

Water Supply Outlook

August 3, 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 Washington metropolitan area's backup water supply reservoirs for the 2023 summer and fall seasons. These releases are typically prompted by low flows resulting from a combination of insufficient summer precipitation and low groundwater levels. July's average precipitation in the Potomac Basin was 0.4 inches below normal. Although recent rainfall improved conditions reported in the U.S. Seasonal Outlook and the U.S. Drought Monitor, on July 28th, CO-OP resumed daily drought monitoring. Presently, the Potomac River flow at the U.S. Geological Survey's gage in Point of Rocks, Maryland, remains below CO-OP's daily monitoring trigger of 2,000 cubic feet per second (cfs). The basin is also experiencing a long-term cumulative precipitation deficit of approximately 6.4 inches below normal (11 to 12 percent below normal). As a result, the adjusted stream flow at Little Falls remains below normal but remains above the 10th percentile, while groundwater monitoring wells used in the outlook indicate below-normal levels. Despite the current conditions, the Potomac River's flow is adequate to meet the water demands of the Washington metropolitan area without requiring releases from upstream reservoirs. Thanks to well-designed drought-contingency plans, the area is well-prepared to handle further reductions in flow.

ICPRB's Low-Flow Outlook

There is a 15 to 38 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 current conditions. The 15 to 38 percent conditional probability compares to the 7 to 15 percent historical probability and is considered the more reliable indicator.

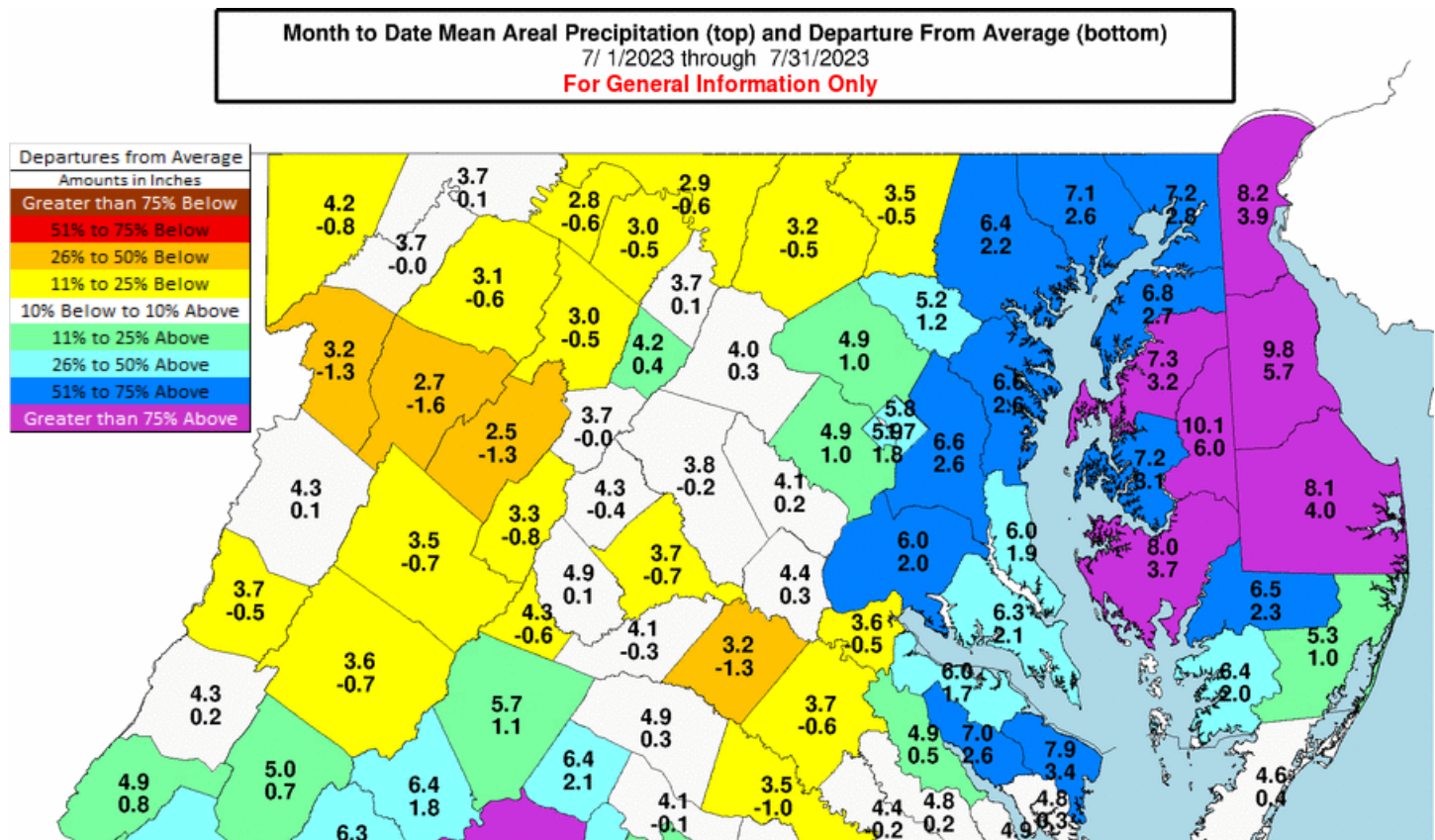
Outlook for natural Potomac River flow at Little Falls – Watershed conditions as of August 2, 2023

