

Water Supply Outlook

September 3, 2015

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Interstate Commission on the Potomac River Basin (ICPRB)

30 W. Gude Drive, Suite 450

Rockville, MD 20850

Tel: (301) 274-8120

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 below normal probability of releases from the Washington metropolitan area's back-up water supply reservoirs for the 2015 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 August has been below normal, with a basin averaged precipitation 1.9 inches below normal. Precipitation is expected to be below normal to above normal in the next month. Low precipitation and river flow caused COOP to initiate daily monitoring and reporting of Potomac River flows and withdrawals on August 31. COOP will continue to prepare for the possibility that more serious drought conditions could develop in the upcoming weeks. 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 3 to 12 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 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. 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 3 to 12 percent compares to a historical probability of 7 to 14 percent and is considered the more reliable indicator.

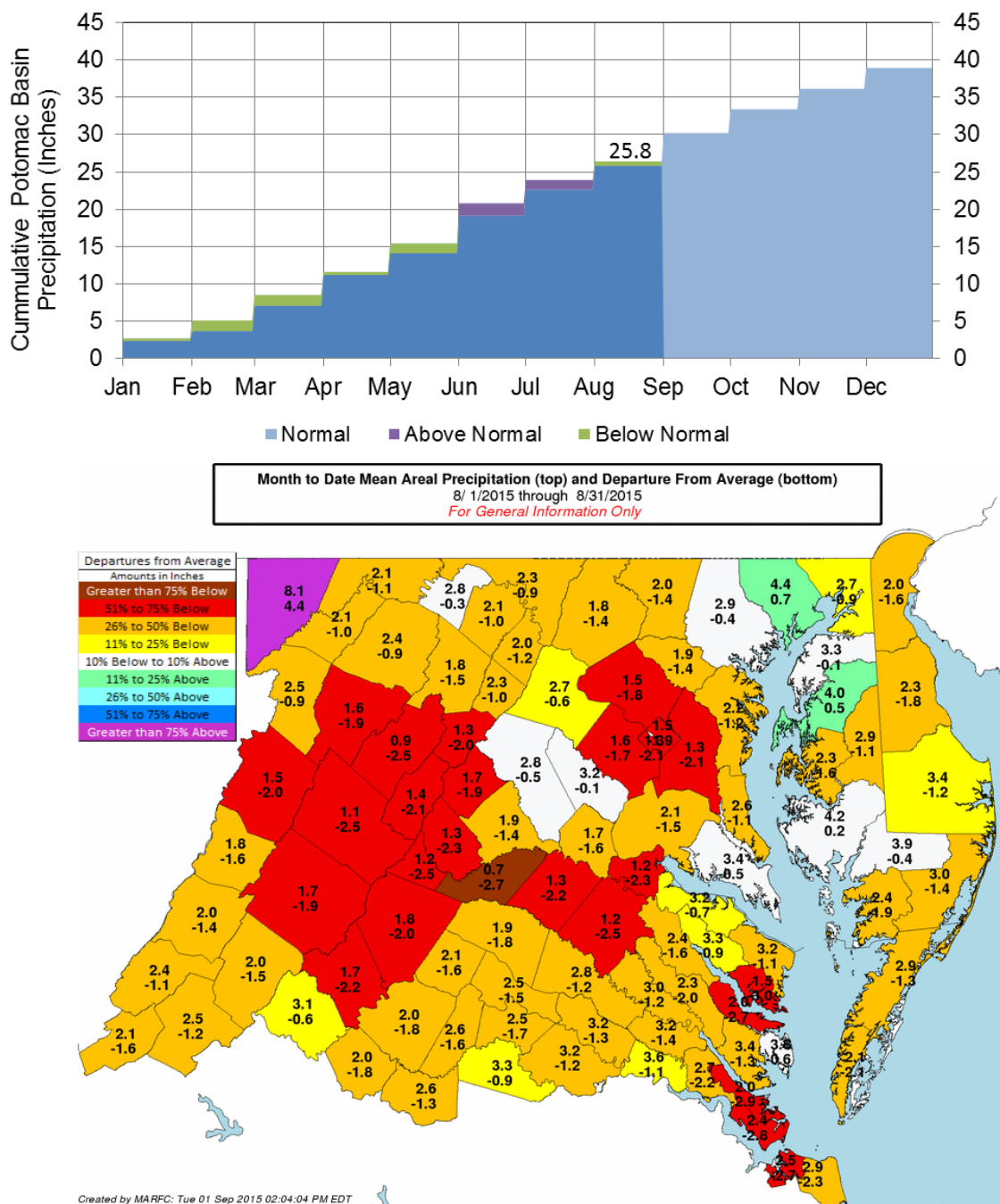
Note: Natural flow at Little Falls was slightly below the 1200 MGD on September 1. The WSO's probabilistic model uses a monthly time step and relies on data from the previous months to compute conditional probabilities for the coming months. Results shown in the last column of the table below reflect conditions as of August 31.

