

2 December 2019

State Climate Extremes Committee Memorandum

FOR: Derek S. Arndt
Chief, Climate Monitoring Section, Center for Weather and Climate
National Centers for Environmental Information

FROM: Ray Martin
Senior Meteorologist, National Weather Service Baltimore/Washington

SUBJECT: Regarding potential Virginia Annual Precipitation record in 2018

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Summary:

On 18 October 2019, a State Climate Extremes Committee (SCEC) convened to verify and validate an annual precipitation accumulation of 94.43" reported at a National Weather Service (NWS) Cooperative Observer Network (COOP) station in Sperryville, VA for the calendar year of 2018. Although there is no SCEC-recognized annual precipitation record for Virginia, there are multiple candidates. The value referenced on the Virginia Climatologist Website states 81.78" in Montebello in 1972 is the record, but more recent totals which might have held the record include Philpott Dam 2 in 1996 (86.06"), Chesapeake 3.9 NE in 2016 (84.14"), Norfolk 3.0 S in 2016 (83.81") and Meadows of Dan 5 SW in 2003 (83.34"). None of these were ever certified as the record, and no SCEC or other review was ever conducted. A total of three sites in Virginia, one within the CoCoRaHS network and two within the National Weather Service Cooperative Observer Network, reported annual values in 2018 which exceeded all prior annual totals which may have been the previous record (Fig. 1). The following observation was examined by the State Climate Extremes Committee (SCEC) to determine its validity and potential status of the greatest annual precipitation total observed and verified in Virginia:

- **LOCATION:** Sperryville COOP
- **YEAR:** Calendar Year 2018
- **PRECIPITATION TOTAL:** 94.43"

The committee considered the meteorological plausibility and reviewed the gauge and observing practices which measured the record in question. After reviewing the observational evidence, **the SCEC unanimously agreed that the Sperryville annual precipitation total of 94.43" would set the inaugural record for the State of Virginia.**

Sequence of Events, Examination & Decision

Background & Meteorological Plausibility

Due to persistent storms and copious tropical moisture, much of the eastern United States experienced unusually excessive precipitation during 2018. Nine states from Tennessee to Massachusetts recorded their wettest year on record, and many stations within this region experienced their wettest year on record (Fig. 2), including the long-term climate stations in Washington, D.C. and Baltimore.

In Virginia, three stations exceeded the existing highest amount from Philpott Dam 2 from 1996. These stations were clustered on the eastern slopes of the Blue Ridge Mountains, a location known for enhanced upslope precipitation when flow is easterly, southeasterly or southerly. This sort of flow is commonly present during passing storm systems.

Investigation Sequence

Initially, the two highest reported totals in Virginia were the Montebello Fish Hatchery NWS COOP site located southwest of Sperryville along the Blue Ridge. The next highest known total was at station Roanoke 5.8 SW, a CoCoRaHS station located southwest of Montebello but also along the Blue Ridge. After a thorough SCEC review of both stations, documented in a separate report, both values were deemed unacceptable for certification, warranting a review of the next potential record value. This led to the investigation of the station in Sperryville, which at the time was the third highest known total.

Review of Observing Practices & Equipment

The Climate Program Leader at NWS Weather Forecast Office Baltimore / Washington visited the Sperryville station in June 2019. Sperryville is a small town at about 750 feet above sea level, located in Rappahannock County in north-central Virginia, just east of Shenandoah National Park (Fig. 3). Rappahannock County is very rural with less than 8,000 residents, with one of the lowest population densities in Virginia. Its topography consists of the Blue Ridge Mountains located immediately west and northwest of the town, with lower foothills of the Piedmont spread out to the south and east.

The observer at this station is a music teacher with a keen interest in meteorology. He has been observing since 1 April 1995. His paper forms are extremely meticulous with many extra weather details documented.

When the station's data were initially reviewed, there were several days noted with missing data. However, during the site visit, it was determined that this was due to missing data transmissions, not actual missing observations. The observer's paper forms were complete, and in fact a report had been made on every day in 2018. Inclusion of the entire year's reports elevated the total for Sperryville above the other candidates.

