

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

**July 2016 Highlights:** [Historic flooding in Ellicott City, Maryland. Record high July groundwater level in Queen Anne’s County, Maryland. Seventy-nine percent of groundwater levels and 76 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.

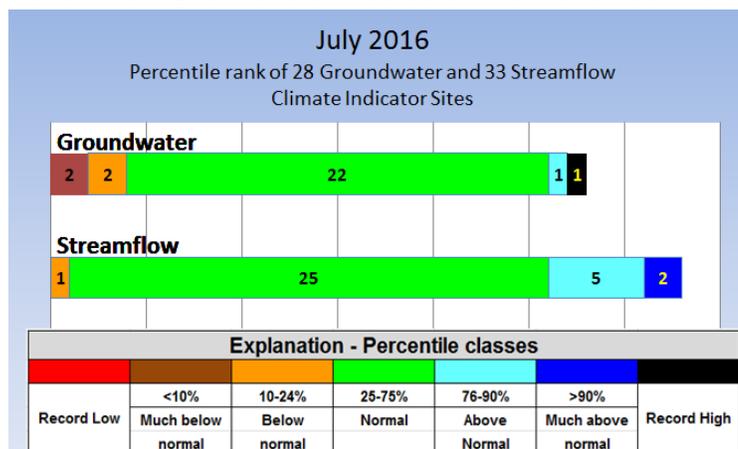
The sites used in this water summary were carefully selected to show the response of streamflow and groundwater levels to weather conditions. Ideally, these sites will show no effects from human influences. The streamflow and groundwater data are ranked in comparison to the historical record and summarized.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

## USGS July 2016 Water Conditions Summary

More than 75 percent of the groundwater levels and monthly mean streamflows were normal (25<sup>th</sup>-75<sup>th</sup> percentiles) in July 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 at a record July high at a USGS observation well in Queen Anne’s County, Maryland and above normal at another USGS observation well. Groundwater was below normal at four wells, two of which were below the 10<sup>th</sup> percentile.

Monthly mean streamflow was normal at 25 of the 33 streamgages used to monitor climatic conditions. Streamflow was above normal at seven streamgages and below normal at one streamgage.



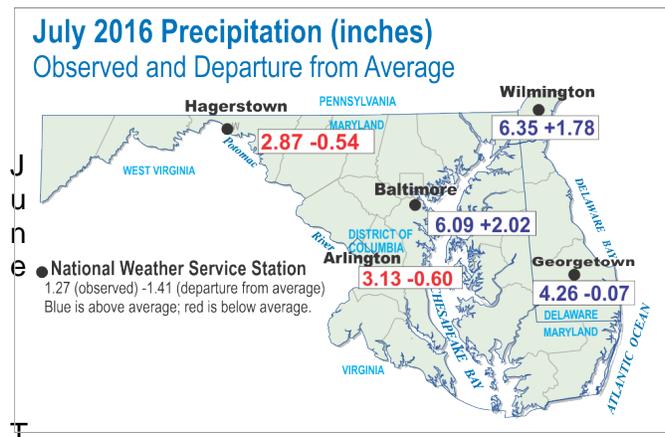
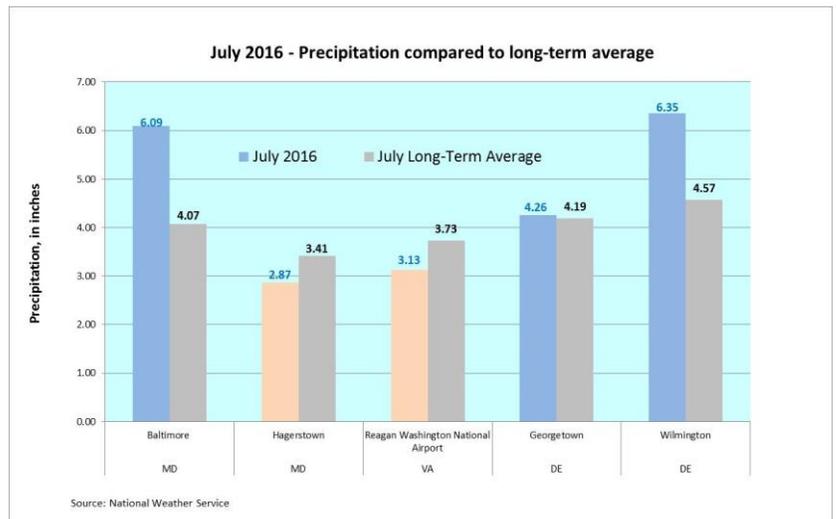
A **percentile** is a value on a scale from 0 to 100 that indicates the percent of a distribution that is equal to or below it. A percentile between 25 and 75 is considered normal. For example, a groundwater level in the 90th percentile is equal to or greater than 90 percent of the values recorded for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

