

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

April 2012

Why is it important for the USGS to collect and analyze water-resources data?

USGS water data is 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 in wells 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 collects water data and quality-assures the data by employing standardized techniques across the country. The uniformity of the dataset allows for multi-state comparisons and other comparative statistical analyses that better inform policy makers of the possible water resource 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.

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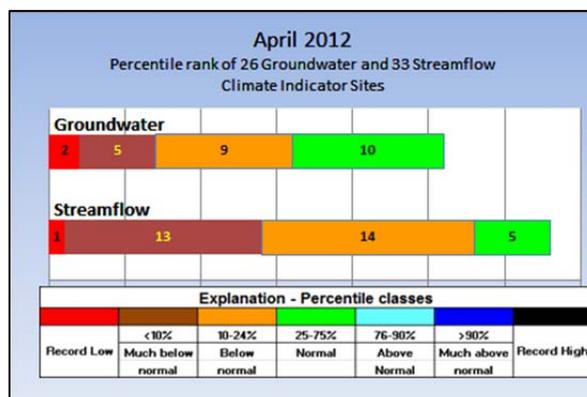
Precipitation below the long-term average and temperatures above the long-term average affected April groundwater levels and streamflow in Maryland, Delaware, and the District of Columbia. Groundwater levels were below normal in more than 60 percent of wells and streamflow was below normal at nearly 85 percent of the sites used by the USGS to assess the response of streamflow and groundwater levels to climatic conditions in the region. New April record lows were set on the Pocomoke River in Worcester County, and in observation wells in Carroll and Charles Counties in Maryland.

Streamflow was normal at 5 of the 33 sites in Maryland, Delaware, and the District of Columbia. The remaining 28 sites were below normal, with 1 site at a record low monthly mean streamflow level and 13 sites in the lowest 10th percentile. Many of these streams in the lowest 10th percentile were in western Maryland and the southern Delmarva Peninsula region. The estimated streamflow to the Chesapeake Bay during April 2012 was the lowest since record-keeping began in 1936. Just last fall, in September 2011, the inflow to the Bay was at a monthly record high.

April groundwater levels were in the normal range in 10 of the 26 wells. The remaining 16 wells had below normal groundwater levels with record lows set in Carroll and Charles Counties and groundwater in the lowest 10th percentile at 5 observation wells. At the observation well in Carroll County, Maryland, preliminary data for April show the groundwater level at a record low for the third consecutive month.

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.

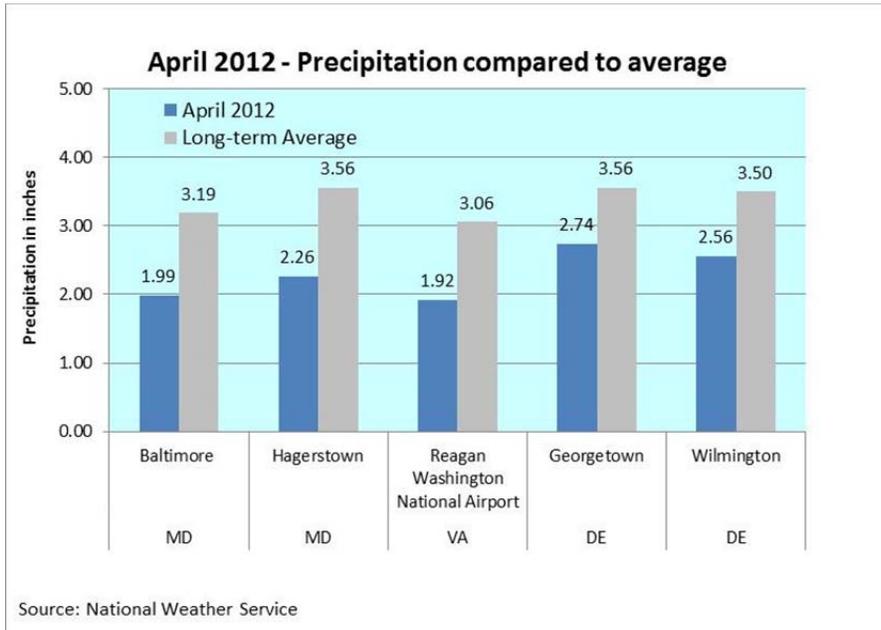


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April 2012 Precipitation and Weather

April 2012 precipitation was more than an inch below the long-term average for the climate normal period* in Maryland and the District of Columbia. In Delaware, precipitation was also below the long-term average, but it was less than an inch below average. There has been a precipitation deficit and warmer than average temperatures in the Mid-Atlantic region since the year began.

