

U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

August 2016 Highlights: Fifty percent of groundwater levels and 88 percent of monthly mean streamflows were normal at sites monitored by the U.S. Geological Survey across Maryland, Delaware, and the District of Columbia.

Why is it important for the USGS to collect and analyze water-resources data?

USGS water data are valuable to the public, researchers, water managers, planners, and agricultural users, especially during floods and droughts. These data can be used to assess how water resources respond to changes in climate. Scientists at the USGS have measured streamflow and groundwater levels to assess water resources for over 125 years.

In addition to providing the most extensive set of historical streamflow and groundwater data available to the public, the USGS continues to collect water data and quality-assures the data using standardized techniques across the country. The uniformity of the dataset enables multi-state comparisons and other comparative statistical analyses that better inform policy makers of the possible water-resources conditions they might encounter in the future.

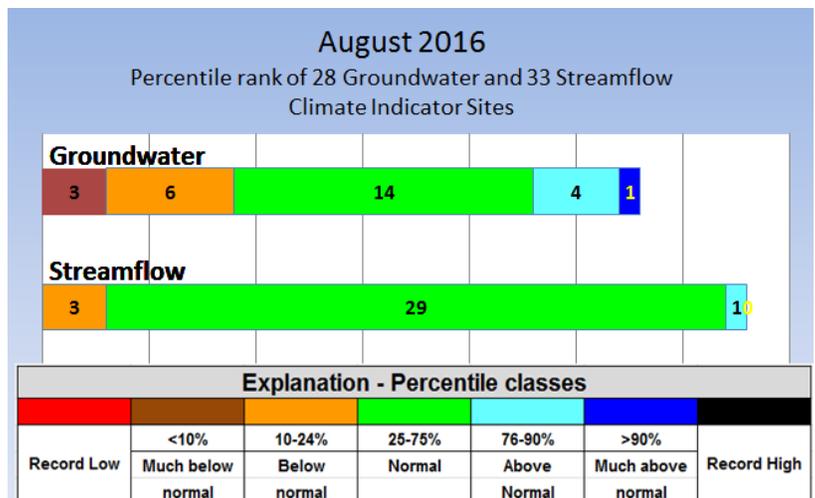
The sites used in this water summary were carefully selected to show the response of streamflow and groundwater levels to weather conditions. Ideally, these sites will show no effects from human influences. The streamflow and groundwater data are ranked in comparison to the historical record and summarized. Precipitation and reservoir data are also presented to give a more complete picture of the region's water resources.

USGS August 2016 Water Conditions Summary

Fifty percent of the groundwater levels and 88 percent of the monthly mean streamflows were normal (25th-75th percentiles) in August at sites used to monitor the response of water resources to changes in climatic conditions in Maryland, Delaware, and the District of Columbia.

Groundwater was normal at 14 of the 28 USGS observation wells, below normal at nine wells, three of which were below the 10th percentile, and above normal at five wells, one of which was above the 90th percentile.

Monthly mean streamflow was normal at 29 of the 33 streamgages used to monitor climatic conditions. Streamflow was above normal at one streamgage and below normal at three streamgages.



