Water Supply Outlook

August 30, 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 a much 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. August's average Potomac Basin precipitation was 0.8 inches below normal as of the 29th, with a long-term (12-month) cumulative deficit of about 7.1 inches (11 to 25 percent below normal). Consequently, Little Falls' adjusted stream flow remains below average yet above the historical minimum, and groundwater monitoring indicates below-normal levels. Presently, the Potomac River observed flow at Little Falls Dam, Washington D.C., is at 472 MGD (730 cfs), demanding close monitoring under CO-OP's declared enhanced drought operations since August 25. The Washington Aqueduct voluntarily shifted water withdrawals from Great Falls to Little Falls to ensure river environmental flows. Notably, a substantial portion of the Potomac watershed is facing D1 drought conditions per the U.S. Drought Monitor, triggering a discussion among the Metropolitan Washington Council of Governments (MWCOG) Drought Coordination Technical Committee (DCTC) to potentially initiate a "Drought Watch" stage. Despite basin conditions, the Potomac River's flows are currently 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 34 to 51 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 34 to 51 percent conditional probability compares to the 7 to 14 percent historical probability and is considered the more reliable indicator.

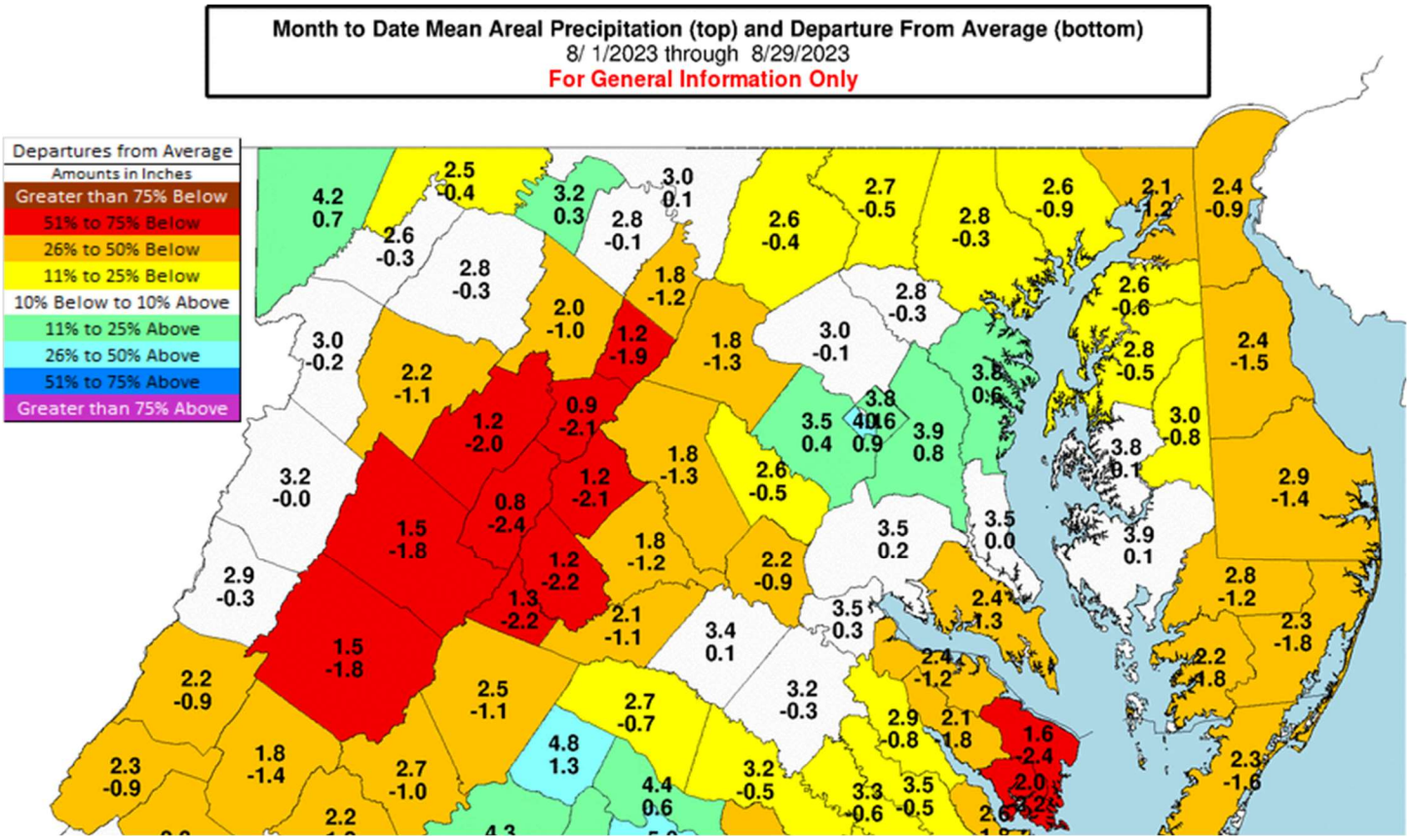
Outlook for natural Potomac River flow at Little Falls – Watershed conditions as of August 30, 2023

