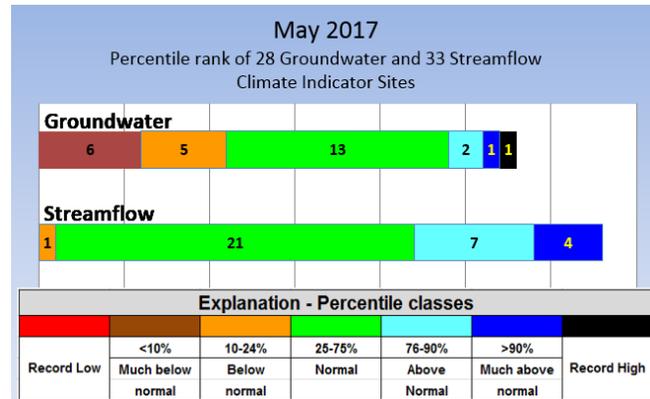


U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

USGS May 2017 Water Conditions Summary

At sites used to monitor the response of water resources to changes in weather conditions in Maryland, Delaware, and the District of Columbia in May 2017, 46 percent of groundwater levels and 64 percent of monthly mean streamflows were in the normal range. Since April, groundwater levels decreased at 5 wells and increased at 23 wells. Monthly mean streamflows decreased at 13 streamgages and increased at 20 streamgages in May.

In May, groundwater levels at 13 of 28 USGS observation wells were in the normal range (25th-75th percentiles). The groundwater level in Queen Anne’s County was at a record May high, and was above normal at an additional 3 observation wells. Groundwater levels were below normal at 11 wells, with 6 wells below the 10th percentile.



Monthly mean streamflows were in the normal range at 21 of 33 USGS streamgages. Streamflow was above normal at 11 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.*

May 2017 freshwater flows to the Chesapeake Bay were in the above normal range in May. Precipitation was above the long-term average at the five Mid-Atlantic weather stations. Hydrologic and weather data have not been reviewed, and are therefore provisional and subject to revision.

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 extreme conditions like floods and droughts. The USGS is known for its consistent measurement techniques and the most extensive set of historical groundwater and streamflow data available to the public. Since these long-term data were collected during wet and dry periods, they can be used to assess how water resources respond to changes in temperature and precipitation, and to evaluate how current data compare to the historical data. The uniformity of the dataset enables multi-state comparisons and other comparative statistical analyses that better inform policy makers of possible water-resources conditions they might encounter in the future.

The sites used in this water summary were carefully selected to include long-term datasets, and show the response of streamflow and groundwater levels to weather conditions, rather than the effects of human influences. Of the USGS sites presented in this summary, 13 wells and 29 streamgages have more than 50 years of data. The current streamflow and groundwater data are ranked in comparison to the historical record and summarized. In addition to groundwater and streamflow data, this summary includes precipitation and temperature data, reservoir levels, and freshwater streamflow to the Chesapeake Bay to give a more complete picture of the region’s water resources.

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

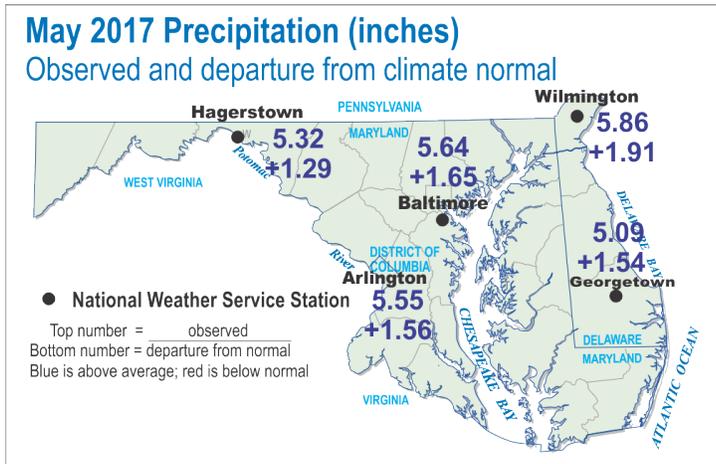
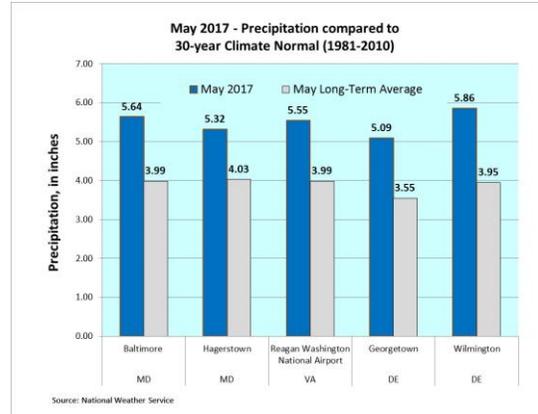
Weather Conditions

