv?referred_module=sw&site_no=01646502,
https://waterwatch.usgs.gov/index.php?mt=real&st=potomac&usst=&ushuc=&go=GO&id=wwlmap_viewer



Little Falls flow statistics are based on the 1930-2021 USGS published gage flow, "USGS 01646502 POTOMAC RIVER (ADJUSTED) NEAR WASH, DC". To create this flow record, the USGS has added historical water supply withdrawals from the Potomac as reported by the U.S. Army Corps of Engineers, Washington Suburban Sanitary Commission, Fairfax Water, city of Rockville, and Loudoun Water to the Little Falls gage flow record.

Environmental Flow-by

The average observed Potomac flow at Little Falls in June was well above the minimum recommendation of 100 MGD.

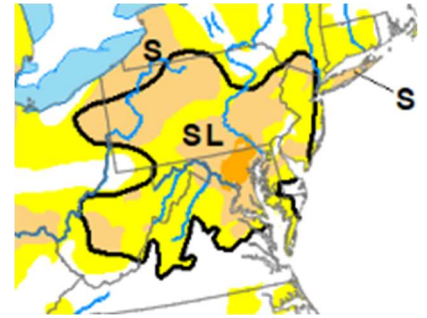
Drought Status

As of June 30, there is a drought watch in Maryland's Western and Central regions. In Virginia, as of June 15, the Task Force recommends a drought watch for Northern Virginia and Northern Coastal Plain while maintaining a drought watch for the Eastern Shore, Shenandoah, and Northern Piedmont regions. Pennsylvania has been in a drought watch since June 15. On June 5, the Metropolitan Washington Council of Governments (MWCOG) reported that the current drought stage is normal according to their water supply and drought response plan.

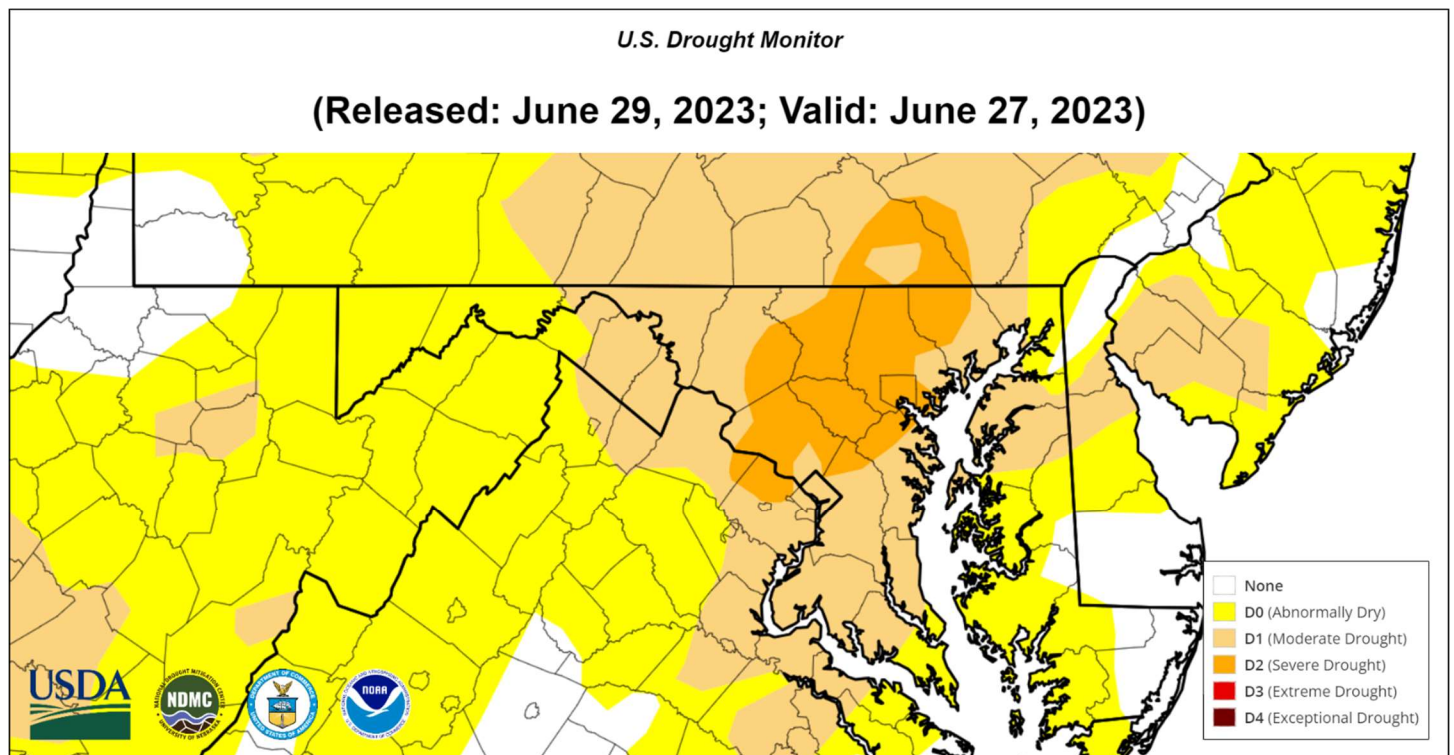
Sources: <https://mde.maryland.gov/programs/Water/droughtinformation/Currentconditions/Pages/index.aspx>,
<https://www.deq.virginia.gov/our-programs/water/water-quantity/drought>,
<https://www.deq.virginia.gov/Home/Components/News/News/193/16>,
<https://www.dep.pa.gov/Business/Water/PlanningConservation/Drought/Pages/default.aspx>,
<https://www.mwcog.org/documents/2022/05/02/regional-drought-and-water-supply-status--drinking-water-drought-wise-water-use-campaign/>

Drought Monitor and Soil Moisture

The map provided by the NOAA Climate Prediction Center's U.S. Drought Monitor (refer to the first figure below) indicates the presence of abnormally dry (D0) to severe drought (D2) conditions in the Potomac basin. It is worth noting that severe drought (D2) conditions have emerged in the area north of Washington, D.C., extending towards Baltimore and into Pennsylvania. Furthermore, moderate drought (D1) has expanded across Maryland and Pennsylvania. In the figure to the right, the Potomac basin is labeled as "SL," representing "S" for short-term impacts (usually affecting agriculture and grasslands for less than 6 months) and "L" for long-term impacts (typically impacting hydrology and ecology for more than 6 months). Additionally, the Palmer Drought Severity Index by Division map (refer to the second figure on the following page) illustrates the occurrence of moderate to extreme drought conditions in various parts of the basin.



Sources: <https://droughtmonitor.unl.edu/CurrentMap.aspx>,
https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif



Drought Severity Index by Division
Weekly Value for Period Ending JUL 1, 2023
Long Term Palmer

