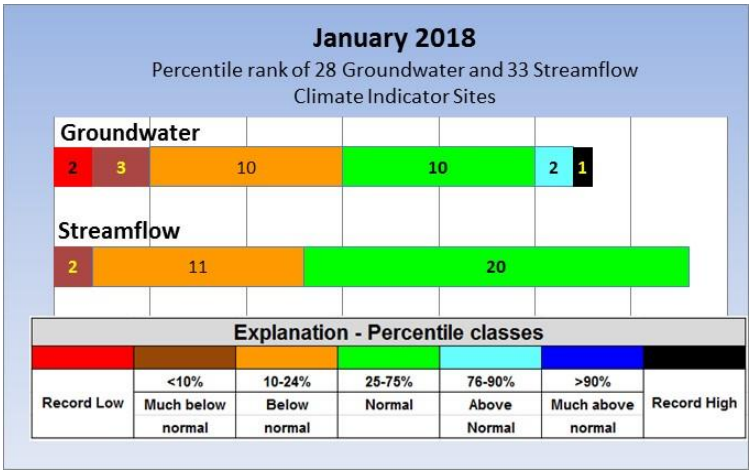
U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia
Monthly Water Conditions Summary

USGS January 2018 Water Conditions Summary

In January 2018, groundwater levels ranged from monthly record highs to monthly record lows. Monthly mean streamflows were normal to below normal. Thirty-six percent of groundwater levels and 61 percent of monthly mean streamflows were in the normal range at sites used to monitor the response of water resources to changes in weather conditions in Maryland, Delaware, and the District of Columbia. Since December, groundwater levels decreased at 12 wells and increased at 16 wells. Monthly mean streamflows decreased at 1 streamgage and increased at 32 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.*

Groundwater levels at 10 of 28 USGS observation wells were in the normal range (25th-75th percentiles) at the end of January. Groundwater levels were above normal in three wells, including a record high in one well. Groundwater levels were below normal in 15 wells, including 10 wells in the 10th-24th percentiles, 3 wells below the 10th percentile, and 2 wells that set a record January low.

Monthly mean streamflows were in the normal range at 20 of 33 USGS streamgages. Streamflow was below normal at 13 streamgages, including 11 streamgages in the 10-24th percentiles, and 2 streamgages below the 10th percentile. January 2018 freshwater flow to the Chesapeake Bay was normal. Precipitation was below the long-term average at the five Mid-Atlantic National Weather Service (NWS) 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?

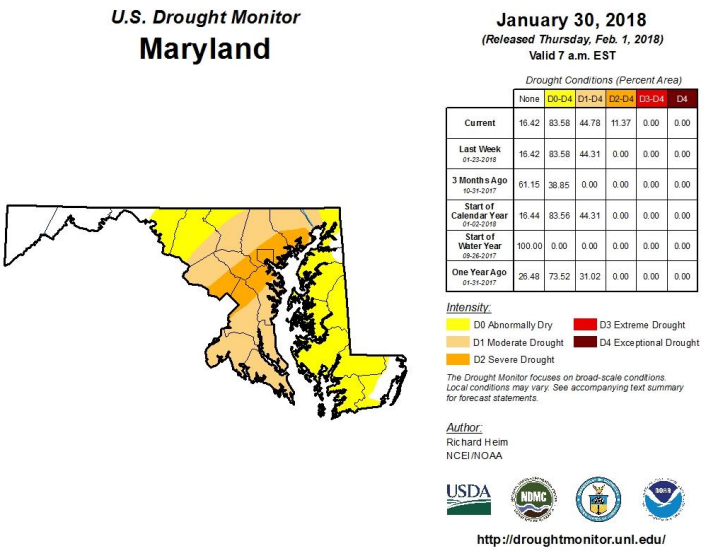
USGS water data are valuable to the public, researchers, water managers, planners, and agricultural users, especially during extreme conditions like floods and droughts. The USGS is known for its consistent measurement techniques and the most extensive set of historical groundwater and streamflow data 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 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 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.