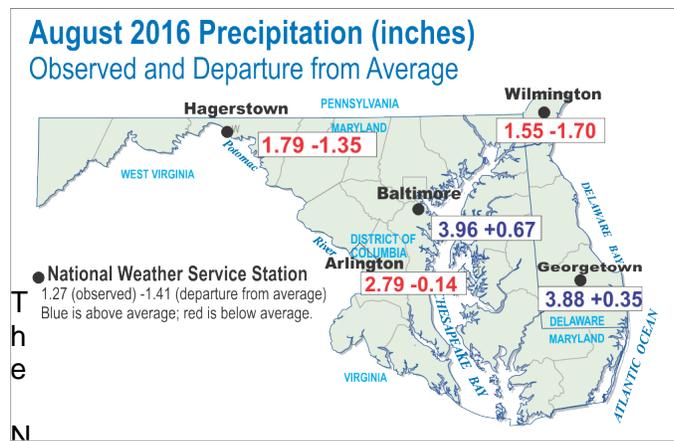
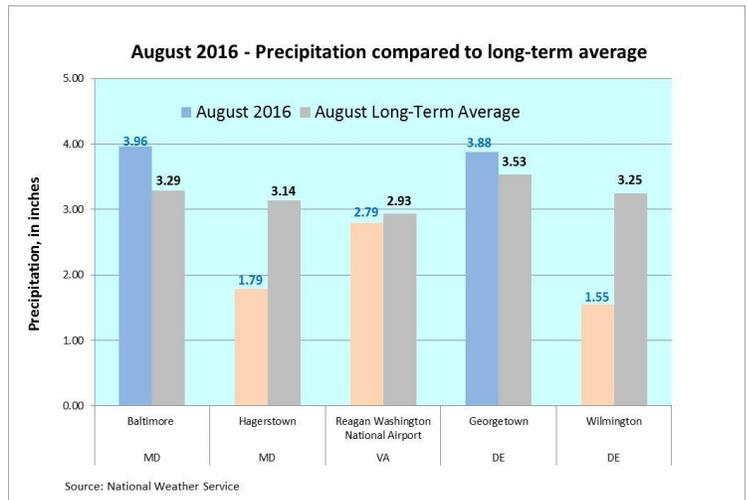
A **percentile** is a value on a scale from 0 to 100 that indicates the percent of a distribution that is equal to or below it. A percentile between 25 and 75 is considered normal. For example, a groundwater level in the 90th percentile is equal to or greater than 90 percent of the values recorded for that month.

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August 2016 Precipitation and Weather

Precipitation in August was above the long-term average (shown as blue bars) in Baltimore, Maryland and Georgetown, Delaware, but below average (shown as tan bars) at the other three National Weather Service (NWS) Mid-Atlantic weather stations.

The weather station with the lowest precipitation was in Wilmington, Delaware with 1.55 inches in August, which was 1.70 inches below average. In July, this station had the highest precipitation with 6.35 inches. Precipitation was also more than an inch below the long-term average at Hagerstown, Maryland (1.35 inches lower) and 0.14 inches below average at the Reagan Washington National Airport in Arlington, Virginia, near Washington, D.C.



National Weather Service Stations

- Baltimore =**
Baltimore/Washington International Thurgood Marshall Airport (BWI)
- Georgetown =**
Georgetown, Sussex County Airport
- Hagerstown =**
Hagerstown Regional Airport
- Arlington =**
Ronald Reagan Washington National Airport
- Wilmington =**
New Castle Airport

The Middle Atlantic River Forecast Center's (MARFC) 365-day precipitation totals for the District of Columbia and all counties in Maryland and Delaware were average to above average. Thirteen of the 23 counties in Maryland and the District of Columbia were between 10 percent above to 10 percent below the long-term average. The remaining 10 counties in Maryland (mainly on the Eastern Shore of Maryland) and all three counties in Delaware were in the 10-24 percent above average range.

August temperatures were 3.0 degrees Fahrenheit to 5.8 degrees above average at the five Mid-Atlantic NWS stations. The largest departure from average for the second consecutive month was at the weather station in Hagerstown, Maryland, where the temperature was 79.1 degrees and 5.8 degrees above average. Temperatures are typically cooler in western Maryland because of the higher elevation. This temperature was the same as that at the Baltimore weather station and only 0.1 degree less than the temperature at the weather station in Wilmington, Delaware. There were 14 days in August where the temperature reached or exceeded 90 degrees in Baltimore. The highest temperature was 82.7 degrees in Arlington, Virginia where the August temperature ranked the second hottest August and the third hottest summer temperature on record: <https://www.washingtonpost.com/news/capital-weather-gang/wp/2016/09/01/d-c-simmered-in-second-hottest-august-and-third-hottest-summer-on-record/>

Sources: National Weather Service and Middle Atlantic River Forecast Center (MARFC)
 MD and DC: <http://www.weather.gov/climate/index.php?wfo=lwx>
 DE: <http://www.weather.gov/climate/index.php?wfo=phi>
 MARFC: http://www.weather.gov/marfc/Precipitation_Departures

