

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

June 2016 Highlights: Record high monthly mean streamflow in Somerset County, Maryland. Seventy-five percent of groundwater levels and 54 percent of monthly mean streamflow 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.

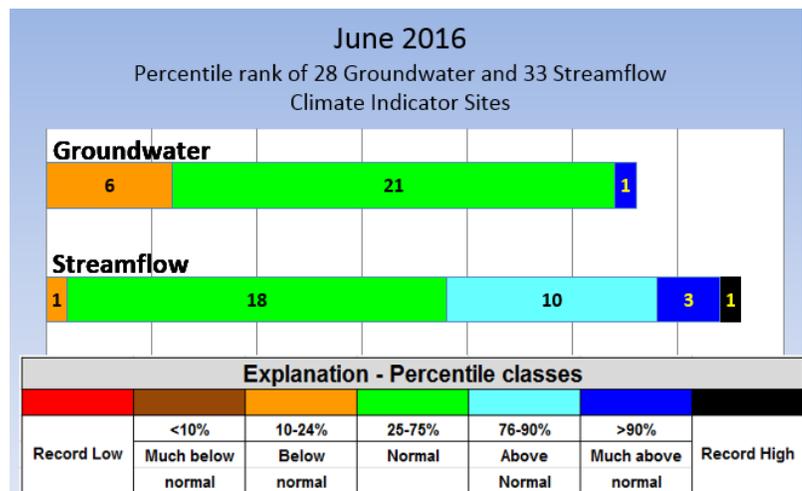
The sites used in this water summary were carefully selected to show the response of streamflow and groundwater levels to weather conditions. Ideally, these sites will show no effects from human influences. The streamflow and groundwater data are ranked in comparison to the historical record and summarized.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

USGS June 2016 Water Conditions Summary

In June, 75 percent (21 of 28 wells) of groundwater levels at USGS observation wells were normal (between the 25th – 75th percentiles) and 54 percent (18 of 33 sites) of the monthly mean streamflows were normal 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 above normal at a USGS observation well in Queen Anne’s County, Maryland and below normal at six USGS observation wells—two in Harford County, one in Frederick County, and one in Somerset County in Maryland and at the USGS observation well in Kent County, Delaware.

Monthly mean streamflow was at a record high at Manokin Branch (Somerset County) in June and above normal at another 13 of the 33 streamgages used to monitor climatic conditions. Streamflow was below normal at a USGS streamgage in New Castle County, Delaware.



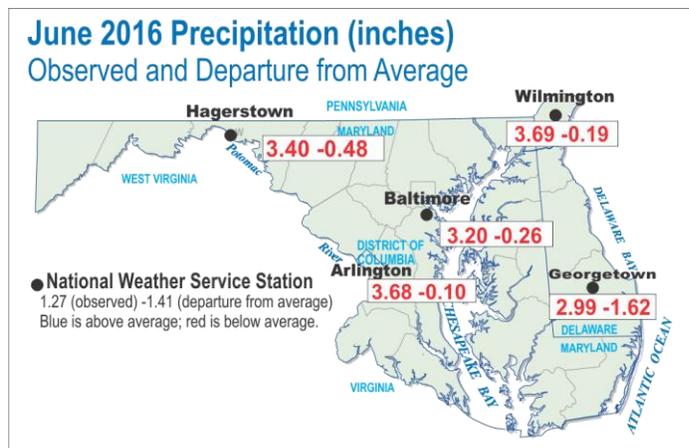
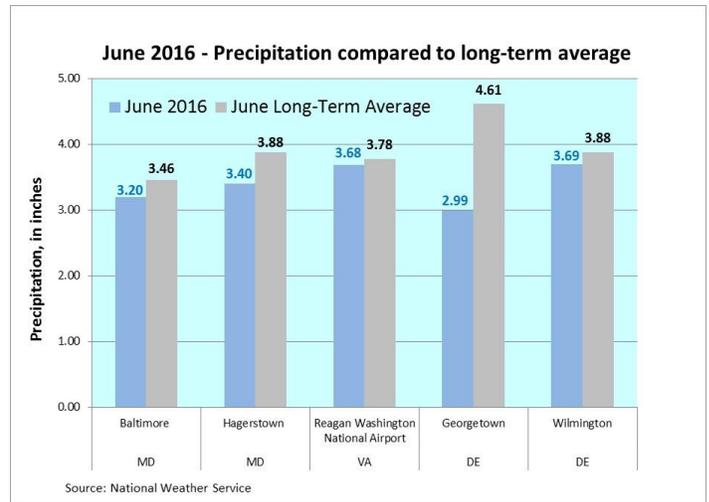
A **percentile** is a value on a scale from 0 to 100 that indicates the percent of a distribution that is equal to or below it. A percentile between 25 and 75 is considered normal. For example, a groundwater level in the 90th percentile is equal to or greater than 90 percent of the values recorded for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