<i>Low flow threshold (MGD)</i>	<i>Low flow threshold (cfs)</i>	<i>Historical probability of lower flow August 1 through December 31</i>	<i>Conditional probability of lower flow August 1 through December 31</i>
1200	1858	67%	94%
1000	1548	47%	80%
800	1238	24%	57%
700	1084	15%	38%
600	929	7%	15%

Past Precipitation

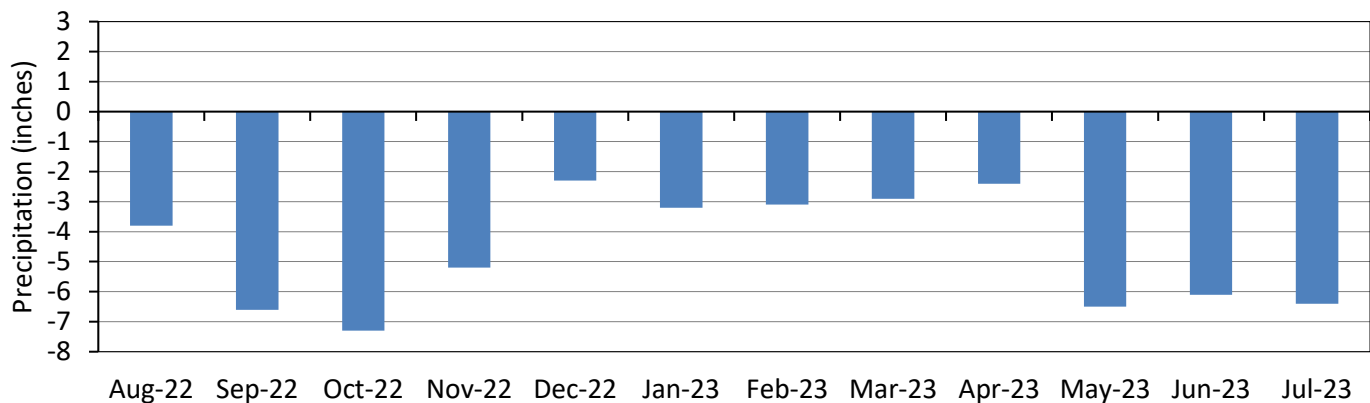
Data from the National Weather Service's Middle Atlantic River Forecast Center (MARFC) shows that the Potomac basin upstream of Washington, D.C., has received 3.5 inches of precipitation for July, 0.4 inches below normal. The 12-month departure from average is 6.4 inches as of July 31, which is about 11 to 12 percent below normal for this time of year (see graph).