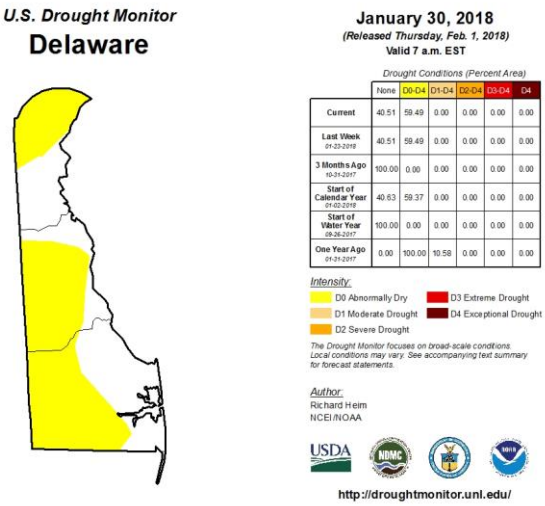
Weather Conditions

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

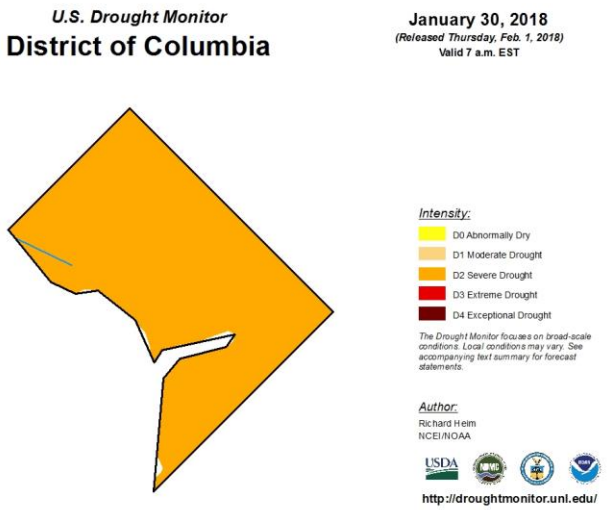
During drought periods, the status from the National Drought Mitigation Center (U.S. Drought Monitor) and the Maryland Department of the Environment (MDE) may be included. The U.S. Drought Monitor shows that in Maryland, as of January 30, 2018, 11.37 percent of the state was in severe drought, 33.40 percent was in moderate drought, and 38.80 percent was classified as abnormally dry. In Delaware, 59.49 percent of the state was classified as abnormally dry. In the District of Columbia, 100 percent was in severe drought status.

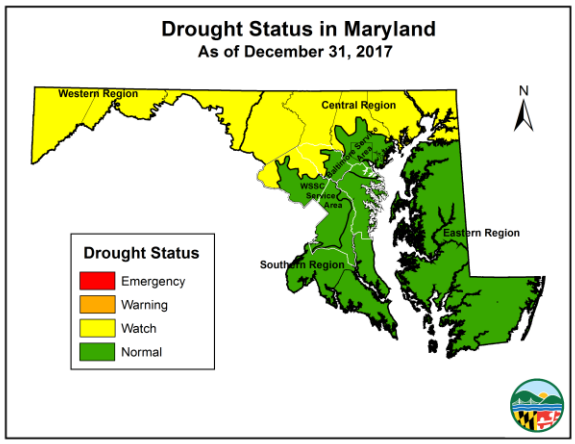


	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	16.42	83.58	44.78	11.37	0.00	0.00
Last Week 01-23-2018	16.42	83.58	44.31	0.00	0.00	0.00
3 Months Ago 10-31-2017	61.15	38.85	0.00	0.00	0.00	0.00
Start of Calendar Year 01-02-2018	16.44	83.56	44.31	0.00	0.00	0.00
Start of Water Year 09-26-2017	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 01-31-2017	26.48	73.52	31.02	0.00	0.00	0.00



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	40.51	59.49	0.00	0.00	0.00	0.00
Last Week 01-23-2018	40.51	59.49	0.00	0.00	0.00	0.00
3 Months Ago 10-31-2017	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 01-02-2018	40.63	59.37	0.00	0.00	0.00	0.00
Start of Water Year 09-26-2017	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 01-31-2017	0.00	100.00	10.58	0.00	0.00	0.00





