STATE CLIMATE EXTREMES COMMITTEE MEMORANDUM

FROM: State Climate Extremes Committee (Horne, Stachelski, Schmitz, Heuser, Gleason)
DATE: June 17, 2019
SUBJ: North Carolina State Record – Annual Rainfall Total 2018

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Summary

The combination of tropical cyclones and an overall unsettled weather pattern during 2018 led to one of the wettest years on record for North Carolina. The following observation was examined by the State Climate Extremes Committee (SCEC) to determine its validity and potential status of the highest annual precipitation total directly observed at a weather station in North Carolina:

- Location: Mount Mitchell, North Carolina
- Date: 1 January – 31 December 2018
- Value: 139.94 inches

After considering the observation and various surrounding factors, the ***SCEC determined the Mount Mitchell observation to be valid, and it now stands as the record annual rainfall total for North Carolina.***

About the SCEC

This State Climate Extremes Committee (SCEC) was composed of members representing five bodies: the National Weather Service (NWS) Weather Forecast Office in Greer, South Carolina (WFO Greenville-Spartanburg; GSP), the NWS Eastern Region's Cooperative Observer Program leadership, the State Climate Office of North Carolina, the Southeast Regional Climate Center, and the National Centers for Environmental Information. It is convened to adjudicate potential records for validity. If validated, the observation is considered the state record for that record type. More details about the SCEC are available online at https://www.ncdc.noaa.gov/extremes/scec/details.

About the Station and Observation

Mount Mitchell (Cooperative Observer ID 31-5923; GHCN-Daily ID USC00315923) is a traditional daily observing station located in Yancey County, in the Mountains of North Carolina. The station is operated by the North Carolina State Parks.

The site reports its official 24-hour precipitation totals from a Standard 8" Rain Gauge (SRG) (Figure 1), with a backup 4" plastic rain gage on site. The Mount Mitchell COOP site is on an annual visitation/inspection cycle (typically completed during the Fall) and was last inspected on 24 September 2018. This visit did not yield any issues as the equipment tested well within performance standards.

The rain gauge and other associated/related observing equipment is located on the grounds of the maintenance/ranger residence facilities within Mount Mitchell State Park. The terrain immediately surrounding the gage site is a narrow ridge paralleling the road leading to the summit.

Figure 1. SRG, MMTS and Plastic rain gage. Courtesy of S.Heuser.

Co-Located North Carolina ECONet Station

The State Climate Office of North Carolina maintains an automated weather station at Mount Mitchell which is co-located with the COOP equipment (Figure 3). Precipitation is measured at the ECONet station using a tipping bucket rain gage and impact sensor. During 2018, the ECONet tipping bucket measured 132.24” and the impact sensor recorded 131.05”. Both of these totals were a respectable 6% difference in comparison to the manually measured 8” SRG.

Meteorological Plausibility of the Observation

According to the Climate at a Glance Tool from NCEI, the statewide average annual precipitation for 2018 was 68.36 inches, the wettest in the 124 year period of record. This is 19.03 inches above the 1895-2018 base period average of 49.33 inches.

During 2018, the Mount Mitchell station recorded monthly rainfall totals greater than ten inches for 8 of the 12 months, and over twenty inches during the stormy and/or tropical months of May and October (Table 1).

NCEI’s confirmation of receipt of 2018’s precipitation:

I'm assuming that I'm cc'd on this e-mail thread now to confirm what NCEI has as the 2018 Annual Precip. Total for Mount Mitchell, NC (GHCN ID: USC00315923; COOP ID #315923). Here's what GHCN-Daily has as of Sunday's (3/31) Full Reprocess for Summed Monthly Totals and Annual Total for 2018 based on daily PRCP values at Mount Mitchell as the following:

1/2018: 11.41"
2/2018: 10.36"
3/2018: 6.18"
4/2018: 11.38"
5/2018: 20.42"
6/2018: 4.14"
7/2018: 9.53"
8/2018: 12.54"
9/2018: 20.70"
10/2018: 13.04"
11/2018: 7.67"
12/2018: 12.57"
2018 Annual Total: 139.94"

None of the daily PRCP values are flagged as invalid by GHCN-Daily's QC. Additionally, no daily PRCP values are missing which makes it a complete data record for the 2018 Data-Year.

Table 1. Monthly Rainfall totals from Mount Mitchell. (Courtesy Bryant Korzeniewski).

Based on data collected from the area, the meteorological conditions and favorable terrain were optimal for the extreme amount of precipitation recorded at Mount Mitchell during 2018, and is supported by observations of annual precipitation from nearby COOP and CoCoRaHS. (Figure 2).