According to the National Weather Service (NWS) website for the Baltimore weather station, “the period from April 1 to 20 was the second driest on record” and “April was the 15th consecutive month with a monthly average temperature above the 1981--2010 30-year monthly normal.” Conditions were similar in Delaware and the District of Columbia.



Sources:

National Weather Service
MD and DC:
<http://www.weather.gov/climate/index.php?wfo=lsx>
DE: <http://www.erh.noaa.gov/phi/>
Middle Atlantic River Forecast Center (MARFC):
<http://www.weather.gov/marfc/Precipitation/Departures>

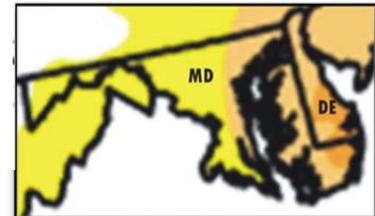
**Note from the National Weather Service: September 2011 was the first month to incorporate the new 1981--2010 climate normals that were calculated by the National Climatic Data Center. The new normals replaced the 1971--2000 normals.*

The Maryland Department of the Environment has designated Central, Eastern Shore, and Western regions of Maryland in a drought watch status at the end of April. The assessment is based on groundwater levels, streamflow, precipitation, and reservoir levels at specific sites:
<http://www.mde.state.md.us/programs/Water/DroughtInformation/Pages/Water/Drought/index.aspx>

U.S. Drought Monitor (http://droughtmonitor.unl.edu/DM_northeast.htm) has designated 4

percent of the State of Maryland with severe drought status, 51 percent with a moderate drought status, and all but 1.35 percent as abnormally dry. The region with the drought designation is along the Chesapeake Bay and the entire Delmarva Peninsula. In Delaware, the entire state is in a drought status, with 41 percent of the state in severe drought status and 59 percent considered to be in moderate drought status.

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



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The warmer than average temperatures over the past winter and spring have caused plants to begin spring growth 2-4 weeks earlier than usual in the Baltimore-Washington region. The unusually warm temperatures, along with the lack of snowfall and the earlier growing season, led to an increased demand from evapotranspiration on water resources and these conditions may have an impact on streamflow and groundwater levels this summer.

The USGS is participating with other agencies and universities to study phenology, one of the key biological indicators of climate variation and change. Phenology tracks the timing of life cycle events such as leafing, the flowering of plants, and migration and hibernation patterns. The USA National Phenology Network scientists note that “Around the Country, scientific evidence reveals that as the climate and environment change, spring has been coming earlier every year.” The USA National Phenology Network is looking for volunteers to expand their network of observers. If you are interested in being a part of the nationwide effort, please visit: <http://www.usanpn.org/home>.

Streamflow

Streamflow data are used for many purposes. A few of the most obvious 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 to 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:

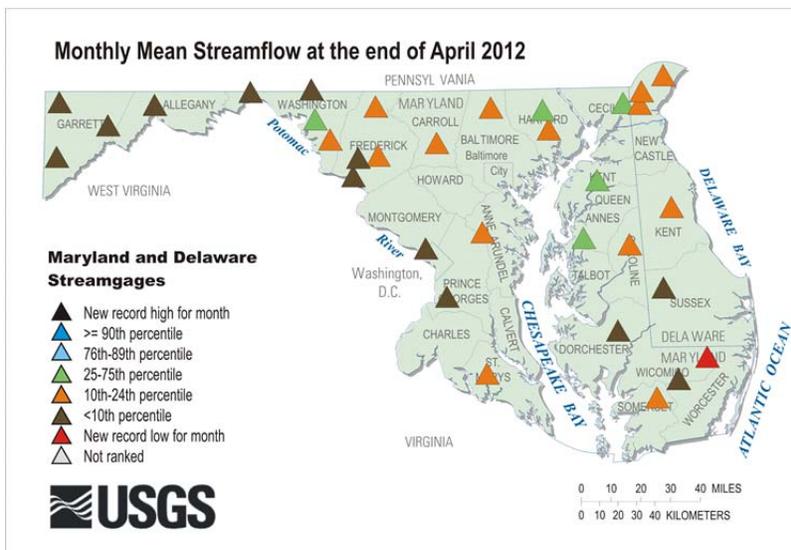
- Minimum period of record is 10 years of continuous data;
- Watershed areas greater than 5 square miles;
- Streamflow is not regulated, or has relatively natural flow;
- Streamflow data reflect climatic conditions; and
- The surrounding area and watershed are not urban.