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



Source: Middle Atlantic River Forecast Center, National Weather Service

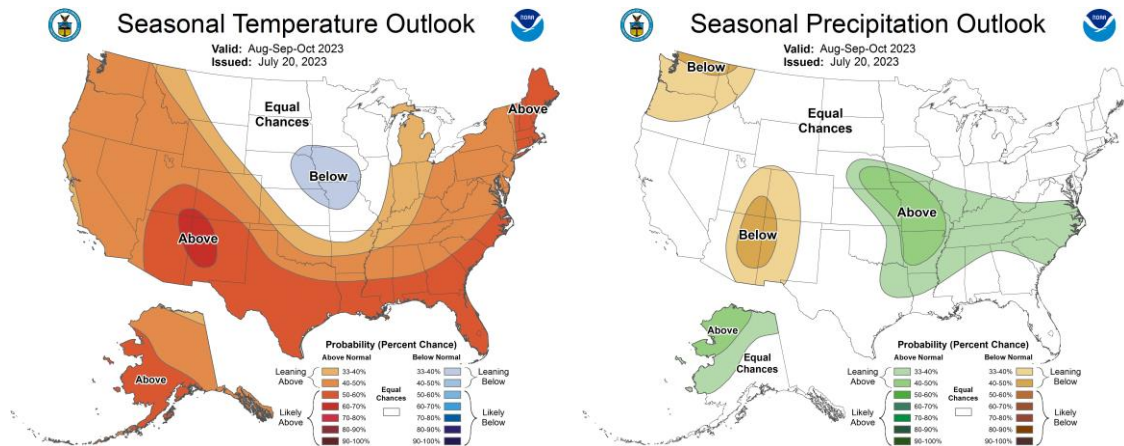
12-month cumulative departure from normal, through August 2023



Precipitation and Drought Outlook for August, September, and October

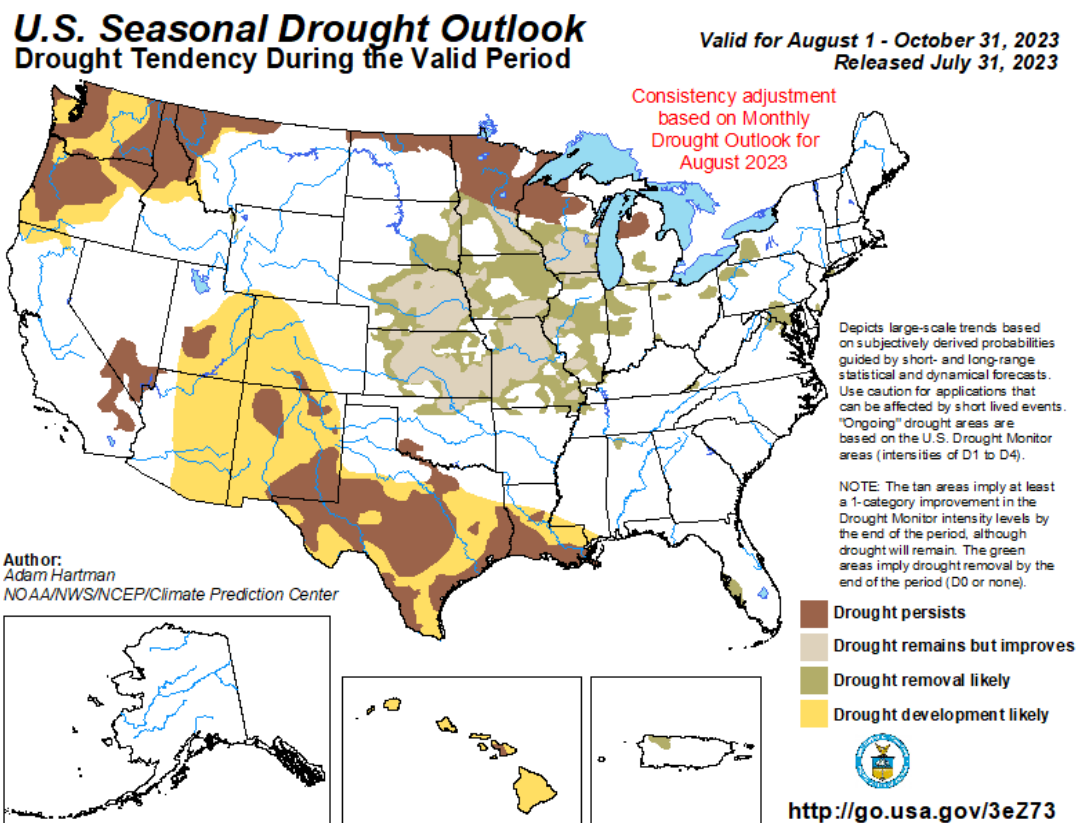
The Middle Atlantic River Forecast Center (MARFC) provides an August outlook that indicates a tendency towards normal temperatures and above-normal precipitation in the Potomac basin. Looking ahead to the next 90 days (Aug-Sep-Oct shown below), MARFC predicts above-normal temperatures and normal precipitation 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 July 31, "drought removal" in the Potomac basin is likely. The outlook of drought improvement and removal is due to the possibility of near to above-normal precipitation and daytime thunderstorm activity over the next month in the eastern third of the U.S.

