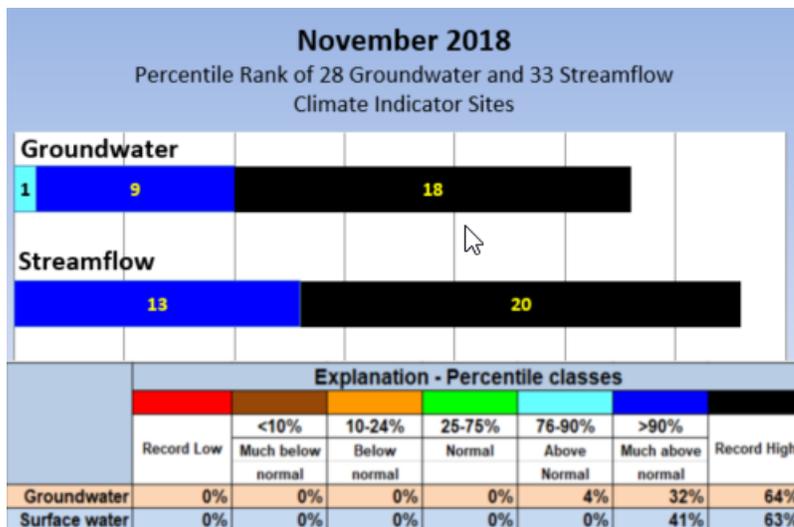


# U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

## USGS November 2018 Water Conditions Summary

Hydrologic data from 28 wells and 33 streamgages were used to monitor the monthly groundwater and streamflow response to weather conditions in Maryland, Delaware, and the District of Columbia. In November 2018, groundwater levels were at record November highs at 18 wells, and monthly mean streamflow was at record highs at 20 streamgages. The freshwater flow to the Chesapeake Bay was above normal, after 2 months of a November record high.

The number of groundwater and surface-water sites, and the percentage of the total number of groundwater and surface-water sites that fall within each percentile range, are shown in the graph for November 2018.



*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.*

### 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 weather, 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 can 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 32 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 data to give a more complete picture of the region's water resources and the monthly freshwater flow to the Chesapeake Bay. Hydrologic and weather data have not been reviewed and are therefore provisional and subject to revision.

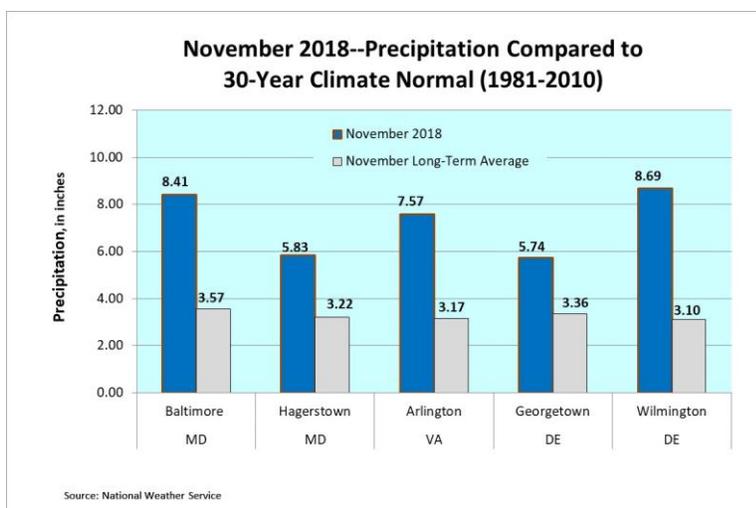
# U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

## Precipitation

Monthly data from five Mid-Atlantic National Weather Service (NWS) stations were used to show the relation between monthly precipitation and monthly groundwater levels and streamflows. The NWS uses averages of data over the 30-year climate normal period from 1981 through 2010.