Streamflow for April 2012

In April 2012, a combination of the below normal precipitation, warmer than normal temperatures, and the early spring caused plants to grow and trees to have their leaves sooner than usual, which likely has contributed to below normal monthly mean streamflows at 28 of the 33 sites used to monitor climatic response in Maryland, Delaware, and the District of Columbia. Normal is considered between the 25th and 75th percentiles. The remaining five sites had normal monthly mean streamflows.

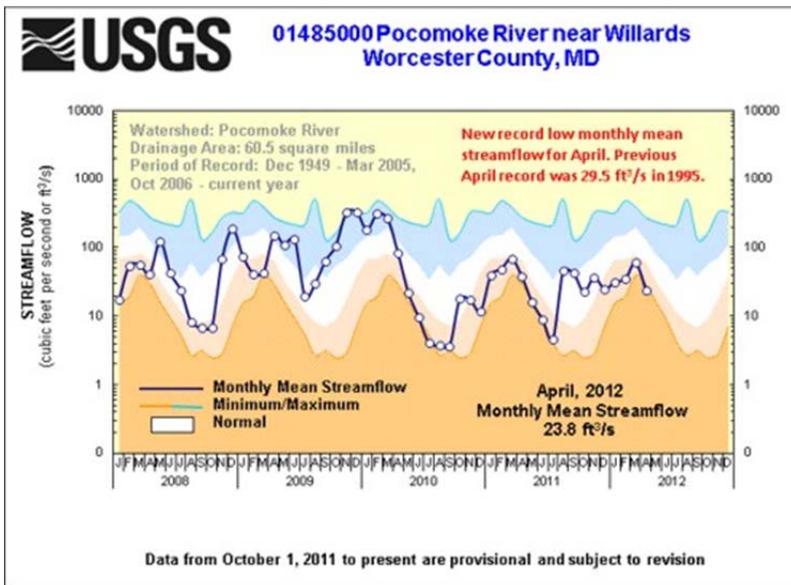
The monthly mean streamflow on the Pocomoke River was the lowest it has been in April since record-keeping began in 1949. Streamflow at 13 sites was in the lowest 10th percentile; many of these sites are in western Maryland and the southern Delmarva Peninsula.

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

Monthly mean streamflow on the Pocomoke River in Worcester County, Maryland on the southern Delmarva Peninsula was 23.8 cubic feet per second (ft³/s), which is a new record low for April. The previous record low was 29.5 ft³/s in 1995.



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

The dark line in the 5-year hydrograph represents the current monthly mean streamflow and the white band shows the normal range (25th to 75th percentile) 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.