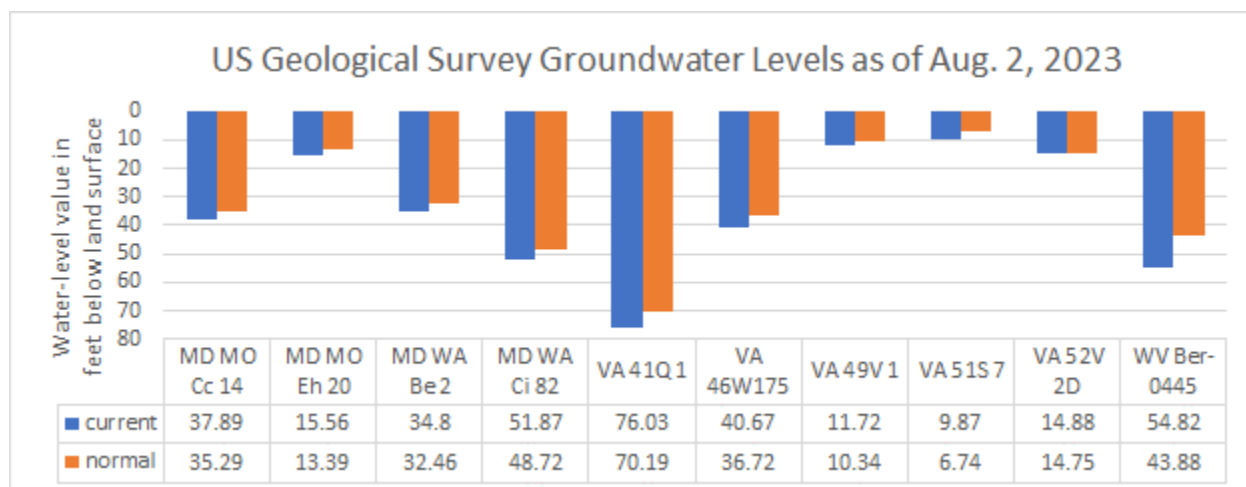
Source: https://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php



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 July. The National Water Dashboard provides a larger data set of 43 stations within the geographic extent (37.8570, -79.7129), (40.2322, -76.1902). Of these, 16.3% of wells are considered "Normal," with water levels falling between the 25th and 75th percentiles of historical records; 11.6% of wells are categorized as "Below Normal," with water levels between the 10th and 24th percentiles; 4.7% of wells are classified as "Much Below Normal," with water levels below the 10th percentile; and 7.0% are at an all-time low for this day-of-year. Additionally, about 44.2% of wells are experiencing an increase in water levels, while 14.0% 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. An artificially varied flow release from Jennings Randolph Reservoir is scheduled for Sat-Sun, 26-27 August. 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 August 2, 2023

Facility	Percent Full	Current usable storage, BG	Total usable capacity, BG
WSSC Water's Patuxent reservoirs ¹	59	6.2	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	75	12.1	16.3
Savage Reservoir ⁵	67	4.2	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).