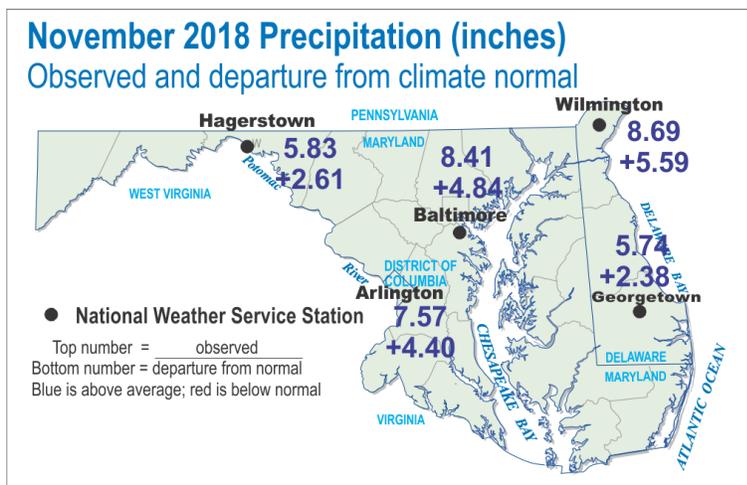
### November 2018 Precipitation

Precipitation was above normal at the five Mid-Atlantic NWS weather stations in November. At the weather station in Baltimore, Maryland, precipitation was 8.41 inches, which is a November record high. The previous November record high was 7.68 inches in 1952. The long-term average November 2018 precipitation for the five Mid-Atlantic NWS weather stations is shown next to the November 2018 precipitation in the graph and map below.



### 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  
 DC and MD: <http://w2.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](http://www.weather.gov/marfc/Precipitation_Departures)

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

## Groundwater

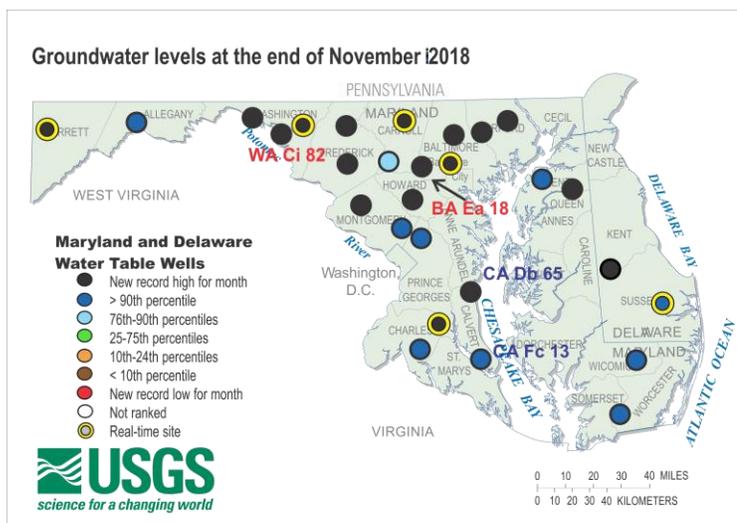
The USGS monitors groundwater levels in surficial or unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in weather conditions. The groundwater wells used for the monthly water summary were selected based on the following criteria:

- 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 data from the droughts of 1999-2002 and the 1960s. There are 12 wells that have over 60 years of groundwater data, and 26 wells that have more than 30 years of groundwater data as of November 2018.

## November 2018 Groundwater Levels

Groundwater levels were at record November highs at 18 of 28 wells, above the 90<sup>th</sup> percentile at 9 wells, and within the 76<sup>th</sup>-90<sup>th</sup> percentile range at one well. Between October and November, groundwater levels increased at all of the wells included in this report.