Outlook for natural Potomac River at Little Falls – Watershed conditions as of September 1, 2015

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%	71%
1000	1548	45%	51%
800	1238	22%	23%
700	1084	14%	12%
600	929	7%	3%

Past Precipitation:

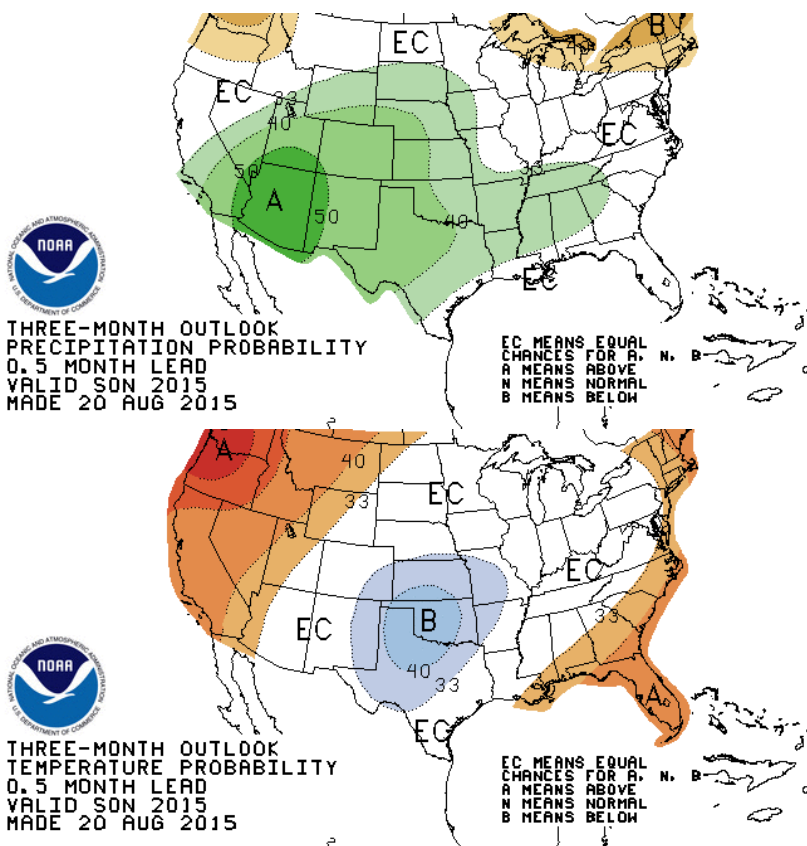
Data from the National Weather Service's Middle Atlantic River Forecast Center (MARFC) shows that the Potomac basin upstream of Washington, D.C. has received a precipitation total of 1.9 inches for the month of August, which is 1.9 inches below normal. The cumulative basin precipitation is 25.8 inches for the year to date (January 1 to August 31), which is 0.6 inches below normal (see graph). The map on the bottom of the page shows that August precipitation has been 10 to more than 75 percent below normal across the Potomac basin.



Source: Middle Atlantic River Forecast Center, National Weather Service.

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

Precipitation and Drought Outlook for September, October and November 2015:



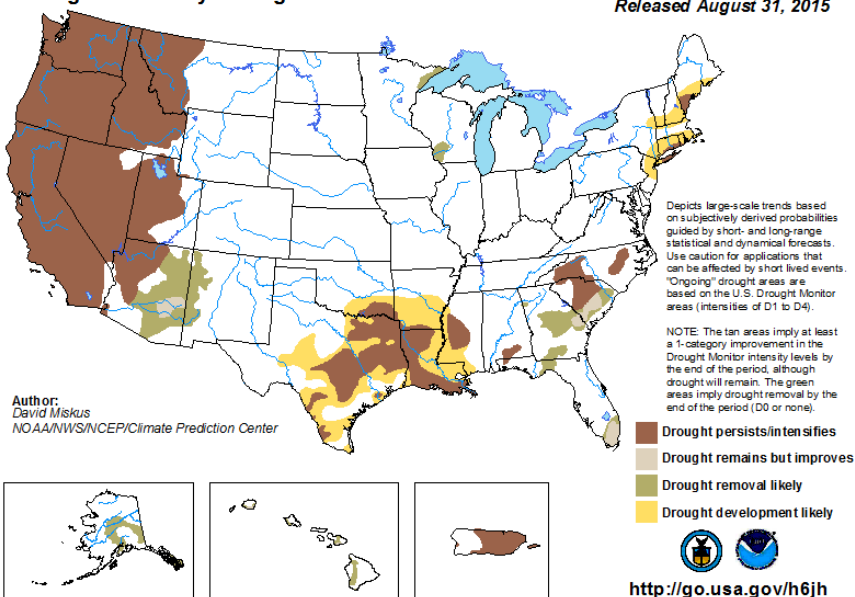
MARFC's Water Resource Outlook for the southern portion of the Middle Atlantic for the next couple of weeks calls for below normal rainfall for the beginning of the period, then above normal by the end of the outlook.

Temperatures are expected to be above or much above normal.

The NWS Climate Prediction Center's 30 day outlook for September calls for normal rainfall and above normal temperatures. The 90 day outlook for August through October calls for normal precipitation and normal temperatures.

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

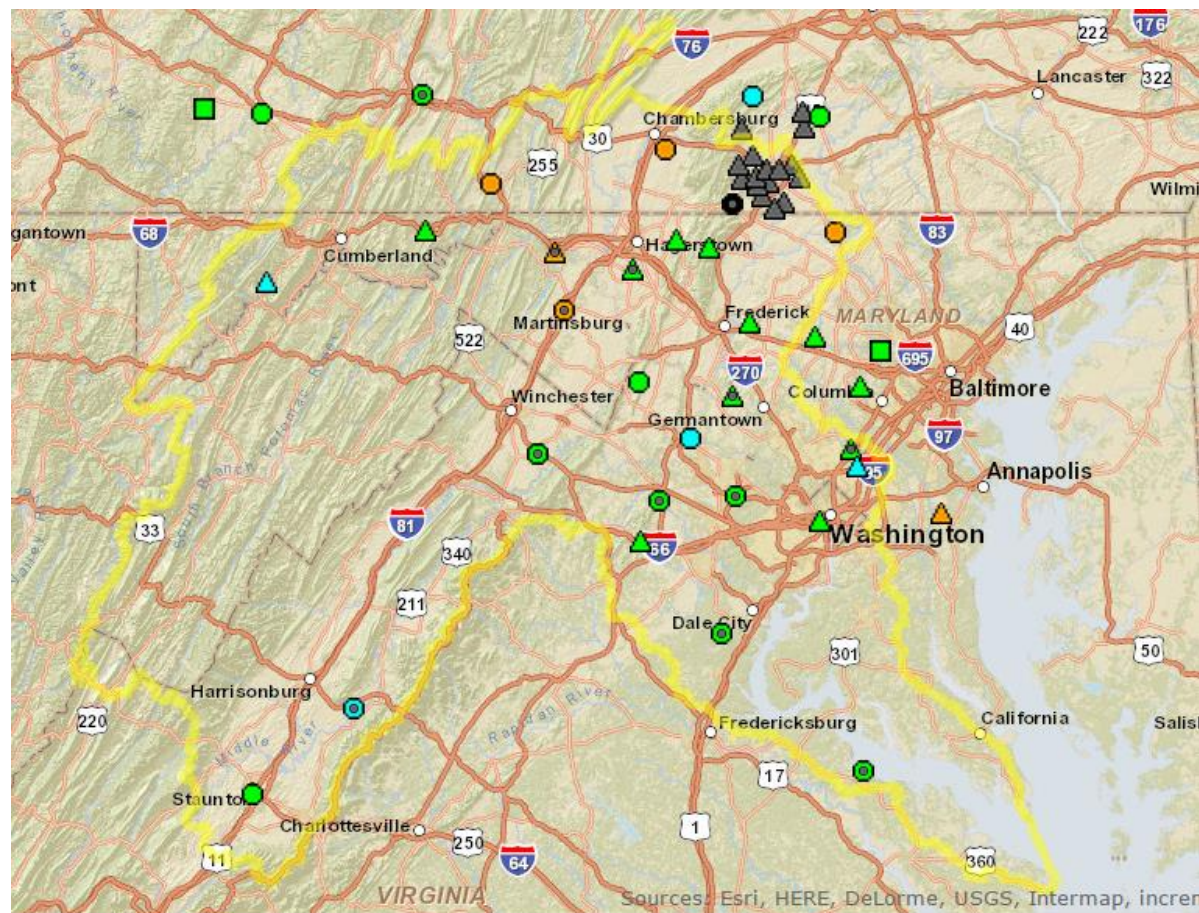
Valid for September 2015
Released August 31, 2015