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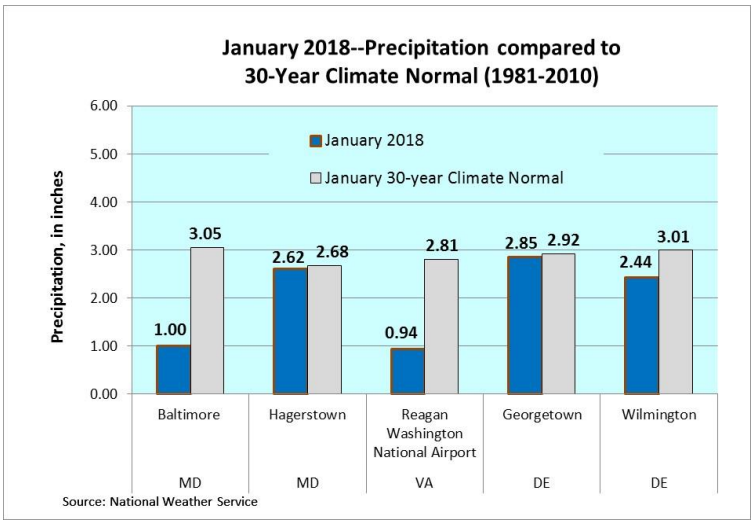
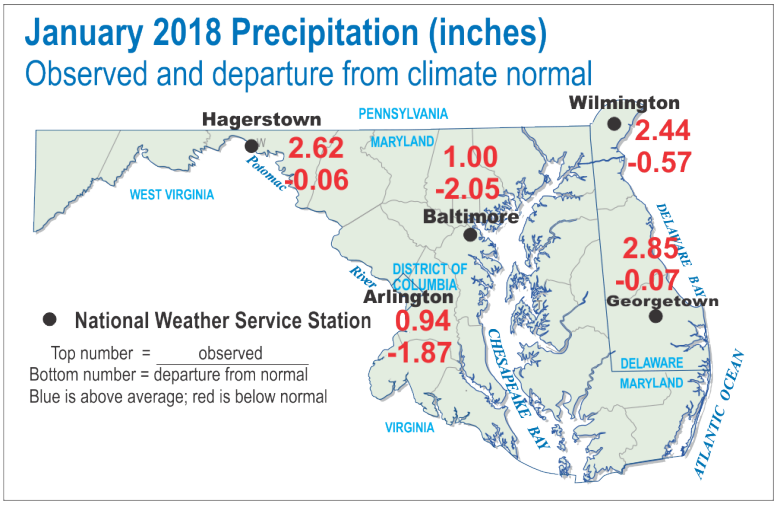
January 2018 Precipitation

January precipitation was below the long-term average at five Mid-Atlantic NWS weather stations. Precipitation was lowest in Arlington, Virginia, with 0.94 inches, or 1.87 inches below the long-term average. The highest precipitation in January was in Georgetown, Delaware, with 2.85 inches, which is 0.07 inches below the long-term January average.

The precipitation graph and map show January precipitation and the departure from the 30-year climate normal from 1981-2010.





National Weather Service Stations

Baltimore =
Baltimore/Washington International Thurgood Marshall Airport (BWI)

Georgetown =
Georgetown, Sussex County Airport

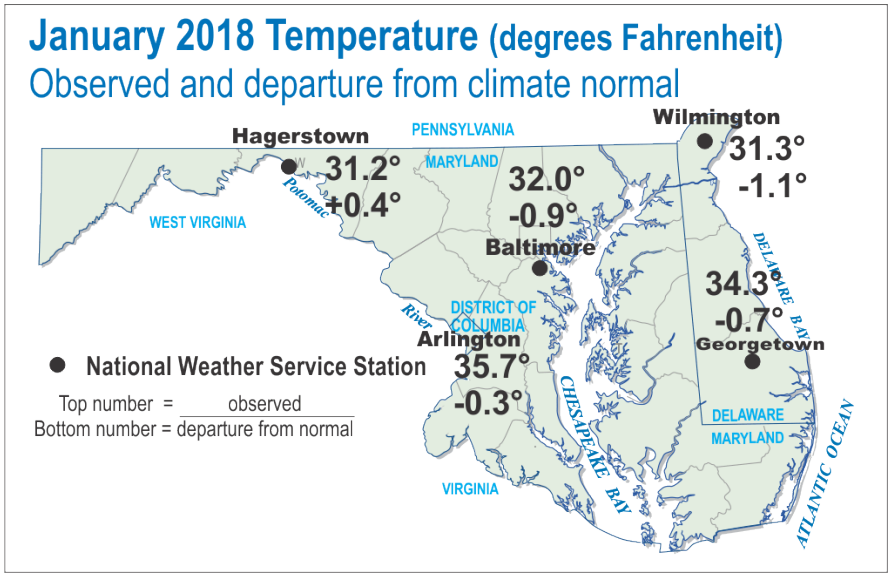
Hagerstown =
Hagerstown Regional Airport