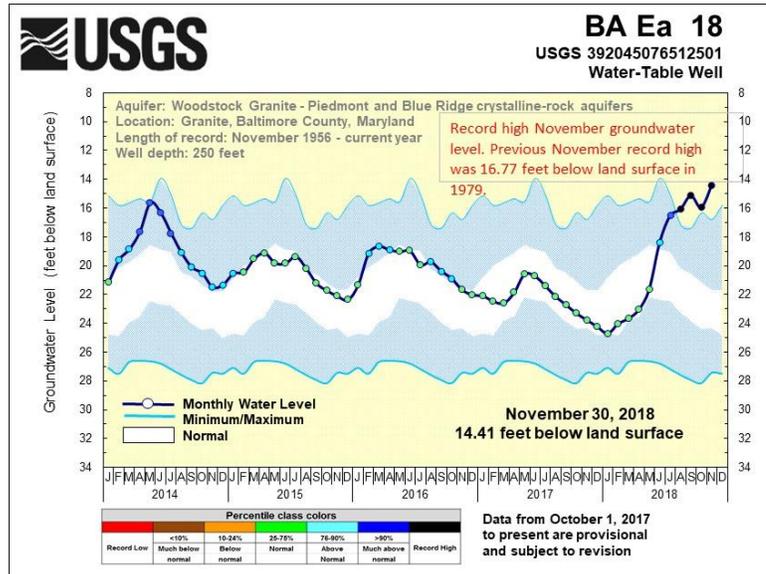


To access the clickable groundwater map, go to:  
[http://md.water.usgs.gov/groundwater/web\\_wells/current/water\\_table/counties/](http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/)

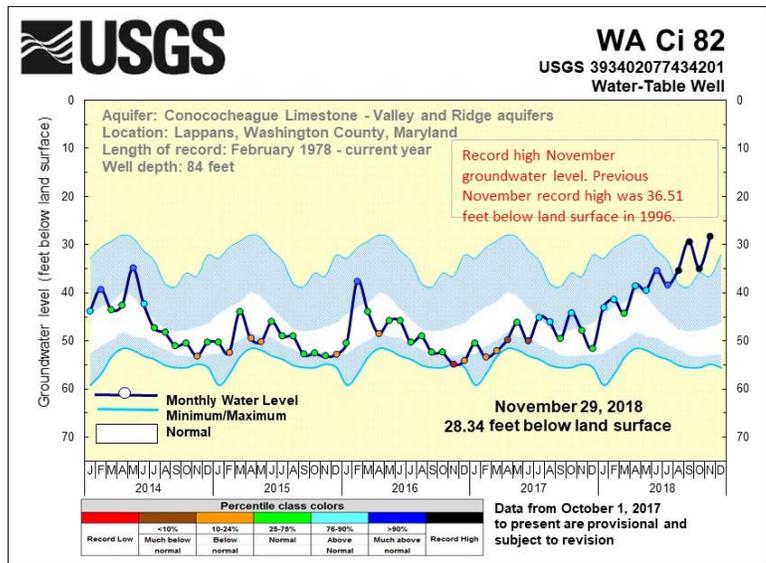
## U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

In the 5-year hydrographs for the selected wells, 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 BA Ea 18 in Baltimore County, Maryland, was 14.41 feet below land surface, which is a November record high. The previous record was 16.77 feet below land surface in 1979. Monthly record-keeping at this well began in November 1956.



The groundwater level at USGS observation well WA Ci 82, in Washington County, Maryland, was 28.34 feet below land surface, which is a November record high. November was the fourth consecutive month with record highs. The previous record was 36.51 feet below land surface in 1996. Monthly record-keeping at this well began in February 1978.