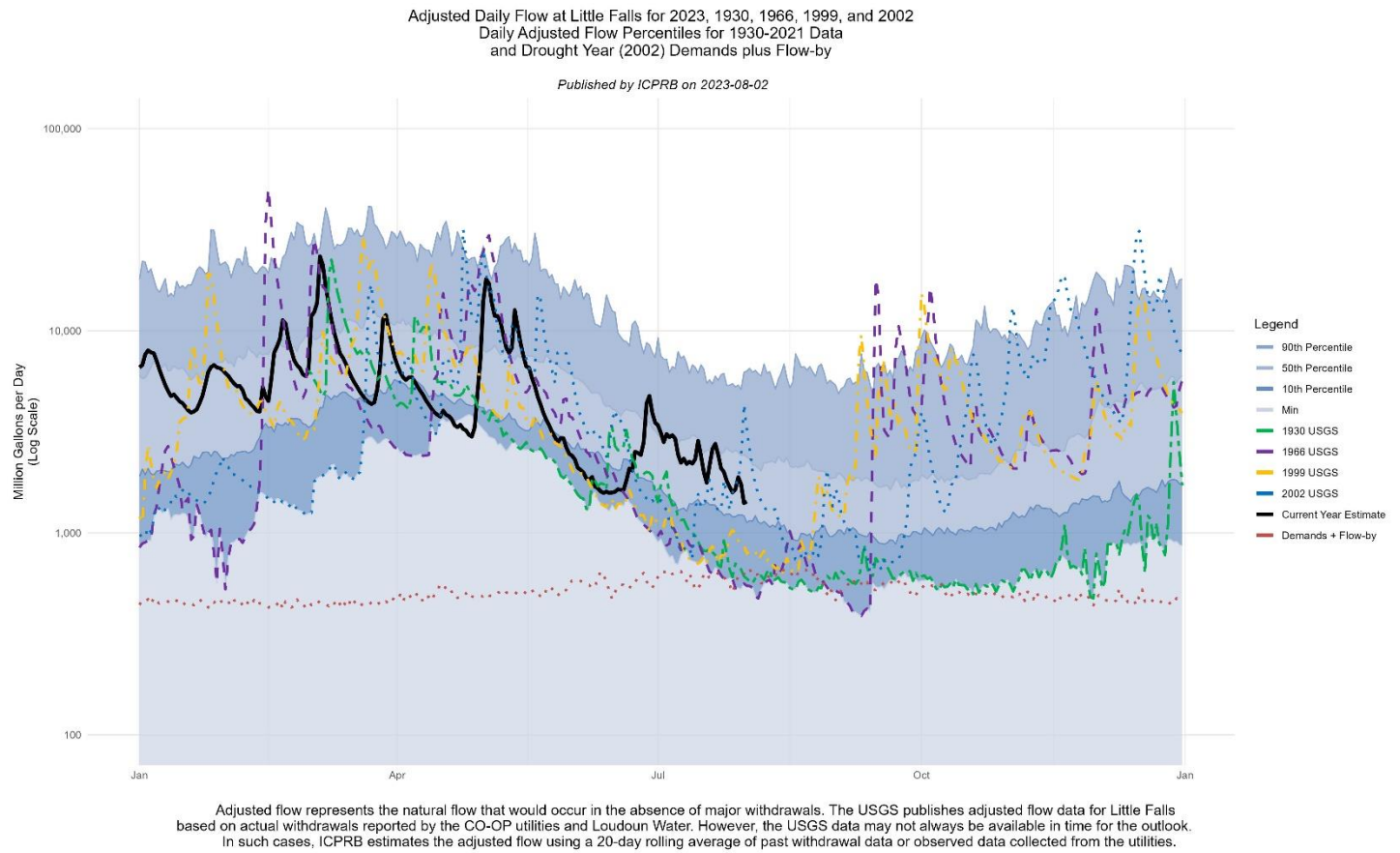
⁴ 2013 revised stage-storage curve provided by Bill Haines, US Army Corps of Engineers, Baltimore District.

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 August 1 was 1.43 billion gallons per day (BGD). For this day of the year, this value was below the 50th percentile flow value of 2.37 BGD and above the 10th percentile flow value of 1.12 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 5.39 BGD for the past seven months and 2.30 BGD in July.

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 July was well above the minimum recommendation of 100 MGD.