Arlington =
Ronald Reagan Washington National Airport

Wilmington =
New Castle Airport

January 2018 Temperatures

January temperatures at four of the five Mid-Atlantic NWS stations were below the climate normal and ranged from 31.2 to 35.7 degrees Fahrenheit. The temperature at Hagerstown, Maryland was the lowest of the five weather stations, but above the long-term average and it was only 0.1 degrees cooler than the temperature at Wilmington, Delaware. Temperatures are typically colder in the mountains of Maryland than along the coast. The highest temperature was in Arlington, Virginia at 35.7 degrees.



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

Groundwater

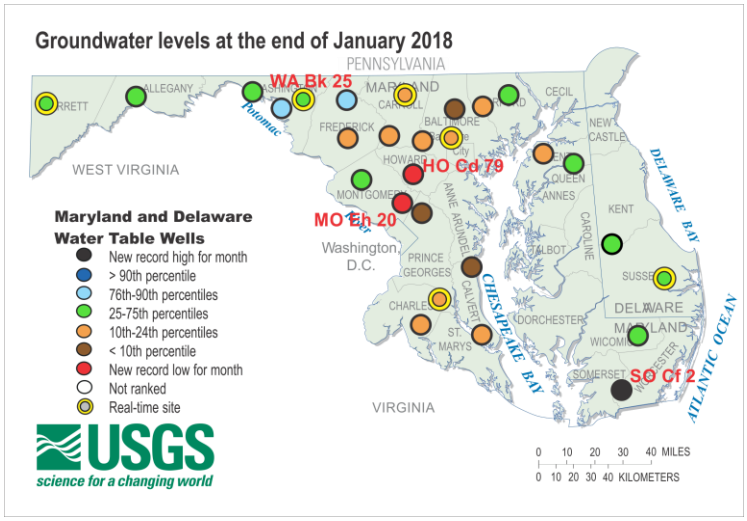
The USGS monitors groundwater levels in surficial or unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in weather conditions. The groundwater wells used for the monthly water summary were selected based on the following criteria:

- 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 2002 and the 1960s. There are 11 wells that have over 60 years of groundwater data, and 23 wells that have more than 30 years of groundwater data as of 2018.

January 2018 Groundwater Levels

Thiry-six percent, or 10 USGS observation wells, had groundwater levels within the normal range in January. Groundwater levels were above normal at 3 wells including a record high at well SO Cf 2 in Somerset County, Maryland. Groundwater levels were below normal at the remaining 15 wells, including 10 wells in the 10th-24th percentile range, 3 wells below the 10th percentile, and 2 wells at record lows: USGS Observation wells HO Cd 79 and MO Eh 20. This is the third consecutive month that observation well MO Eh 20 in Montgomery County, Maryland set a new monthly record low. Between December and January, groundwater levels decreased at 12 of 28 wells, and increased at 16 wells.