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## July 2016 Precipitation and Weather

During the last days of July, storms with intense rainfall led to flash flooding in some parts of Maryland, most notably Ellicott City near Baltimore, which received over 6 inches of rain in a few hours. At the weather station in Baltimore, precipitation was 6.09 inches for July, but 2.87 inches fell during the last 4 days. This rainfall was 2.02 inches above the long term average in Baltimore.

The highest precipitation of the five National Weather Service (NWS) Mid-Atlantic weather stations was in Wilmington, Delaware with 6.35 inches, which was 1.78 inches above the July average. Precipitation was below the long-term average (shown as tan bars) at Hagerstown, Maryland (0.54 inches lower) and at the Reagan Washington National Airport in Arlington, Virginia, near Washington, D.C. (0.60 inches lower).



### 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 NWS Middle Atlantic River Forecast Center's (MARFC) 365-day precipitation totals for the District of Columbia and all counties in Maryland and Delaware were between 10 percent above to 10 percent below the long-term average, except for some counties on the Eastern Shore of Maryland, which were above average.

July temperatures were 2.7 degrees Fahrenheit to 3.9 degrees above average at the five Mid-Atlantic NWS stations. The largest departure from average was 3.9 degrees above average at the weather station in Hagerstown, Maryland; however, the weather station in Arlington, Virginia had the warmest monthly average temperature at 82.7 degrees. The lowest average temperature was in Hagerstown, Maryland at 79.2 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](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.

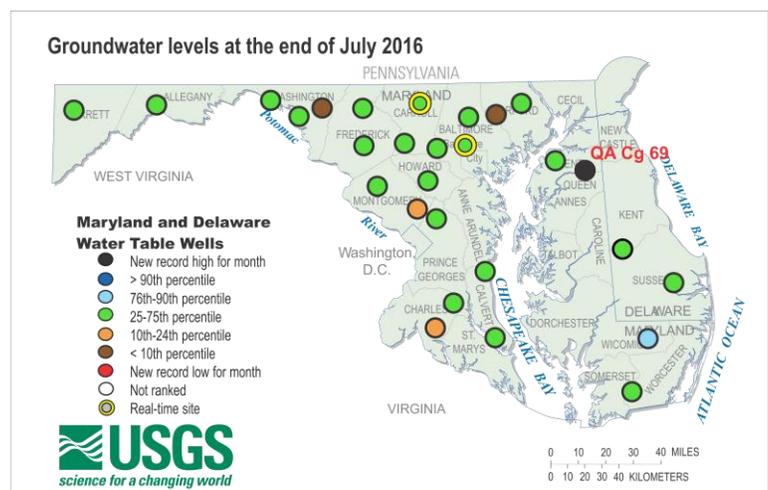
## July 2016 Groundwater Levels

A record high July groundwater level was set at a USGS observation well in Queen Anne's County, Maryland. This is the eighth consecutive month that groundwater levels have been above normal at this well. The groundwater level was also above normal (76<sup>th</sup> to 90<sup>th</sup> percentiles) at the USGS observation well in Wicomico County, Maryland.

Seventy-nine percent (22 of 28 wells) of the groundwater levels were in the normal range (25<sup>th</sup>-75<sup>th</sup> percentiles).

There were four USGS observation wells with below normal groundwater levels--two were between the 10<sup>th</sup> and 24<sup>th</sup> percentiles, and two were below the 10<sup>th</sup> percentile.

These data are provisional and subject to revision.



