

# Sterling Reporter

Volume 18, Issue 1

National Weather Service Baltimore MD/Washington DC Forecast Office

Fall 2019



## MIC's Corner

*By, James E. Lee  
Meteorologist in Charge*

The National Weather Service (NWS) Baltimore/Washington Weather Forecast Office has been very busy in helping to fulfill the *NWS Weather-Ready Nation Strategic Plan (2019-2022)*. There are three goals of this plan:

- 1-Reduce the impacts of weather, water, and climate events by transforming the way people receive, understand, and act on information.
- 2-Harness cutting-edge science, technology, and engineering to provide the best observations, forecasts, and warnings.
- 3-Evolve the NWS to excel in the face of change through investment in our people, partnerships, and organizational performance.

I want to give you examples of how the Baltimore/Washington Weather Forecast Office has been working towards achieving the goals of this plan.

For Goal 1, in collaboration with the NWS Mid-Atlantic River Forecast Center, we recently initiated hydrologic forecasts and flood warning services at Dam 5 on the Potomac River upstream from Williamsport, MD. This new forecast point allows for better monitoring and flood warning services for the

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## Ellicott City Flood of 2018

*by Jason Elliott, Senior Service Hydrologist*

For the second time in just 22 months, torrential rain fell in the Ellicott City and Catonsville areas of Howard and Baltimore Counties. The heavy rainfall, between 6 and 12 inches in the heaviest band, caused catastrophic damage, especially in Historic Ellicott City. One person -- 39-year old Eddison Hermond, died while trying to help a woman who was seeking assistance after the first flood wave. Many buildings were damaged and dozens of vehicles experienced flood damage. Hundreds of people were addressed by first responders during the event, with around 1100 separate 911 calls reported in to Howard County. Some roads were washed out and land erosion and localized landslides were reported.

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*MIC's Corner (continued)* long stretch of the Potomac River between Shepherdstown, WV, and Hancock, MD. This new forecast point will also provide better flood warning services downstream of Dam 5, including the critical commerce and flood-prone locations of Shepherdstown and Harpers Ferry, WV.

For Goal 2, our staff recently upgraded the river gauge at Harpers Ferry, WV. This upgraded observation site now enables our staff to observe the Potomac River using robust satellite communications, and can now better observe the Potomac during periods of low flow. The previous sensor was challenged in reading the river levels at low flow, and access to it was via telephone.

Finally, for Goal 3, we have been working very hard at training our staff in providing Impact-based Decision Support Services (IDSS). Four staff members, in collaboration with the Federal Emergency Management Agency and the Virginia Department of Emergency Management, recently completed intensive training in providing IDSS. This training allows for staff to provide weather information to support onsite decision making at federal, state, and local Incident Command Centers, Multi-Agency Coordination Centers, and State/Local Emergency Operations Centers.

You can find further details of the *NWS Weather-Ready Nation Strategic Plan (2019-2022)* at the following link: <https://www.weather.gov/news/192203-strategic-plan>

Thanks for taking the time to read this issue of *The Sterling Reporter*. If you have any questions, please call me at 703-996-2200, extension 222, or email me at [James.E.Lee@noaa.gov](mailto:James.E.Lee@noaa.gov).

*Ellicott City Flood (continued)*

The National Weather Service (NWS) began highlighting the potential for flooding in the Hazardous Weather Outlook (link) beginning on Friday morning, May 25th:

*Thunderstorms capable of producing locally heavy rain may lead to isolated incidents of flooding on Saturday and Sunday.*

On Sunday morning, May 27th, a Flash Flood Watch was issued for the Baltimore/Washington corridor, highlighting the potential for showers and thunderstorms capable of producing heavy rain during the afternoon and evening.

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Just as the rain began, a [Flood Warning](#) was issued at 3:19pm for portions of Howard County, Baltimore County, and Baltimore City, including Ellicott City, Catonsville, Dundalk, and Baltimore City, all of which experienced significant flooding during this event. This initial rain pushed south of Ellicott City after causing an estimated 1.5 to 2 inches of rain, but by 4:00pm, had built back over both Ellicott City and Catonsville. At 4:00pm, video footage showed a small amount of flowing water near the curbs on Main Street in Ellicott City, with rain increasing in intensity. Video shows Main Street was still passable until around 4:20pm.

Between 4:00pm and 4:30pm, the heavy rain persisted, quickly dropping an estimated two inches of rain in a band just south of Ellicott City to near Catonsville. This heavy rain caused a major rise in the New Cut Branch ([click here](#) for an annotated map of the watershed), and the added water pushed the Tiber River out of its banks at 4:18pm near Tiber Alley. Two minutes later, at 4:20pm, the water level in the Tiber further increased, exceeding the capacity of the channel in the 8100 block of Main Street and near Tiber Alley, sending water both into nearby structures and down the Alley onto Main Street.

As initial reports of this more significant water came in to the National Weather Service, the Flood Warning was upgraded to a [Flash Flood Warning](#), at 4:26pm. Remarkably, conditions continued to worsen throughout the Ellicott City area between 4:30pm and 5:00pm as the rain shifted just south of the city, with overland flooding occurring in West End as well as even more significant water coming down the Tiber and through both Tiber Alley and the buildings on the south side of Main Street. The highest water - up to the top of the first floor of buildings - was observed between 4:40-5:00pm, then water levels began to recede somewhat.

At the time of this highest water (4:40pm), a [Flash Flood Emergency](#) was declared by the National Weather Service, in coordination with Howard County Emergency Management, due to the ongoing catastrophic flooding, and the heaviest rain was still falling at that point. Total rainfall estimates reached six inches by 5:15pm just south of Old Town Ellicott City, and in the Oella and Catonsville areas.

A second round of heavy rain pushed across Ellicott City between 5:00pm and 6:00pm, with the heaviest rain occurring between 5:20pm and 5:50pm. This second round was of nearly equal intensity to the first, and had equal or greater impacts. This second round of heavy rain prompted [even stronger statements](#) in the Flash Flood Emergency:

**HEAVY RAIN HAS MOVED BACK INTO THIS AREA. THOSE CURRENTLY RESPONDING TO EARLIER FLASH FLOODING MUST SEEK HIGHER GROUND IMMEDIATELY AS A NEW ROUND OF FLOODING IS IMMINENT! THIS NEW FLOODING COULD BE MORE SIGNIFICANT THAN THE INITIAL ROUND! YOU MUST GO TO THE HIGHEST POSSIBLE LOCATION IMMEDIATELY AND STAY AWAY FROM ANYWHERE WHERE THERE IS WATER OR COULD BE WATER!!!**

On the Hudson Branch, water levels were higher than the first round by 5:35pm, going over a deck near Court Street by 5:40pm. Water levels on the Hudson Branch peaked at 5:53pm at a level almost equal to the 2016 flood. Downstream at Tiber Alley, the relative lull ended around 5:40pm as well, with floodwaters rising back up to the top of the first floor of buildings for about half an hour, until 6:10pm.

The second round of rainfall shifted south by 6:00pm, but another round of heavy rain, which caused  
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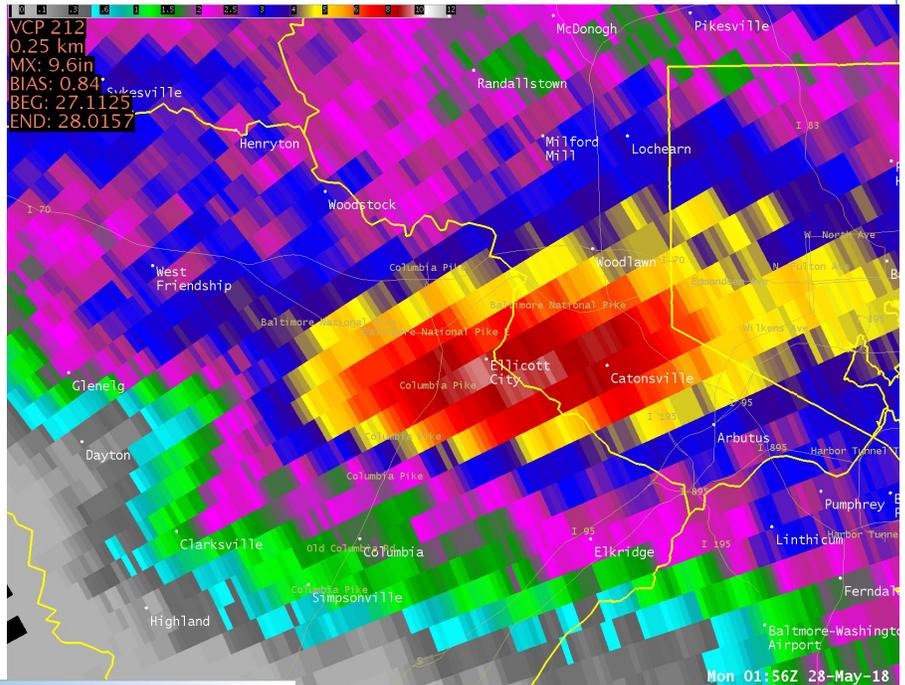
***Ellicott City Flood (continued)***

flash flooding in the Sykesville area, was moving toward the affected region. Luckily, it weakened as it approached Ellicott City, sparing the area from a third flood wave. Therefore, all the small streams in the Tiber-Hudson basin were back within their banks by around 6:45pm.

