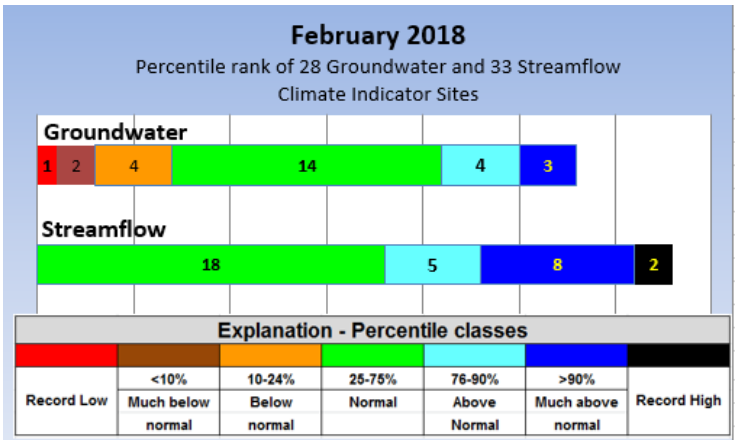
U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia
Monthly Water Conditions Summary

USGS February 2018 Water Conditions Summary

In February 2018, groundwater levels ranged from a monthly record low to much above normal. Monthly mean streamflows ranged from normal to a record high. Fifty percent of groundwater levels (14 of 28 wells) and 55 percent of monthly mean streamflows (18 of 33 streamgages) were in the normal range (25th-75th percentiles) at sites used to monitor the response of water resources to changes in weather conditions in Maryland, Delaware, and the District of Columbia.



In February, 25 percent of the groundwater levels were above normal and 25 percent were below normal. Groundwater levels decreased at 2 wells and increased at 26 wells. Monthly mean streamflows increased at all 33 streamgages in February, and 45 percent of the streamflows were above normal.

*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.*

Precipitation and temperatures were above 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?

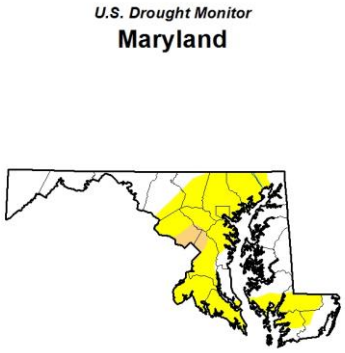
USGS water data are valuable to the public, researchers, water managers, planners, and agricultural users, especially during extreme conditions like floods and droughts. The USGS is known for its consistent measurement techniques and the most extensive set of historical groundwater and streamflow data 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 when available, 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 February 27, 2018, 3.10 percent of the state was in moderate drought, and 46.81 percent was classified as abnormally dry. In Delaware, 5.99 percent of the state was classified as abnormally dry. In the District of Columbia, 99.99 percent was in moderate drought status.



February 27, 2018
(Released Thursday, Mar. 1, 2018)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
Current	50.09	46.81	3.10	0.00	0.00	0.00
Last Week 02-20-2018	50.09	46.81	3.10	0.00	0.00	0.00
3 Months Ago 11-28-2017	61.23	38.77	0.00	0.00	0.00	0.00
Start of Calendar Year 01-02-2018	16.44	39.25	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 02-28-2017	11.74	18.15	61.90	8.21	0.00	0.00

Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Deborah Bathke
National Drought Mitigation Center

http://droughtmonitor.unl.edu/

February 27, 2018
(Released Thursday, Mar. 1, 2018)
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Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	94.01	5.99	0.00	0.00	0.00	0.00
Last Week 02-20-2018	94.01	5.99	0.00	0.00	0.00	0.00
3 Months Ago 11-28-2017	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 02-28-2017	0.00	100.00	100.00	0.00	0.00	0.00

Intensity:
D0 Abnormally Dry
D1 Moderate Drought
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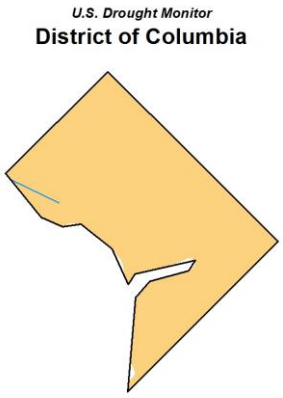

February 27, 2018
(Released Thursday, Mar. 1, 2018)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	99.99	0.00	0.00	0.00
Last Week 02-20-2018	0.00	100.00	99.99	0.00	0.00	0.00
3 Months Ago 11-28-2017	0.00	100.00	0.00	0.00	0.00	0.00
Start of Calendar Year 01-02-2018	0.00	100.00	100.00	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 02-28-2017	0.00	100.00	100.00	100.00	0.00	0.00