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)

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

## Streamflow

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

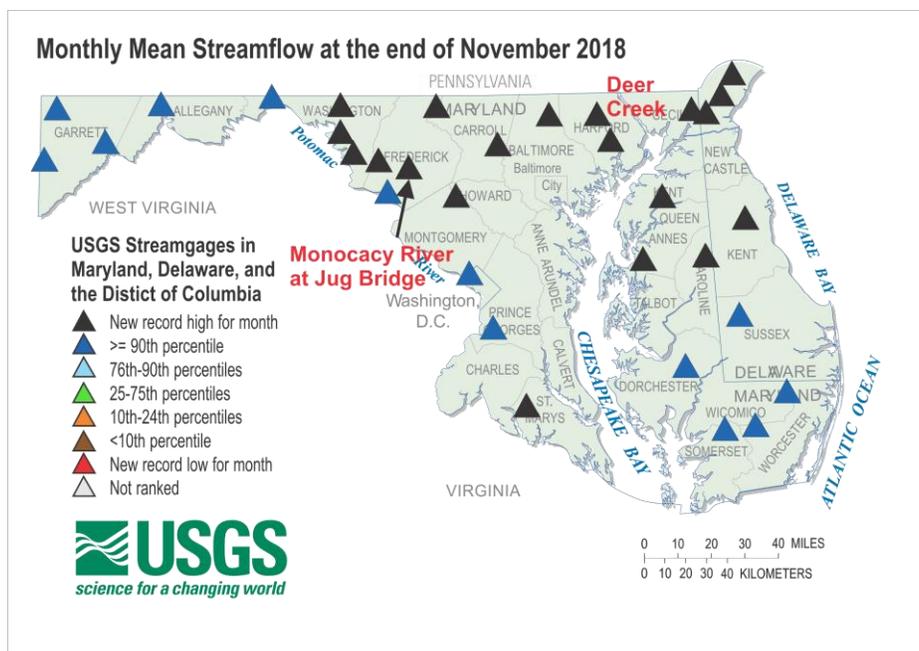
The USGS streamgages chosen for the monthly water summary were selected based on the following criteria:

- 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 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, 27 have more than 60 years of data, allowing for comparison to data from the historical droughts of 1999--2002 and the 1960s. All 33 streamgages have at least 30 years of monthly mean streamflow data.

## November 2018 Streamflow

Monthly mean streamflows were at record November highs at 20 streamgages and above the 90<sup>th</sup> percentile at 13 streamgages. Monthly mean streamflow increased at 33 streamgages (100 percent) between October and November.

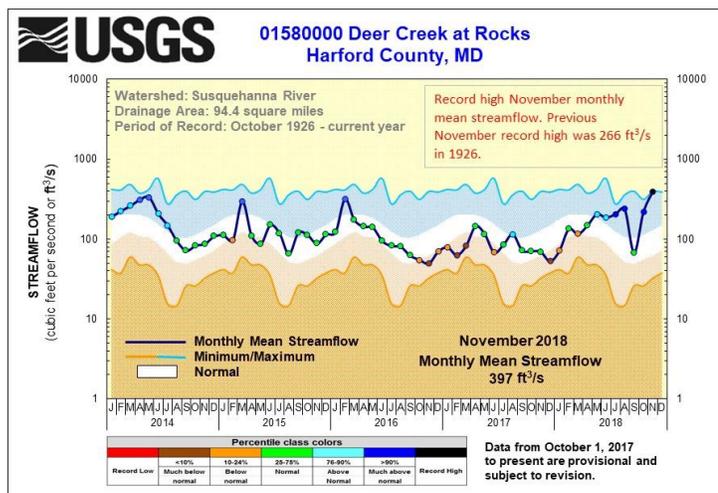


To access the clickable streamflow map, go to:  
<http://md.water.usgs.gov/surfacewater/streamflow/>

