

Water Supply Outlook

May 4, 2016

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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 the major 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 near normal probability of releases from the Washington metropolitan area's back-up water supply reservoirs for the 2016 summer and fall seasons. Generally, the use of Jennings Randolph and Little Seneca reservoirs is triggered by low flows brought about by a combination of low summer precipitation and low groundwater levels. The MARFC's Water Resource Outlook for the southern portion of the Middle Atlantic reports that precipitation in the month of April has been below normal, with a basin averaged precipitation 1.2 inches below normal. After a spell of dry weather, rainfall events in the last week of April and beginning of May have brought Potomac River flows to normal. Precipitation is expected to be normal in May. At present, there is sufficient flow in the Potomac River to meet the Washington metropolitan area's water demands without augmentation from upstream reservoirs. In the event that low-flow conditions do develop, the Washington metropolitan area is well-protected from a water supply shortage because of carefully designed drought-contingency plans.

ICPRB's Low Flow Outlook:

There is a 7 to 16 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 predicted flow is less than demand plus a required environmental flow. Drinking water demand ranges from 400 to 700 MGD during the summer months and the minimum flow-by at Little Falls is 100 MGD. Note that 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.

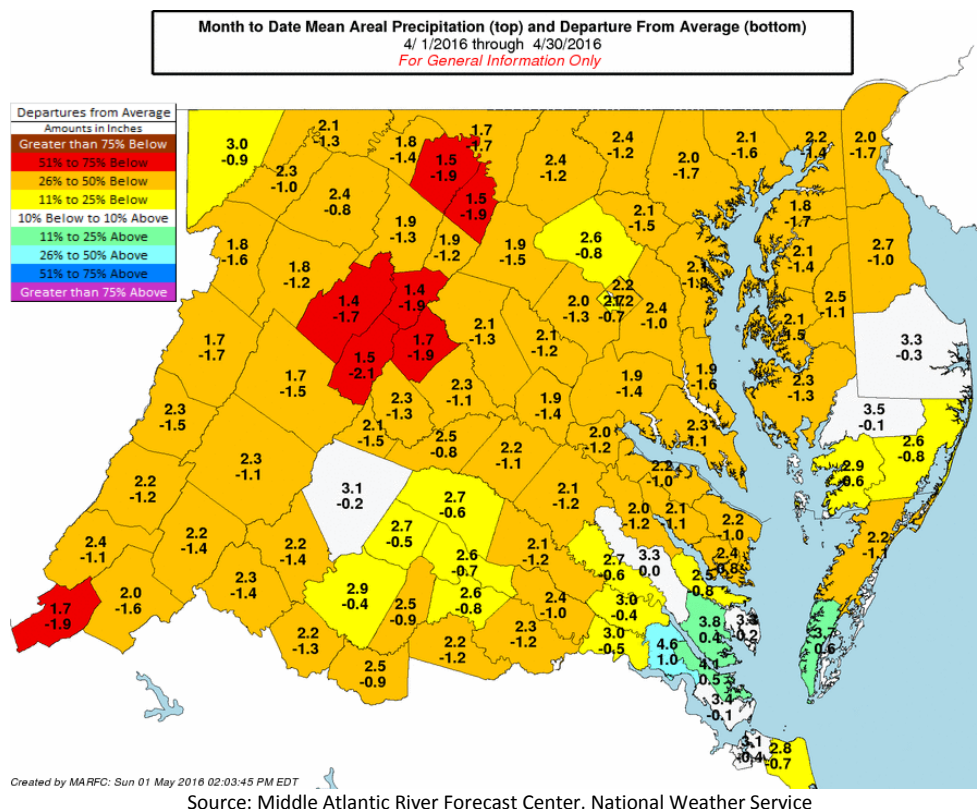
The conditional probability is estimated by analyzing the historical stream flow records and giving consideration to recent stream flow values, precipitation totals for the prior 12 months, current groundwater levels, and the current Palmer Drought Index. Past years in which watershed conditions most closely resemble current conditions are weighted more heavily in the determination of conditional probability. The historical, or unconditional, probability is based on an analysis of the historical record without weighing for current conditions. The conditional probability of 7 to 16 percent compares to a historical probability of 8 to 15 percent and is considered the more reliable indicator.