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June 2016 Precipitation and Weather

June precipitation was below average at the five National Weather Service (NWS) Mid-Atlantic weather stations, but close to the long-term average except in Georgetown, Delaware, which has the highest monthly average of 4.61 inches.

The highest rainfall for the second consecutive month was in Wilmington, Delaware with 3.69 inches, which was 0.19 inches below the June average. The next highest rainfall was at the Reagan Washington National Airport in Arlington, Virginia with 3.68 inches. The lowest precipitation of the five Mid-Atlantic weather stations was in Baltimore, Maryland with 3.20 inches, which was 0.26 of an inch below average.



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

June precipitation for the NWS Middle Atlantic River Forecast Center's (MARFC) 365-day precipitation totals for the District of Columbia and all counties in Maryland and Delaware was between 10 percent above to 10 percent below the long-term average in all counties except Wicomico County in Maryland, which was in the 11 percent to 25 percent above average range or 4.8 inches.

The departure from average temperatures in June ranged from -0.0 to +1.9 degrees Fahrenheit at the five Mid-Atlantic NWS stations. The largest departure from average was 1.9 degrees above average at the weather station in Hagerstown, Maryland; however, the weather station in Arlington, Virginia had the warmest monthly average temperature at 76.2 degrees. The lowest average temperature was in Georgetown, Delaware at 72.0 degrees.

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

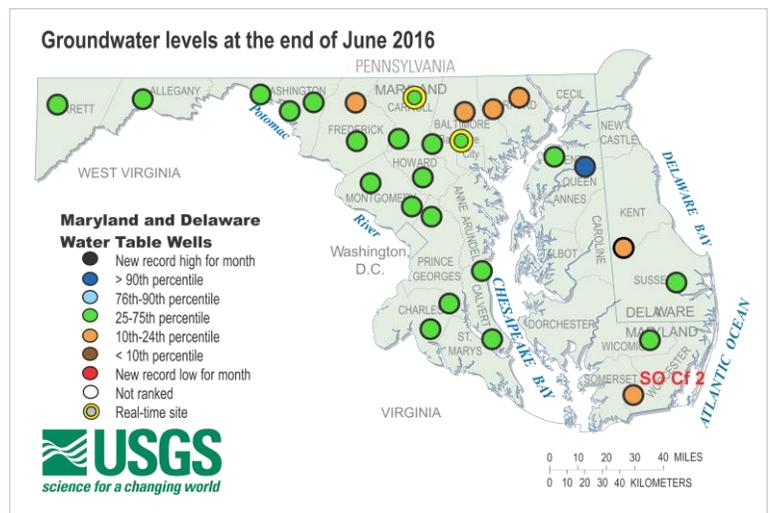
- Located in an unconfined (water-table) aquifer;
- Open to a single, known hydrogeologic unit/aquifer;
- Groundwater hydrograph reflects changes in climatic conditions;
- No indicated nearby pumpage and likely to remain uninfluenced by pumpage, regulated streamflow, or changes related to human activities;
- 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.

June 2016 Groundwater Levels

For the fourth consecutive month, groundwater levels ranged from the lowest 10th percentile to the highest 90th percentile in USGS wells used to monitor climatic conditions in Maryland and Delaware in June. Seventy-five percent (21 of 28 wells) of the groundwater levels were normal (25th-75th percentiles) in June in Maryland and Delaware.