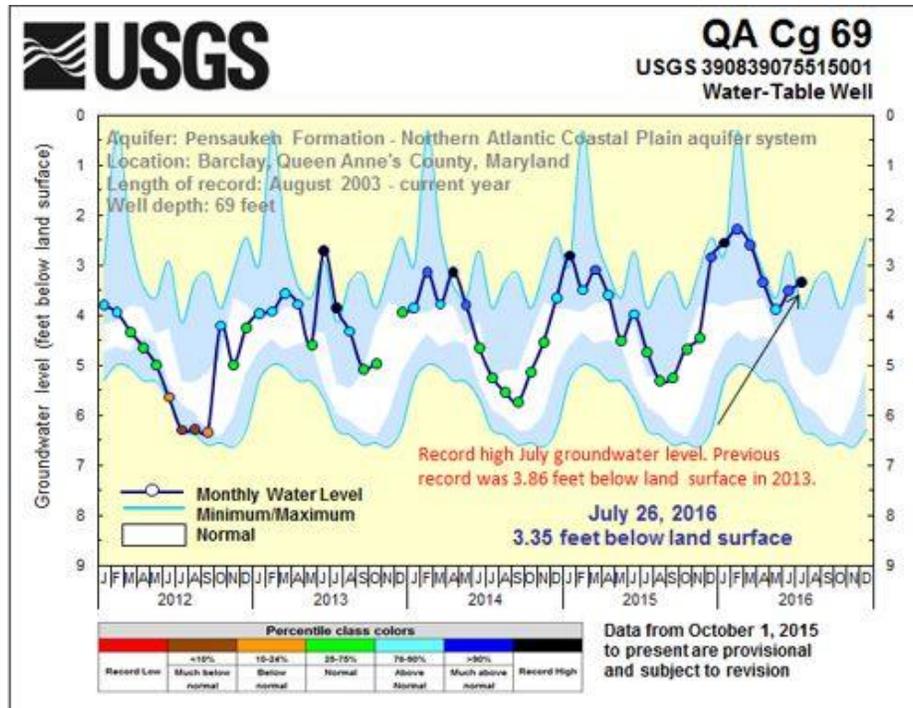
To access the clickable groundwater map, go to:

[http://md.water.usgs.gov/groundwater/web\\_wells/current/water\\_table/counties/](http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/)

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

The groundwater level in USGS observation well QA Cg 69 in Queen Anne's County, Maryland was 3.35 feet below land surface and set a new July record high, breaking the record set in 2013 by 0.51 foot. Data collection began at this well in 2003.

The 5-year hydrograph shows groundwater levels as a dark blue line, the minimum and maximum monthly values, and the normal range (between the 25<sup>th</sup> and 75<sup>th</sup> 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.



Five-year groundwater hydrographs can be viewed at:  
[http://md.water.usgs.gov/groundwater/web\\_wells/current/water\\_table/counties](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.

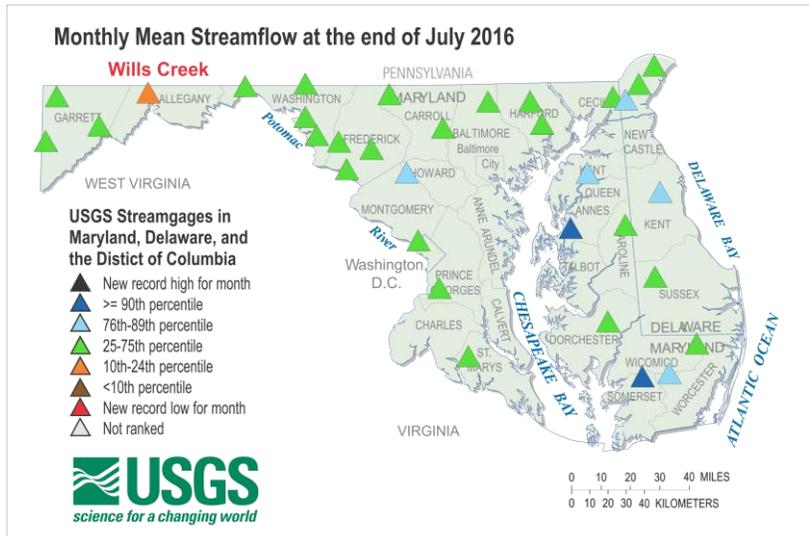
The streamflow locations chosen for the monthly water summary were selected based on the following criteria:

- 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.