Outlook for natural Potomac River flow at Little Falls – Watershed conditions as of May 3, 2016

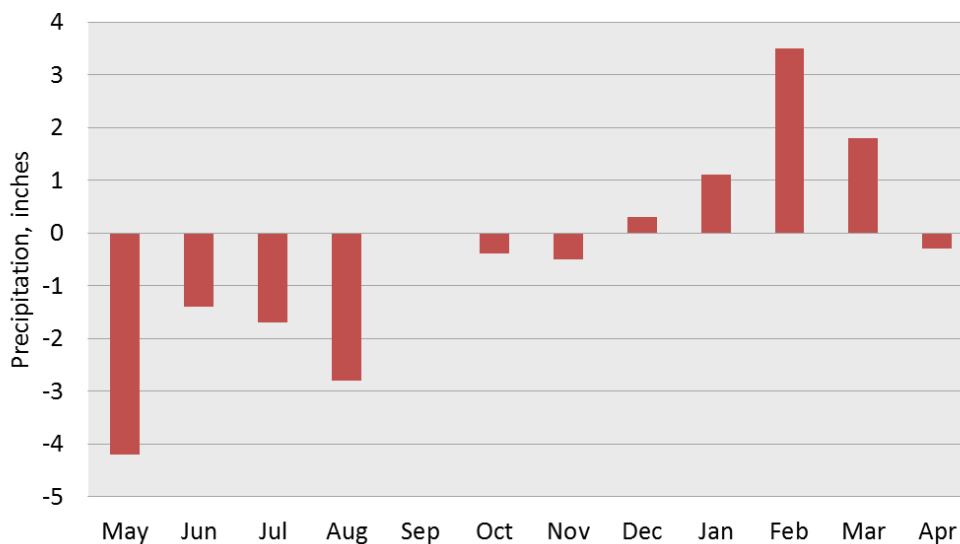
<i>Low flow threshold (MGD)</i>	<i>Low flow threshold (cfs)</i>	<i>Historical probability of lower flow May 1 through December 31</i>	<i>Conditional probability of lower flow May 1 through December 31</i>
1200	1858	68%	72%
1000	1548	49%	55%
800	1238	25%	28%
700	1084	15%	16%
600	929	8%	7%

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 a precipitation total of 2 inches for the month of April, which is 1.2 inches below normal. The map below shows that April precipitation has been 26 to 50 percent below normal across most of the Potomac basin. The 12-month cumulative basin precipitation dropped from 1.8 above normal in March to 0.3 below normal in April (see graph).