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Groundwater

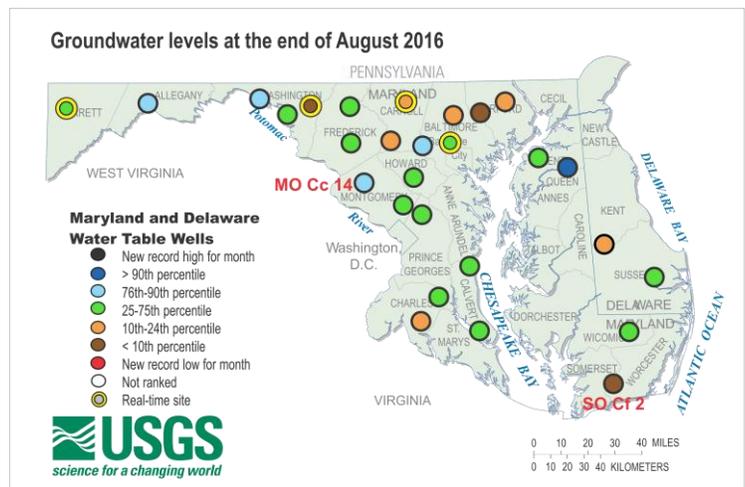
The USGS monitors groundwater levels in unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in climatic conditions. The groundwater wells used for the monthly water summary were selected based on the following criteria:

- Located in an unconfined (water-table) aquifer;
- Open to a single, known hydrogeologic unit/aquifer;
- Groundwater hydrograph reflects changes in climatic conditions;
- No indicated nearby pumpage and likely to remain uninfluenced by pumpage, regulated streamflow, or changes related to human activities;
- Minimum period of record is 10 years of continuous/monthly records;
- Minimally affected by irrigation, canals, drains, pipelines, and other potential sources of artificial recharge;
- Well has a casing – dug wells are generally not used;
- Water levels show no apparent hydrologic connection to nearby streams;
- Well has never gone dry; and
- Long-term accessibility likely.

August 2016 Groundwater Levels

Fifty percent (14 of 28 wells) of the groundwater levels were in the normal range (25th-75th percentiles). There were nine USGS observation wells with below normal groundwater levels--six were between the 10th and 24th percentiles, and three were below the 10th percentile. There were five USGS observation wells with above normal groundwater levels--four between the 76th and 90th percentiles, and one greater than the 90th percentile. Well QA Cg 69 has been above normal for the last 9 months.

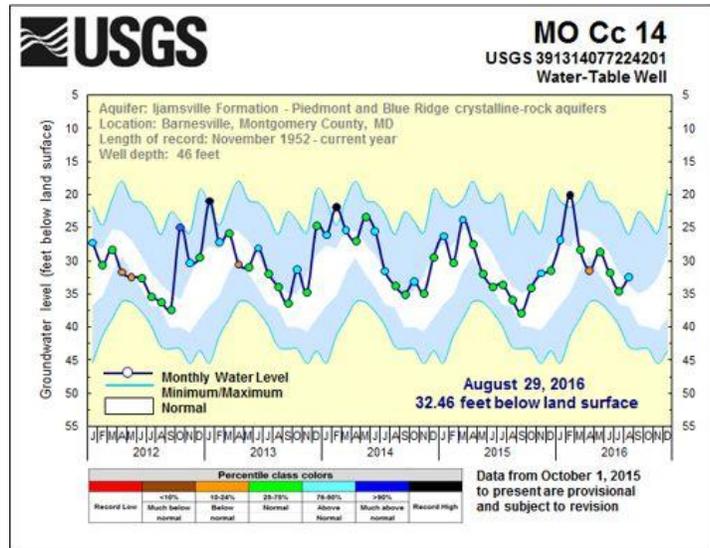
These data are provisional and subject to revision.



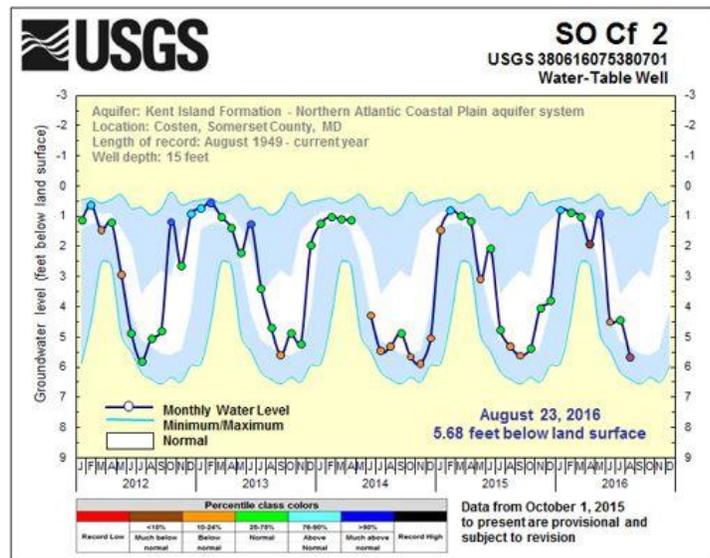
To access the clickable groundwater map, go to:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/