The groundwater level was above the 90th percentile at one USGS observation well in Queen Anne's County, Maryland and has been above normal for the previous 6 months.

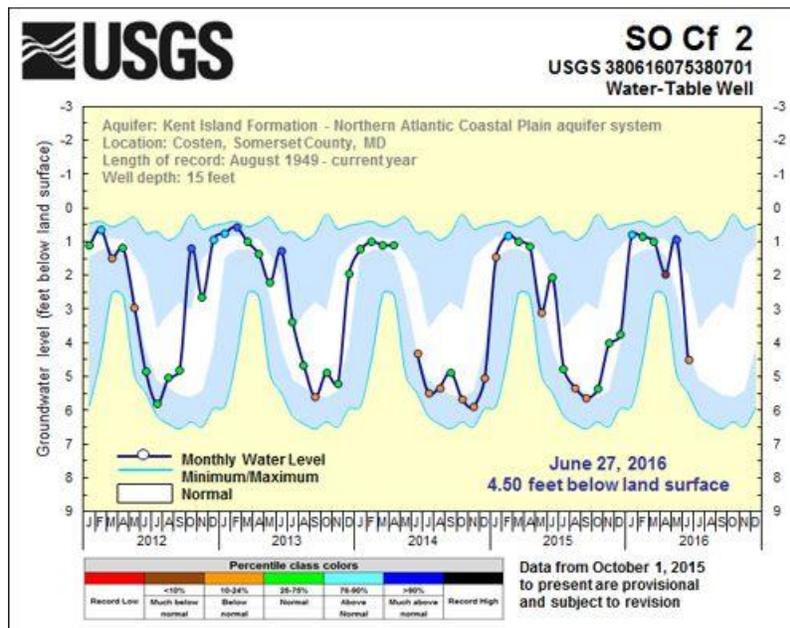
There were six USGS observation wells with below normal groundwater levels between the 10th and 24th percentiles. These data are provisional and subject to revision.



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 SO Cf 2 in Somerset County, Maryland dropped from above normal in May to below normal in June.



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

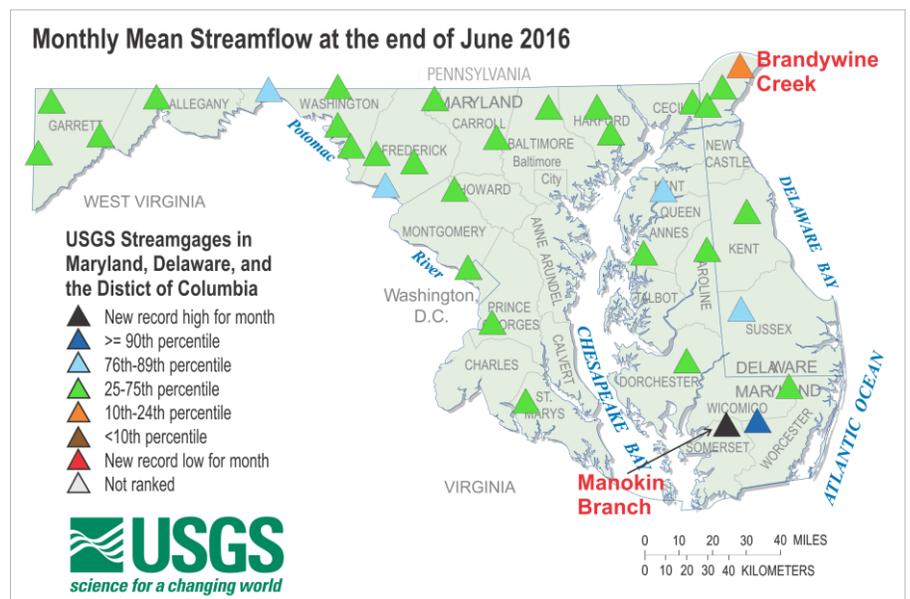
Streamflow data are used for many purposes. A few of the most common uses are to assess water supply and the risk of droughts and floods. Streamflow data are also used to calculate loads of chemical constituents and assess how biological communities are affected by hydrologic conditions. The USGS operates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