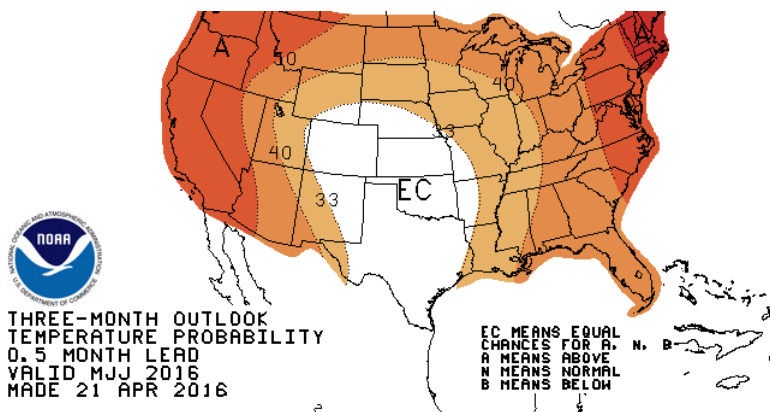


12 month cumulative departure from normal, through April 2016

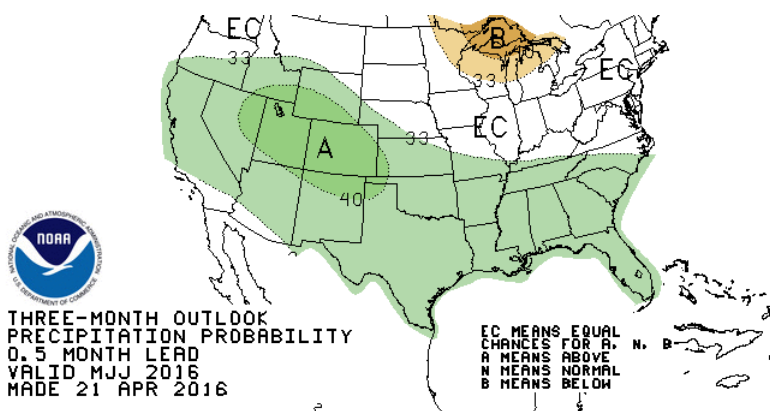


Information provided by the USGS, the Middle Atlantic River Forecast Center, and the National Weather Service.

Precipitation and Drought Outlook for May, June and July 2016:



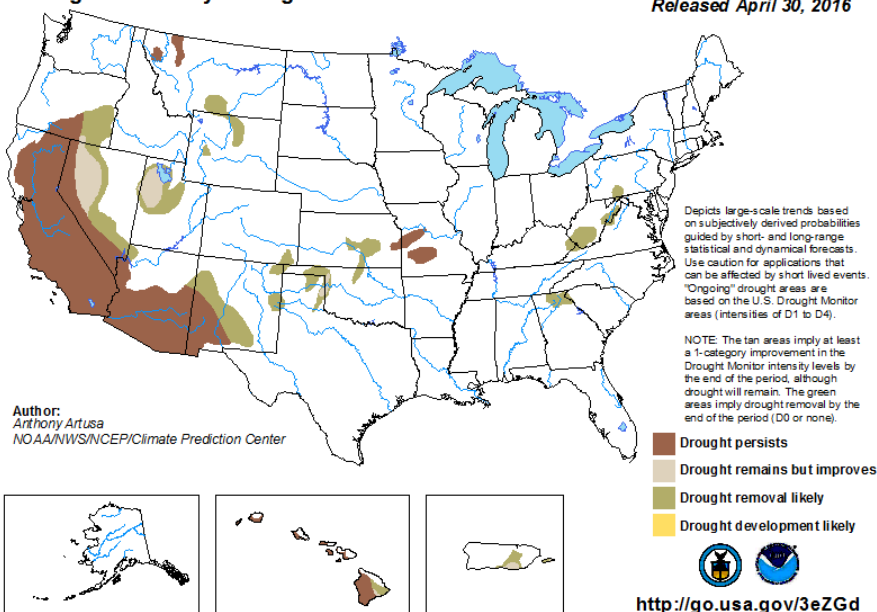
MARFC's Water Resource Outlook for the southern portion of the Middle Atlantic into early May calls for near or above average rainfall. Temperatures are expected to be mostly above normal.



The National Weather Service Climate Prediction Center's 30 day outlook for May calls for normal rainfall and above normal temperatures. The 90 day outlook for May through July also calls for normal precipitation and above normal temperature.

