

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

September 2016 Highlights: Record low groundwater level recorded in Carroll County, Maryland. Fifty-two percent of groundwater levels and 55 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.

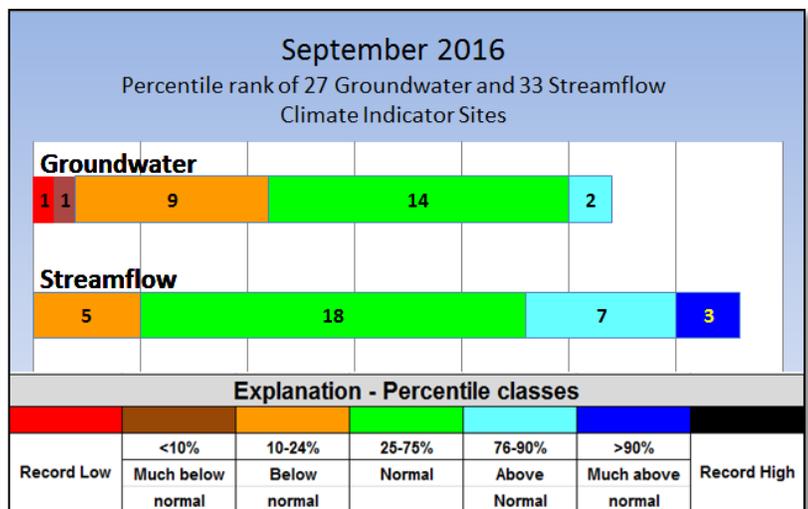
USGS September 2016 Water Conditions Summary

Fifty-two percent of the groundwater levels and 55 percent of monthly mean streamflows were normal (25th-75th percentiles) in September at sites used to monitor the response of water resources to changes in climatic conditions in Maryland, Delaware, and the District of Columbia.

Groundwater levels were normal at 14 of the 27 USGS observation wells, and below normal at 11 wells, one of which was below the 10th percentile, and another of which was at a record September low. Groundwater levels were above normal at two wells.

Monthly mean streamflow was normal at 18 of the 33 streamgages used to monitor climatic conditions.

Streamflow was above normal at ten streamgages and below normal at five streamgages.

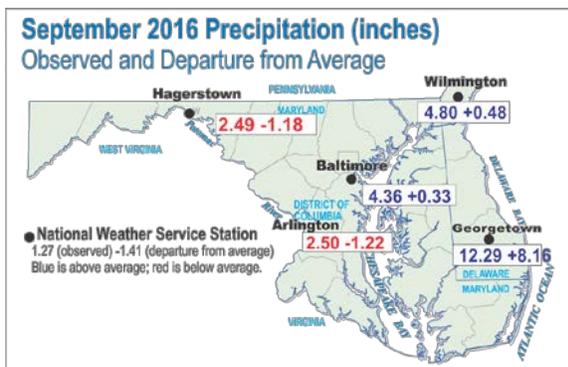
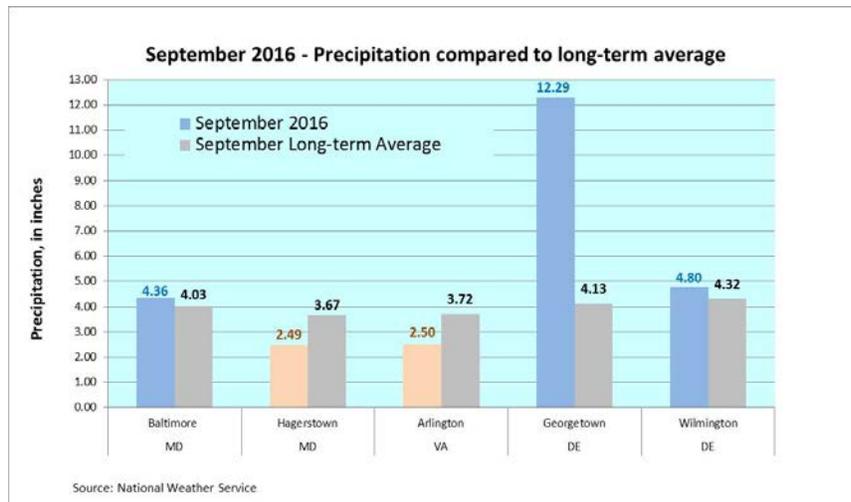