Low flow threshold (MGD)	*Low flow threshold (cfs)*	*Historical probability of lower flow September 1 through December 31*	*Conditional probability of lower flow September 1 through December 31*
1200	1858	64%	95%
1000	1548	45%	88%
800	1238	22%	74%
700	1084	14%	51%
600	929	7%	34%

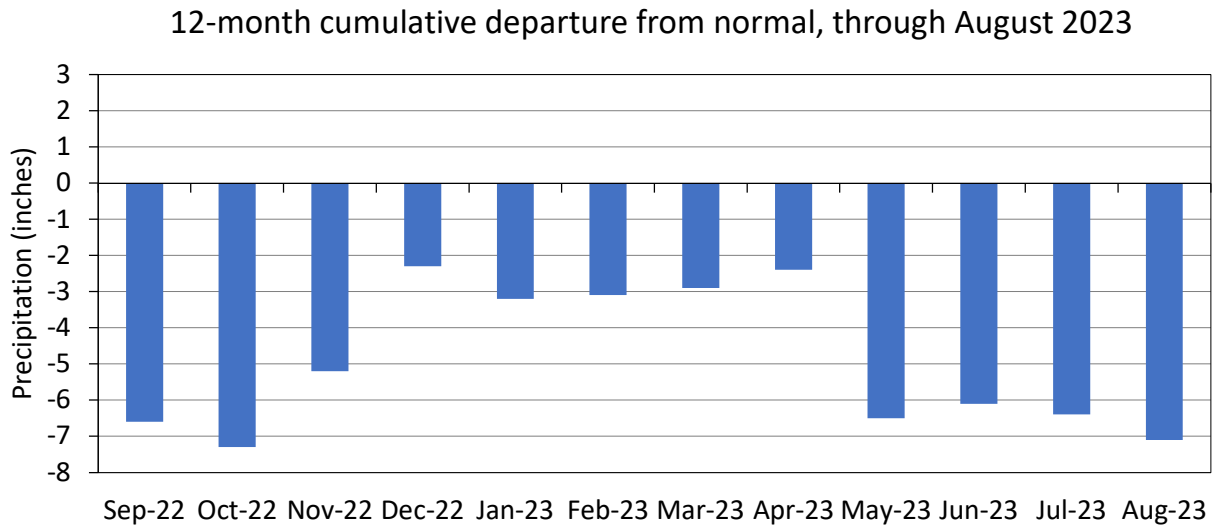
Past Precipitation

As of August 29, 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 2.3 inches of precipitation, 0.8 inches below normal. The 12-month departure from average is 7.1 inches, which is about 11 to 25 percent below normal for this time of year (see graph). Due to early publication of the outlook, the full month of August precipitation is not reported here.