U.S. Monthly Drought Outlook Drought Tendency During the Valid Period

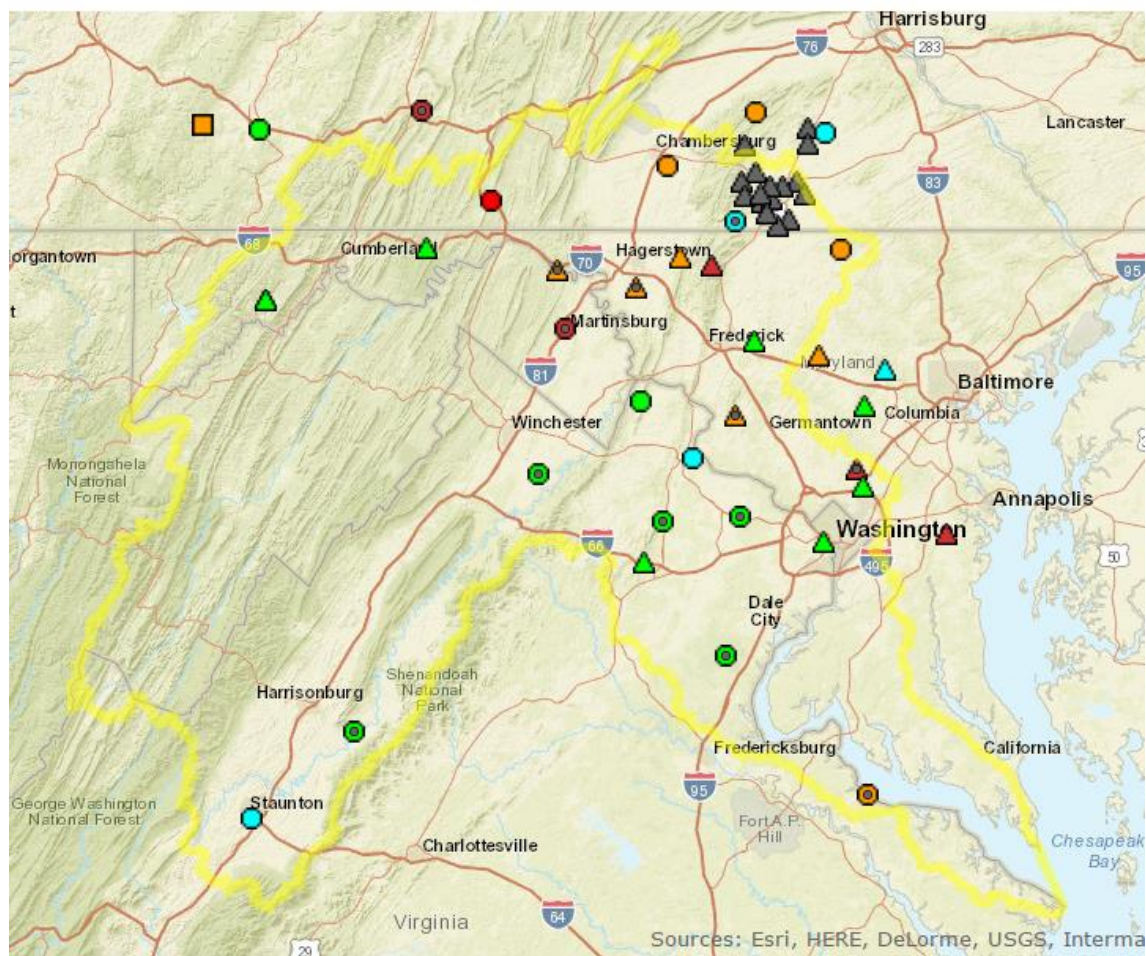
Valid for May 2016
Released April 30, 2016



As of April 30, the Climate Prediction Center's U.S. Seasonal Drought Outlook indicates that drought development is not likely for the Potomac basin.

Groundwater – Current Conditions:

MARFC's Water Resource Outlook for the southern portion of the Middle Atlantic reports that groundwater levels are generally near normal. The groundwater map below, created by the U.S. Geological Survey (USGS), Pennsylvania Water Science Center, shows that current water levels in monitoring wells in the Potomac basin range from "Much Below Normal" to "Above Normal", with most falling in the "Normal" category. In this map, the USGS defines "Normal" as between the 25th and 75th percentiles, and "Below Normal" as between the 10th and 24th percentile.



Reservoir storage as of May 3, 2016

Facility	Percent Full	Current usable storage, BG	Total usable capacity, BG
WSSC's Patuxent reservoirs	94	11.1	11.69
Fairfax Water's Occoquan Reservoir	100	8.1	8.1
Little Seneca Reservoir ¹	100	3.9	3.9
Jennings Randolph water supply ²	100	13.1	13.1
Jennings Randolph water quality ²	100	16.3	16.3
Savage Reservoir ³	87	5.5	6.3

¹ Usable capacity consistent with Ortt, *et al.* (2011).