The image below shows radar rainfall estimates from the entire event. Radar estimated an unusually large area which received 4.5 inches or more, as indicated by the yellow, red, and white colors in the image. Areas colored in red were estimated to have received 6.5" or more, and the white/grey areas near and southwest of Old Town Ellicott City as well as across the river toward Catonsville received an estimated 9" or more.

As with the 2016 event in Ellicott City, Howard County's rain gauge at the Howard County government facility provided real-time rainfall observations.

As you can see from the 30 and 60 minute durations, there were two distinct waves of heavy rain in Ellicott



**Ellicott City, MD – May 27, 2018**



Duration	Max Rainfall in Duration	Time of Occurrence
1 minute	0.16"	4:15pm-4:16pm
5 minutes	0.56"	4:15pm-4:20pm
10 minutes	0.96"	4:11pm-4:21pm
15 minutes	1.44"	4:06pm-4:21pm
30 minutes	1.84" 1.84"	3:53pm-4:22pm 5:20pm-5:50pm
60 minutes	2.68" 2.84"	3:20pm-4:20pm 5:00pm-6:00pm
2 hours	5.00"	3:53pm-5:53pm
3 hours	6.56"	3:15pm-6:15pm

City, with a bit of a lull in between (only 0.32" was observed between 4:22pm and 5:00pm, with little or no measurable rain observed between 4:22pm and 4:33pm or between 4:50pm and 4:59pm).

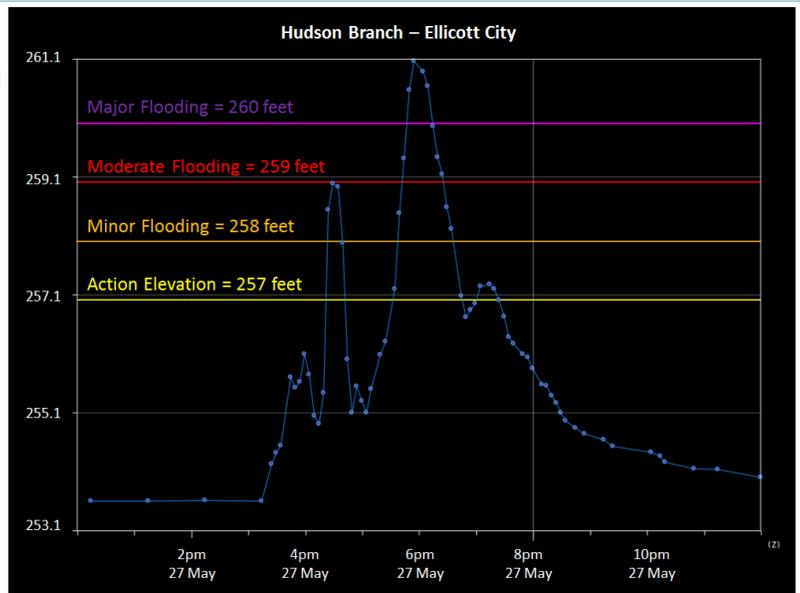
**As noted in the rainfall estimates, heavier rain was estimated to have fallen to the south of this gauge's location, so this gauge was not within the heaviest rainfall area.**

An image with selected observed rainfall totals on a background of estimates is available [here](#). A comparison of the 2018 rainfall to the 2016 rainfall can be found

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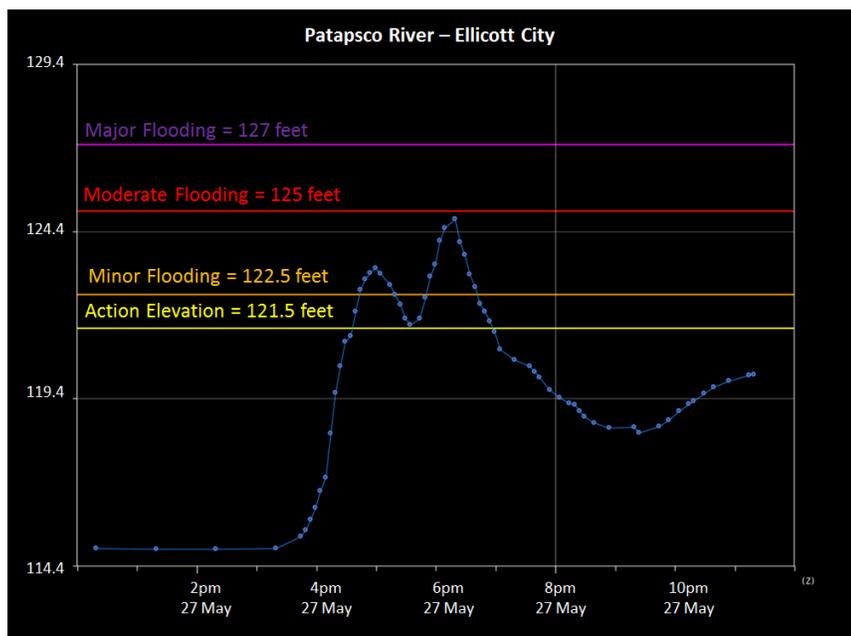
*Information obtained from the Ellicott City (ELYM2) rain gauge. Data is preliminary and subject to correction. This gauge reports in 0.04" increments.*

A stream gauge owned by Howard County on the Hudson Branch in Ellicott City was installed just before the 2016 flood, and operated during both the 2016 and 2018 flood events. In the 2018 flood, due to the two distinct periods of heavier rain, there were two peaks with a drop in water level in between. This differs from 2016 when there was a continuous one-hour period where water was out of banks and on Frederick Road / Main Street. A comparison of both events can be found later in this review.



The stream rose a couple feet from the rain between 3pm and 4pm, but was still within its banks. The heavy rain just after 4pm caused the stream to rise about four feet between 4:14pm and 4:27pm, exceeding the capacity of the stream channel by nearly a foot. This lasted just 14 minutes and the stream then returned to the level it had been previously. A gradual rise was observed in the half hour between 5:00pm and 5:30pm, but the second round of heavy rain caused the stream to swell out of its banks again, rising five feet in 24 minutes, and exceeding the minor flood elevation of 258 feet for nearly an hour. The peak elevation observed was 261.06 feet at 5:53pm, a level almost equal to what occurred in the 2016 event (261.02 feet). A third rise occurred around 7pm as the third round of rain weakened while moving into the area; as a result of the weakening precipitation, there was not a third flood wave, just a small rise.

Although we do not have gauge information for the main Tiber River at the bottom of Main Street, video evidence clearly shows the event on lower Main Street was extremely significant during the first round of heavy rain, indicating that other branches of the Tiber were primary contributors to the initial flooding.



Meanwhile, the Patapsco River played less of a role in 2018 than in the 2016 event. The gauge at Ellicott City peaked at 124.78 feet elevation, which is more than three feet lower than 2016 (comparison is at the end of this review), but still high enough that the Patapsco's height probably kept water from being able to drain off Main Street as quickly as it otherwise would have. Similar to what occurred on the Hudson Branch, there were two separate peaks (shown to the left).