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The groundwater level in USGS observation well MO Cc 14 in Montgomery County, Maryland was 32.46 feet below land surface in August, which is above normal. The groundwater level had been normal for the previous three months.



The groundwater level in USGS observation well SO Cf 2 in Somerset County, Maryland was 5.68 feet below land surface in August, which is below normal. The groundwater level had been normal in July.



Five-year groundwater hydrographs can be viewed at:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties

The 5-year hydrograph shows groundwater levels as a dark blue line, the minimum and maximum monthly values, and the normal range (between the 25th and 75th percentiles) as a white band based on the period of record. The maximum water level is at the top of the upper blue section and the minimum water level is at the bottom of the lower blue section in the graph. Each monthly measurement is colored according to the percentile rank in which it falls for the month.

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Streamflow

Streamflow data are used for many purposes. A few of the most common uses are to assess water supply and the risk of droughts and floods. Streamflow data are also used to calculate loads of chemical constituents and assess how biological communities are affected by hydrologic conditions. The USGS operates the most extensive network of streamgages in the region.

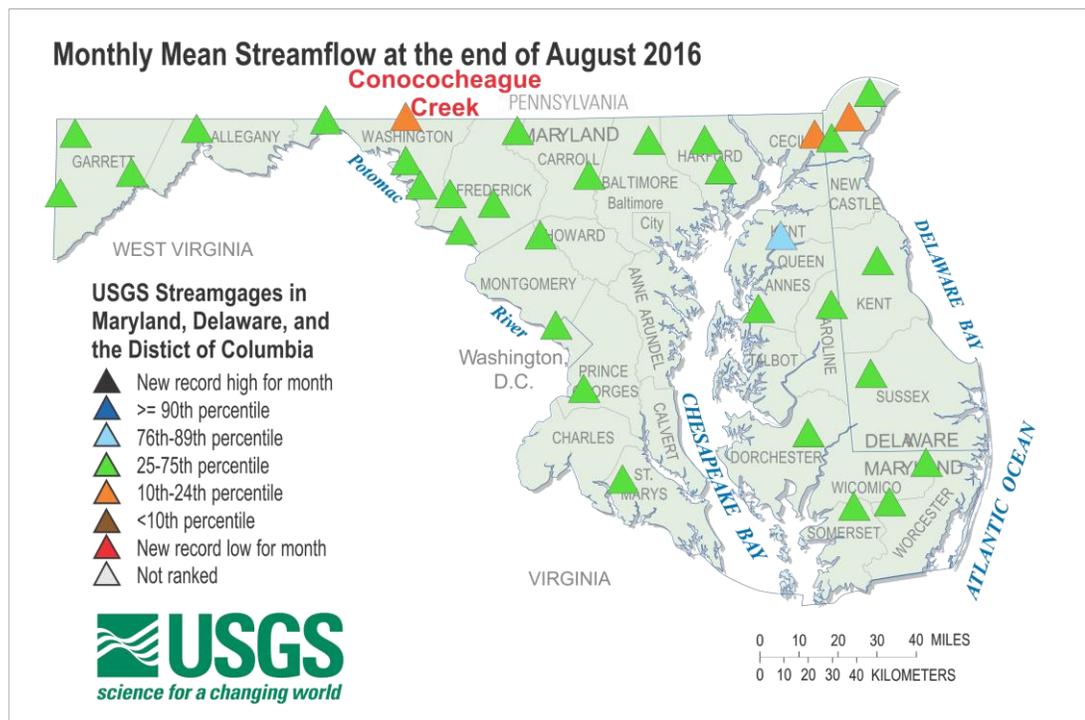
The streamflow locations chosen for the monthly water summary were selected based on the following criteria:

- Minimum period of record is 10 years of continuous data;
- Watershed areas greater than 5 square miles;
- Streamflow is not regulated, or has relatively natural flow;
- Streamflow data reflect climatic conditions; and
- The surrounding area and watershed are not urban.