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



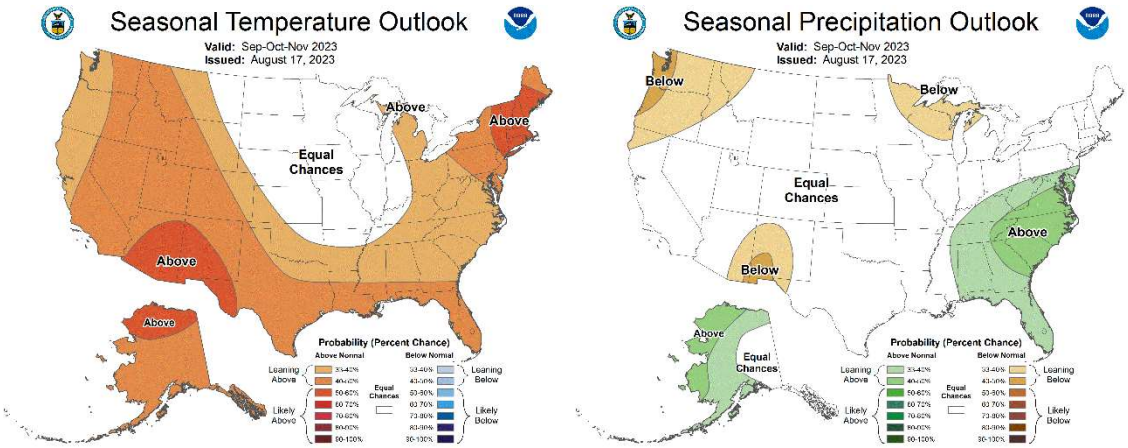
Source: Middle Atlantic River Forecast Center, National Weather Service



Precipitation and Drought Outlook for September, October, and November

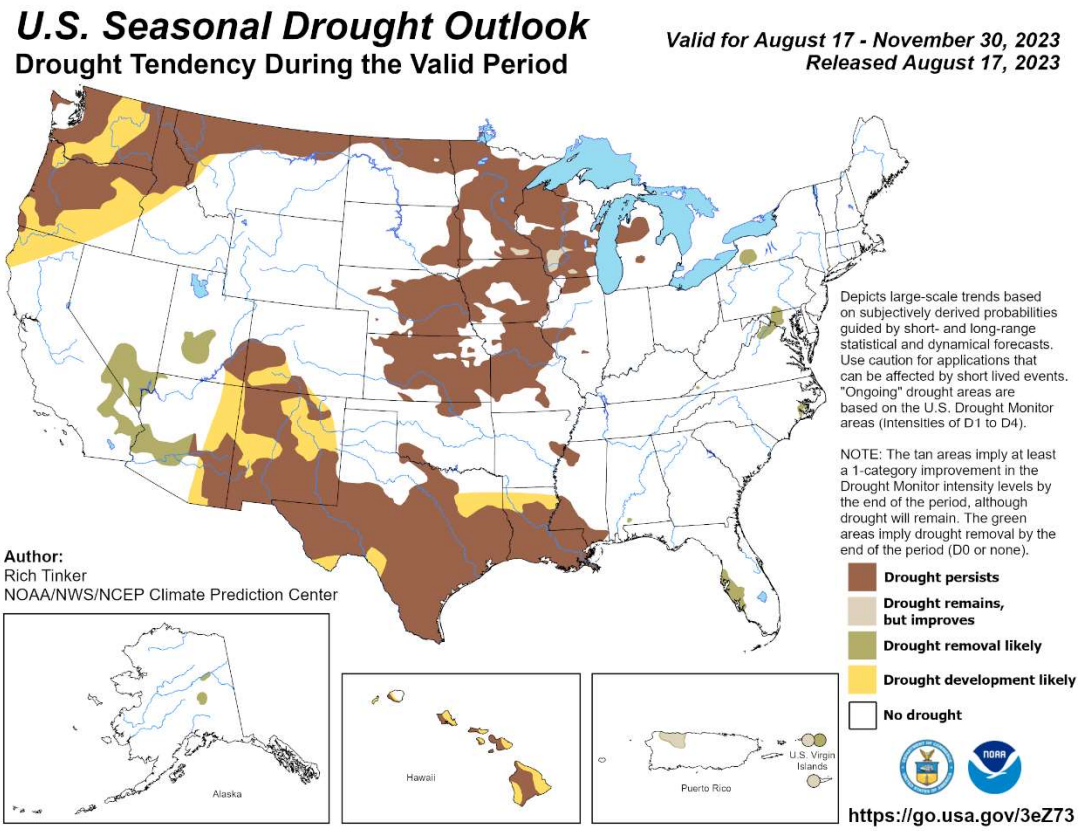
The Middle Atlantic River Forecast Center (MARFC) provides a September outlook that indicates an equal chance of above- or below-normal temperatures and above-normal precipitation in the Potomac basin. In the next 90 days (Sep-Oct-Nov shown below), MARFC predicts above-normal temperatures and above-normal 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 August 17, "drought removal" in the Potomac basin is still being reported as likely.

