

State Climate Extremes Committee Memorandum

FOR: Russell Vose
Acting Chief, Monitoring Section, Climatic Sciences and Services Division
National Centers for Environmental Information (NCEI) Asheville, NC

FROM: Chris Stachelski
Observing and Climate Services Program Leader
National Weather Service, Eastern Region Headquarters, Bohemia, NY

DATE: 27 May 2021

SUBJECT: State Climate Extremes Committee Decision Regarding 24-Hour State
Snowfall Record for Pennsylvania Following December 2020 Winter Storm at Burlington
6.1 SW CoCoRaHS Site and February 1958 Winter Storm at Lakeville 1 NNE Site

Table of Contents

Summary	1
About the State Climate Extremes Committee (SCEC)	3
About the 24-Hour Snowfall Observation and Burlington 6.1 SW Station	3
Meteorological Plausibility of the 24-Hour Burlington 6.1 SW Snowfall Observation	9
About the 24-Hour Snowfall Observation and Lakeville 1 NNE Station	14
Meteorological Plausibility of the 24-Hour Lakeville 1 NNE Snowfall Observation	18
Previous 24-Hour Snowfall Total Record	24
Finding of Committee on 24-Hour Snowfall Total	27

Summary

On 24 February 2021, a State Climate Extremes Committee (SCEC) convened to discuss and vote on acceptance of a new 24-hour snowfall value for a new state record for Pennsylvania. Beginning in the evening of 16 December 2020 and lasting into the morning of 17 December 2020 an area of low pressure spread abundant moisture into northeastern Pennsylvania as the low moved northeast along the Mid-Atlantic coast toward the New England coast. In under 24 hours, significant snowfall fell in a large swath of the Northeast including much of north-central and northeastern Pennsylvania. Totals in excess of two feet were reported in these areas, even in valley locations, with a few areas observing values that exceeded three feet.

After reviewing snowfall totals, the Weather Prediction Center (WPC) and the State Climatologist for Pennsylvania both were concerned that a report of 43.0 inches reported initially as 3 miles east-northeast of Alba may have established a new 24-hour snowfall record for Pennsylvania. After contact with the National Weather Service Office in Binghamton, New York, which oversees northeast Pennsylvania, the

Binghamton office corresponded with the observer who took this measurement and conducted remote interviews in the weeks after the storm. Due to COVID-19 risks and the event occurring near the holiday period, no in-person site visit was made.

After the remote interviews were conducted, the Observing Program Leader (OPL) at the Binghamton, New York National Weather Service Office contacted the State Climatologist for Pennsylvania and Eastern Region Headquarters for the National Weather Service. The three parties agreed that a State Climate Extremes Committee should still be convened to appropriately make a decision by a full committee and to have the results of the findings documented for such a significant snowstorm. During the interview process, it was learned the observer also participated in the Community Collaborative Rain, Hail and Snow Network, also known as CoCoRaHS, and reports as the site Burlington 6.1 SW, Pennsylvania. Since this is a more commonly understood designation, the report from here out will refer to the Alba site as Burlington 6.1 SW. Alba was the initial location referenced in public reports and many news articles on the storm, however, no official station exists under that name.

The State Climate Extremes Committee discussed the findings of the Binghamton OPL on a conference call held on 24 February 2021. After considering the evidence at hand and surrounding observations as well as the meteorology of the event, the members of the SCEC voted unanimously 5-0 to reject the Burlington 6.1 SW measurement value as the new official maximum 24-hour snowfall total as a new record for the Commonwealth of Pennsylvania. **The following observation was examined by the SCEC to determine its validity and potential status as the greatest 24 hour snowfall total measured in Pennsylvania:**

- **Location:** Burlington, 6.1 SW, Pennsylvania
- **Site Type:** Community Collaborative Rain, Hail and Snow Network (CoCoRaHS)*
- **CoCoRaHS Station ID:** PA-BF-24
- **24 Hour Snowfall Value:** 43.3 inches*
- **Date:** 2020 December 16 - 2020 December 17*

* In the official NCEI dataset, GHCN-Daily, the station has not reported the minimum number of observations, 100, to have data added, however, the station value reported for the aforementioned observation period within the CoCoRaHS database is 36.0 inches. Although the observer's official observation time reflects 36.0 inches of snow ending at 0700 Local Standard Time (LST) on 17 December 2020, the observation was entered that day at 0445 LST. An additional 7.3 inches of snow was reported by the observer in CoCoRaHS covering the period from 17 December 2020 through 18 December 2020. Radar imagery and surrounding reports clearly indicate the initially-reported 43.3 inch value outside of CoCoRaHS but from this same observer and location had to occur from 16 December 2020 and 17 December 2020 in less than 24 hours despite the observer not indicating an event time on their observation form or in their remarks.