August 2016 Streamflow

Monthly mean streamflow was normal at 29 of the 33 USGS streamgages used to monitor climatic conditions in Maryland, Delaware, and the District of Columbia.

Eighty-eight percent (29 of 33) of the monthly mean streamflows were in the normal range (25th-75th percentiles) in August. Streamflow was above normal at Morgan Creek in Kent County, Maryland (between the 76th - 89th percentiles). Streamflow was below normal (between the 10th – 24th percentiles) at three streamgages, located in Cecil and Washington Counties in Maryland, and New Castle County in Delaware.

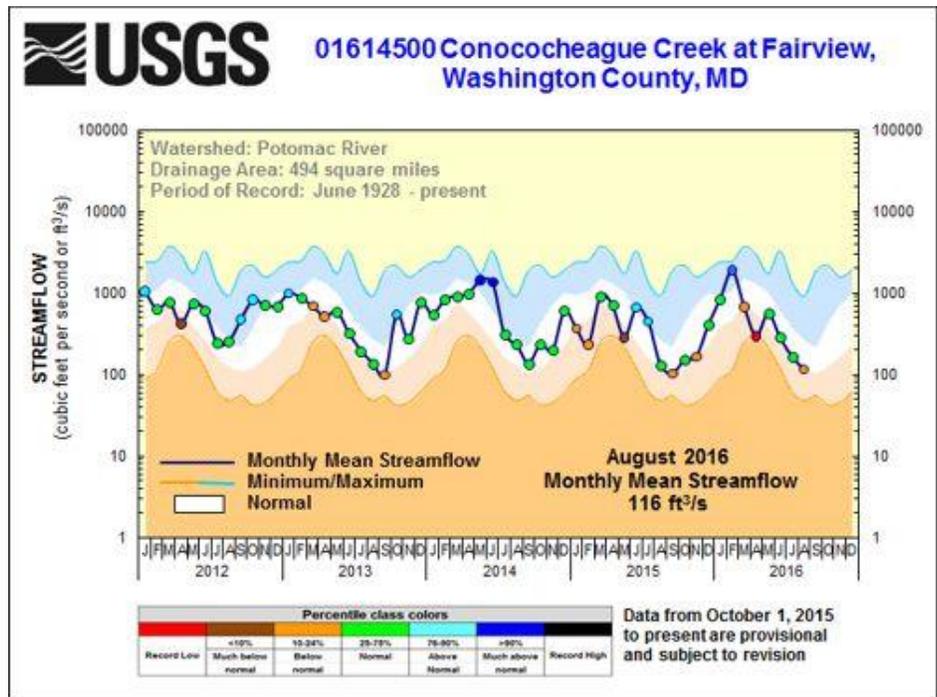


To access the clickable streamflow map, go to:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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Monthly mean streamflow on Conococheague Creek at Fairview, Maryland was 116 cubic feet per second (ft³/s) in August, which is below normal (10th-24th percentiles). Streamflow at this site had been normal during the previous 3 months.

The dark line in the 5-year hydrograph represents the monthly mean streamflow for this period and the white band shows the normal range (25th-75th percentiles) based on the period of record. The maximum monthly mean streamflow is at the top of the blue shaded section, and the lowest monthly mean streamflow is at the top of the dark orange area. Each monthly mean measurement is colored according to the percentile rank in which it falls for the month.