Data from five Mid-Atlantic National Weather Service (NWS) stations are used to present monthly precipitation and temperature data. The NWS uses averages of data over the 30-year climate normal period between 1981 and 2010.

During drought periods, the status from the National Drought Mitigation Center (U.S. Drought Monitor) and the Maryland Department of the Environment (MDE) is included. There is currently no drought in Maryland, Delaware, and the District of Columbia.

May 2017 Precipitation

May precipitation was more than an inch above normal at the five Mid-Atlantic NWS weather stations in Maryland. The precipitation graph and map show the May precipitation and the departure from the climate normal. Precipitation was lowest in Georgetown, Delaware with 5.09 inches, and highest in Wilmington, Delaware with 5.86 inches, which also had the largest departure from average with 1.91 inches above the long-term 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

Source: National Weather Service
MD and DC:
<http://www.weather.gov/climate/index.php?wfo=lx>
http://w2.weather.gov/climate/index.php?wfo=lx
DE: <http://www.weather.gov/climate/index.php?wfo=phi>:

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

The NWS precipitation departures for May 2017 are shown on the map below for Delaware, the District of Columbia, Maryland, Virginia, and West Virginia. This region includes parts of the Potomac River and Susquehanna River Basins and other rivers, most of which eventually flow to the Chesapeake and Delaware Bays.

The May 2017 precipitation was above average in all counties in Maryland, Delaware, and the District of Columbia.

The NWS data and maps can be accessed here:
http://www.weather.gov/marfc/Precipitation_Departures

May 2017 Temperatures

May temperatures at the five Mid-Atlantic NWS stations ranged from 61.9 to 65.5 degrees Fahrenheit. The highest departure from average for May for the second consecutive month was in Hagerstown, Maryland, with 1.0 degrees above normal. Also for the second consecutive month, the temperature in Hagerstown, Maryland (63.0 degrees) was higher than the temperatures in Baltimore, Maryland (62.3 degrees) and Wilmington, Delaware (61.9 degrees), which is unusual because temperatures are often cooler in the mountainous regions of Maryland.

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

Groundwater

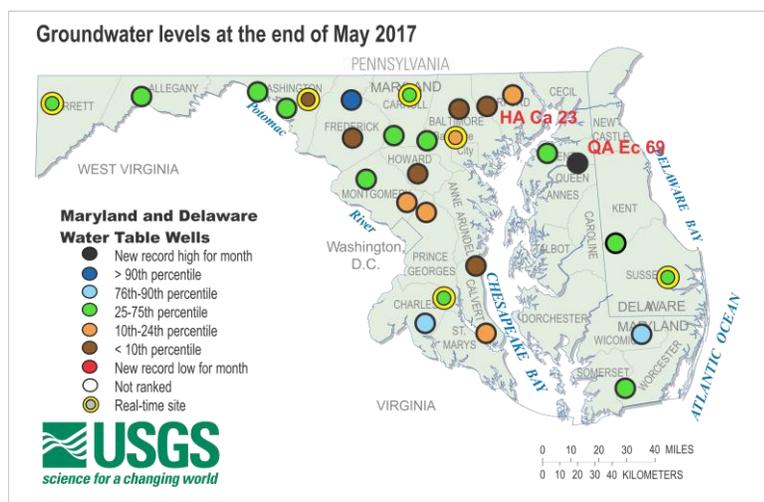
The USGS monitors groundwater levels in surficial or unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in weather conditions. The groundwater wells used for the monthly water summary were selected based on the following criteria:

- Located in a surficial or unconfined (water-table) aquifer
- Open to a single, known hydrogeologic unit/aquifer
- Groundwater hydrograph generally reflects response to weather
- No indicated nearby pumpage, and likely to remain uninfluenced by pumpage 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 rarely goes dry
- Long-term accessibility likely, such as on public land

In the Maryland, Delaware, and District of Columbia region, it is useful to compare current data to historical data, such as during the droughts of 2002 and the 1960s. There are 11 wells that have over 60 years of groundwater data and 23 wells have more than 30 years of groundwater data as of 2017.

May 2017 Groundwater Levels

At 13 USGS observation wells, the groundwater levels were within the normal range. Groundwater levels were above normal at four observation wells, and the observation well in Queen Anne's County, Maryland set a record May high. Groundwater levels were below normal at 11 wells; including 5 wells in the 10th-24th percentiles, and 6 wells below the 10th percentile. Between April and May, groundwater levels decreased at 5 of 28 wells and increased at 23 wells.

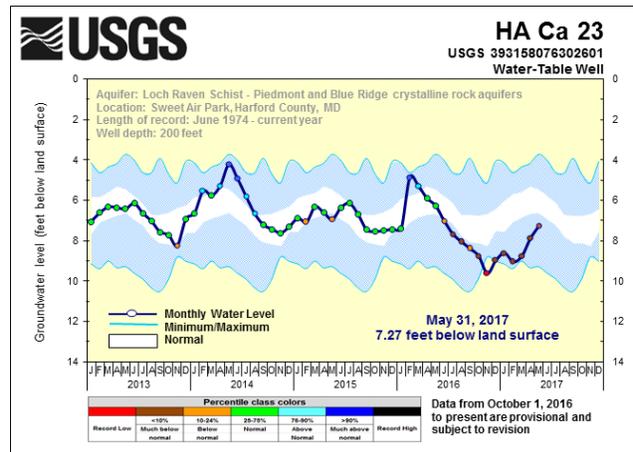


To access the clickable groundwater map, go to:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/

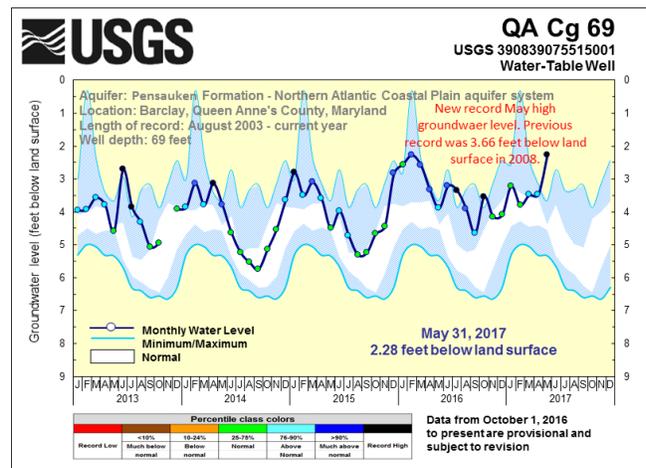
U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

In the two 5-year hydrographs presented below, groundwater levels are shown as a dark blue line. Each monthly measurement is colored according to the percentile rank compared to the historical values at the site for the month. The normal range is displayed as a white band, and is 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 area in the graph.

The groundwater level at observation well HA Ca 23, in Harford County, Maryland, rose between April and May, but remained below normal in May at 7.27 feet below land surface. Normal May groundwater levels at this well range from 5.48 to 6.69 feet below land surface. Record-keeping began in June 1974.