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

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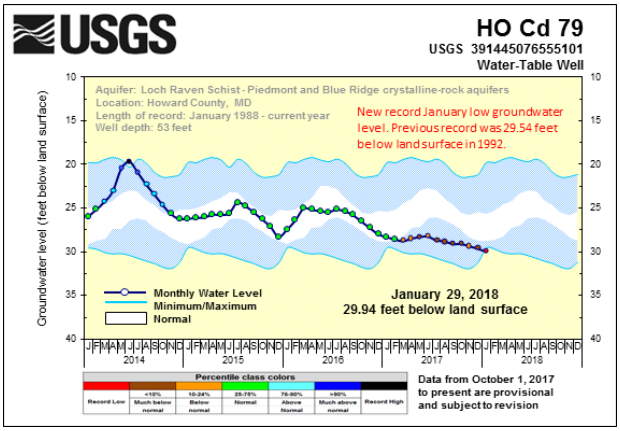
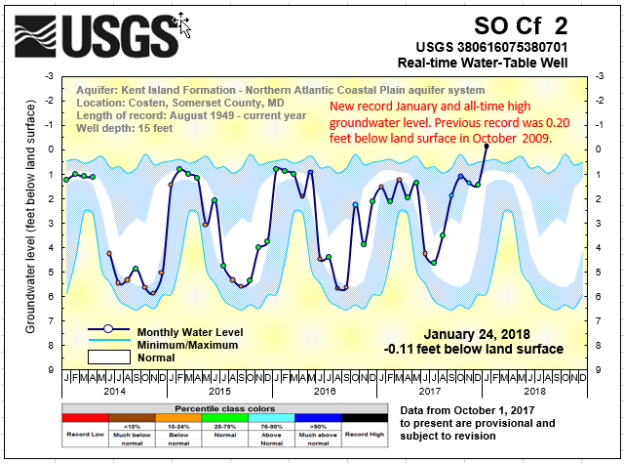
In the two 5-year hydrographs for the selected wells, groundwater levels are shown as a dark blue line. Each monthly measurement is colored according to the percentile rank compared to the historical values at the site for the month. The normal range is displayed as a white band, and is based on the 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 HO Cd 79, in Howard County, Maryland, was at a record January low at 29.94 feet below land surface. The previous January record low was 29.54 feet below land surface in 1992. Groundwater levels have been below normal for the past 11 months at this well. Normal January groundwater levels at this well range from 25.97 to 29.07 feet below land surface. Monthly record-keeping at this well began in January 1988.



The groundwater level at USGS observation well SO Cf 2, in Somerset County, Maryland, rose 0.7 feet to a January and all-time record high at -0.11 feet below land surface, which because it is a negative number is above land surface in the well casing. The previous January record high was in 1964 at 0.46 feet below land surface. The previous all-time record was 0.20 feet below land surface in October 2009. The normal range of groundwater levels for January at this well is between 0.85 and 1.45 feet below land surface. Record-keeping at this well began in August 1949.

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

Streamflow

Streamflow data are most commonly used 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.

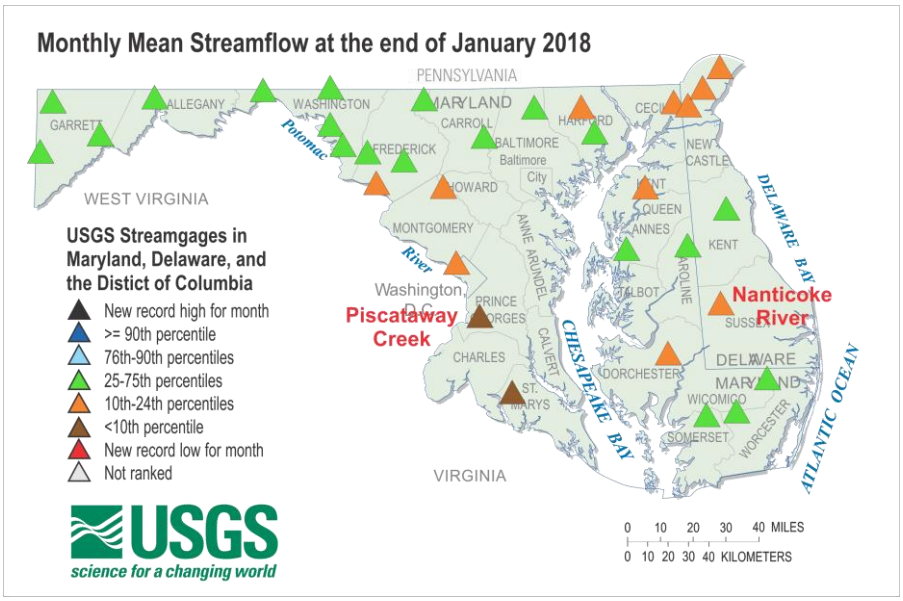
The USGS streamgages chosen for the monthly water summary were selected based on the following criteria:

- 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 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 data from the historical droughts of 2002 and the 1960s. All 33 streamgages have at least 30 years of monthly mean streamflow data.