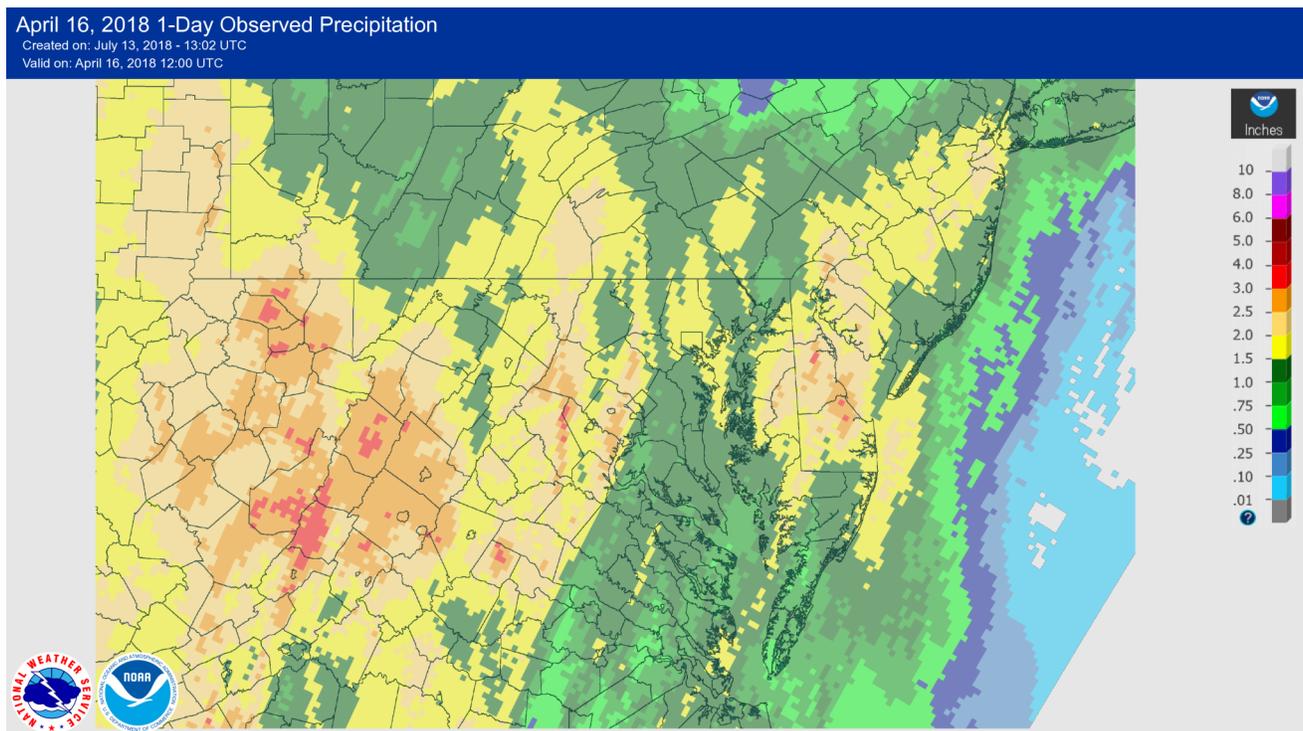
## Spring Floods of 2018

by Jason Elliott, Senior Service Hydrologist

Widespread flooding occurred throughout the mid-Atlantic during the spring of 2018, between the months of April and June. This was after an unseasonably dry autumn of 2017 and winter of 2017-2018. This article chronicles the various events which caused flooding, and provides historical perspective where appropriate.

The first flood event of the spring began in the overnight hours of April 15th into the early morning hours of the 16th, as low pressure moved east along what was a stalled boundary over the region.

Conditions leading up to this event had been mostly dry, with only light rain events due to an unseasonably chilly period. The amounts which occurred, ranging from 2-3 inches over a large portion of the area, would have caused much more flooding later in the season when antecedent conditions were wetter.



As it was, flooding was primarily confined to the DC metro area, and larger streams in the western portion of the region. Ultimately, the floodwaters moved downstream, affecting the more flood-prone areas of the Potomac River as well.

Twelve stream gauges reached flood stage, including six forecast points. The South Branch Potomac River at Springfield WV reached their highest crest since 2007, and the South Branch Potomac River at Franklin WV reached its highest crest since 2007.

Half of the twelve stream gauges that reached flood stage were in the Washington D.C. metro area.

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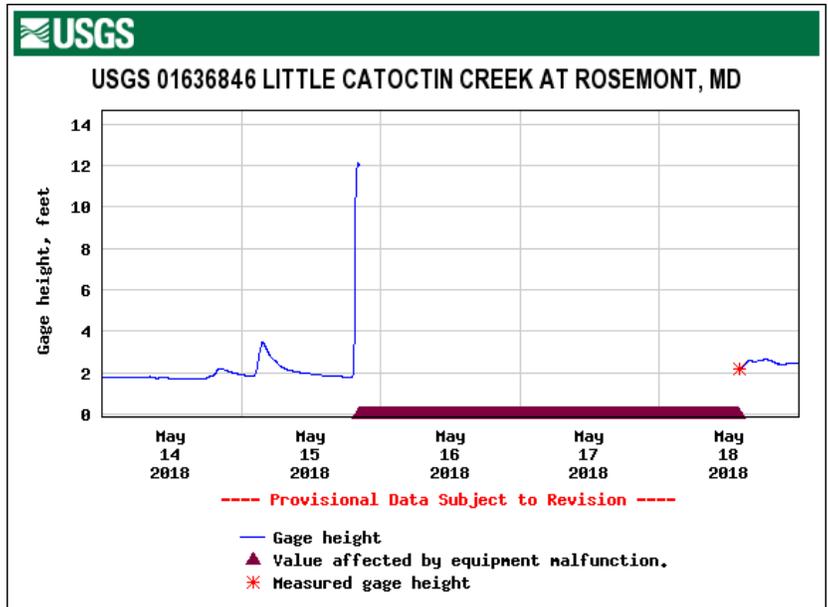
The first of several significant flood events occurred on May 15th, 2018. A line of thunderstorms moved southward near an approaching cold front into Maryland. The line stalled across southeastern Washington and southern Frederick Counties. Torrential rain of 4 to 6 inches fell in a very short period of time, along with impressive baseball-sized hail.

Widespread flooding was reported in the city of Frederick, with numerous water rescues and flood damage to the YMCA building and other structures. The heaviest rain was southwest of the city, where roads were washed out and some structures, especially in far southeastern Washington County, suffered flood damage. In one case, a small creek that usually barely flows turned into a raging river and inundated the lower level of one home, requiring a water rescue. With some rugged terrain in that area, some landslides also occurred.

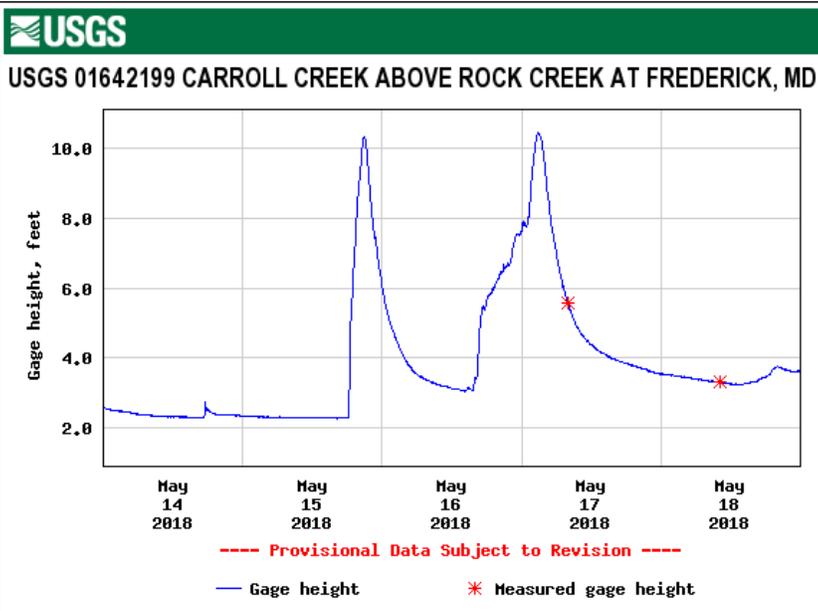
The USGS stream gages on Little Catoctin Creek were right in the line of the heaviest rainfall, and one recorded a flood wave of at least ten feet in depth before being damaged, as shown in the observed graph on the right:

At this location, the gauge height rose from 2 feet to 11 feet in just 20 minutes.

Floodwaters from the creek damaged Jefferson Pike (Maryland 180) in this area, closing the road for weeks. The same floodwave undermined a section of train tracks near Brunswick, temporarily stranding dozens of MARC passengers.