A **percentile** is a value on a scale from 0 to 100 that indicates the percent of a distribution that is equal to or below it. A percentile between 25 and 75 is considered normal. For example, a groundwater level in the 90th percentile is equal to or greater than 90 percent of the values recorded for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

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September 2016 Precipitation and Weather

At National Weather Service (NWS) Mid-Atlantic stations, three sites were above the long-term average, and two were below average. Precipitation in Georgetown, Delaware was 12.29 inches, which is nearly 3 times the long-term average September value. Above average precipitation (shown as blue bars) also occurred in Baltimore, Maryland and Wilmington, Delaware. Precipitation was below average (shown as tan bars) at the Hagerstown, Maryland and Arlington, Virginia weather stations.



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, except for Garrett County, Maryland. The Eastern Shore of Maryland and counties on the Delmarva Peninsula had above average precipitation ranging from 5.1 to 12.8 inches above average.

September temperatures were 3.8 degrees Fahrenheit to 7.1 degrees above average at the five Mid-Atlantic NWS stations. The largest departure from average for the third consecutive month was at the weather station in Hagerstown, Maryland, where the average temperature was 72.8 degrees or 7.1 degrees above average. The average temperature at the weather station in Georgetown, Delaware was also 72.8 degrees, and at the weather station in Baltimore, average temperature was just 0.5 degree lower. Temperatures are typically cooler in western Maryland because of the higher elevation. The highest temperature was 76.0 degrees in Arlington, Virginia, and the lowest temperature was in Baltimore, Maryland (72.3 degrees).

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

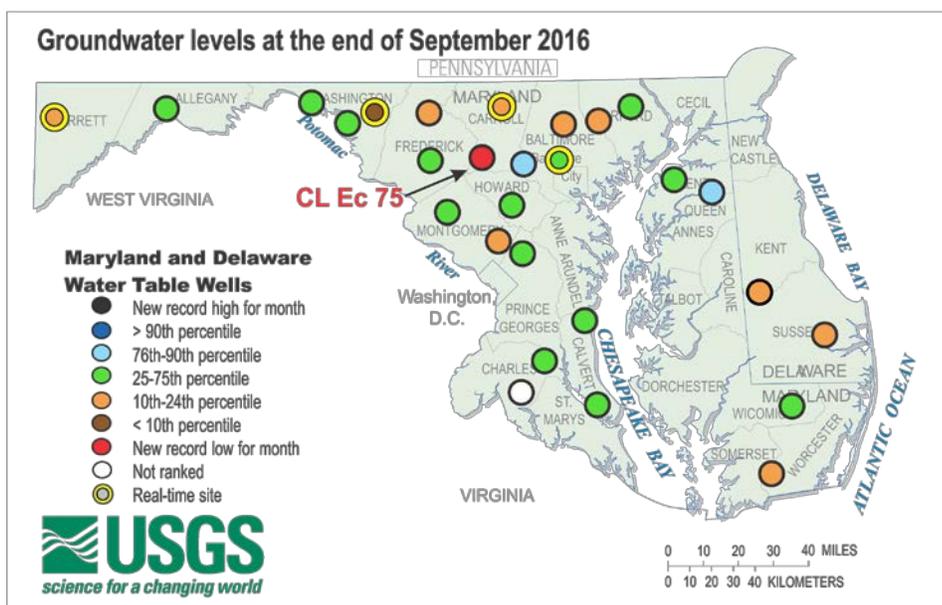
The USGS monitors groundwater levels in unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in climatic conditions. The groundwater wells used for the monthly water summary were selected based on the following criteria:

- 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.

September 2016 Groundwater Levels

Fifty-two percent (14 of 27 wells) of the groundwater levels were in the normal range (25th-75th percentiles). There were 11 USGS observation wells with below normal groundwater levels—9 were between the 10th and 24th percentiles, one well was below the 10th percentile, and one well in Carroll County, Maryland had a record September low.