January 2018 Streamflow

Monthly mean streamflows were in the normal range at 61 percent, or 20 of 33 selected USGS streamgages, although the values were estimated in 29 of the streams due to ice. (See the explanation of the effects of ice on streamflow at the end of the streamflow section). Streamflow was below normal at 13 streamgages in Maryland, Delaware, and the District of Columbia, including 11 streamgages in the 10th -24th percentiles, and 2 streamgages in less than the 10th percentile. Streamflow decreased at the Nanticoke River and increased at the remaining 32 streamgages between December 2017 and January 2018.



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

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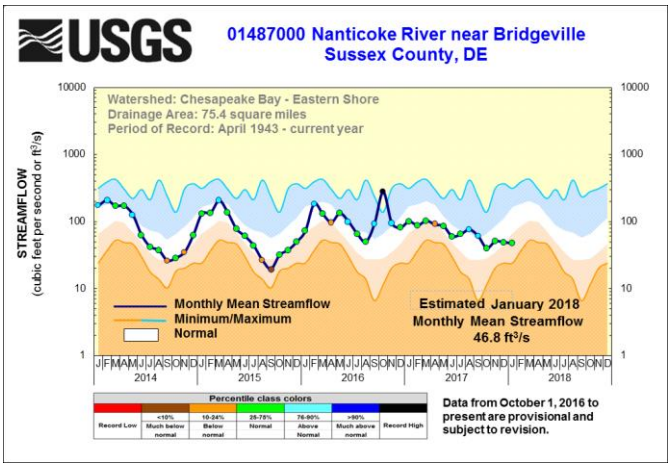
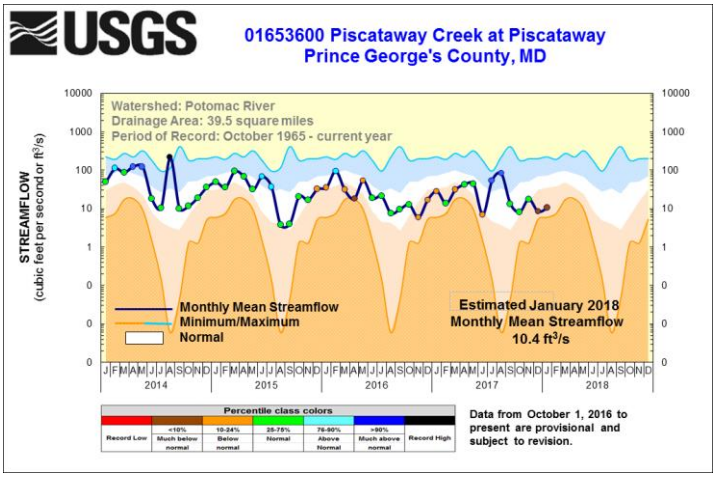
In the hydrograph for the selected streamgages, the dark line in the 5-year hydrograph represents the monthly mean streamflow for this period, and the white band shows the normal range (25th-75th percentiles) based on the period of record. The maximum monthly mean streamflow is at the top of the blue shaded section, and the lowest monthly mean streamflow is at the bottom of the tan area. Each monthly mean streamflow is colored according to the percentile rank compared to the historical data for the month.



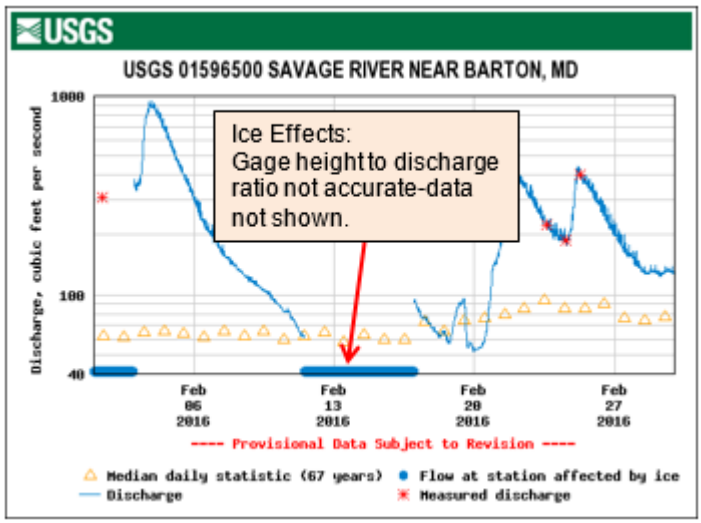
At the Nanticoke River near Bridgeville in Sussex County, Delaware, the monthly mean streamflow decreased slightly between December and January to 46.8 cubic feet per second (ft^3/s), which is below normal. The normal streamflow range for January at this streamgage is between 65.3 ft^3/s and 165 ft^3/s. Record-keeping at this streamgage began in April 1943.