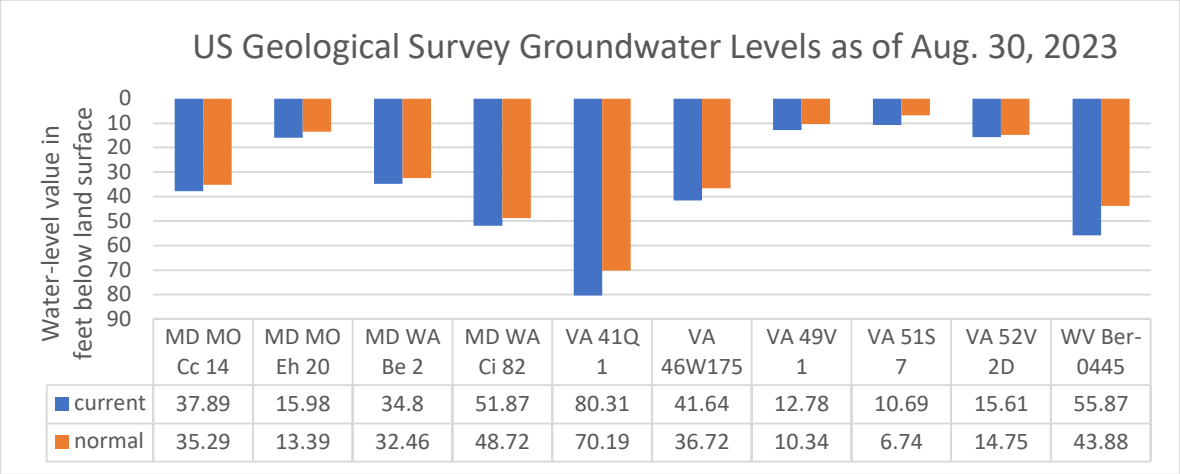
Source: https://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php



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 normal values for August. The National Water Dashboard provides a larger data set of 43 stations within the geographic extent (37.8780, -79.6979), (40.2468, -76.1954). Of these, 11.6% of wells are considered "Normal," with water levels falling between the 25th and 75th percentiles of historical records; 14.0% of wells are categorized as "Below Normal," with water levels between the 10th and 24th percentiles; 7.0% 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 18.6% of wells are experiencing an increase in water levels, while 30.2% are experiencing a decrease in water levels. Due to early publication of the outlook, some groundwater records are incomplete for the month of August.