Although instability and moisture had decreased somewhat, the Frederick area remained in the vicinity of another stalled front during the next afternoon/evening (May 16th) and the scenario repeated itself, with another band of torrential rain (3-6 inches) that affected the same areas as the night before, plus portions of Jefferson County, West Virginia.



another stalled front during the next afternoon/evening (May 16th) and the scenario repeated itself, with another band of torrential rain (3-6 inches) that affected the same areas as the night before, plus portions of Jefferson County, West Virginia.

Local officials estimate between the two events, several million dollars in damage occurred just to public infrastructure. However, one success story was Frederick's Carroll Creek/Baker Park flood mitigation project, which kept water within the designed

*(continued on next page)*

***Spring Floods of 2018 (continued)***

As the Frederick (and nearby area) flooding was occurring, much of the rest of the region was seeing several consecutive days of moderate rainfall. The cumulative effects of these events caused some smaller stream flooding initially, and then flooded larger rivers as the flow moved downstream. Some locations experienced multiple peaks in flood during this time due to the multiple rounds of rainfall.

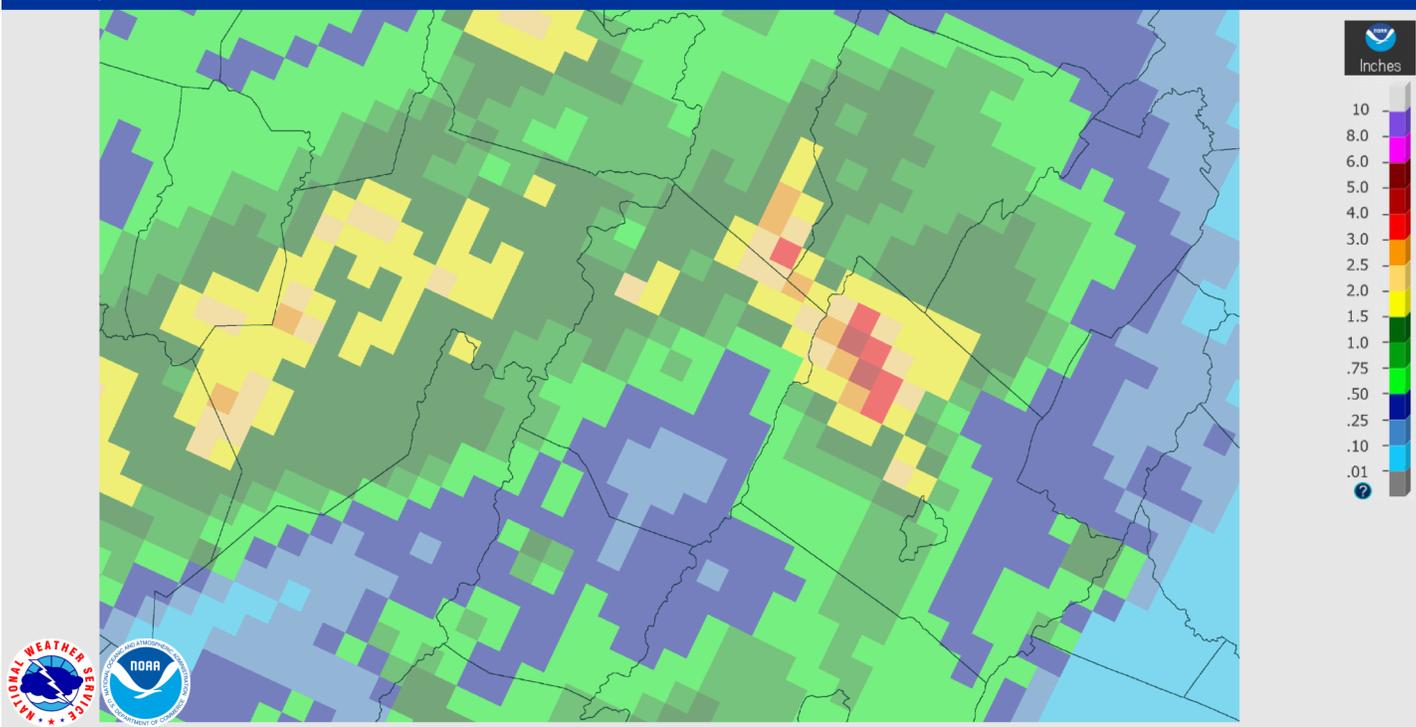
To view rainfall from this time period, visit <http://water.weather.gov/precip> and select the archive data section under the map.

A classic wedge of cooler air left yet another stalled front stretching across the vicinity of the Blue Ridge Mountains during the overnight hours of May 21st into the 22nd. Heavy rain up to four or five inches fell in a fairly short period of time, mainly in northwestern Rockingham County.

Significant flooding was reported in the Fulks Run and Yankeetown areas, with vehicles stranded in the floodwaters and damage reported to some homes. That portion of northwestern Rockingham County forms the North Fork Shenandoah River, which saw a flood wave move downstream through the course of the day on the 22nd.

**May 22, 2018 1-Day Observed Precipitation**

Created on: July 13, 2018 - 15:02 UTC  
Valid on: May 22, 2018 12:00 UTC



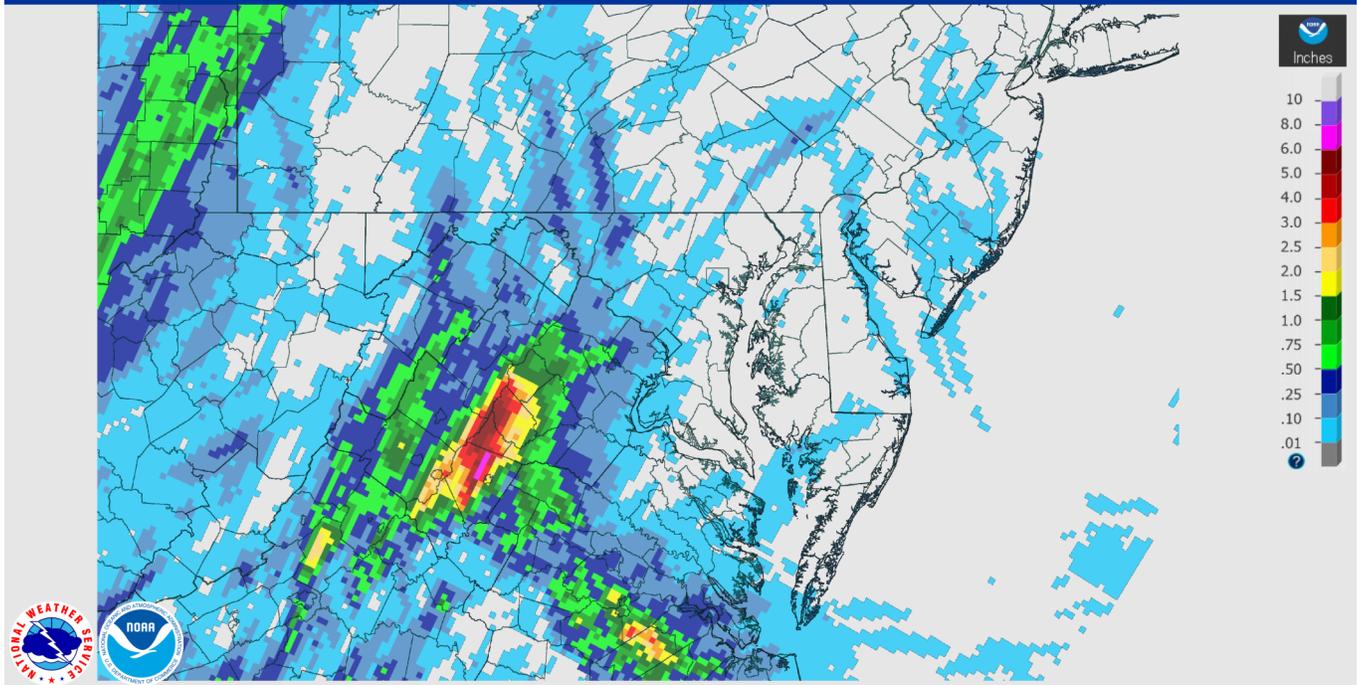
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As Tropical Depression Alberto moved northward through the Ohio Valley about a week later, a boundary set up across central and southern Virginia between cooler air to the north and the tropical warm air to the south and west, and remained stationary on the 30th and 31st.