The groundwater level at USGS observation well QA Cg 69, in Queen Anne's County, Maryland, rose to a record May high, exceeding the May 2008 record by 1.38 feet. The groundwater level was 2.28 feet below land surface. The May 2017 normal range of groundwater levels is between 3.51 and 4.43 feet below land surface. Record-keeping began in August 2003.



Five-year groundwater hydrographs can be viewed at:
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

Streamflow

Streamflow data are used most commonly for assessing water supply and to determine the risk of droughts and floods. Streamflow data are also used to calculate loads of chemical constituents, and to assess how biological communities are affected by hydrologic conditions.

The USGS streamgages chosen for the monthly water summary were selected based on the following criteria:

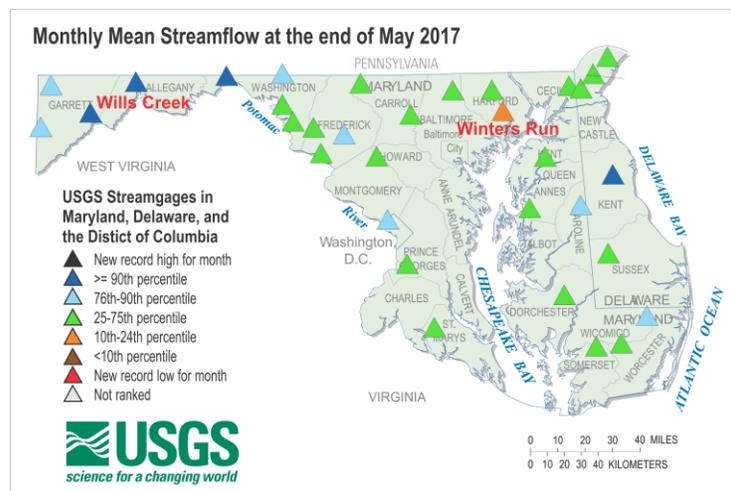
- Minimum period of record is 10 years of continuous data
- Watershed areas greater than 5 square miles
- Streamflow is not regulated, such as by a dam or diversion, and it has relatively natural flow
- Streamflow data reflect a response to weather conditions
- Most of the surrounding area and watershed are not urban

Of the 33 streamgages used in this summary, 22 have more than 60 years of data, allowing for comparison to the historical droughts of 2002 and the 1960s. All 33 streamgages have at least 30 years of monthly mean streamflow data.

May 2017 Streamflow

Monthly mean streamflows were in the normal range at 64 percent or 21 of 33 selected USGS streamgages. Streamflow was below normal (between the 10th and 24th percentiles) at Winters Run in Harford County, Maryland, and above normal at 11 streamgages in May.

Streamflow decreased at 13 streamgages and increased at 20 streamgages used to monitor the response to weather conditions in Maryland, Delaware, and the District of Columbia between April and May.

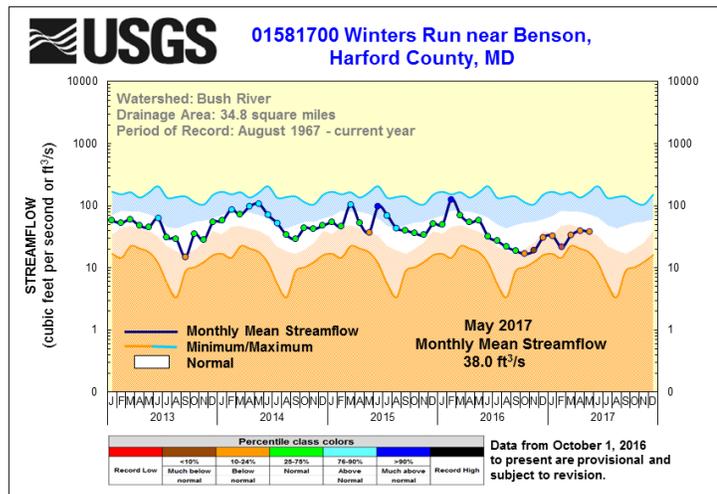


To access the clickable groundwater map, go to:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/