As of August 31, 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 on September 3, shows that water levels in monitoring wells in the Potomac basin range from "Below Normal" to "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.



Source: Esri, HERE, DeLorme, USGS, Intermap, increment

Wells with a gray dot inside the symbol identify water supply outlook wells

Explanation - Percentile classes (symbol color based on most recent measurement)						
Low	<10	10-24	25-75	76-90	>90	High
	Much Below Normal	Below Normal	Normal	Above Normal	Much Above Normal	Not Ranked

Wells		(on/off)
	Real Time	<input checked="" type="checkbox"/>
	Continuous	<input checked="" type="checkbox"/>
	Periodic Measurement	<input checked="" type="checkbox"/>

Reservoir Storage – Current Conditions:

No water supply releases from the COOP shared system have been made this year. There will be an artificially varied flow release from Jennings Randolph Reservoir on Saturday-Sunday, 19-20 of September.

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

Reservoir storage as of September 3, 2015

Facility	Percent Full	Current usable storage, BG	Total usable capacity, BG
WSSC's Patuxent reservoirs	67	7.8	11.68
Fairfax Water's Occoquan Reservoir	98	7.9	8.1
Little Seneca Reservoir ¹	98	3.8	3.9
Jennings Randolph water supply ²	100	13.1	13.1
Jennings Randolph water quality ²	69	11.3	16.3
Savage Reservoir ³	75	4.7	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.

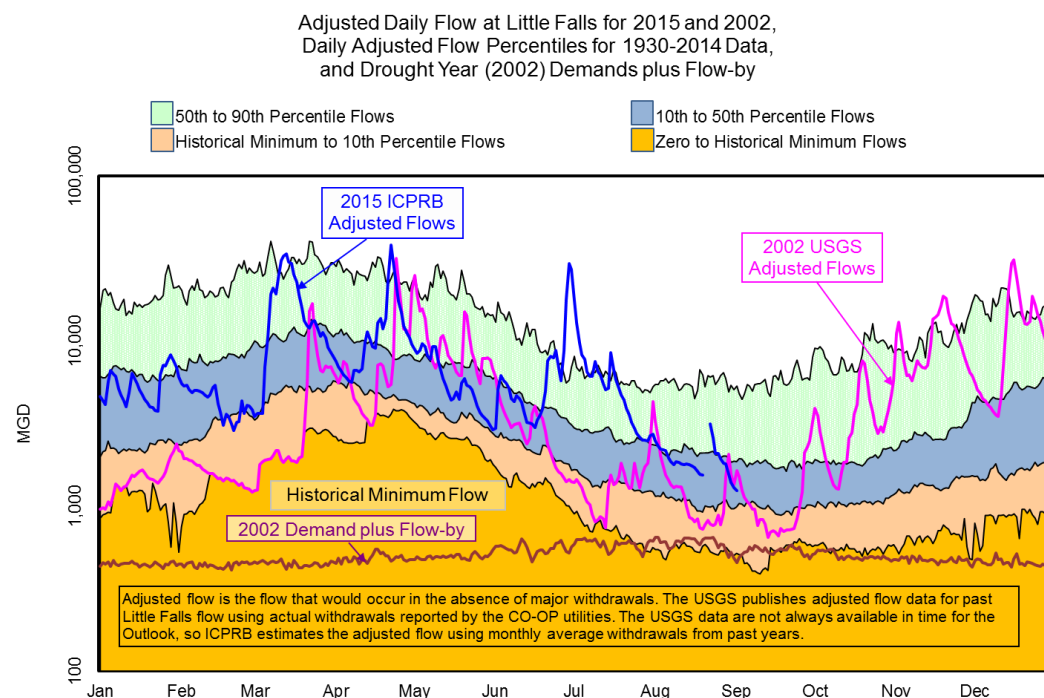
³ 1998 revised stage-storage curve provided by Bill Haines, US Army Corps of Engineers, Baltimore District.