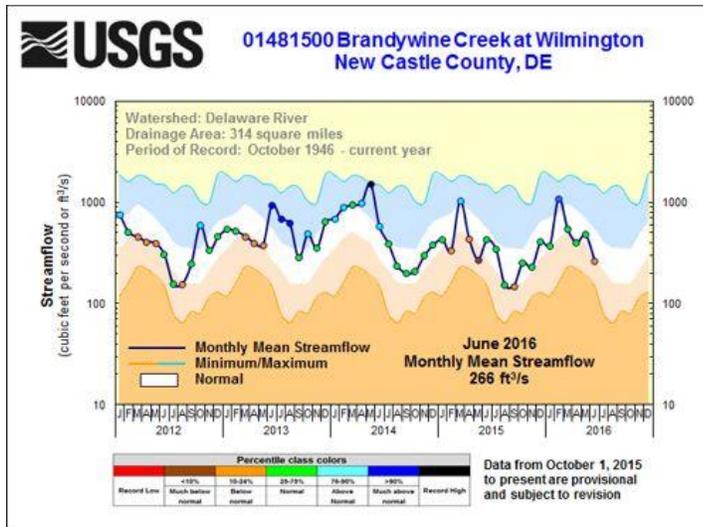
June 2016 Streamflow

At streamgages used to monitor climatic response in Maryland, Delaware, and the District of Columbia, monthly mean streamflow ranged from below normal, or the 10th-24th percentiles at Brandywine Creek in Delaware, to a record June high monthly mean streamflow at Manokin Branch in Somerset County, Maryland.

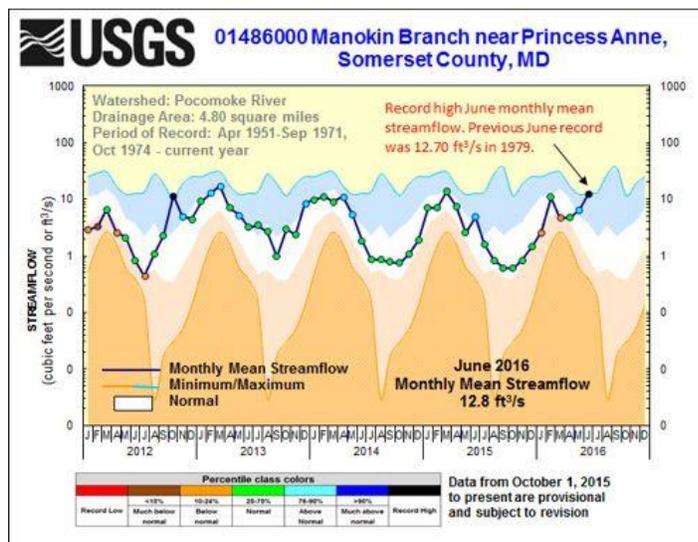


To access the clickable streamflow map, go to:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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On Brandywine Creek in New Castle County, Delaware, monthly mean streamflow was 266 cubic feet per second (ft³/s), which was below normal (10th-24th percentiles). Streamflow had been in the normal range the previous 3 months.



On Manokin Branch near Princess Anne, in Somerset County, Maryland, the monthly mean streamflow of 12.8 ft³/s set a new record high for June. The previous record was 12.70 ft³/s set in 1979. Record-keeping began in 1951.