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



	MD MO Cc 14	MD MO Eh 20	MD WA Be 2	MD WA Ci 82	VA 41Q 1	VA 46W175	VA 49V 1	VA 51S 7	VA 52V 2D	WV Ber-0445
current	37.89	15.98	34.8	51.87	80.31	41.64	12.78	10.69	15.61	55.87
normal	35.29	13.39	32.46	48.72	70.19	36.72	10.34	6.74	14.75	43.88

Reservoir Storage – Current Conditions

The CO-OP shared system has not released any water supply storage this year. An artificially varied flow release from Jennings Randolph Reservoir is scheduled for Sat-Sun, 16-17 September. A whitewater release from Savage Reservoir is scheduled for Sat, 23 September. 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 30, 2023

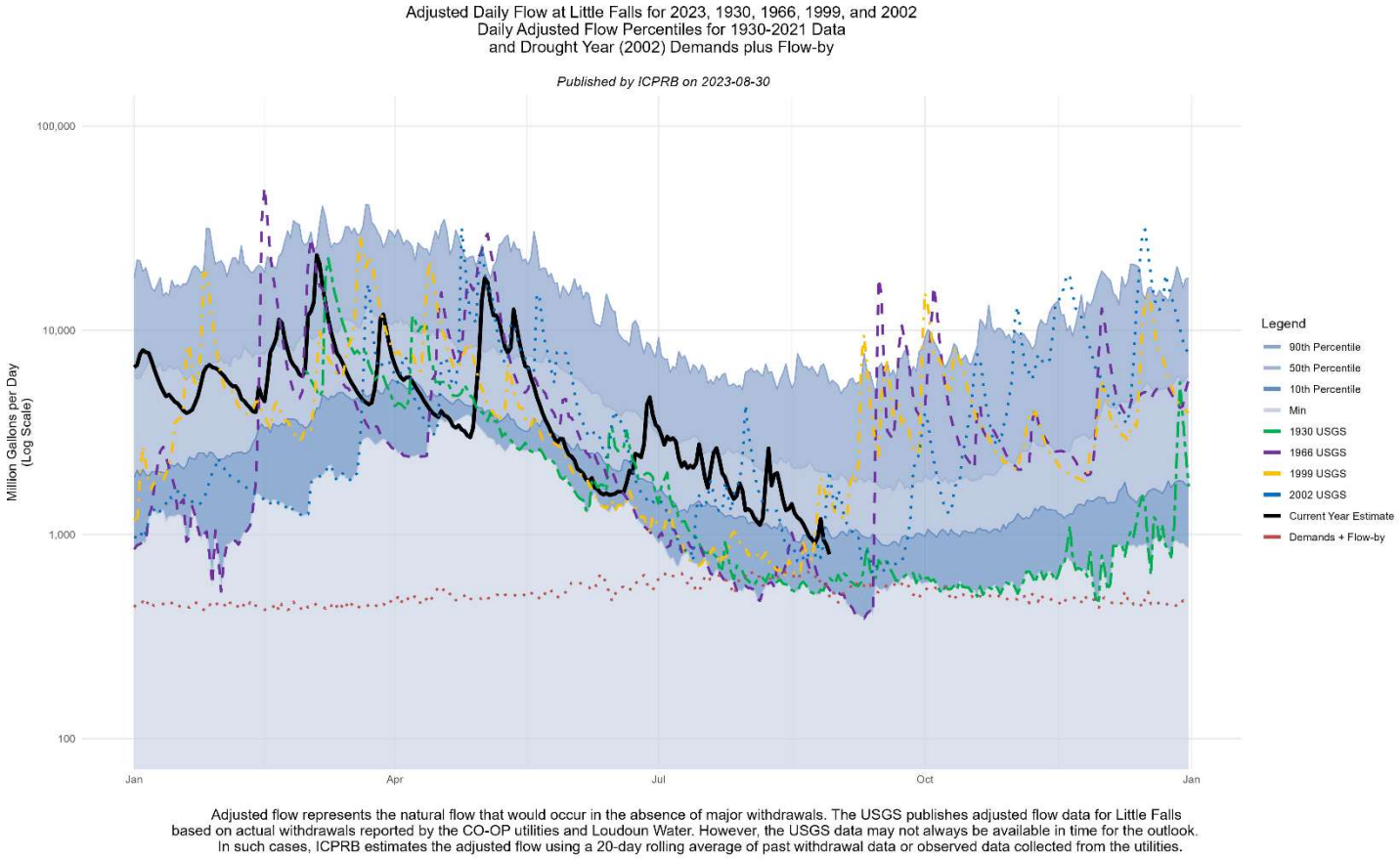
Facility	Percent Full	Current usable storage, BG	Total usable capacity, BG
WSSC Water's Patuxent reservoirs[1]	50	5.31	10.53
Fairfax Water's Occoquan Reservoir[2]	97	7.96	8.17
Little Seneca Reservoir[3]	98	3.78	3.87
Jennings Randolph water supply[4]	100	13.10	13.10
Jennings Randolph water quality[4]	62	8.93	16.30
Savage Reservoir[5]	57	3.61	6.33