Potomac River Flow:

The estimated adjusted Potomac flow at Little Falls on September 1 was 1.242 billion gallons per day (BGD). For this day of the year, this value was above the historical 10th percentile value of 0.989 BGD and below the 50th percentile value of 1.861 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 7.4 BGD for the first seven months of the year and 1.9 BGD in August.

Environmental Flow-by:

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



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.

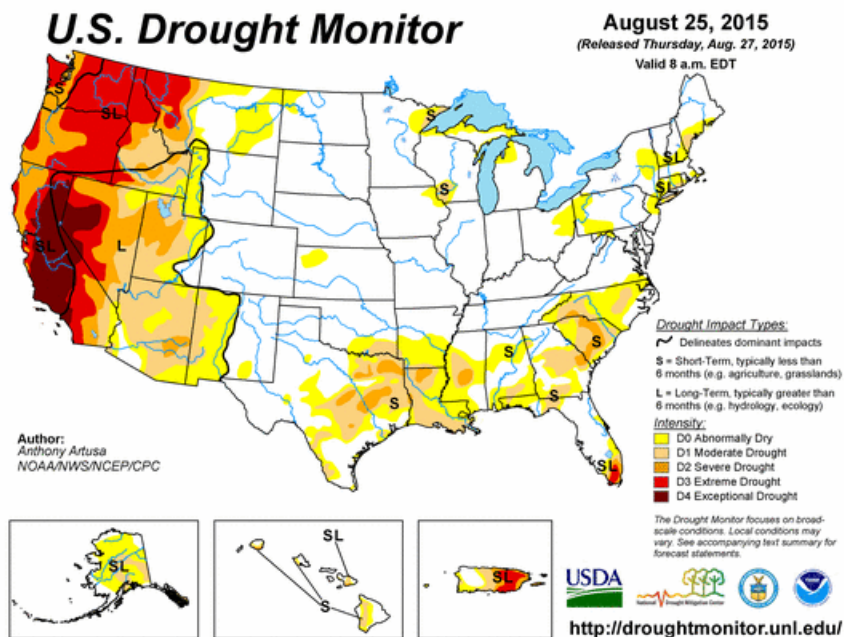
Information provided by the USGS, the Middle Atlantic River Forecast Center, and the National Weather Service.

Drought Status:

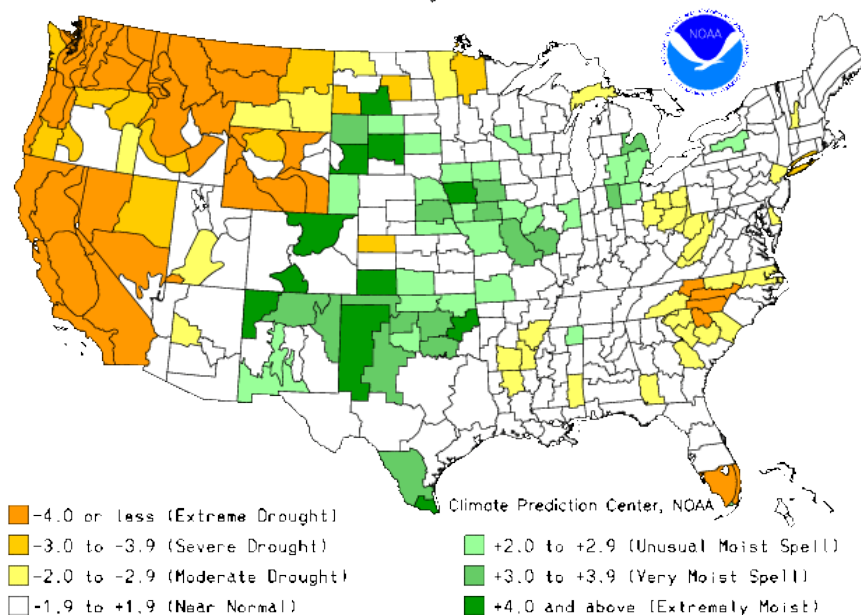
The Metropolitan Washington Council of Government's Drought Awareness Response Plan status is "Normal".

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 a small portion of the Potomac basin. The Palmer Drought Severity Index by Division map (see second figure below) indicates near normal in the Potomac basin.



Drought Severity Index by Division
Weekly Value for Period Ending AUG 29, 2015
Long Term Palmer



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