Inspection of the site revealed that the standard rain gauge used here is located 4 feet above ground attached to standard support in the observer's back yard. A greenhouse is located about 10 feet to the east and a small cultivated field is immediately west (Fig. 4). The gauge is situated in a flat location. A large tree is located 30 feet east of the gauge, which may provide some obstruction, especially in the future, but has not yet grown overhead. The obstructions present are not believed to be of significance as far as

influencing the rain gauge measurements, and if they did, they most likely resulted in a negative bias (readings lower than reality). Hoses for field irrigation were also noted in the vicinity, but they were determined to be of the drip type and the observer insisted that no irrigation had impacted his measurements.

While many other stations in the region reported excessive precipitation, including some stations with 70 to 80 inch accumulations for 2018, there are extremely few reliable measurements in the immediate area due to the very rural nature of the location.

Comparing the data to the NWS AHPS estimate shows the estimate is notably lower than the observer report (Fig. 5). However, as the site is in an area with significant radar beam blockage due to terrain, it is considered likely that the AHPS estimate is too low. (Fig. 6).

In summation, the SCEC believes the observation practices and gauge setting are within acceptable standards.

Finding of the Committee

All of the above evidence was reviewed by the SCEC leading to a teleconference call on 18 October 2019. Based upon the documented evidence, the SCEC agreed unanimously (by a vote of 5-0) that the annual precipitation value for Sperryville COOP station in 2018 is valid and **recommends the NCEI Climate Monitoring Chief approve the SCEC action to acknowledge the 94.43” annual precipitation accumulation for 2018 in Sperryville, VA as the state record annual precipitation value for Virginia.**

NCEI Climate Monitoring Chief Decision:

Approved

as recommended in boldface above:

Not approved

returned to SCEC with no action taken:

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Roster of Participants

Voting Members of the State Climate Extremes Committee:

- Ray Martin, Senior Meteorologist, National Weather Service (NWS) Baltimore/Washington
- Dr. Jerry Stenger, Virginia State Climatologist
- William Schmitz, Service Climatologist, Southeast Regional Climate Center (SERCC)
- Christopher Stachelski, Climate Services Program Manager, System Operations Division, NWS Eastern Region Headquarters
- Karin Gleason, Meteorologist, National Centers for Environmental Information (NCEI)

Additional teleconference participants:

- Bryant Korzeniewski, Meteorologist/Datzilla Programmer, NCEI

Figures

Maximum 1-Year Total Precipitation for Virginia

Click column heading to sort ascending, click again to sort descending.

Name	Station Type	Value	Ending Date	Missing Days	Valid Date Range
SPERRYVILLE	COOP	94.43	2018-12-31	0	1995-12-01 to 2019-10-15
MONTEBELLO FISH CULTURAL STATION	COOP	89.90	2018-12-31	62	1948-09-01 to 2019-10-21
ROANOKE 5.8 SW	CoCoRaHS	87.33	2018-12-31	18	2015-05-07 to 2019-10-20

Fig. 1. Stations which exceeded the previous highest annual precipitation measurement in Virginia during 2018