Intensity:
D0 Abnormally Dry
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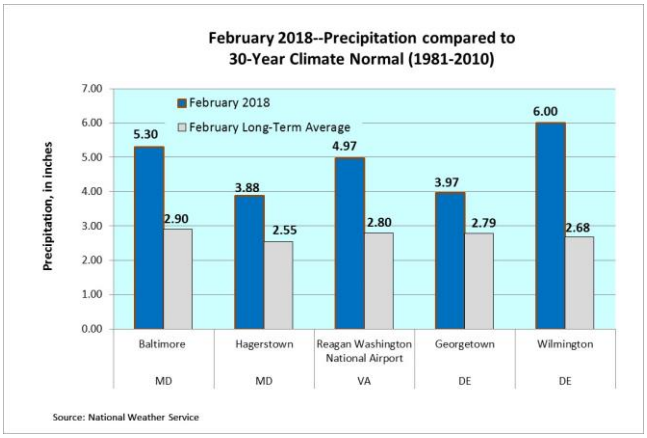
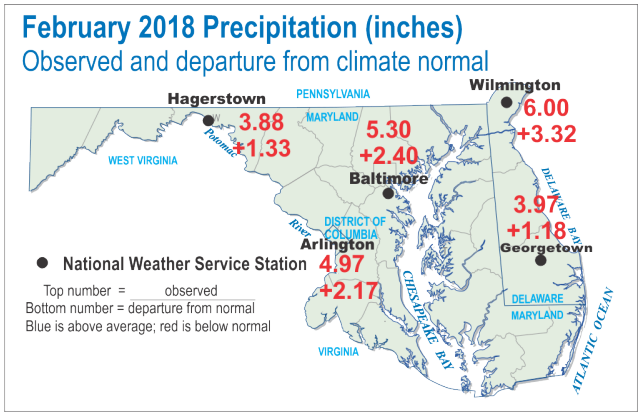
February 2018 Precipitation

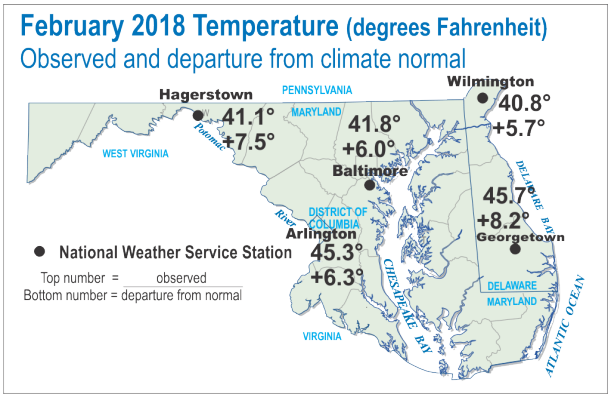
February precipitation was above the long-term average at five Mid-Atlantic NWS weather stations. Precipitation was lowest in Hagerstown, Maryland, with 3.88 inches, and highest in Wilmington, Delaware, with 6.00 inches, which is 3.32 inches above the long-term February average. The precipitation graph and map show February precipitation and the departure from the 30-year climate normal period from 1981-2010.





February 2018 Temperatures

February temperatures at five Mid-Atlantic NWS stations were more than 5 degrees Fahrenheit above the climate normal and ranged from 40.8 to 45.7 degrees Fahrenheit. The temperature at Wilmington, Delaware was the lowest of the five weather stations. Temperatures are typically colder in the mountains of Maryland than along the coast. The highest temperature in February was in Georgetown, Delaware. The highest temperature among these five Mid-Atlantic NWS stations is generally in Arlington, Virginia. It is unusual that the lowest and highest temperatures for February were both on the eastern coast.



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=lwxhttp://w2.weather.gov/climate/index.php?wfo=lwx
DE: http://www.weather.gov/climate/index.php?wfo=phi:

Groundwater

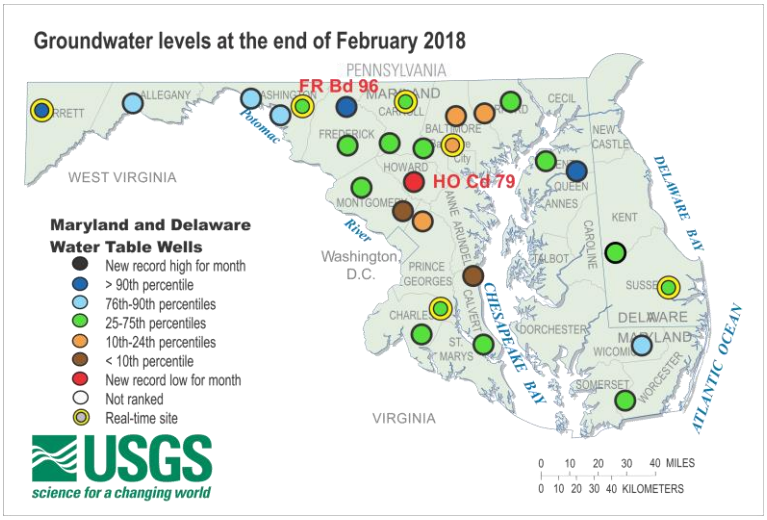
The USGS monitors groundwater levels in surficial or unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in weather conditions. The groundwater wells used for the monthly water summary were selected based on the following criteria:

- 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.

February 2018 Groundwater Levels

Fifty percent, or 14 USGS observation wells, had groundwater levels within the normal range in February. Groundwater levels were above normal at seven wells, and below normal at the remaining seven wells, including four wells in the 10th-24th percentile range, two wells below the 10th percentile, and one well at a record low (USGS observation well HO Cd 79 in Howard County, Maryland). This is the second consecutive month that observation well HO Cd 79 set a monthly record low. Between January and February, groundwater levels decreased at 2 of 28 wells, and increased at 26 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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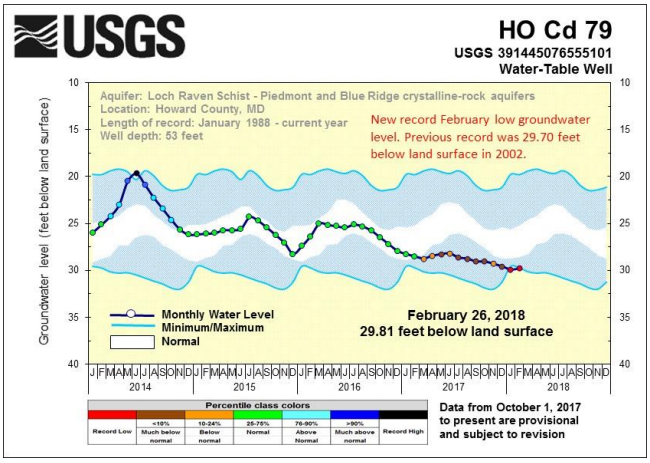
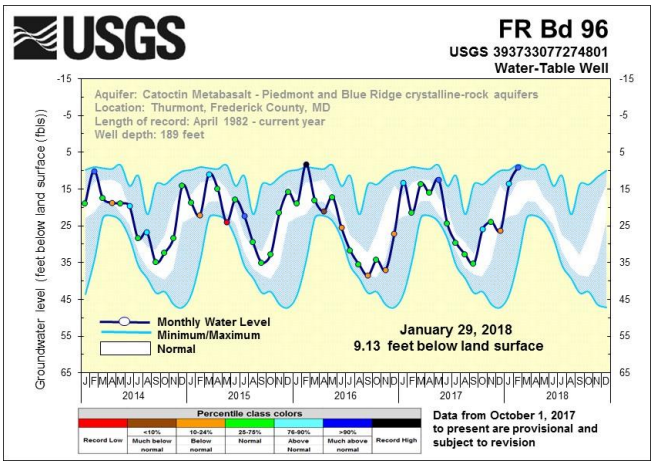
In the two 5-year hydrographs for the selected wells, groundwater levels are shown as a dark blue line. Each monthly measurement is colored according to the percentile rank compared to the historical values at the site for the month. The normal range is displayed as a white band, and is based on the 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.



For the second consecutive month, the groundwater level at observation well HO Cd 79, in Howard County, Maryland, was at a record low at 29.81 feet below land surface. The previous February record low was 29.70 feet below land surface in 2002. Groundwater levels have been below normal for the past 12 months at this well. Normal February groundwater levels at this well range from 25.40 to 28.60 feet below land surface. Monthly record-keeping at this well began in January 1988.



The groundwater level at USGS observation well FR Bd 96, in Frederick County, Maryland, rose 4.47 feet in February to 9.13 feet below land surface. The normal range of groundwater levels for February at this well is between 12.97 and 21.79 feet below land surface. Record-keeping at this well began in April 1982.

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.