[1] Values from the 2015 bathymetric study adjusted for 1.37 BG of unusable reserved storm inflow storage (T. Supply, personal communication, Aug. 3, 2018).
[2] Values from the 2020 bathymetric study adjusted for 0.33 BG of dead storage.
[3] Values from Ortt *et al.* (2011) bathymetric study.
[4] Values from the 2013 revised stage-storage curve (B. Haines, US Army Corps of Engineers, Baltimore District) adjusted for 110 ac-ft (0.04 BG) of dead storage.
[5] Values from the 1998 revised stage-storage curve (B. Haines, US Army Corps of Engineers, Baltimore District) include up to 2000 ac-ft (0.652 BG) of the Town of Westernport water supply storage.

Potomac River Flow

The estimated adjusted Potomac flow at Little Falls on August 29 was 0.80 billion gallons per day (BGD). For this day of the year, this value was below the 10th percentile flow value of 1.00 BGD and above the minimum flow value of 0.54 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 4.90 BGD for the past eight months and 1.32 BGD in August (as of the 29th).

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 August was above the environmental flow-by of 100 MGD (155 cfs).

Drought Status

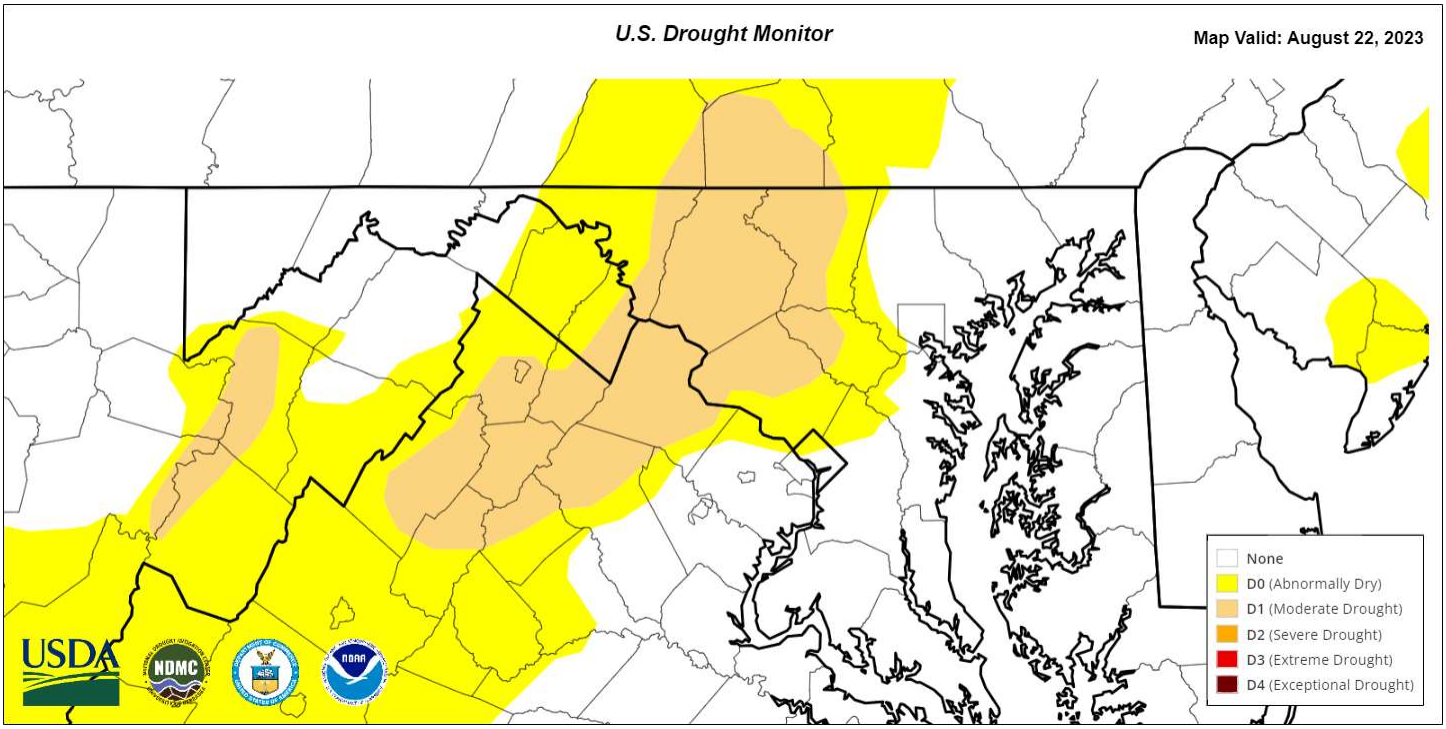
As of August 15, a drought watch continues for Maryland's Western and Central regions, while Virginia's drought condition status as of August 24 includes drought watch advisories for the Eastern Shore, Northern Virginia, and York-James drought evaluation areas, along with a drought warning advisory for the Shenandoah region. Pennsylvania currently has significant portions of the state under drought watch as of August 30. Although not obligatory, both Pennsylvania residents and non-farm businesses are being encouraged to conserve water voluntarily by reducing nonessential usage. In this regard, twenty-one Pennsylvania public water suppliers are either requesting or mandating water conservation measures within their communities. The Metropolitan Washington Council of Governments (MWCOG) presently reports a normal drought stage; however, discussions are underway within the COG Drought Coordination Technical Committee (DCTC) about potentially transitioning into a "Drought Watch" stage soon. This transition would be based on the U.S. Drought Monitor's assessment, requiring most of the Potomac watershed to be rated under D1 (or worse) drought conditions.