Statewide Precipitation Ranks

January–December 2018

Period: 1895–2018

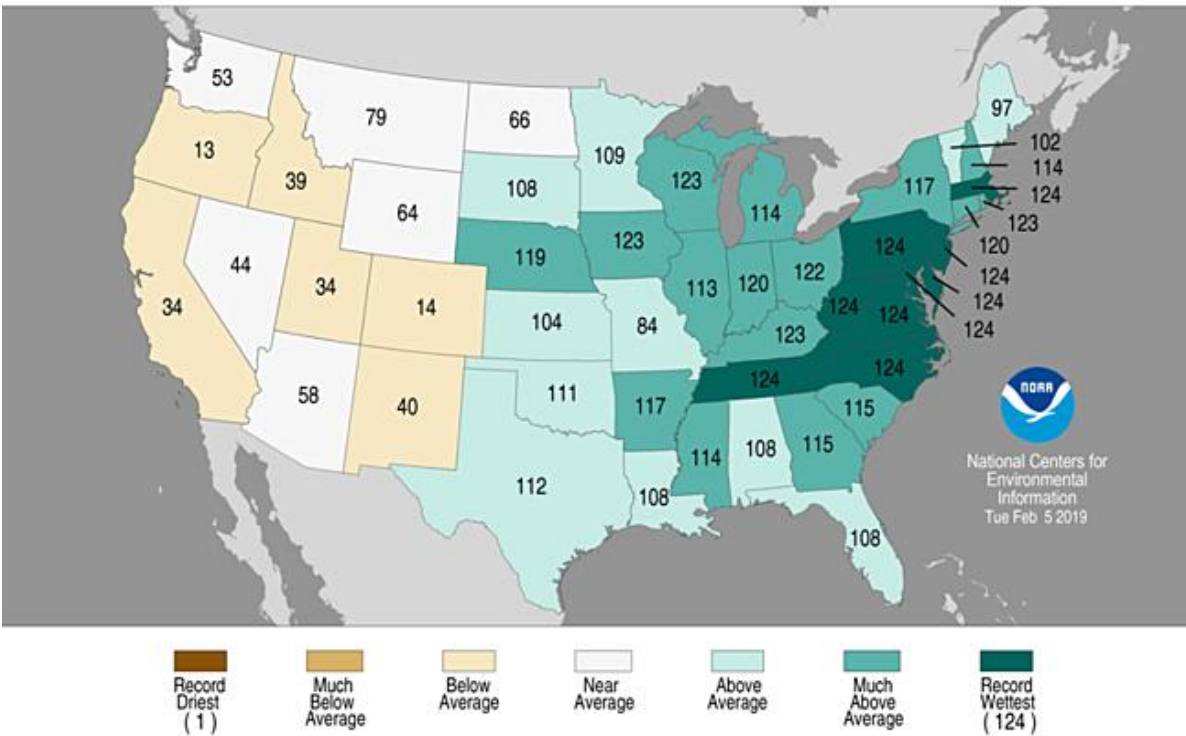


Fig. 2. Precipitation rankings from 2018



Fig. 3. Map of Virginia, with Sperryville's location noted by a red circle



Fig. 4. Photographs of the rain gauge taken by NWS (upper left is looking north, upper right looking south, lower left looking west, lower right looking east)