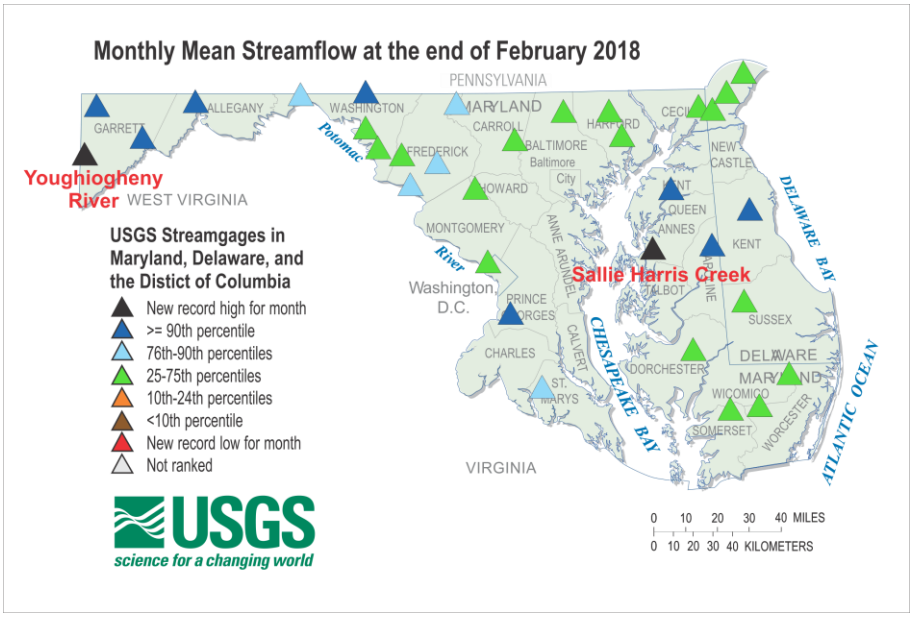
The USGS streamgages chosen for the monthly water summary were selected based on the following criteria:

- 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.

February 2018 Streamflow

Monthly mean streamflows were in the normal range at 55 percent, or 18 of 33 selected USGS streamgages, although the values had to be estimated in 4 of the streams due to ice. (See the "Effects of Ice on Streamflow" section). Streamflow was above normal at the remaining 15 streamgages in Maryland, Delaware, and the District of Columbia, including 2 streamgages at record February highs, 8 streamgages above the 90th percentile, and 5 streamgages with streamflows ranging between the 76th and 90th percentiles. Streamflow increased at all 33 streamgages in February.



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

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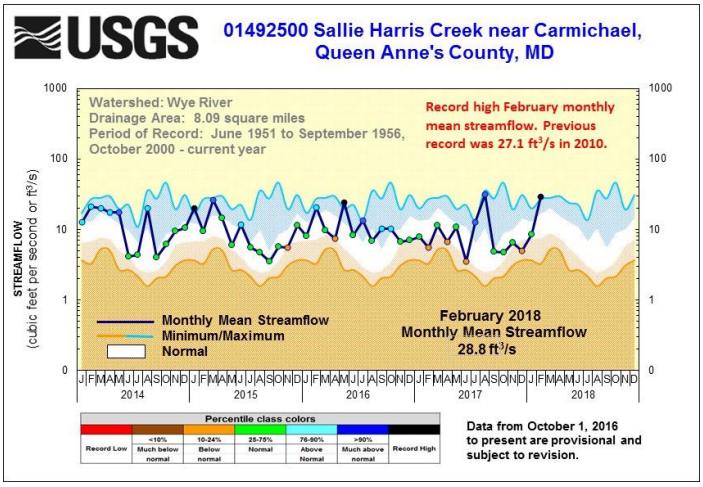
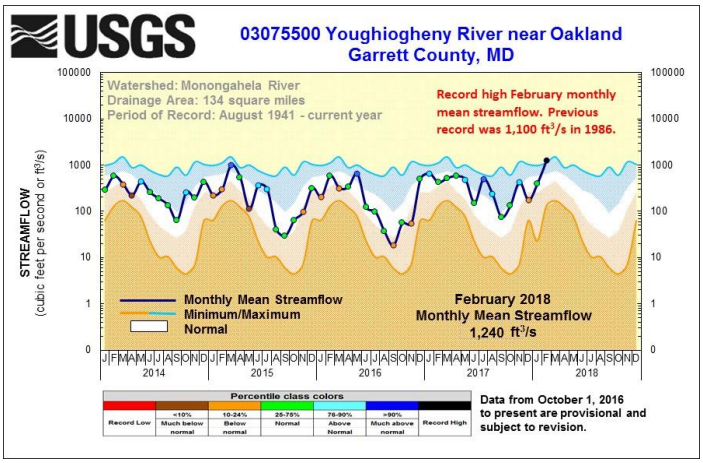
In the hydrograph for the selected streamgages, the dark line in the 5-year hydrograph represents the monthly mean streamflow for this period, and the white band shows the normal range (25th-75th percentiles) based on the period of record. The maximum monthly mean streamflow is at the top of the blue 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.