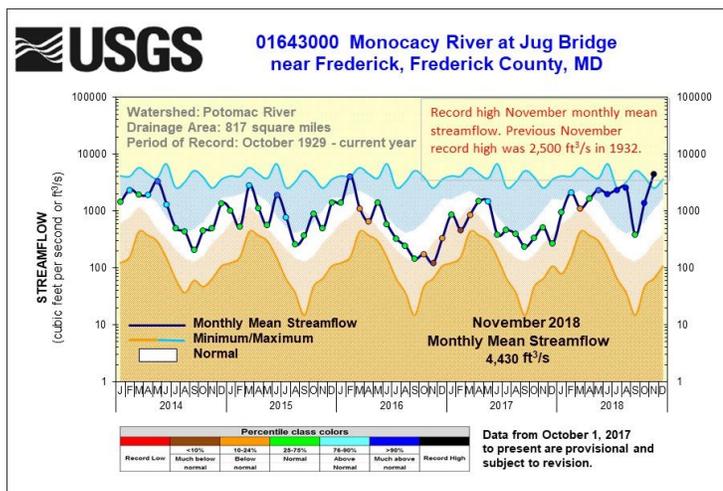
## U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

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

Monthly mean streamflow at Deer Creek at Rocks, Harford County, Maryland, was 397 cubic feet per second (ft<sup>3</sup>/s), which is a record November high. The previous record was 266 ft<sup>3</sup>/s, set in 1926. Record-keeping at this streamgage began in October 1926.



At the Monocacy River at Jug Bridge near Frederick, in Frederick County, Maryland, the monthly mean streamflow was 4,430 ft<sup>3</sup>/s, which is a November record high. The previous record of 2,500 ft<sup>3</sup>/s was set in 1932. Record-keeping at this streamgage began in October 1929.



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**

Estimated streamflow entering the Chesapeake Bay is computed on a monthly and annual basis using streamflow measurements from the Susquehanna, Potomac, and James Rivers. Data are presented in tables and graphs, typically grouped by water year — the natural, annual water cycle used by hydrologists. A water year is the 12-month period beginning October 1 and ending September 30. The water year is designated by the calendar year in which it ends and includes 9 of the 12 months in that year. For example, the year beginning October 1, 2017 and ending September 30, 2018, is called “water year 2018.”

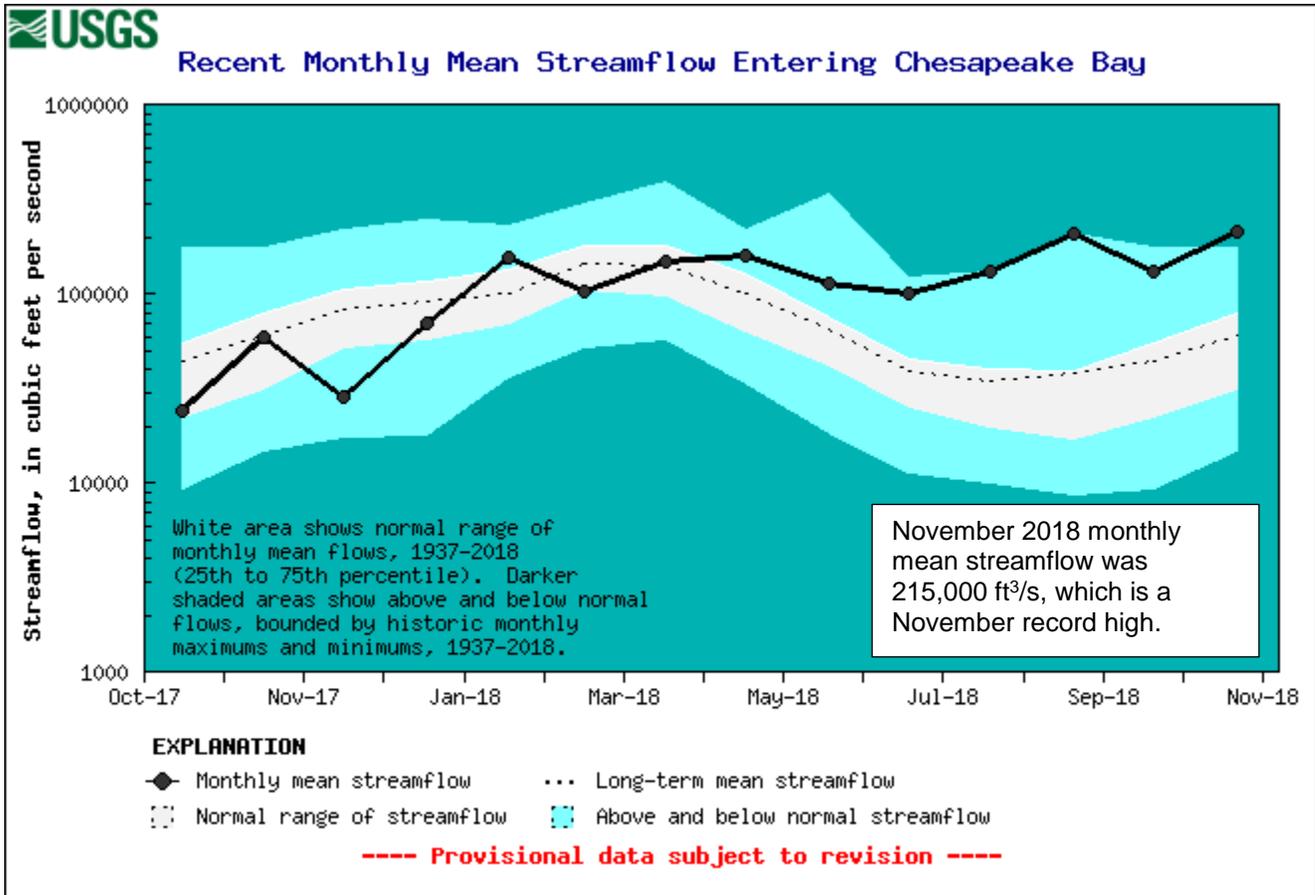
The health of the Chesapeake Bay largely is driven by changes in streamflow and the amount of pollution it contains. Runoff in the Chesapeake Bay watershed carries pollutants, such as nutrients and sediment, to rivers and streams that drain to the Bay. Scientists can use estimated streamflow entering the Chesapeake Bay to assess the health of the Bay and make ecological forecasts.