## July 2016 Streamflow

Monthly mean streamflow was normal to above normal at all USGS streamgages used to monitor climatic conditions in Maryland, Delaware, and the District of Columbia, except for Wills Creek in Allegany County, Maryland.

Seventy-six percent (25 of 33) of the monthly mean streamflows were in the normal range (25<sup>th</sup>-75<sup>th</sup> percentiles) in July. Streamflow was above normal at seven streamgages: above the 90<sup>th</sup> percentile at two, and between the 76<sup>th</sup> to 89<sup>th</sup> percentiles at five.

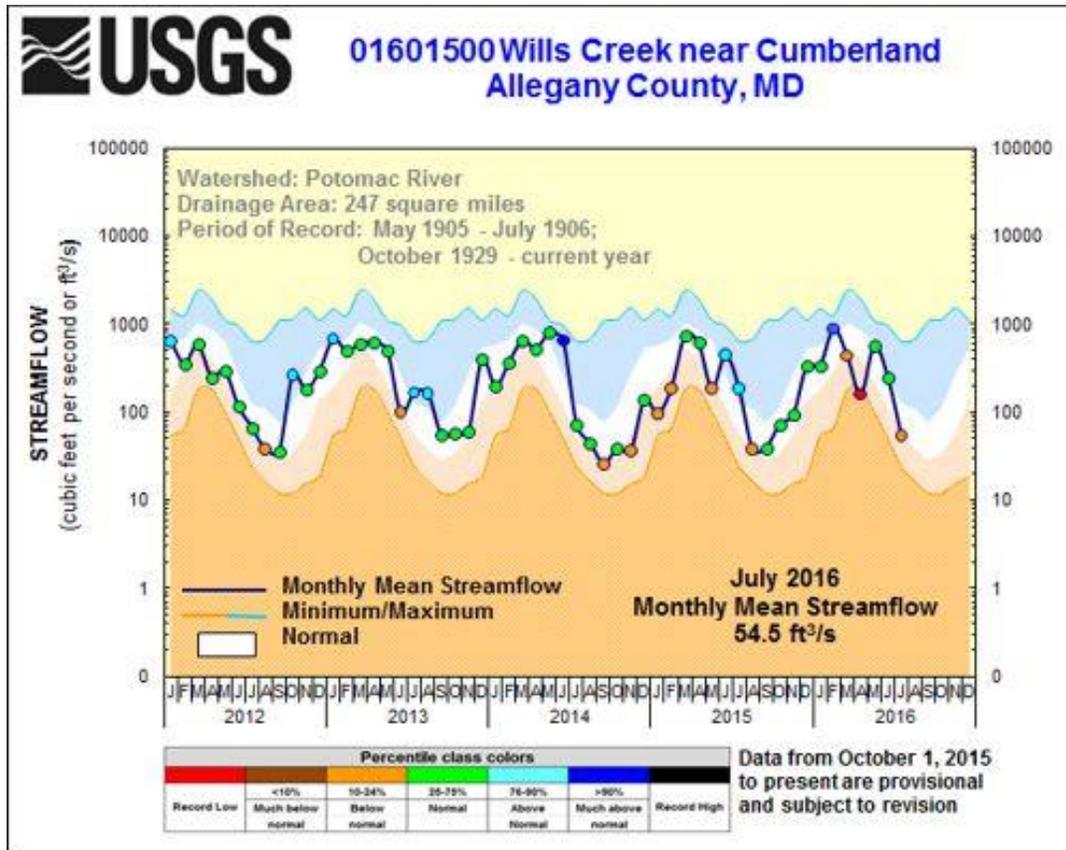


To access the clickable streamflow map, go to:  
<http://md.water.usgs.gov/surfacewater/streamflow/>

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

Monthly mean streamflow on Wills Creek near Cumberland, Maryland was 54.5 cubic feet per second (ft<sup>3</sup>/s) in July, which is below normal (10<sup>th</sup>-24<sup>th</sup> percentiles). Streamflow at this site was normal in June.