There were two USGS observation wells with above normal groundwater levels— between the 76th and 90th percentiles. There was one well with no September groundwater measurement.

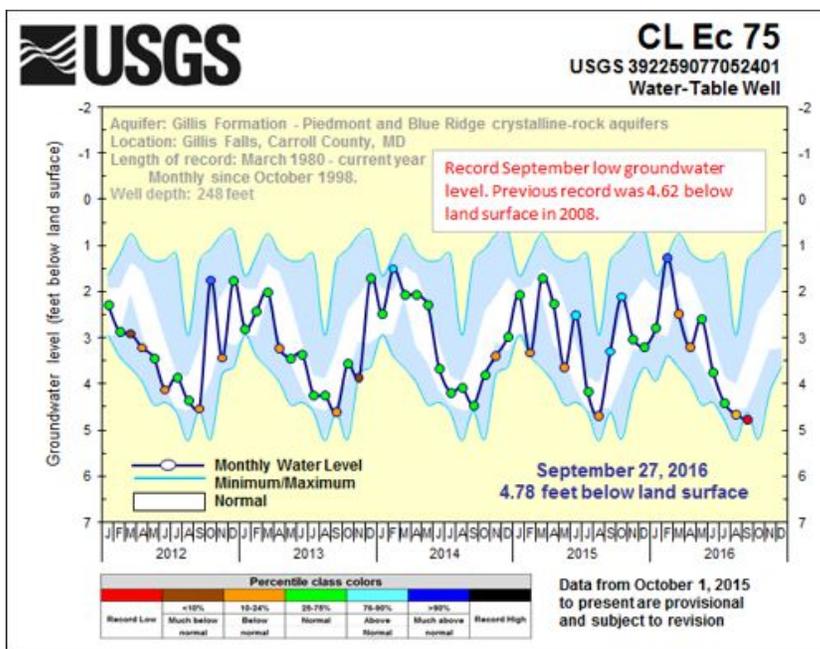


To access the clickable groundwater map, go to:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/

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The groundwater level in USGS observation well CL Ec 75 in Carroll County, Maryland was 4.78 feet below land surface in September, which is a record September low. The previous September record was 4.62 feet below land surface in 2008.

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. These data are provisional and subject to revision.



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

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Streamflow

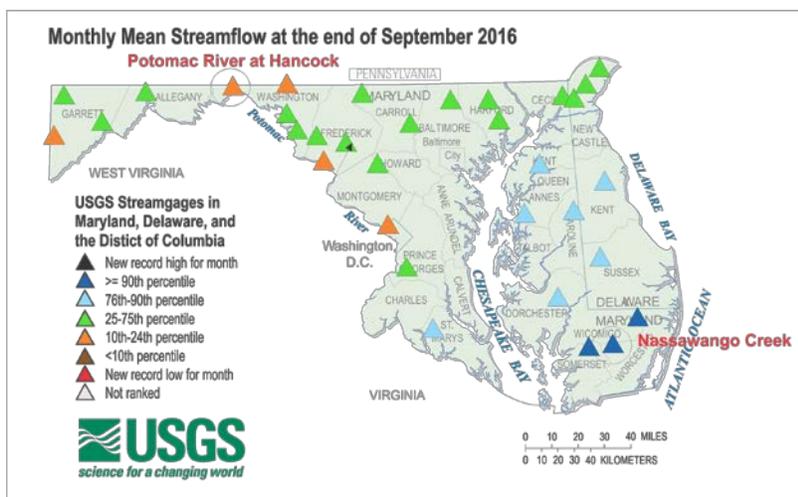
Streamflow data are used for many purposes. A few of the most common uses are to assess water supply and the risk of droughts and floods. Streamflow data are also used to calculate loads of chemical constituents and assess how biological communities are affected by hydrologic conditions. The USGS operates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

September 2016 Streamflow

Monthly mean streamflow was normal at 18 of the 33 USGS streamgages used to monitor climatic conditions in Maryland, Delaware, and the District of Columbia.