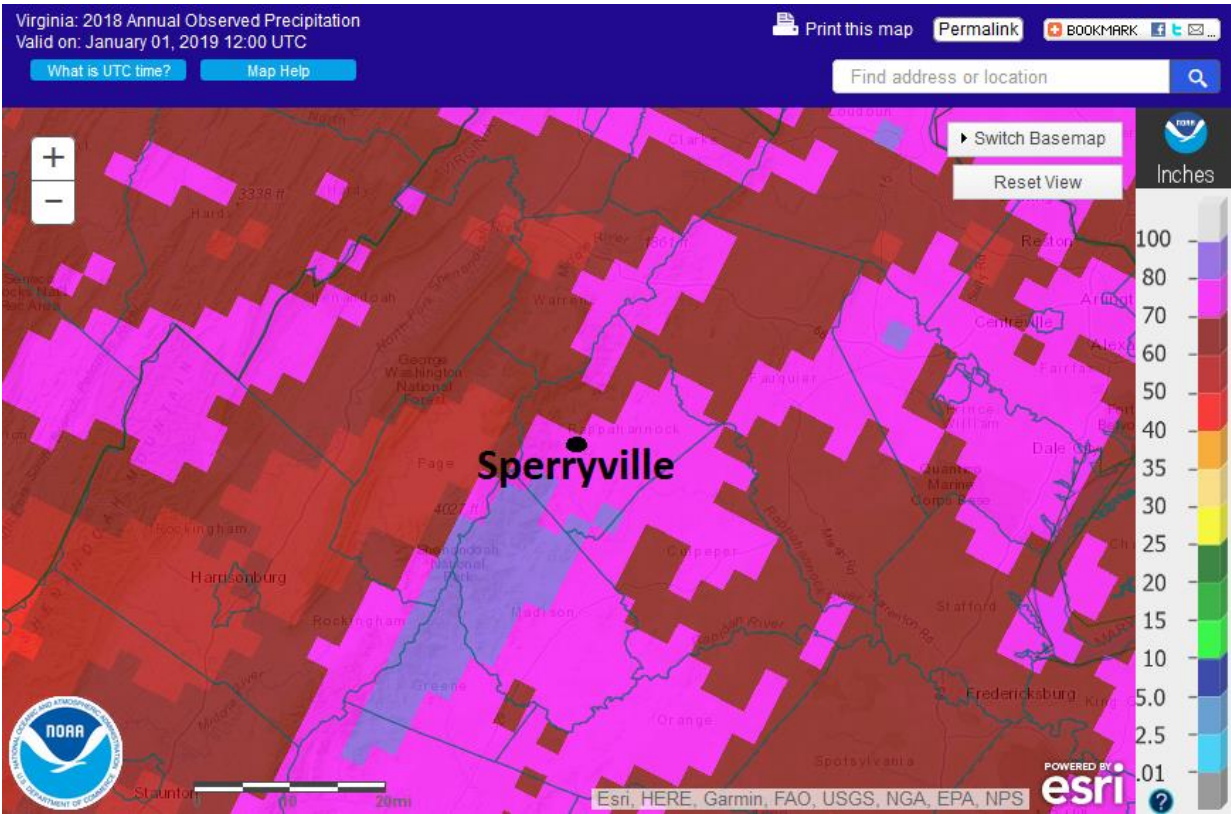


Fig. 5. NWS Advanced Hydrologic Prediction Service precipitation estimate for 2018

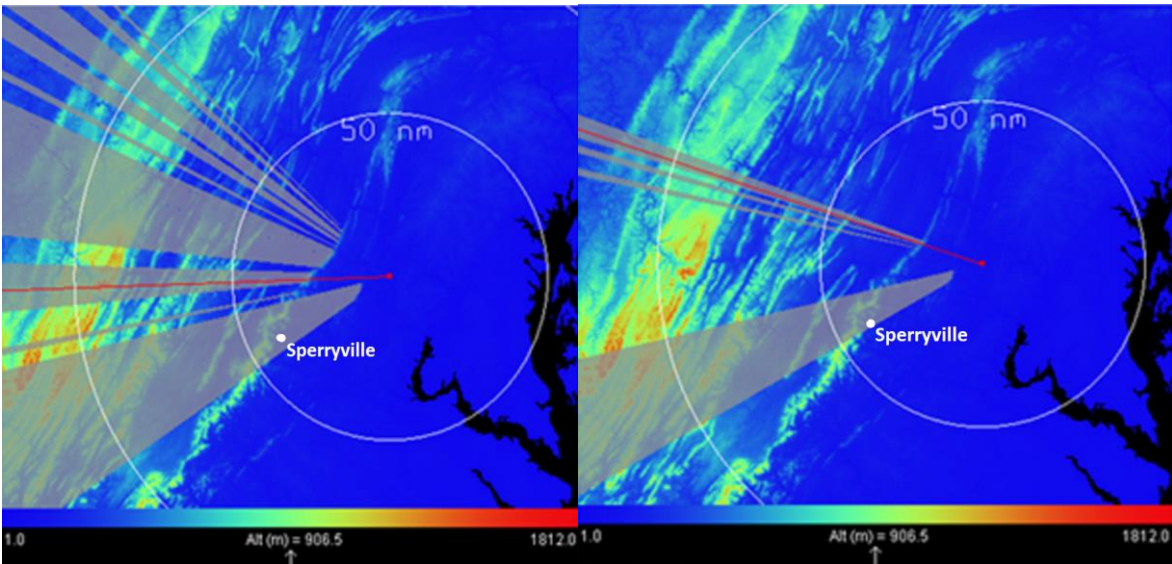


Fig. 6. 25 percent (left) and 50 percent (right) beam blockage maps for KLWX NEXRAD showing the terrain blockage over Sperryville resulting in reduced precipitation estimates (maps courtesy of NOAA Volume Coverage Pattern Explorer software)