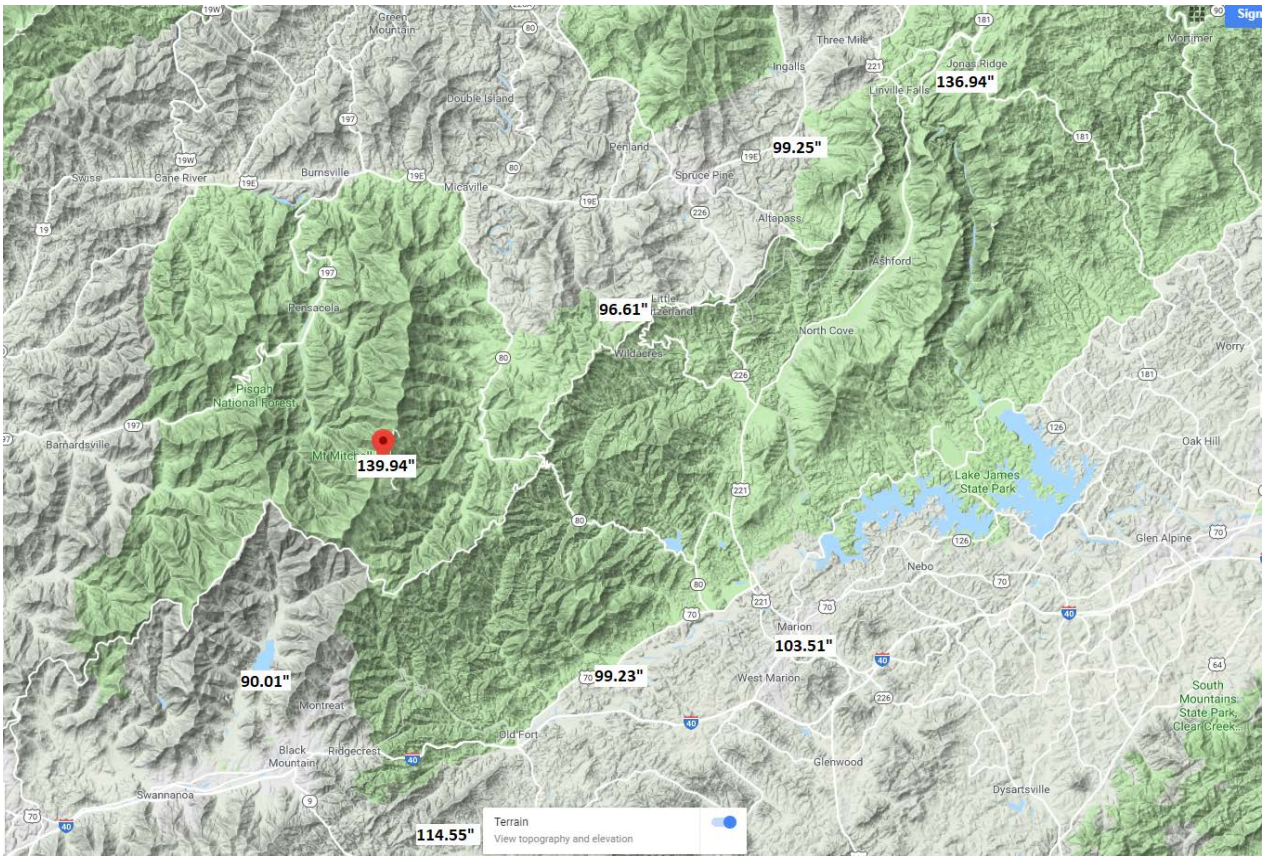

Figure 2. Select annual rainfall totals from stations surrounding the area.

Historical Perspective

Historically, the North Carolina Blue Ridge is no stranger to heavy rainfall given it's favorable terrain orientation and proximity to the Gulf of Mexico and the Atlantic Ocean. An ACIS query yielded North Carolina's highest annual precipitation totals (Table 2). Additional maps and station photos are provided in Appendix A (Figures 3, 4, and 5).