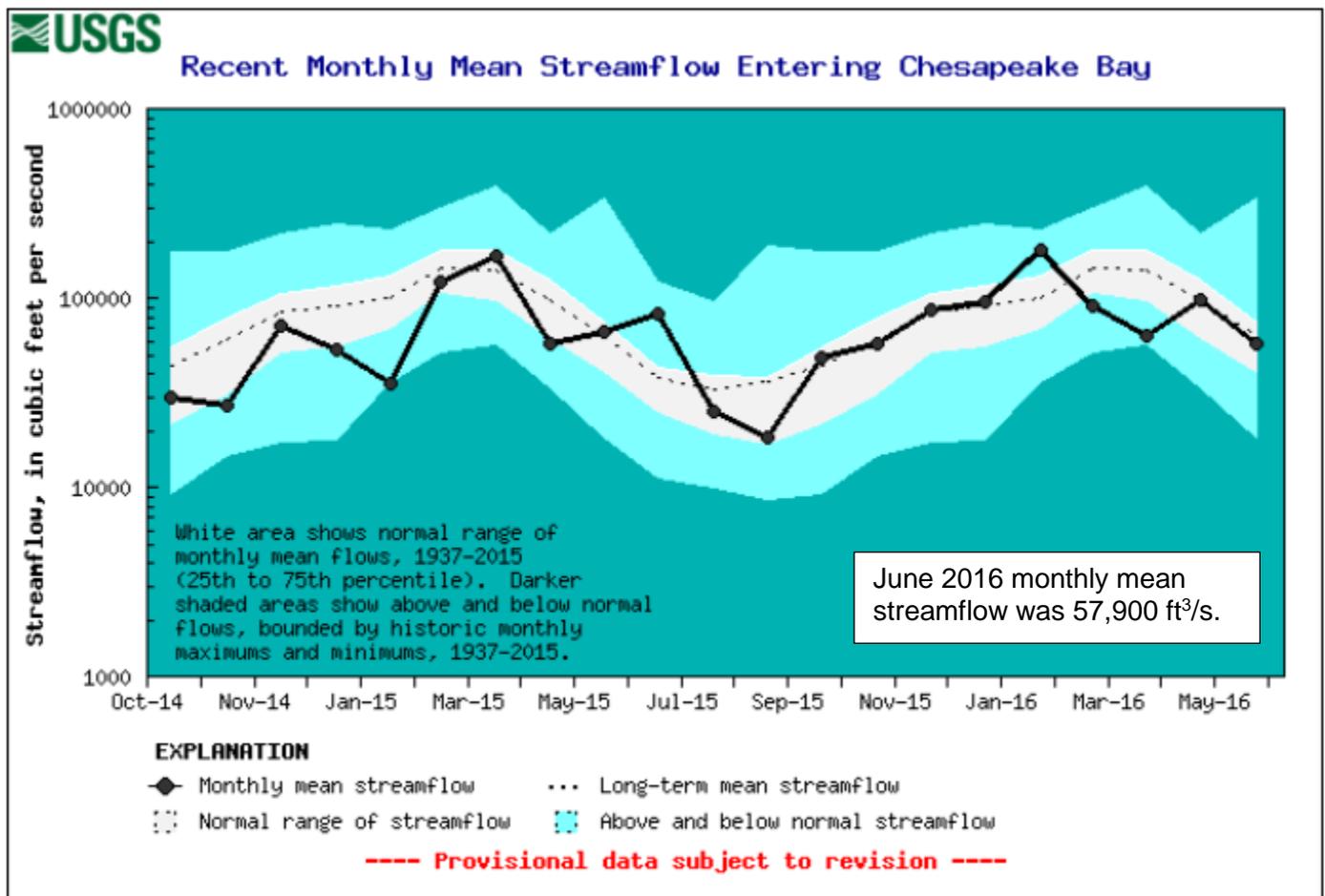
Five-year hydrographs can be viewed at:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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.

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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 June 2016, the monthly mean freshwater flow to the Chesapeake Bay was 57,900 ft³/s (provisional, and subject to revision), which is in the normal range. The long-term June average (mean) is 64,600 ft³/s, and the normal range is between 40,500 ft³/s and 75,000 ft³/s, the 25th and 75th percentiles of all June 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 June 2016 in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) was 99.24 percent of available storage capacity, or a total of 75.40 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 97.96 percent of normal storage capacity at the end of June 2016, with 10.39 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.

June 2016	Percent available/normal storage	Volume (billion gallons)
Baltimore Reservoirs		
Baltimore City – Environmental Services Division		
Liberty	99.78%	36.72
Loch Raven	100.00%	21.20
Prettyboy	97.93%	17.48
Total	99.24%	75.40
Patuxent Reservoirs		
Washington Suburban Sanitary Commission (WSSC)		
Triadelphia	96.95%	5.43
Duckett	98.98%	4.96
Total	97.96%	10.39