The dark line in the 5-year hydrograph represents the monthly mean streamflow for this period and the white band shows the normal range (25<sup>th</sup>-75<sup>th</sup> 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.

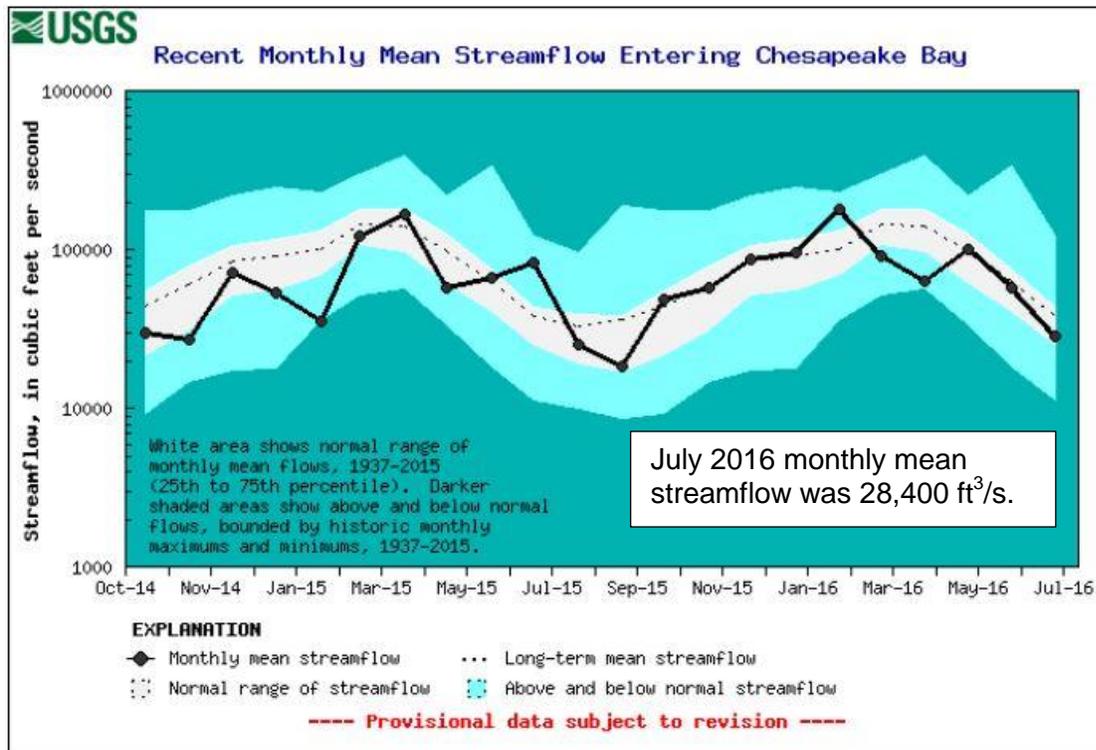


Five-year hydrographs can be viewed at:  
<http://md.water.usgs.gov/surfacewater/streamflow/>

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

## 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 July 2016, the monthly mean freshwater flow to the Chesapeake Bay was 28,400 ft<sup>3</sup>/s (provisional, and subject to revision), which is in the normal range. The long-term July average (mean) is 38,800 ft<sup>3</sup>/s, and the normal range is between 24,800 ft<sup>3</sup>/s and 43,800 ft<sup>3</sup>/s, the 25<sup>th</sup> and 75<sup>th</sup> percentiles of all July 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 July 2016 in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) was 97.87 percent of available storage capacity, or a total of 74.02 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 98.67 percent of normal storage capacity at the end of July 2016, with 10.49 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.

July 2016	Percent available/normal storage	Volume (billion gallons)
<b>Baltimore Reservoirs</b> Baltimore City – Environmental Services Division		
Liberty	96.52%	35.52
Loch Raven	99.15%	21.02
Prettyboy	97.93%	17.48
<b>Total</b>	<b>97.87%</b>	<b>74.02</b>
<b>Patuxent Reservoirs</b> Washington Suburban Sanitary Commission (WSSC)		
Triadelphia	101.95%	5.71
Duckett	95.39%	4.78
<b>Total</b>	<b>98.67%</b>	<b>10.49</b>