² 2013 revised stage-storage curve provided by Bill Haines, US Army Corps of Engineers, Baltimore District.

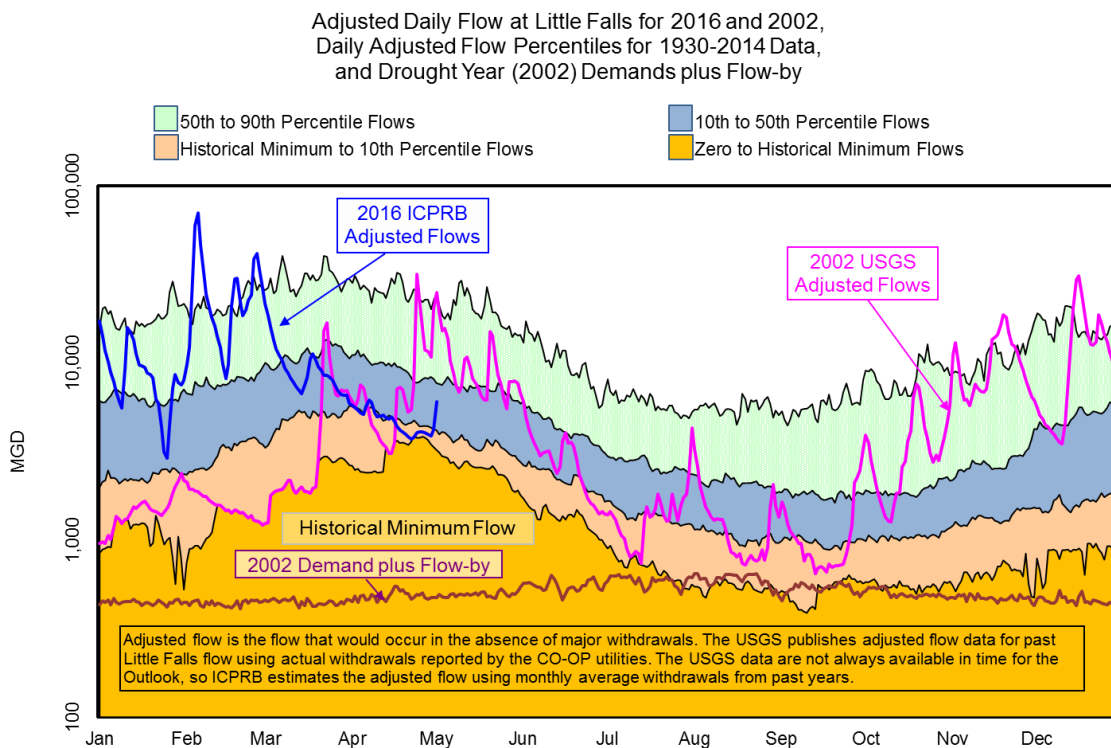
³ 1998 revised stage-storage curve provided by Bill Haines, US Army Corps of Engineers, Baltimore District.

Potomac River Flow:

The estimated adjusted Potomac flow at Little Falls on May 1 was 6.08 billion gallons per day (BGD). For this day of the year, this value was above the historical 10th percentile value of 4.17 BGD and below the 50th percentile value of 7.72 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 12.0 BGD for the first four months of the year and 4.7 BGD in April.

Environmental Flow-by:

Average observed Potomac flow at Little Falls in April was well above the minimum flow recommendation of 100 MGD.