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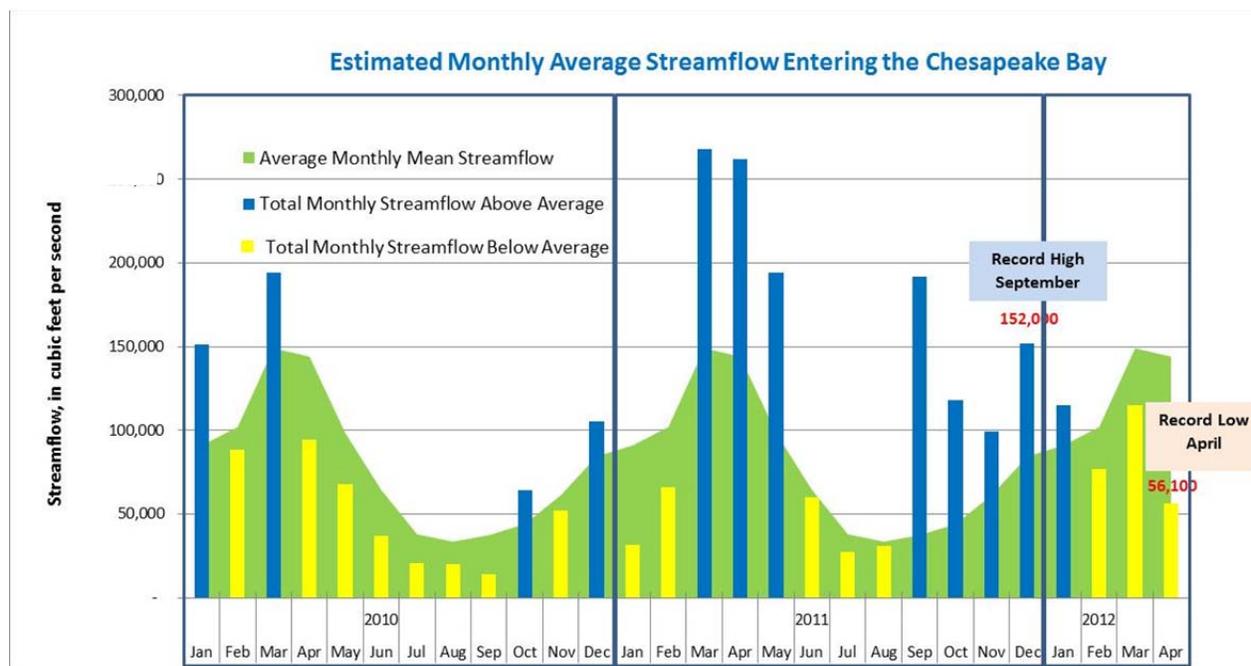
Estimated Streamflow to the Chesapeake Bay

The health of the Chesapeake Bay is largely driven by changes in streamflow and the amount of pollution it contains. Runoff in the Chesapeake Bay watershed carries pollutants, such as nutrients and sediments, 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.

Estimated streamflow entering the Chesapeake Bay is computed on a monthly and annual basis using streamflow measurements from the Susquehanna, Potomac, and James Rivers. The estimated monthly average streamflow entering Chesapeake Bay for April 2012 was 56,300 ft³/s, which is the **lowest April streamflow since record-keeping began in 1936**. The April 2012 value beat the previous record low of 59,000 ft³/s, set in 1995. During the drought conditions in April 2002, the streamflow to the Bay was 84,700 ft³/s, which was the 10th lowest April flow since 1936.

Normal April streamflow entering the Bay is between 95,700 and 179,000 ft³/s, the 25th and 75th percentiles, respectively, of all April values. Average (mean) monthly streamflow for April is 144,000 ft³/s. The total freshwater inflow to the Chesapeake Bay was much higher than normal in March, April, May, and September of 2011 and record setting low in April 2012.

Streamflow to the Chesapeake Bay in September 2011 was the highest September flow to the Bay. There were also high flows to the Bay in March and April 2011. The USGS will be tracking the streamflow to the Bay and looking at the effects of the high flows in the previous autumn and the low flows in the spring of 2012 to see if there are any implications to the health of flora and fauna in the Bay.



Graphs and data are available on the “Estimated Streamflow Entering Chesapeake Bay” website: <http://md.water.usgs.gov/waterdata/chesinflow/>

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Groundwater

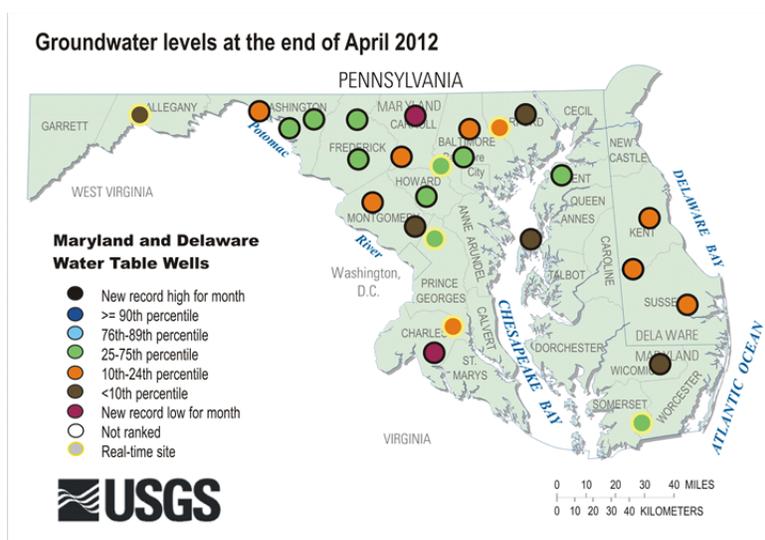
The USGS monitors groundwater levels in unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in climatic conditions. Twenty-six groundwater wells were selected based on the following criteria:

- 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 casing--dug wells not used;
- Water levels show no apparent hydrologic connection to nearby streams;
- Well has never gone dry; and
- Long-term accessibility likely.