Torrential rain fell north of this boundary, enhanced by easterly winds pushing up against the Blue Ridge Mountains. This led to widespread rainfall totals of 5-8 inches across western Madison and Greene Counties, and much of Albemarle County.

#### May 31, 2018 1-Day Observed Precipitation

Created on: June 27, 2018 - 17:50 UTC  
Valid on: May 31, 2018 12:00 UTC



Dozens of roads were closed, with flooding of homes. At least a dozen water rescues occurred.

Tragically, three fatalities occurred during this flooding event.

In Madison County, Virginia, two women who were camping at Graves Mountain attempted to cross a flooded stretch of water in an ATV.

Tasha Hardy of Culpeper County was swept away and perished. Her companion was stranded on an island for several hours.

In Albemarle County, two vehicles were swept into Ivy Creek. One vehicle's occupant was rescued, but the occupants of the other vehicle, Robert and Carol Gilges, were swept away and could not be rescued.

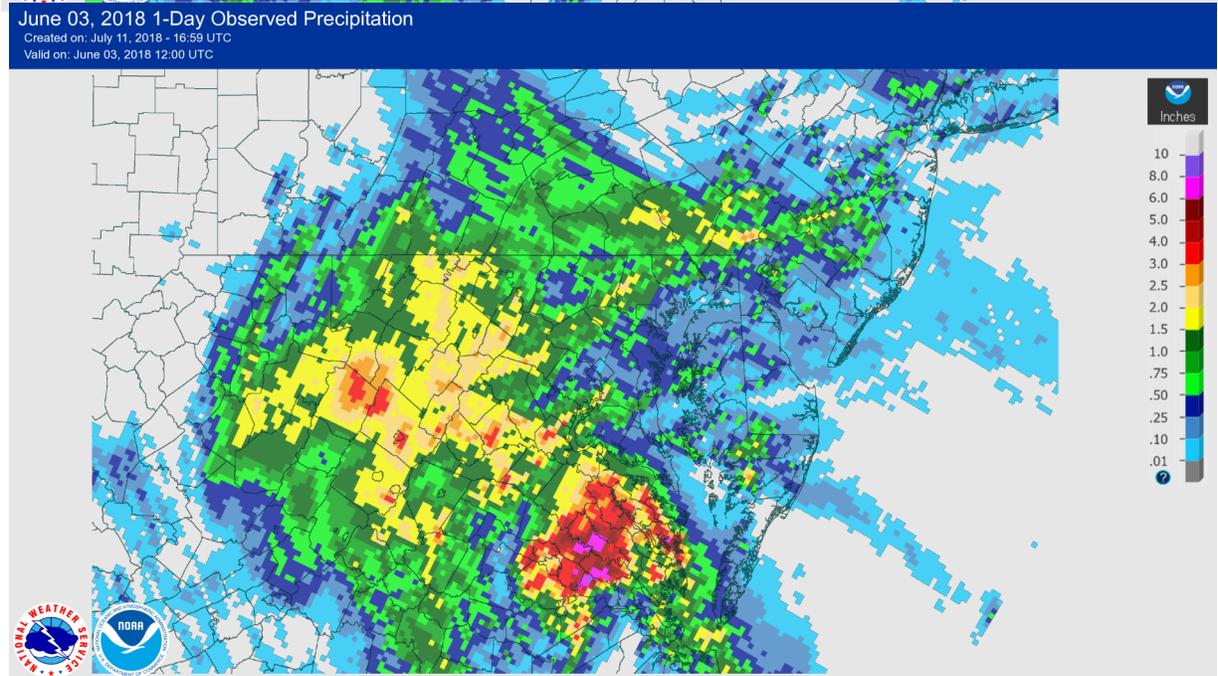
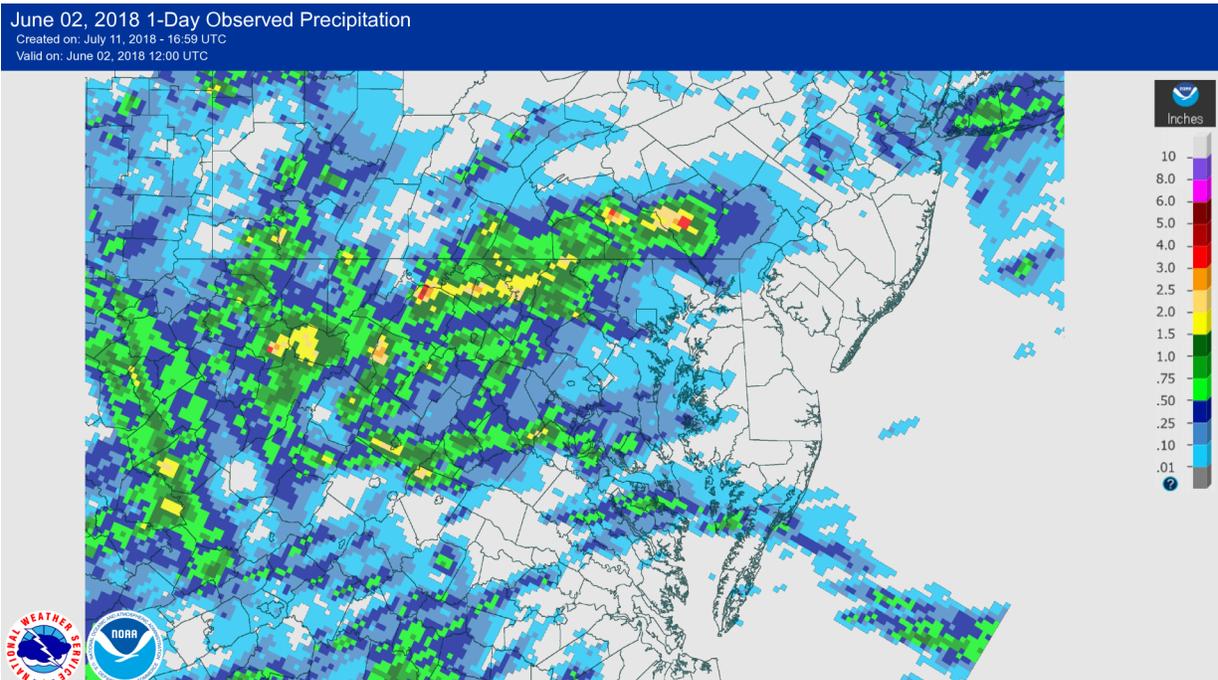
Heavy rain later in the day on the 31st produced 1.5-2.5 inches of rain in portions of Rockingham and Culpeper counties in Virginia, and Berkeley County, West Virginia, causing flooding, including of streams, in those areas as well.

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***Spring Floods of 2018 (continued)***

On June 1st through 4th, a series of generally weak systems (and yet another stalled front for a portion of the time) moved through the mid-Atlantic. Heavy rains throughout the first three days of the month, combined with very wet soils from the relentless period of rain in late May, caused widespread, and in some areas, quite significant, flooding.

On the evening of the 1st, widespread flooding was reported in Washington and Frederick Counties in Maryland, and in Hampshire, Morgan, and Berkeley Counties in West Virginia. This included several rescues of people from cars. Some of that flooding continued into the 2nd, and by afternoon, new flooding was occurring throughout much of north central Virginia and the eastern West Virginia panhandle. Flooding