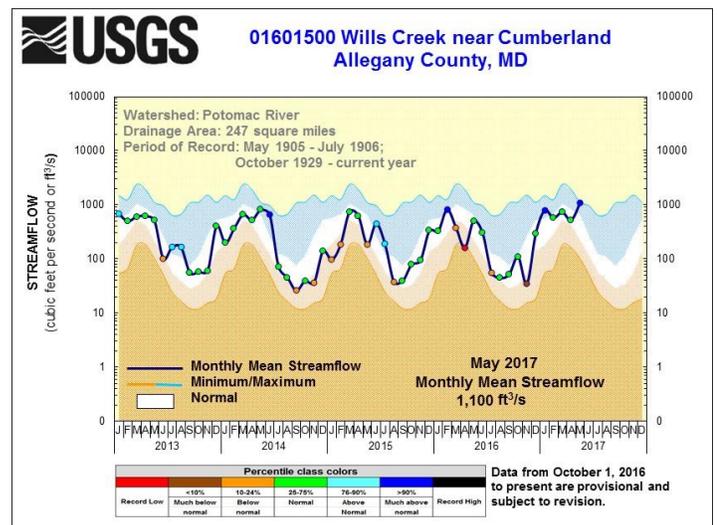
U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

In the hydrograph for the selected streamgage, 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 bottom of the tan area. Each monthly mean streamflow (each circle) is colored according to the percentile rank compared to the historical data for the month.

At Winters Run near Benson, in Harford County, Maryland, the monthly mean streamflow decreased since April and remained between the 10th-24th percentiles at the end of May, which is below normal. May monthly mean streamflow was 38.0 cubic feet per second (ft³/s). The normal range is between 38.2 ft³/s and 70.6 ft³/s for May.



At Wills Creek in Allegany County, Maryland, the monthly mean streamflow increased since April and was at 1,100 ft³/s. The normal range for May is between 222 ft³/s and 654 ft³/s.