April 2012 Groundwater Levels

Groundwater levels across Maryland and Delaware were normal at 10 observation wells and below normal at 16 observation wells used by the USGS to assess climatic conditions in the region. Normal is considered between the 25th and 75th percentiles. There were two USGS observation wells with record low April groundwater levels, one in Carroll County and one in Charles County.

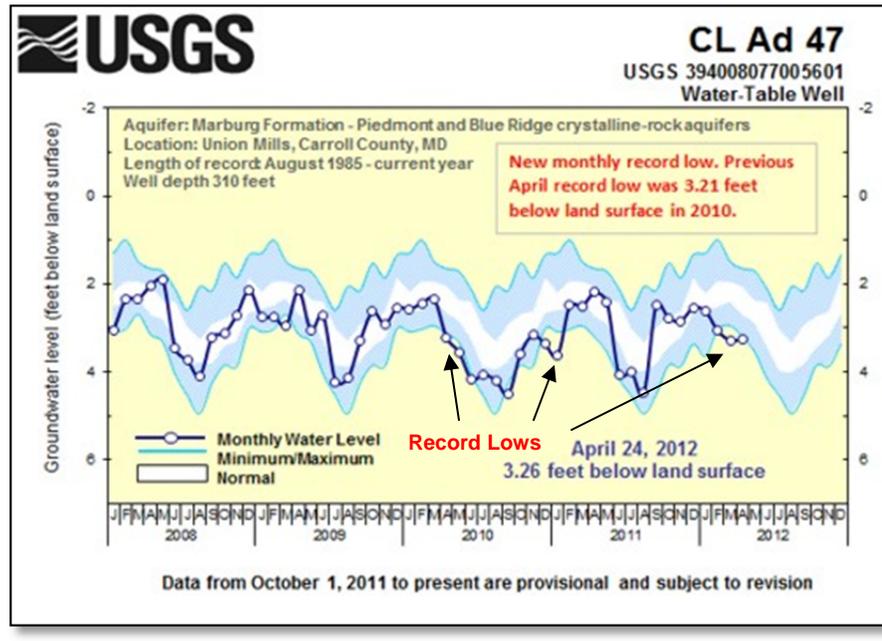
Groundwater levels were in the lowest 10th percentile in 5 wells spread across Maryland, including the following central, eastern, and western counties: Allegany, Harford, Montgomery, Queen Anne's, and Wicomico.



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

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Preliminary data show that the groundwater level in one USGS Carroll County observation well (CL Ad 47) has risen slightly since March, but remains at a record low for the third consecutive month. The groundwater level at this well was also below normal during the summers of 2008 through 2011 with record lows in April, May, June, September, and December of 2010, and January 2011.



Five-year groundwater hydrographs can be viewed at:

http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties

The 5-year hydrograph shows groundwater levels as a dark blue line, the minimum and maximum monthly values, and the normal range (between the 25th and 75th percentiles) as a white band based for the period of record. The maximum water level is at the top of the blue section and the minimum water level is at the bottom of the blue section in the graph.

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Reservoir Levels

Reservoir storage at the end of April 2012 dropped below 100 percent of available storage capacity for the first time since September 2011. Storage in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) remains at 98 percent of available storage capacity, or 74.25 billion gallons of water.

Storage in the Triadelphia and Duckett Reservoirs, which serve parts of Howard, Montgomery, and Prince George's Counties in suburban areas around the District of Columbia, was at 98 percent of normal storage capacity at the end of April 2012, with 10.57 billion gallons of water.

April 2012	Percent available/ normal storage	Volume (billion gallons)	Source
Baltimore Reservoirs			Baltimore City – Environmental Services Division
Liberty	96%	35.20	
Loch Raven	100%	21.20	
Prettyboy	100%	17.85	
Total	98%	74.25	
Patuxent Reservoirs			Washington Suburban Sanitary Commission (WSSC)
Triadelphia	100%	5.80	
Duckett	95%	4.77	
Total	98%	10.57	