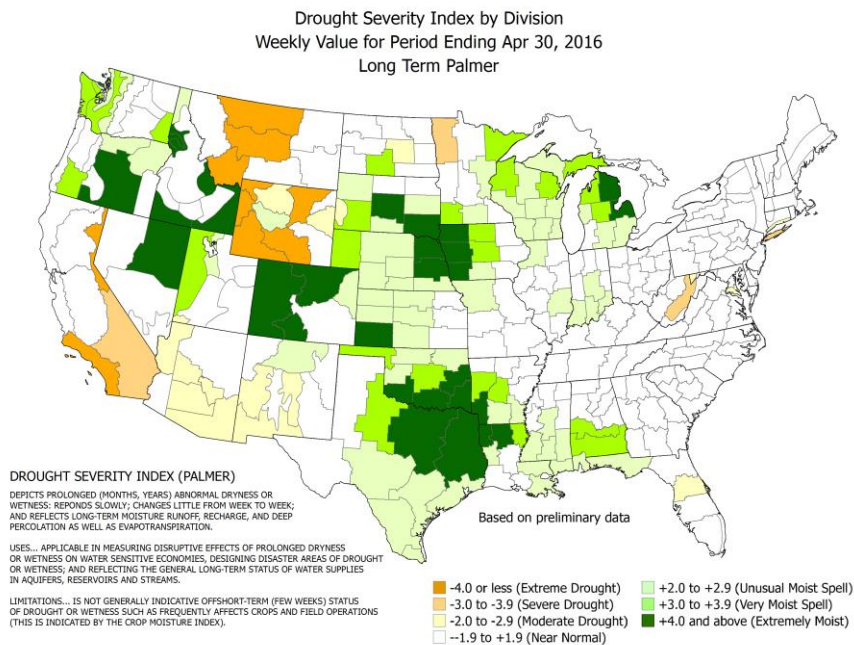
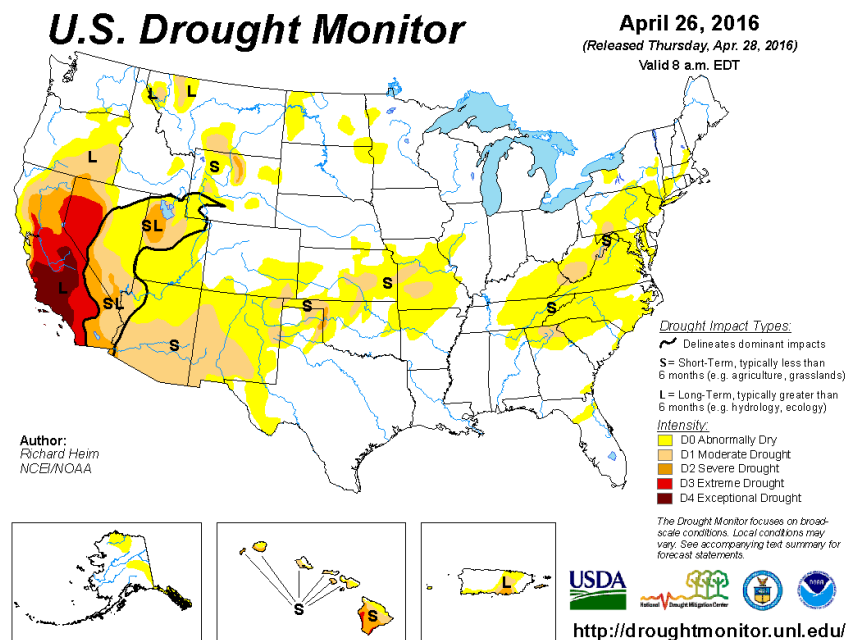


Information provided by the USGS, the Middle Atlantic River Forecast Center, and the National Weather Service.

Little Falls flow statistics are based on 1930 through 2014 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 FW, WSSC, the Aqueduct, and Rockville to the Little Falls gage flow record.

Drought Monitor and Soil Moisture:

The NOAA Climate Prediction Center's U.S. Drought Monitor map (see first figure below) indicates abnormally dry conditions for most of the Potomac basin. The Palmer Drought Severity Index by Division map (see second figure below) indicates near normal conditions in most of the basin.



Information provided by the USGS, the Middle Atlantic River Forecast Center, and the National Weather Service.