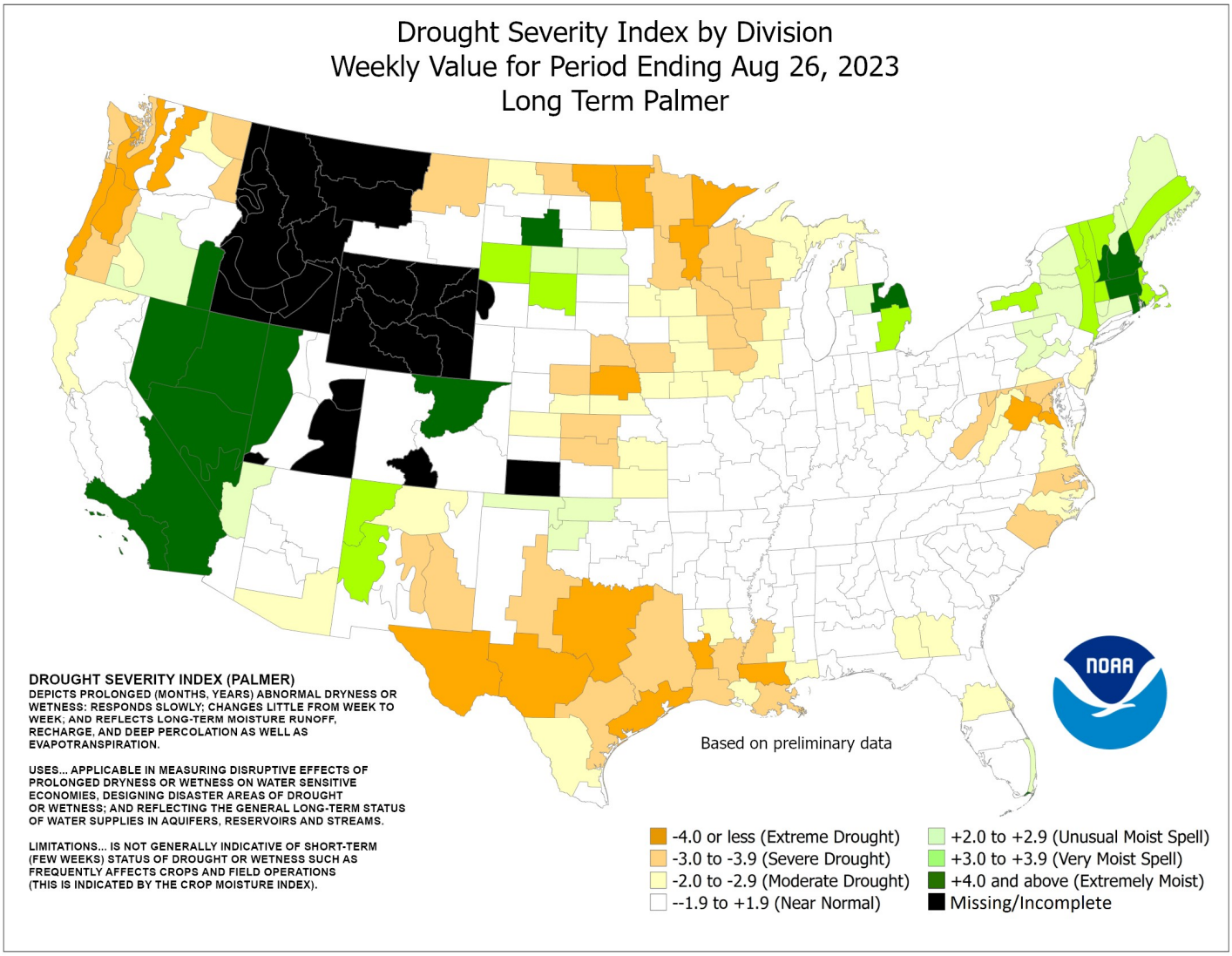
Sources: https://mde.maryland.gov/programs/Water/droughtinformation/Currentconditions/Pages/index.aspx, https://www.deq.virginia.gov/our-programs/water/water-quantity/drought, https://www.dep.pa.gov/Business/Water/PlanningConservation/Drought/Pages/default.aspx, https://www.mwcog.org/documents/2022/05/02/regional-drought-and-water-supply-status--drinking-water-d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

Drought Monitor and Soil Moisture

The NOAA Climate Prediction Center's U.S. Drought Monitor map (see first figure below) shows a significant prevalence of abnormally dry (D0) to moderate drought (D1) conditions across the Potomac basin. Furthermore, the Palmer Drought Severity Index by Division map (refer to the second figure on the next page) also shows that a substantial portion of the Potomac basin is experiencing moderate to extreme drought conditions.

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 Aug 26, 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
NOAA
-4.0 or less (Extreme Drought)
-3.0 to -3.9 (Severe Drought)
-2.0 to -2.9 (Moderate Drought)
--1.9 to +1.9 (Near Normal)
+2.0 to +2.9 (Unusual Moist Spell)
+3.0 to +3.9 (Very Moist Spell)
+4.0 and above (Extremely Moist)
Missing/Incomplete