Station	Value	Year	Missing Data
Mt. Mitchell(1980-2019)	139.94	12/31/2018	0
LAKE TOXAWAY 2 SW	137.37	12/31/2003	0
JONAS RIDGE 1.4 S, NC (CoCoRaHS)	136.98	12/31/2018	12
Haywood Gap	133.3	12/31/1957	0
LAKE TOXAWAY 2 SW	132.17	12/31/1975	0
LAKE TOXAWAY 2 SW	131.8	12/31/1979	0
LAKE TOXAWAY 2 SW	129.99	12/31/2018	10
Rosman	129.6	12/31/1964	0
LAKE TOXAWAY 2 SW	128.69	12/31/2013	27
LAKE TOXAWAY 1.4 NE, NC (CoCoRaHS)	128.28	12/31/2013	174
Rosman	126.73	12/31/1961	0
Highlands(1879-2019)	125.35	12/31/2018	1

Table 2. Top twelve annual precipitation totals in North Carolina. (Courtesy William Schmitz).

Finding of committee

After considering the observation, the state, and condition of the observing equipment, and the meteorological environment in which the observation was recorded, **the SCEC has determined, unanimously, that the 139.94 inches observed at the Mount Mitchell COOP station is indeed valid and constitutes a new record annual precipitation total for North Carolina**. The SCEC made this final determination on 2 May 2019.

NCEI Climate Monitoring Chief Decision Approved (as recommended in boldface above):

Signed ARNDT.DEREK.SHANE.1384496519 Digitally signed by ARNDT.DEREK.SHANE.1384496519 Date: 2019.07.03 14:32:01 -04'00' Date: ~~1384496519~~

Not approved (will be returned to SCEC with no action taken):

Signed _____ Date: _____

Committee Composition:

Committee Members:

- Chris Horne, Observing Program Leader (OPL), NWS WFO Greenville-Spartanburg
- Chris Stachelski, NWS Eastern Region Cooperative Observer Program Lead
- William Schmitz, Service Climatologist, Southeast Regional Climate Center
- Sean Heuser, State Climate Office of North Carolina
- Karin Gleason, Meteorologist, National Centers for Environmental Information

Additional Participant:

- Bryant Korzeniewski, Meteorologist, National Centers for Environmental Information

Appendix – Additional Information

Figure 3. Mount Mitchell 8” SRG with co-located NC ECONet station in background.