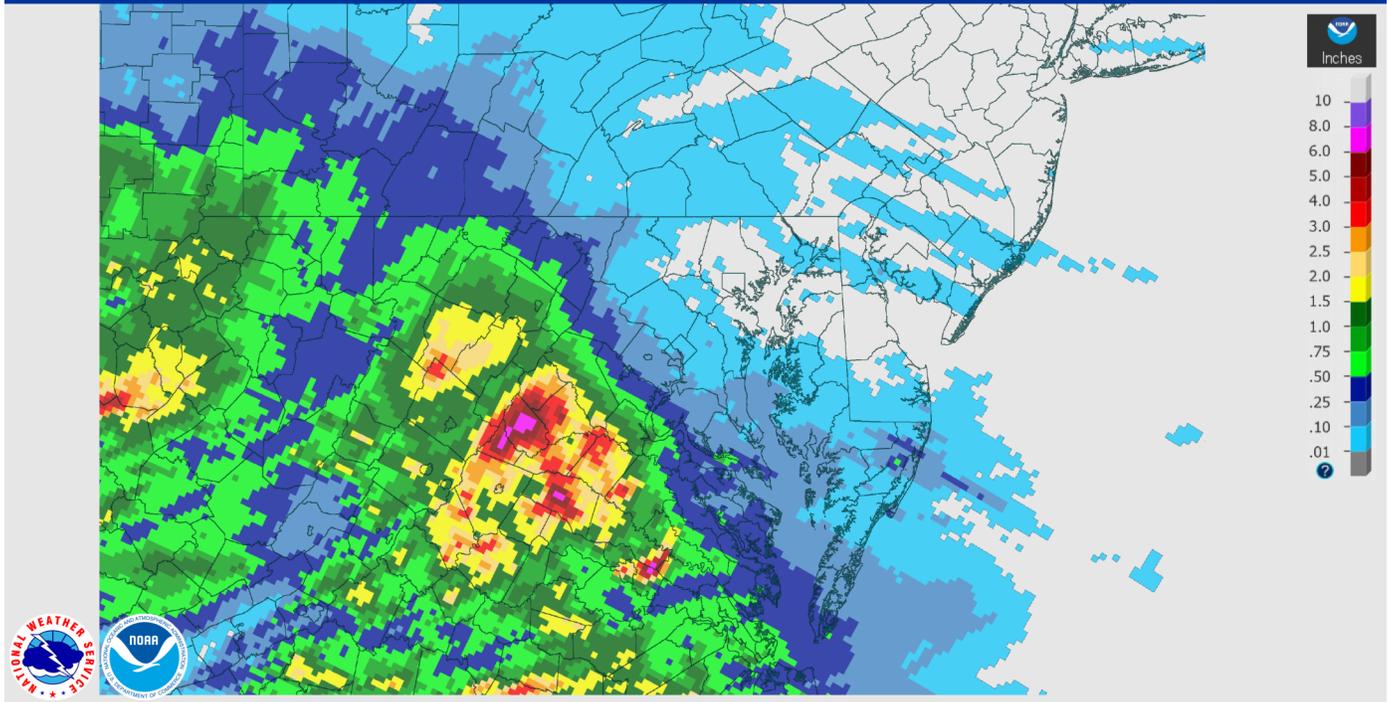


On June 21-22, it happened yet again. A front was stalled across Central Virginia with deep easterly flow to the north of it. This (as also occurred at the end of May) caused significant precipitation in Madison and Greene Counties, as well as surrounding areas, particularly those with upslope to mountains.

Moderate rain persisted into the next day, as the front moved northward as a warm front.

#### June 22, 2018 1-Day Observed Precipitation

Created on: July 11, 2018 - 17:01 UTC  
Valid on: June 22, 2018 12:00 UTC



Widespread flooding occurred in the Rappahannock and Shenandoah basins, with some minor flooding at the susceptible area of the Potomac near Edwards Ferry.

The Cacapon River near Great Cacapon WV and the Opequon Creek near Martinsburg WV flooded for the fifth time in 2018. The Robinson River near Locust Dale VA also flooded for the fifth time in 2018, and the 5th time in 35 days.

Many rivers in central Virginia reached their highest stages on record since 1996 during this late June event.

After a brief reprieve in early July, the rainy pattern resumed and persisted into the early fall. Flooding was a result of convection (thunderstorms) which tend to be more isolated in nature, so the widespread severe levels of flooding were not observed in most cases. But due to the well above normal precipitation and saturated ground, even moderate amounts of rainfall began to cause flooding.

Many area rivers and streams have flooded multiple times this year. By early October, the Opequon Creek near Martinsburg WV had flooded 9 times. The persistent onshore winds that kept moisture levels elevated leading to the repeated heavy rain also kept tides elevated. 39 out of 45 tide cycles at the DC Southwest Waterfront between early September and early October were high enough to cause flooding.

For more details, visit <https://www.weather.gov/lwx/springfloods2018>

New Forecast Maps

# New Forecast Maps

by Michael Muccilli,  
Meteorologist

We are pleased to announce that over the past few months we have added two new features to the National Weather Service Baltimore/Washington webpage at [www.weather.gov/washington](http://www.weather.gov/washington) or [www.weather.gov/baltimore](http://www.weather.gov/baltimore).

## Daily Observed Weather Maps

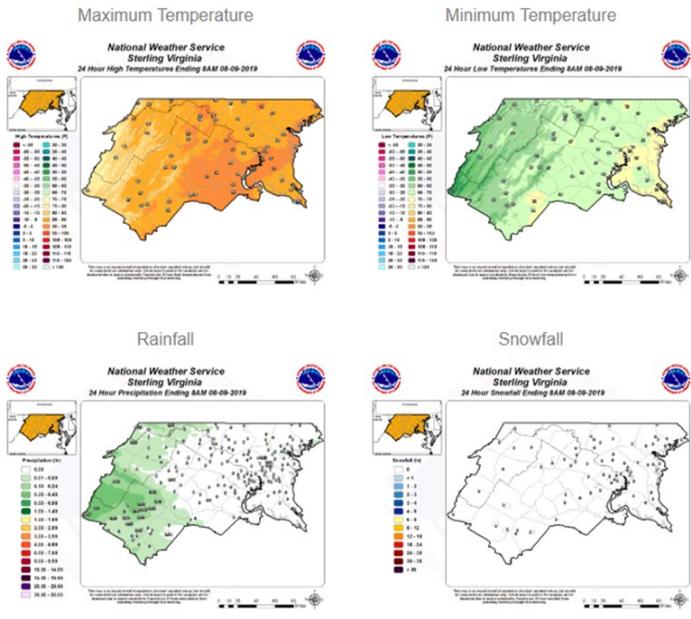
Weather.gov > Baltimore/Washington > Daily Observed Weather Maps

Baltimore/Washington  
Weather Forecast Office

Current Hazards Current Conditions Radar Forecasts Rivers and Lakes Climate and Past Weather Local Programs

### National Weather Service Baltimore/Washington Observed Data

Latest 24 hr Reports  
(click to enlarge)



The first is a page hosting **24-hour summary maps of observed high temperatures, low temperatures, liquid precipitation, and snowfall**. These maps are updated around 12 Noon each day. They can be accessed by hovering over the *Climate and Past Weather* Menu and clicking on *24 Hour Summary*.

The page displays four thumbnails of the images that can be enlarged to normal size when clicked. Beneath the images are the Max/Min Temperature and Precipitation Table that is updated twice a day, and the Daily Hydrometeorological Data Summary which is updated each morning.

Maps are updated by 12 Noon each Day. Sources of data include ASOS/AWOS sites, mesonet sites, cooperative observers, AHPS, and NOHRSC.

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Local forecast by "City, ST" or ZIP code  
 Enter location ...    
[Location Help](#)

**News Headlines**  
 • [Fall 2019 SKYWARN Spotter Class Schedule](#)  
 • [Some towns drier this summer; others still wet. Where does yours fall? Check out estimates here.](#)

**NWS Forecast Office Baltimore/Washington**

Baltimore/Washington  
 Weather Forecast Office

Current Hazards   Current Conditions   Radar   **Forecasts**   Rivers and Lakes   Climate and Past Weather   Local Programs

Click a location below

Watches, Warnings & Advisories  
 Hazardous Weather Outlook

Zoom Out   Zoom In

Weather Obs Map Viewer   Local Radar   Satellite

The second new webpage feature is the **Recreation Forecast page**, which features current conditions and the recreation forecast for Shenandoah National Park.

This can be accessed by hovering over the *Forecasts* menu and clicking on *Recreation*.

At the top of the page are the current observed conditions at three locations near or in the park and their respective elevations. Below this is the text forecast (which you may already be familiar with).

Below the text forecast are maps displaying forecast high temperatures, low temperatures, wind chill values, heat index values, wind gusts, precipitation, snowfall, and ice amounts across Shenandoah National Park.