The estimated monthly mean streamflow entering Chesapeake Bay during November 2018 was 215,000 ft<sup>3</sup>/s, which is a record high for November. This value is provisional and subject to revision. Normal November streamflow entering the Bay is between 31,100 and 78,900 ft<sup>3</sup>/s, the 25<sup>th</sup> and 75<sup>th</sup> percentiles, respectively, of all November values. Average (mean) monthly streamflow for November is 60,400 ft<sup>3</sup>/s. These statistics are based on an 82-year period of record.

Freshwater flow to the Bay has been above normal for the past 7 consecutive months. The November 2018 flow exceeded the previous November record of 175,000 in 1985 by 40,000 ft<sup>3</sup>/s. November 2018 freshwater flow was a November record high at the Susquehanna River at 105,000 ft<sup>3</sup>/s, but November freshwater flows at the Potomac and James Rivers were not records. Streamflow on the Susquehanna River was 53,800 ft<sup>3</sup>/s greater than the previous record set in 1985 (51,200 ft<sup>3</sup>/s). Three of the top five freshwater flows have occurred since 2000. November 2018 is the 28th highest flow to the Bay for all months and years since record-keeping began. The all-time record is April 1993, with 389,000 ft<sup>3</sup>/s. Susquehanna River flow was 235,000 ft<sup>3</sup>/s in April 1993 compared to 105,000 ft<sup>3</sup>/s in November 2018.

<b>Freshwater flow to the Chesapeake Bay</b>		
<b>November</b>		<b>Total Flow to Bay (ft<sup>3</sup>/s)</b>
1	2018	215,000
2	1985	175,000
3	2003	152,000
4	2006	147,000
5	1972	135,000
6	1996	129,000
7	1977	125,000
8	1970	117,000
9	1950	108,000
10	1979	108,000

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



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