Monthly mean streamflow on Sallie Harris Creek near Carmichael in Queen Anne's County, Maryland, was at a record February high at 28.8 cubic feet per second (ft^3/s). The previous record was 27.1 ft^3/s in February 2010. The normal streamflow range for February is between 7.10 ft^3/s and 19.4 ft^3/s. Record-keeping at this streamgage began in June 1951.

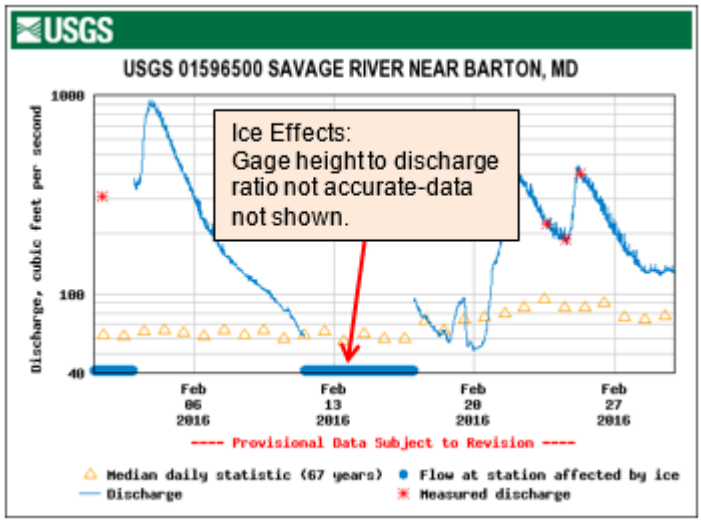


At the Youghiogheny River near Oakland in Garrett County, Maryland, the monthly mean streamflow was at a record February high at 1,240 ft^3/s. The previous record was 1,100 ft^3/s in February 1986. The normal streamflow range for February is between 45.9 ft^3/s and 83.4 ft^3/s. Record-keeping at this streamgage began in August 1941.

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

Effects of Ice on Streamflow

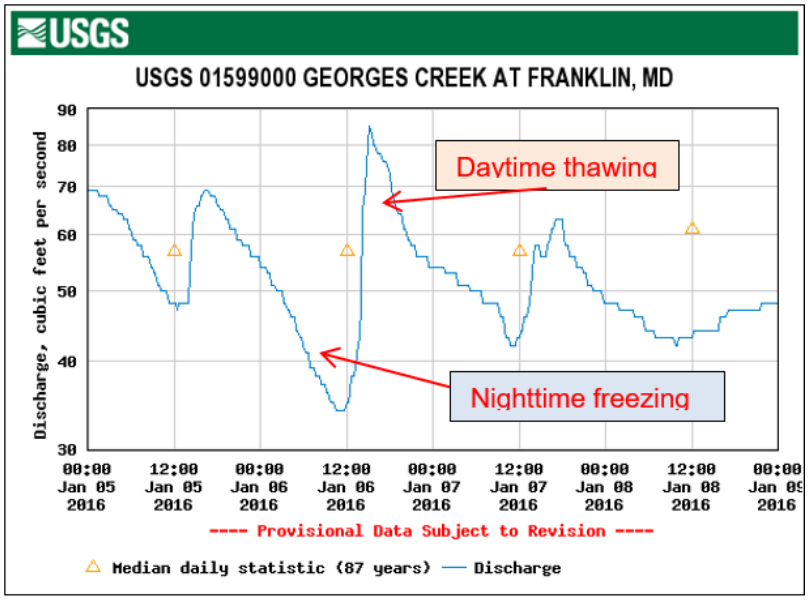
In the Mid-Atlantic region, ice in streams can typically occur between December and March. Below freezing air temperatures can lead to the formation of ice in many channels and may result in erratic water-level readings. Ice in streams can also cause biased gage height records, invalidating the known stage-discharge relation. In February, ice affected streamflow at four streamgages, where the streamflow had to be estimated.



When erroneous gage height values appear, for example from an ice buildup on the control that creates backwater, 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. During 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 (base flow) 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.



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 February 2018, available reservoir storage in the Baltimore Reservoirs was 69.87 billion gallons, or 92 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 February 2018 was 4.71 billion gallons, which is about 45 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.