**Recreation Forecast**

Baltimore/Washington  
 Weather Forecast Office

Current Hazards   Current Conditions   Radar   **Forecasts**   Rivers and Lakes   Climate and Past Weather   Local Programs

**Current Conditions:**

- [Sawmill Ridge](#) (CROV2, 2080 ft)
- [Stanley](#) (DW5387, 2598 ft)
- [East Luray](#) (LHQV2, 1200 ft)

**Text Forecast:**

000  
 SXUS41 KLMX 092336  
 RECLNX  
 VAZ507-508-100300-

Forecast for Shenandoah National Park Above 2000 Feet  
 National Weather Service Baltimore MD/Washington DC  
 736 PM EDT Fri Aug 9 2019

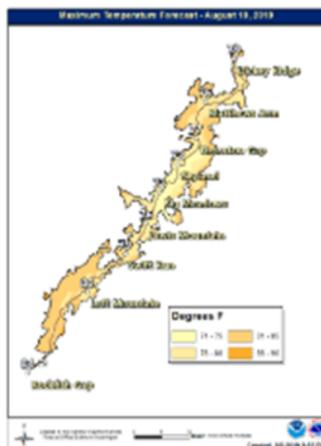
- .TONIGHT...Mostly clear. Lows in the lower 60s.
- .SATURDAY...Sunny in the morning, then becoming partly sunny. Highs in the upper 70s.
- .SATURDAY NIGHT...Mostly clear. Lows in the upper 50s.
- .SUNDAY...Sunny. Highs in the upper 70s.
- .MONDAY...Partly cloudy. Lows in the lower 60s. Highs in the lower 80s.
- .TUESDAY...Mostly cloudy. A chance of showers and thunderstorms. Lows around 70. Highs in the mid 80s.
- .WEDNESDAY...Mostly cloudy. A chance of showers and thunderstorms. Lows in the upper 60s. Highs in the lower 80s.

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**Forecast Graphics:**

**SHENANDOAH NATIONAL PARK**

**High Temperatures -**



We here at the National Weather Service Weather Forecast Office in Sterling, Virginia hope that you will find these new features useful!

## Co-op Awards

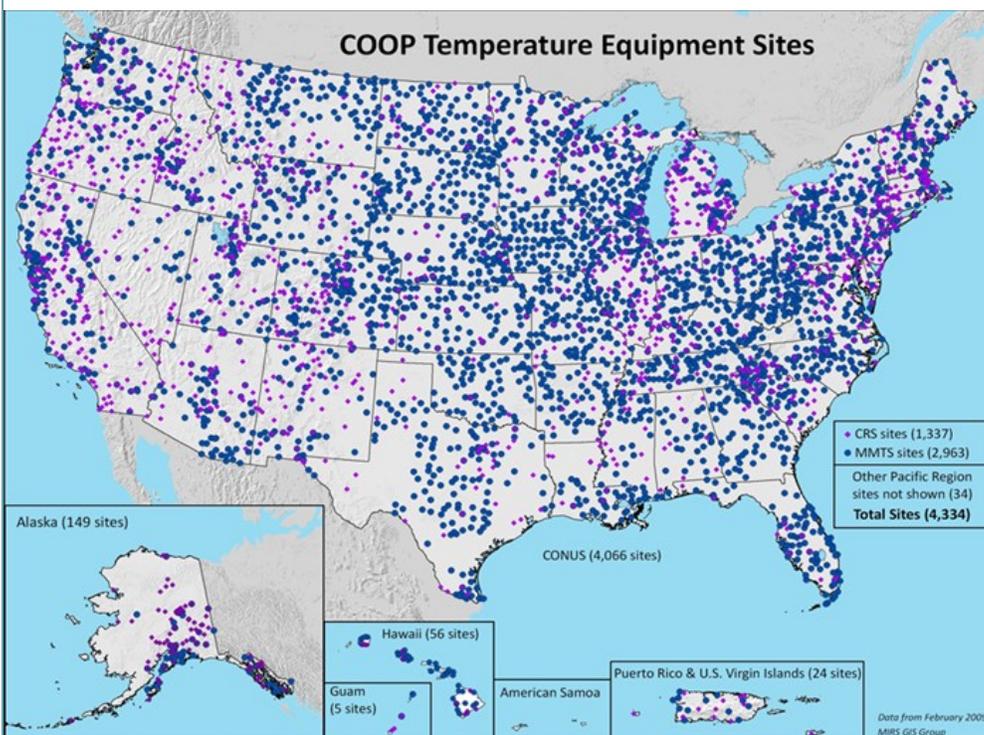
by Brandon Fling, General Forecaster

The National Weather Service (NWS) Cooperative Observer Program (Co-op) consists of more than 8,700 volunteer observers who take daily weather observations and provide that data to the NWS. This data allows us to better understand and solve problems related to climate change, commerce, transportation, and agriculture. The first network of cooperative stations was set up as a result of an act of Congress in 1890 (Organic Act) that established the Weather Bureau, but many Co-op stations began operation long before that time.

The mission of Co-op is to provide observational meteorological data, usually consisting of daily maximum and minimum temperatures, snowfall, and 24-hour precipitation totals, which is required to define the climate of the United States and to help measure long-term climate changes. Additionally, these observational meteorological data in near real-time supports forecast, warning and other public service programs of the NWS.

Because of its many decades of relatively stable operation, high station density, and high proportion of rural locations, the Cooperative Network has been recognized as the most definitive source of information on U.S. climate trends for temperature and precipitation. Cooperative stations form the core of the U.S. Historical Network (HCN) and the U.S. Reference Climate Network.

Throughout our area of forecast responsibility, there are a total of 69 Co-op stations. Observers generally record temperature and precipitation daily, sending the data electronically to the NWS and the National Center for Environmental Information (NCEI). Many cooperative observers provide additional hydrological or meteorological data, such as evaporation or soil temperatures. Cooperative Weather Observers play an integral role in helping the NWS increase our knowledge and understanding of the local, national, and global climate.



To show our appreciation for the level of dedication and commitment that these observers exude, recognition is given to observers after completing a designated amount of years of service.

Over the past two years, we have recognized several observers with a Length of Service Award, acknowledging their continued dedication to the program.

To these observers and to all our Co-op observers, we say:  
**THANK YOU!**

# Summer 2019 Summary and Winter 2019-20 Outlook

*by Ray Martin, Lead Meteorologist*

Summer 2019 goes down in the record books as one of the warmest on record in our region.

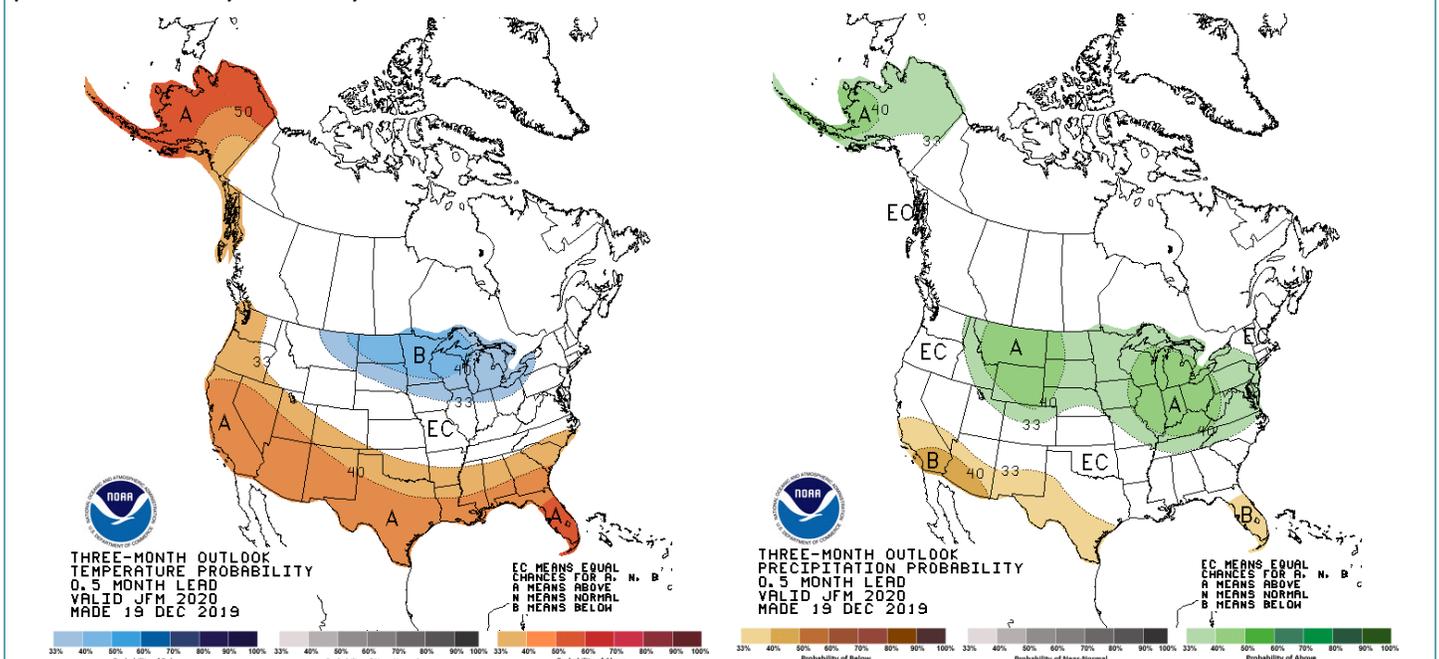
Out of all summers since 1872, Summer 2019 ranked as the 7th warmest in Washington and 6th warmest in Baltimore. However, it was only the warmest summer since 2016 in Washington, while in Baltimore it was the warmest since 2010. Despite the warmth, only 1 daily record high was set in Washington, and 3 daily record highs were set in Baltimore. 1 daily record low was also set in Baltimore, with none in Washington.