Drought Status

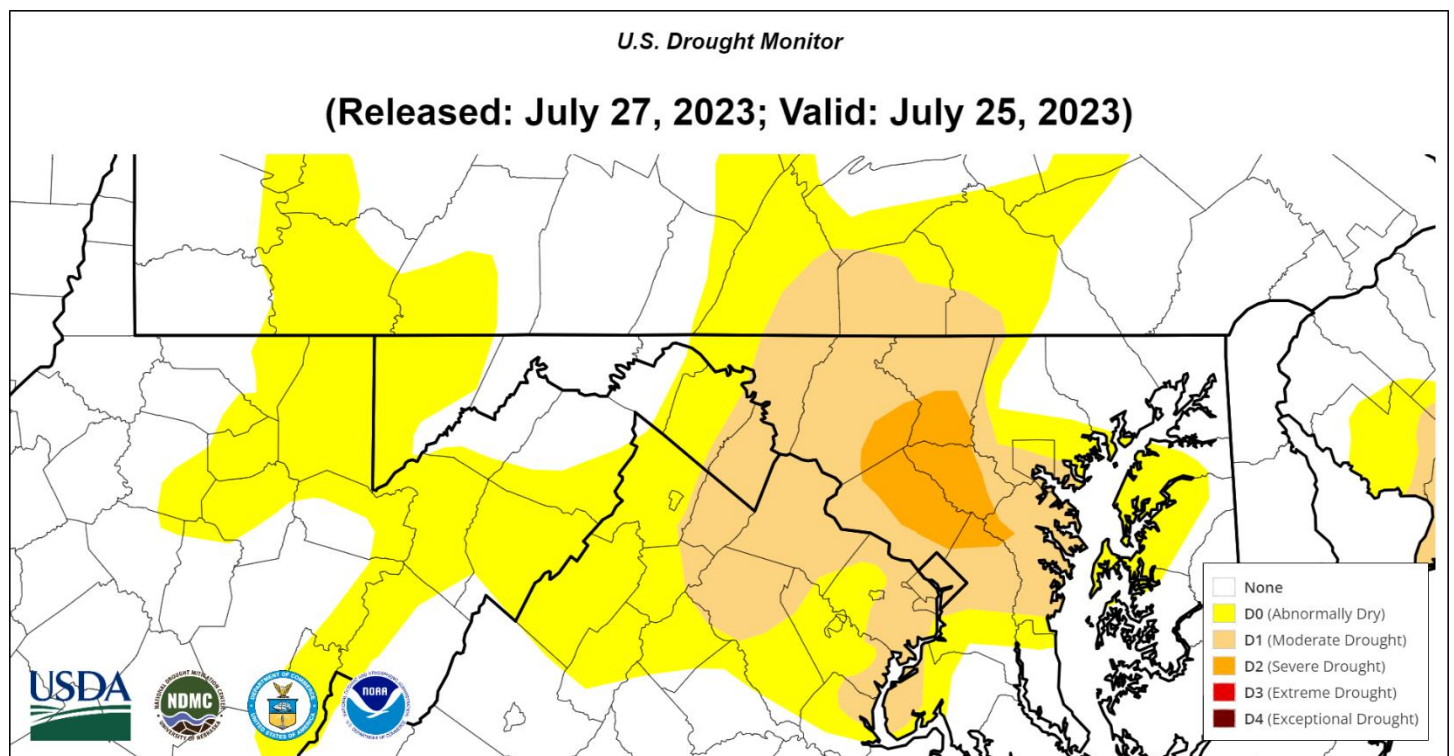
As of July 15, there is a drought watch in Maryland's Western and Central regions. As of July 20, the Virginia Task Force recommends maintaining Drought Watch within the Eastern Shore and Shenandoah regions. Virginia lifted the Drought Watch Advisory issued in June for the Northern Piedmont drought evaluation region. As of July 27, Pennsylvania updated that the statewide drought watch continues. On July 7, the Metropolitan Washington Council of Governments (MWCOC) 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/>