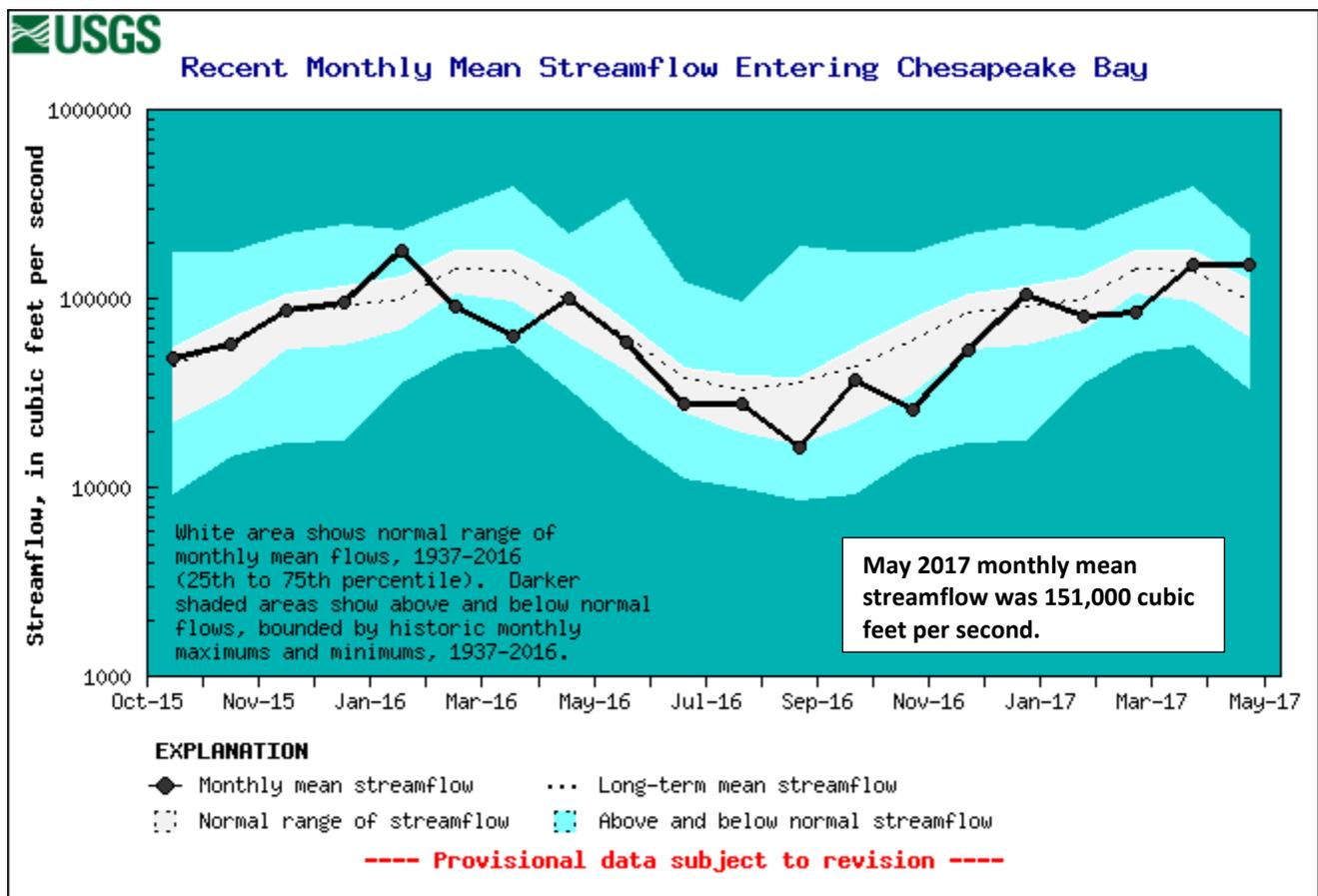


Five-year hydrographs can be viewed at:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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

Estimated Streamflow to the Chesapeake Bay

The estimated monthly mean streamflow entering Chesapeake Bay during May 2017 was 151,000 ft³/s. This value, which is provisional and subject to revision, is considered to be in the above normal range. Normal May streamflow entering the Bay is between 62,300 and 127,000 ft³/s, the 25th and 75th percentiles, respectively, of all May values. Average (mean) monthly streamflow for May is 98,700 ft³/s. These statistics are based on an 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 the survival of fish, crabs, and oysters, with regard to the location and size of breeding/reproductive zones. Generally, as river flow increases, more nutrient and sediment pollution enters the Bay.

More information on freshwater flow to the Bay can be found here:
<http://md.water.usgs.gov/waterdata/chesinflow/>

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

Baltimore and Patuxent Reservoir Levels

Baltimore City’s Department of Public Works provides finished drinking water from three reservoirs (Loch Raven, Liberty, and Prettyboy) to 1.8 million people daily in Baltimore City and parts of Baltimore, Anne Arundel, and Howard Counties in Maryland. Carroll and Harford Counties in Maryland also receive raw water from the Baltimore reservoirs. At the end of May 2017, available reservoir storage in the Baltimore Reservoirs was 75.85 billion gallons, or 100 percent of available storage capacity (total or full storage is 75.85 billion gallons of water).

The Triadelphia and Duckett Reservoirs serve 1.8 million residents in parts of Charles, Howard, Montgomery, and Prince George’s Counties in suburban Maryland around the District of Columbia, and are managed by the Washington Suburban Sanitary Commission (WSSC).

The stored water quantity for the Tridelphia and Duckett Reservoirs at the end of May 2017 was 6.85 billion gallons, which is about 68 percent of normal storage capacity for the two Patuxent reservoirs. The storage numbers were updated in May 2017 by WSSC. Normal storage refers to the volume that is useable for water supply. The full capacity of the two Patuxent reservoirs is 11.93 billion gallons, which is higher than normal storage (10.57 billion gallons); therefore, full capacity values can exceed 100 percent of normal storage.

Note: Water storage in the Tridelphia Reservoir was drawn down for anticipated construction during the summer of 2017.