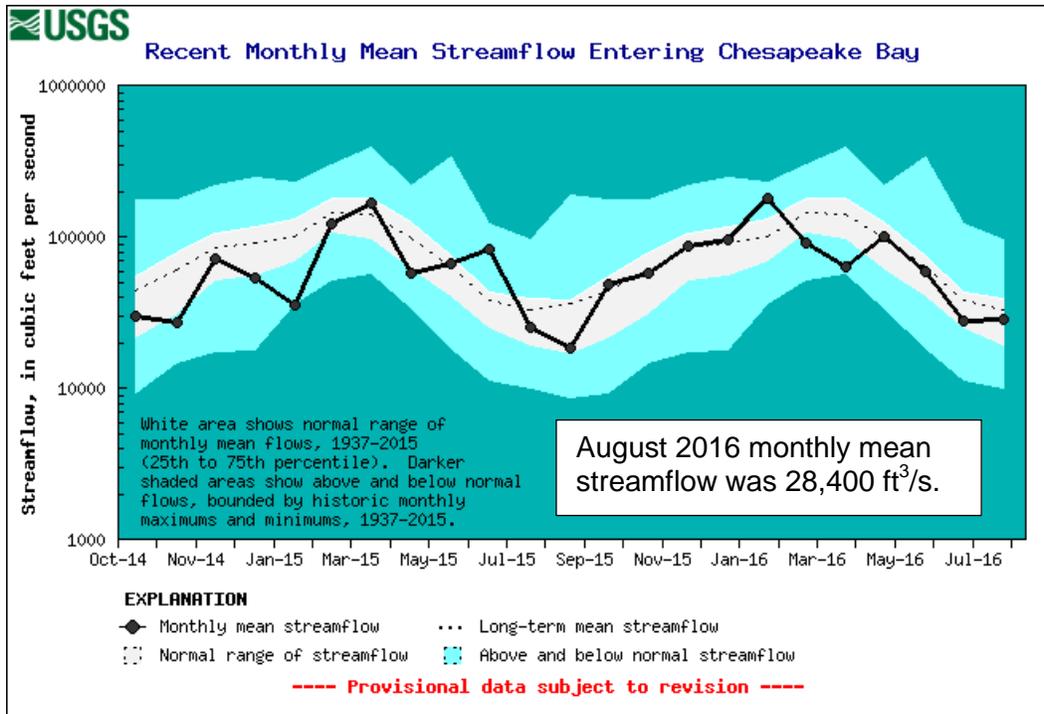


Five-year hydrographs can be viewed at:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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Estimated Streamflow to the Chesapeake Bay

The USGS estimates monthly mean freshwater streamflow to the Chesapeake Bay using streamflow measurements from the Susquehanna, Potomac, and James Rivers. In August 2016, the monthly mean freshwater flow to the Chesapeake Bay was 28,400 ft³/s (provisional, and subject to revision), which is in the normal range. The long-term August average (mean) is 33,300 ft³/s, and the normal range is between 19,200 ft³/s and 39,600 ft³/s, the 25th and 75th percentiles of all August values. These provisional statistics are based on a 79-year period of record.



Runoff in the Chesapeake Bay watershed carries pollutants, such as nutrients and sediment, to rivers and streams that drain to the Bay. The amount of water flowing into the Chesapeake Bay from its tributaries has a direct impact on how much pollution is in the estuary and it also affects the salinity levels that are important for fish, crabs, and oysters. Generally, as river flow increases, it brings more nutrient and sediment pollution to the Bay.

More information on freshwater flow to the Bay can be found here:

<http://md.water.usgs.gov/waterdata/chesinflow/>

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Reservoir Levels

Available reservoir storage at the end of August 2016 in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) was 97.98 percent of available storage capacity, or a total of 74.32 billion gallons of water. The Baltimore City Environmental Services Division manages the Baltimore reservoirs.

Total normal storage in the Triadelphia and Duckett Reservoirs, which serve parts of Howard, Montgomery, and Prince George’s Counties in suburban Maryland around the District of Columbia, was 90.90 percent of normal storage capacity at the end of August 2016, with 9.65 billion gallons of water.

Not all of the water in the Patuxent Reservoirs is usable; for operational purposes, percent of normal storage capacity is used, but this value can exceed 100 percent of the usable storage. In the graph below, 100 percent is the maximum. The Washington Suburban Sanitary Commission (WSSC) manages the Patuxent reservoirs.

| August 2016 | Percent available/normal storage | Volume (billion gallons) |
|---|----------------------------------|--------------------------|
| Baltimore Reservoirs Baltimore City – Environmental Services Division | | |
| Liberty | 98.48% | 36.24 |
| Loch Raven | 97.17% | 20.60 |
| Prettyboy | 97.93% | 17.48 |
| Total | 97.98% | 74.32 |
| Patuxent Reservoirs Washington Suburban Sanitary Commission (WSSC) | | |
| Triadelphia | 91.59% | 5.13 |
| Duckett | 90.20% | 4.52 |
| Total | 90.90% | 9.65 |