Fifty-five percent (18 of 33) of the monthly mean streamflows were in the normal range (25th-75th percentiles) in September. Streamflow was above normal at 10 streamgages including 7 between the 76th and 90th percentiles and 3 above the 90th percentile. Streamflow was below normal (between the 10th and 24th percentiles) at five streamgages in Maryland and the District of Columbia.

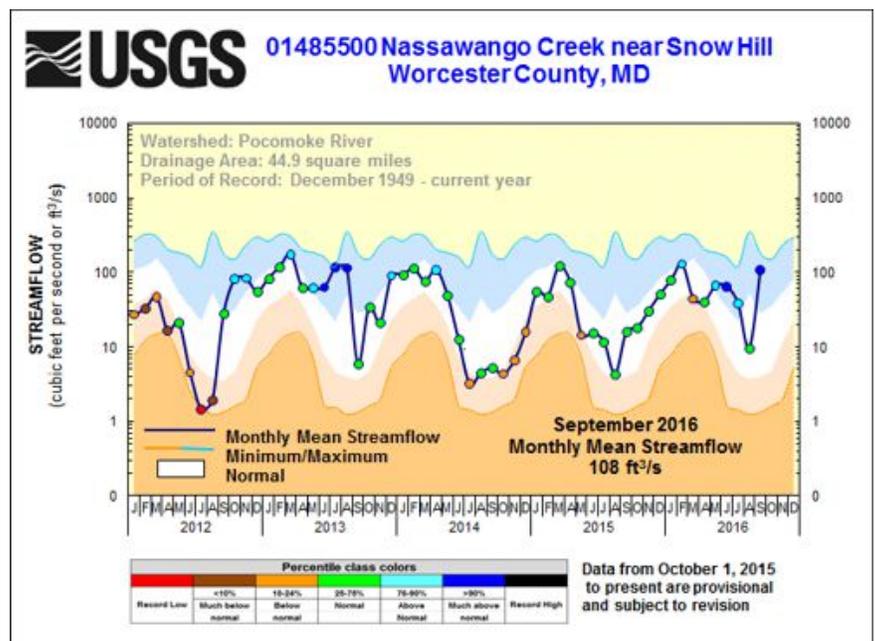
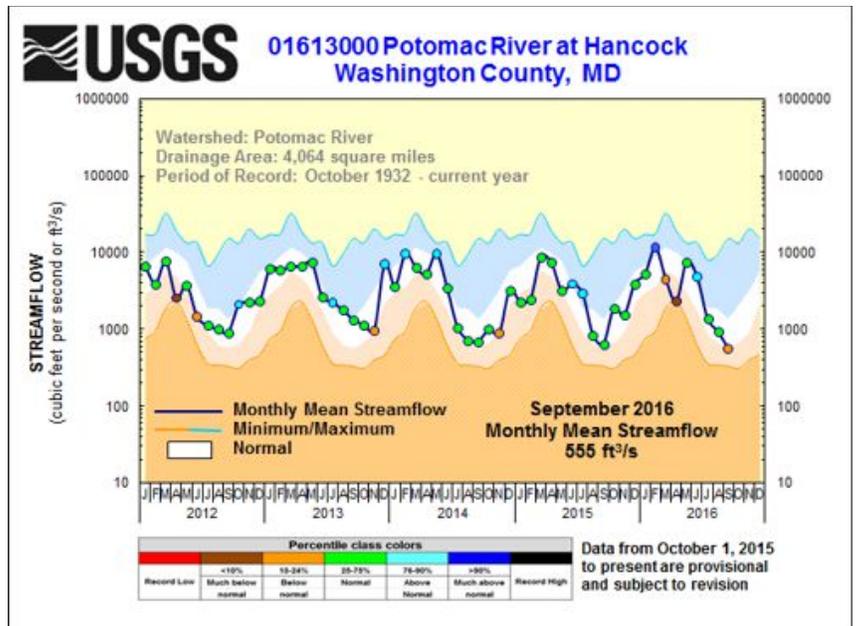
To access the clickable streamflow map, go to:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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Monthly mean streamflow on the Potomac River at Hancock, Maryland was 555 cubic feet per second (ft³/s) in September, which is below normal (10th-24th percentiles). Streamflow at this site had been normal during the previous 2 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.