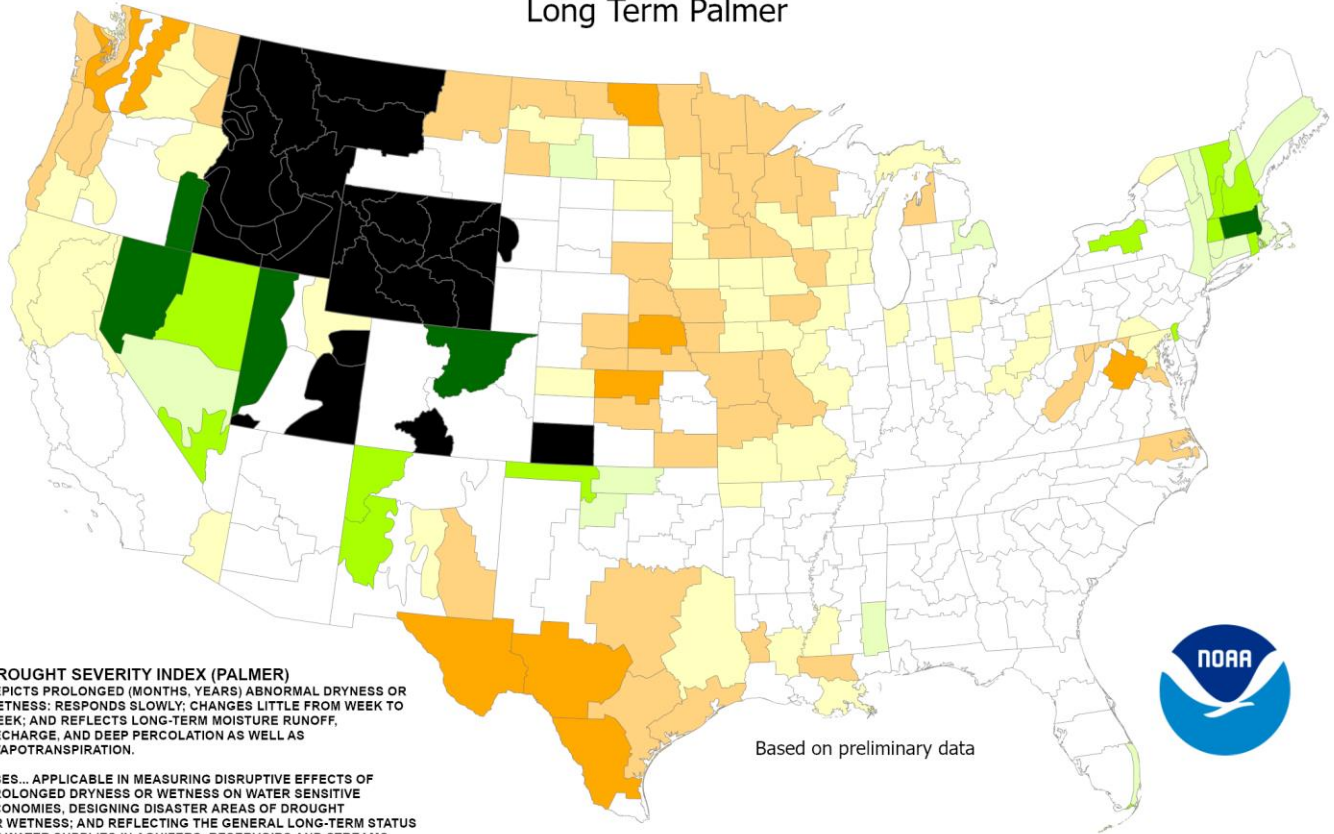
Drought Monitor and Soil Moisture

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 coverage of these drought conditions has shrunk since the July water supply outlook. 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 29, 2023 Long Term Palmer



DROUGHT SEVERITY INDEX (PALMER)

DEPICTS PROLONGED (MONTHS, YEARS) ABNORMAL DRYNESS OR WETNESS; RESPONDS SLOWLY; CHANGES LITTLE FROM WEEK TO WEEK; AND REFLECTS LONG-TERM MOISTURE RUNOFF, RECHARGE, AND DEEP PERCOLATION AS WELL AS EVAPOTRANSPIRATION.

USES... APPLICABLE IN MEASURING DISRUPTIVE EFFECTS OF PROLONGED DRYNESS OR WETNESS ON WATER SENSITIVE ECONOMIES, DESIGNING DISASTER AREAS OF DROUGHT OR WETNESS; AND REFLECTING THE GENERAL LONG-TERM STATUS OF WATER SUPPLIES IN AQUIFERS, RESERVOIRS AND STREAMS.

LIMITATIONS... IS NOT GENERALLY INDICATIVE OF SHORT-TERM (FEW WEEKS) STATUS OF DROUGHT OR WETNESS SUCH AS FREQUENTLY AFFECTS CROPS AND FIELD OPERATIONS (THIS IS INDICATED BY THE CROP MOISTURE INDEX).

Based on preliminary data

- | | |
|-----------------------------------|--------------------------------------|
| ■ -4.0 or less (Extreme Drought) | ■ +2.0 to +2.9 (Unusual Moist Spell) |
| ■ -3.0 to -3.9 (Severe Drought) | ■ +3.0 to +3.9 (Very Moist Spell) |
| ■ -2.0 to -2.9 (Moderate Drought) | ■ +4.0 and above (Extremely Moist) |
| ■ -1.9 to +1.9 (Near Normal) | ■ Missing/Incomplete |