At Piscataway Creek at Piscataway in Prince George's County, Maryland, the monthly mean streamflow increased between December and January to 10.4 ft^3/s. The normal streamflow range for January is between 32.6 ft^3/s and 71.8 ft^3/s. Record-keeping at this streamgage began in October 1965.

Effects of Ice on Streamflow

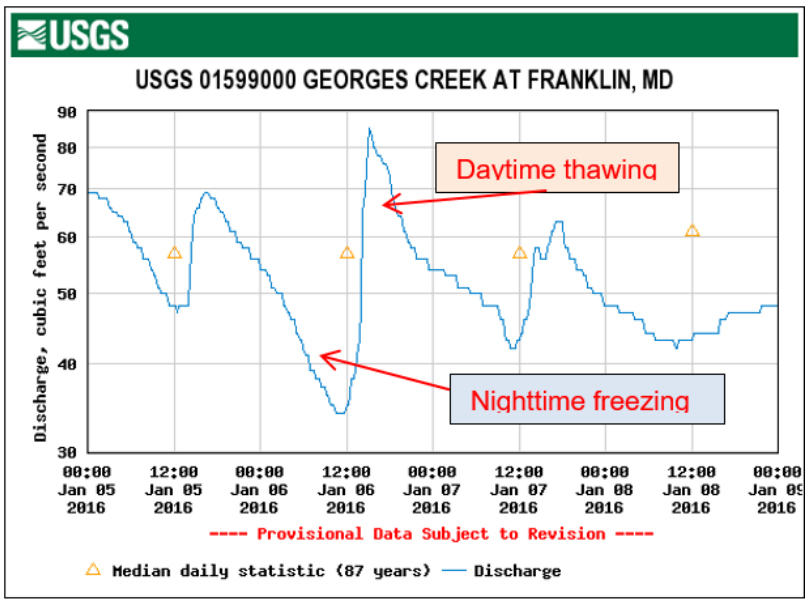
In the Mid-Atlantic region, ice in streams can typically occur between December and March. Below freezing air temperatures can lead to the formation of ice in many channels and may result in erratic water-level readings. Ice in streams may result in biased gage height records, invalidating the known stage-discharge relation.



When erroneous gage height values appear, they are flagged or removed from the web display until they can be reviewed. However, if the gage heights are considered to be accurate but the ice in the channel is causing a bias on the stage-discharge relation, then a heavy blue line will mask discharge values, as shown in this example at the Savage River in Maryland. Hydrographers will later analyze the data available and estimate unit value discharges to derive a daily discharge when the values are affected by ice. Weather records, discharge data obtained through direct measurements (made during the ice-affected period) and (or) hydrographic comparison with non-ice affected streamgages in the surrounding area all play an important role in making these estimates.