Precipitation-wise, the summer was fairly close to normal in Washington with 12.75 inches. This was notably drier than the last two summers. The last summer that turned out drier than 2019 was 2016, when only 9.60 inches of precipitation fell.

In Baltimore, a more noticeable dryness was present, with only 9.19 inches of precipitation. This made the summer of 2019 the driest since 2007, more than a decade ago. No precipitation records were set this summer in Baltimore, but one notable record occurred in Washington on July 8th, when over 3 inches of rain fell in just an hour. The daily total on July 8th of 3.44 inches remains the only daily precipitation record of the year thus far in Washington.

The outlook for Winter 2019-2020 is uncertain. The lack of an El Niño or La Niña makes the winter a bit more unpredictable. General trends suggest that averaged together, the 3 months of January—March will most likely be near average temperature, and slightly better odds of having more precipitation. However, recent fluctuations in the Quasi-Biennial Oscillation, the stratospheric wind patterns in the Pacific, suggest a trend towards greater blocking in the north Atlantic & Arctic regions, which could bring greater cold to the region.

Below is the Climate Prediction Center’s temperature (left) and precipitation (right) outlooks for the 3-month period of January-February-March.



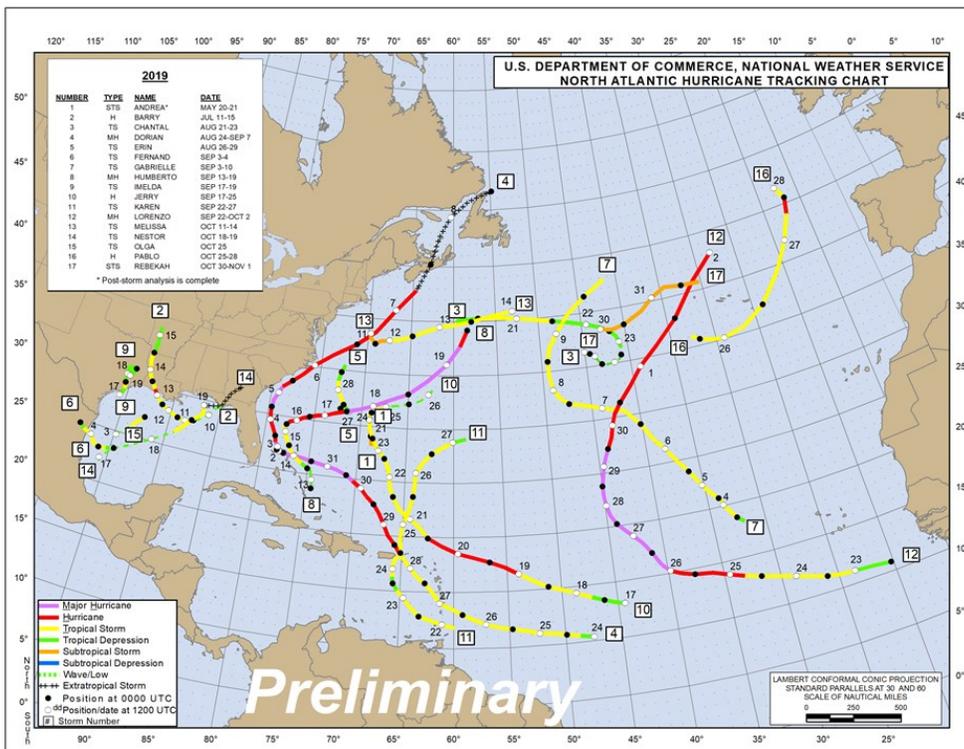
# Atlantic Hurricane Season 2019

by Luis Rosa, Lead Meteorologist

The 2019 Atlantic hurricane season turned out to be an above average season in terms of named storms with 19, but near average in terms of hurricanes (6) and major hurricanes (3). In terms of Accumulated Cyclone Energy (ACE), the Atlantic hurricane season had 124.1 ACE units, which is above the 1981- 2010 long term average of 105.6 units. ACE is defined as the sum of the square of a named storm’s maximum wind speed for each 6-hour period of its existence. ACE is a better measure of the overall tropical cyclone activity during a season as it accounts for both the strength and lifetime of each tropical cyclone.

The season’s most significant storm was Hurricane Dorian. It formed on August 24<sup>th</sup> over the central tropical Atlantic, then became post-tropical on September 7<sup>th</sup> while approaching the Canadian province of Nova Scotia. Dorian first impacted the northern U.S. Virgin Islands on Aug 28 as a minimal Category 1 hurricane, and then devastated the northwestern Bahamas as a Category 5 hurricane during the Labor Day weekend with maximum sustained winds of nearly 200 mph and deadly storm surge of over 20 feet. Dorian then impacted the coastal Carolinas as a Category 2 hurricane causing life-threatening storm surge and high winds. Finally, Dorian struck Nova Scotia as a strong post-tropical storm with winds of up to 100 mph and dangerous high waves.

The second most significant storm of the season from a meteorological perspective was Hurricane Lorenzo which attained Category 5 strength over the eastern Atlantic Ocean on Sep 28<sup>th</sup> becoming the strongest hurricane that far north and east in the Atlantic Basin.



The 2019 season also had a fair number of short-lived storms that lasted 24 hours or less. The most significant of these was Tropical Storm Imelda which caused significant flash flooding over southeast Texas and portions of Louisiana with up to 40 inches of rain in a few spots.

The map at left shows a preliminary plot of the tropical cyclones that developed over the Atlantic Ocean during the 2019 hurricane season, as provided by the National Hurricane Center.

## Aviation Users Meeting

by Andrew Snyder, Meteorologist

Over the years, NWS WFO Baltimore/Washington has taken a proactive approach with engaging our partners and users. Our office routinely gathers these groups for meetings to discuss new information and receive feedback on our services. Such groups have been formed to serve the marine, fire weather, hydrology, coastal flood, and broadcast media communities. Aviation services was a logical addition to this construct, and to kick off the initiative, an all-day forum was held with our aviation partners at Dulles International Airport on November 13.

Nearly 30 attendees represented a wide range of interests, including commercial airlines, airport operations managers, airport control tower managers, the National Business Aviation Association, Potomac TRACON, and the Washington Air Route Traffic Control Center (ARTCC). Also, attending from the NWS side: staff from NWS Baltimore/Washington and State College Weather Forecast Offices, Eastern Region Headquarters, Washington Center Weather Service Unit (CWSU), Aviation Weather Center (AWC), and NWS headquarters Aviation and Space Services Branch.

The two morning sessions focused on “What We Do” and “How We Do It,” with presentations by NWS Baltimore/Washington, the Washington CWSU, and AWC. The entire afternoon was devoted to interactive discussion, with specific high-impact cases involving thunderstorms, a winter storm, and a wind/ceiling/visibility event. Discussion centered on how such events impacted aviation operations and feedback on NWS services during these events. To cap the event, Bruce Entwistle, chief of NWS headquarters Aviation and Space Services Branch, gave a presentation on the future of NWS Aviation Services.

Several of the forum goals included enhancing communication and strengthening partnerships, discussing ways to improve services and best practices, and receiving feedback from our core customers. To that end, the forum was a resounding success. Valuable insight into aviation operations and impacts was gained that could not be obtained from reading a directive or taking a training module. Useful feedback was received that not only could improve local WFO and CWSU services, but that could also be addressed at a regional and national level.

This beneficial information and interaction will serve as important building blocks moving forward in our aviation products, services, and partnerships.



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## Fall/Winter 2019

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Photo Courtesy of Isha Renta



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