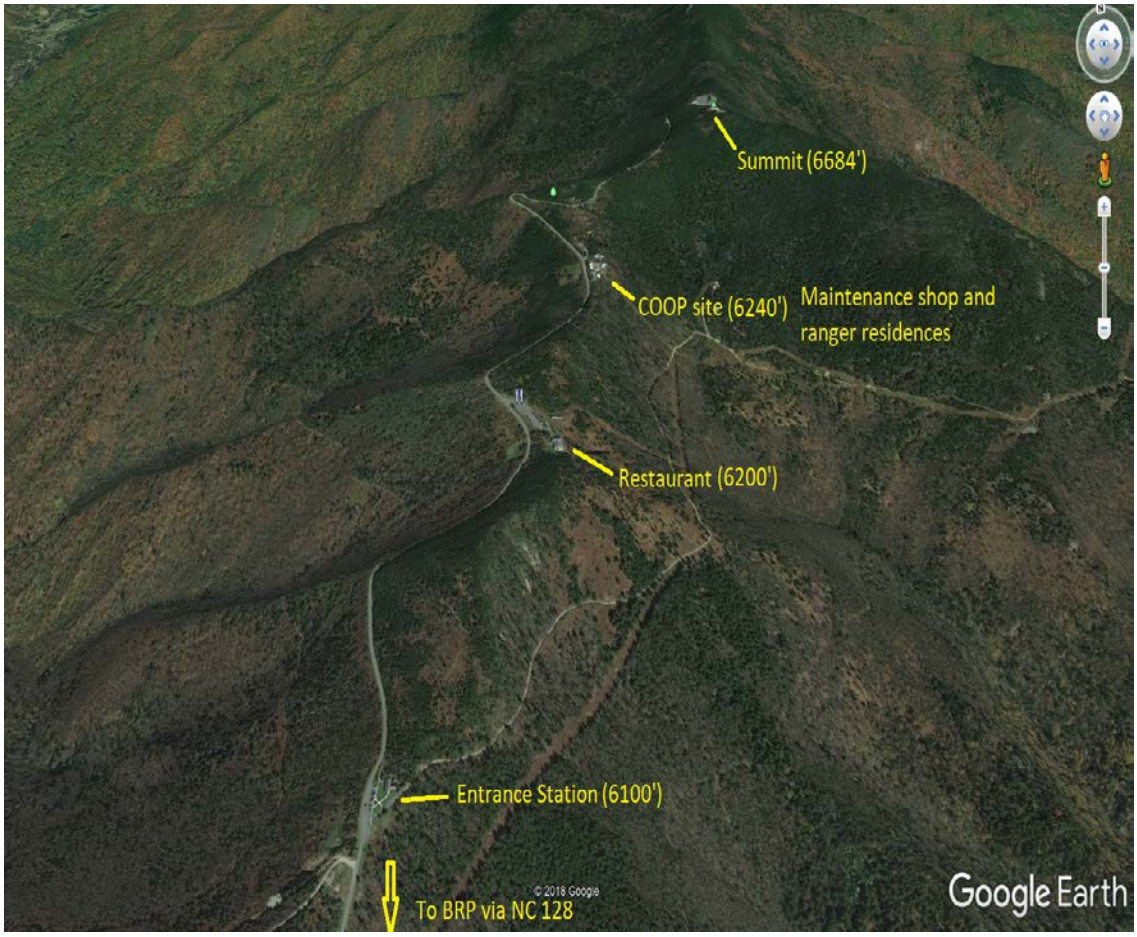

Figure 4. Google Earth satellite photo showing select locations within Mount Mitchell State Park.

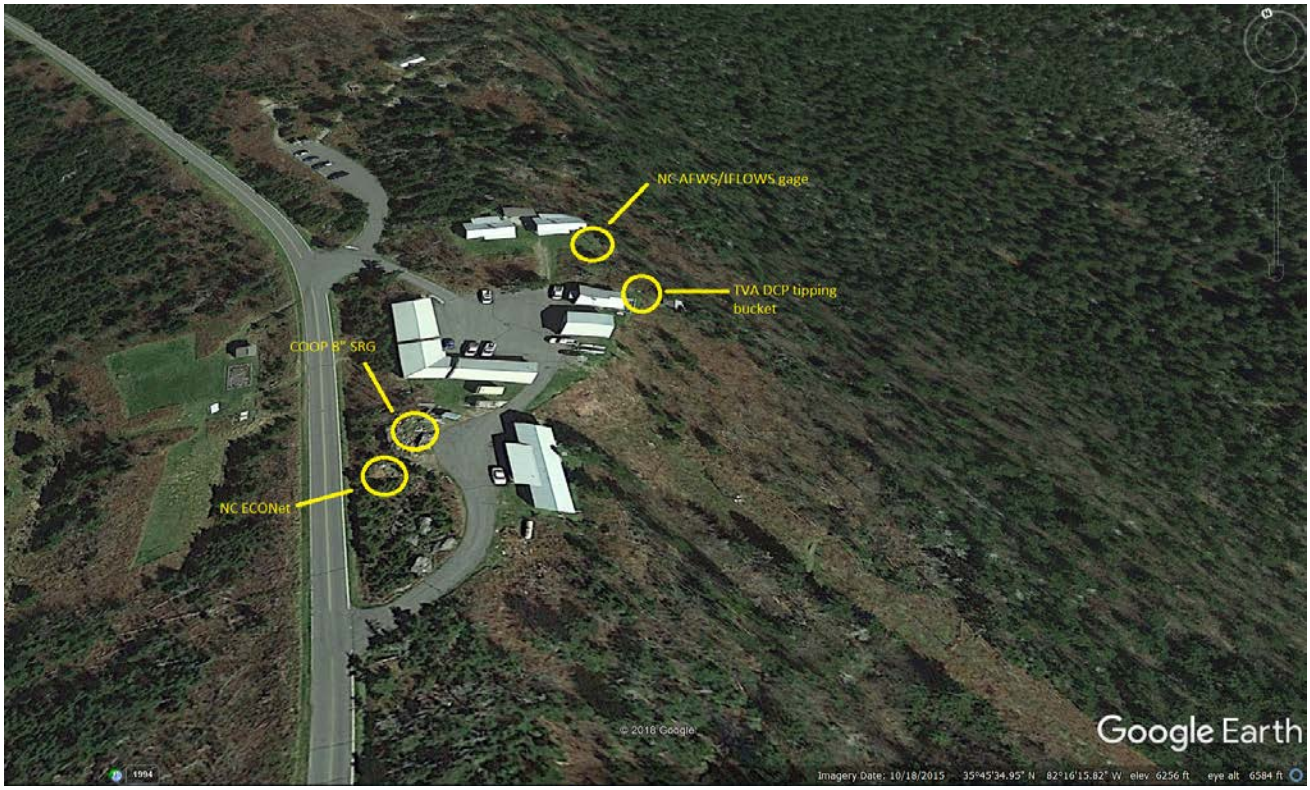

Figure 5. Google Earth satellite view showing weather equipment locations.