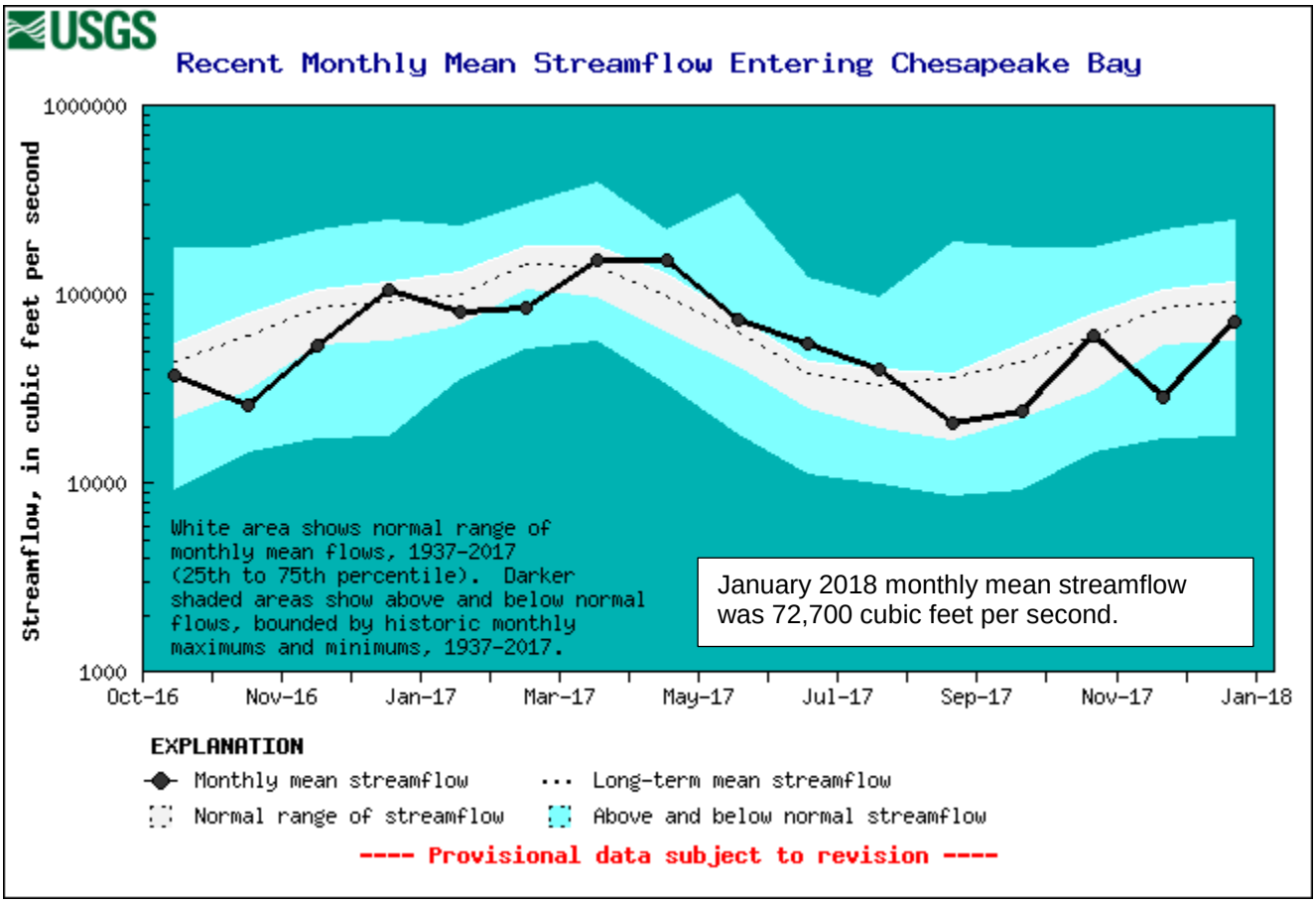
Below-freezing temperatures may also affect the amount of water in a stream channel. In winter, a natural freeze/thaw cycle can occur, as shown in the hydrograph below from Georges Creek, Maryland. When the water in smaller tributary streams upstream of a gaging location freezes, typically after dark, then less water is able to pass by the gage, causing the sudden drop off in flow as seen in the graph below. When the sun comes out the next day and if the air temperature rises, upstream channels will thaw and release the water, resulting in increased streamflow at the gage.

Frozen ground leads to less infiltration and groundwater movement (baseflow) to streams, which could result in lower streamflow, but as temperatures get warmer, the water is released. Fluctuations related to the freeze/thaw cycle may represent actual flow conditions, which would not require corrections to the data.



Estimated Streamflow to the Chesapeake Bay

The estimated monthly mean streamflow entering Chesapeake Bay during January 2018 was 72,700 ft^3/s. This value, which is provisional and subject to revision, is considered to be in the normal range. Normal January streamflow entering the Bay is between 57,200 and 118,000 ft^3/s, the 25th and 75th percentiles, respectively, of all January values. Average (mean) monthly streamflow for January is 91,200 ft^3/s. These statistics are based on an 81-year period of record.



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

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 January 2018, available reservoir storage in the Baltimore Reservoirs was 65.02 billion gallons, or 86 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 Triadelphia and Duckett Reservoirs at the end of January 2018 was 3.40 billion gallons, which is about 32 percent of normal storage capacity for the two Patuxent reservoirs. The storage capacity numbers were updated in June 2017 by the 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: The Triadelphia Reservoir storage level is low because of an ongoing project and will be kept low until 2019, or until the project is complete.