Monthly mean streamflow on Nassawango Creek near Snow Hill, Maryland was 108 ft³/s in September, which was above normal (greater than the 90th percentile). Streamflow at this site had been normal during the previous month.

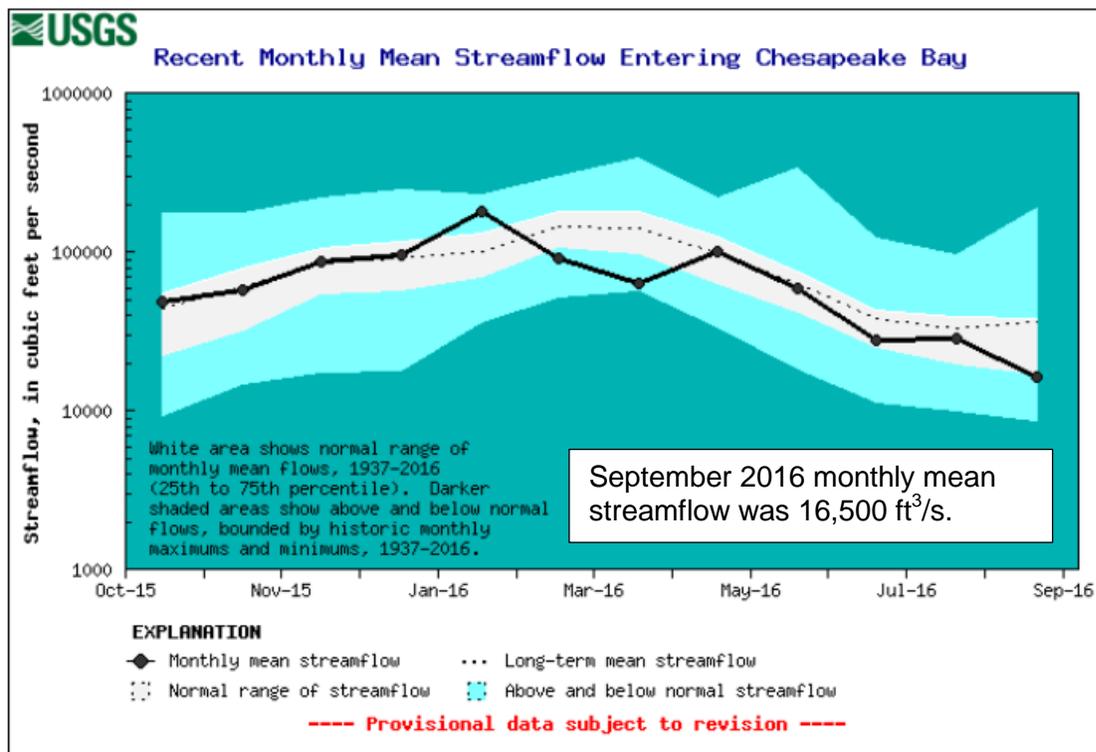


Five-year hydrographs can be viewed at:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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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 September 2016, the monthly mean freshwater flow to the Chesapeake Bay was 16,500 ft³/s (provisional, and subject to revision), which is in the below normal range. The long-term September average (mean) is 36,400 ft³/s, and the normal range is between 17,000 ft³/s and 38,400 ft³/s, the 25th and 75th percentiles of all September values. These provisional statistics are based on a 80-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 September 2016 in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) was 94.31~~2~~ percent of available storage capacity, or a total of 71.54 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 78.27 percent of normal storage capacity at the end of September 2016, with 8.31 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.

September 2016	Percent available/normal storage	Volume (billion gallons)
Baltimore Reservoirs Baltimore City – Environmental Services Division		
Liberty	94.18%	34.66
Loch Raven	95.19%	20.18
Prettyboy	93.56%	16.70
Total	94.31%	71.54
Patuxent Reservoirs Washington Suburban Sanitary Commission (WSSC)		
Triadelphia	78.91%	4.42
Duckett	77.63%	3.89
Total	78.27%	8.31