While preparing to compose the SCEC report on the Burlington measurement and vote, a component of all SCEC reports is to review the current or previous state extreme for the relevant record that the report addresses. During this time, the Observation and Climate Services Program Manager at Eastern Region Headquarters discovered two values representing a 24-hour period in the Applied Climate Information System or ACIS database that exceeded the initially accepted state 24-hour snowfall record for Pennsylvania, 38.0 inches at Morgantown, ending on 20 March 1958. Both of these values took place during well documented significant snowstorms in February 1958 and more recently in March 1993. Given the values were at official National Weather Service cooperative observation sites, it was decided to reconvene the SCEC and investigate the higher total of 41.0 inches at Lakeville 1 NNE ending on 16 February 1958. The Lakeville 1 NNE value was reviewed by the same committee members, and a vote was conducted following the review on 31 March 2021 by conference call.

The SCEC voted 5-0 to accept the Lakeville 1 NNE report considering the evidence at hand and surrounding observations as well as the meteorology of the event as a new official 24 hour snowfall total as a new record for the State of Pennsylvania. **The following observation was examined by the SCEC to determine its validity and potential status as the greatest 24 hour snowfall total measured in Pennsylvania:**

- **Location:** Lakeville 1 NNE, Pennsylvania
- **Site Type:** National Weather Service Cooperative Observing Station*
- **COOP Station ID:** 36-4733-01
- **24 Hour Snowfall Value:** 41.0 inches**
- **Date:** 1958 February 15 - 1958 February 16**

*Lakeville 1 NNE data is available in GHCN-Daily under GHCN ID USC00364733. The station name was changed over the years and last operated as Hawley 4 SW. However, the SCEC felt the station name should reflect what it was known as at the time the record was set.

**In the official NCEI dataset, GHCN-Daily, as well as on the original cooperative observation form this value reflects 41.0 inches of snow ending at 0800 Local Standard Time (LST) on 16 February 1958. However, the observer indicated precipitation time on their original observation form that the event commenced on 15 February 1958.

Given the above, the SCEC requests the 41.0 inch value at Lakeville 1 NNE ending on 16 February 1958 be accepted as the new 24-hour snowfall record for the Commonwealth of Pennsylvania.

It was decided at the conclusion of the vote on the 31 March 2021 to produce one SCEC report discussing the findings of the 43.3 inches measured at Burlington 6.1 SW from 16 December 2020 to 17 December 2020 and the newly accepted 24-hour snowfall record of 41.0 inches at Lakeville 1 NNE measured from 15 February 1958 to 16 February 1958 since the investigation of the Burlington 6.1 SW prompted a review which turned up the Lakeville 1 NNE value.

About the State Climate Extremes Committee (SCEC)

This State Climate Extremes Committee (SCEC) was composed of members representing the National Weather Service Forecast Office in Binghamton, New York, National Weather Service's Eastern Region Headquarters System Operations Division (SOD) in Bohemia, New York, the Northeast Regional Climate Center in Ithaca, New York, the Pennsylvania State Climatologist and the National Centers for Environmental Information in Asheville, North Carolina. 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 24 Hour Snowfall Observation and Burlington 6.1 SW Station

Burlington 6.1 SW operates as a Community Collaborative Rain, Hail and Snow Network or CoCoRaHS weather station officially as site PA-BF-24 but has also provided reports of weather to the National Weather Service Office in Binghamton, NY prior to participating in CoCoRaHS and was a trained spotter, having completed the formal course in 2017. The station itself is located in a high valley in northeast Pennsylvania in Bradford County at an elevation of 1104 feet. The valley itself is oriented west

to east with mountain ranges about 5 miles to the south and 5 to 10 miles to the north with elevations that surpass over 1400 feet. The valley floor is flat to slightly rolling and has areas of wooded parcels intermixed with areas cleared for farming and scattered residential homes and development. The North Branch of the Towanda Creek flows 1115 feet south of the station and eventually empties to the east into the Susquehanna River. Although the station is officially referenced to the community of Burlington, PA, the area where it is situated is known as Bailey Corners. The unincorporated community sits at crossroads just southeast of the station.

The Burlington 6.1 SW station entered their first report in CoCoRaHS on 11 December 2020 and their next two reports on 17 December and 18 December 2020 respectively. Thus, the station was essentially a new site when this event took place in the CoCoRaHS program. The daily report time for this site is listed as 0700 LST. The observer furnished photographs of the measuring site to the National Weather Service Office in Binghamton, NY following contact after the event. The station photos, ground-based photos, and satellite imagery confirm the measurement spot as exact and places it in a small cleared area north of a row of tall White Pine trees, just north of a two story structure. The cleared area is roughly 153 feet by 75 feet based on satellite imagery with the snow measuring area about 30-35 feet east of a two-lane paved road. Woods and small brush surround the site to the north and east with an extensive area of open farmland just west of the site. The measurement area creates some potential for impact from wind due to the open exposure to the west.

The observer uses a homemade snowboard made of wood that was painted yellow. The board location is marked with two roughly 4 foot tall plastic markers. A 48 inch yellow colored yardstick is used as a measuring tool and clearly marked with more detailed measurements but not in the tenths of an inch an official snow measuring tool would have. The observer stated the snowboard is placed in the middle of the clearing to have it away from obstructions. Although the snowboard was not painted the traditional white in color, it was still a light enough color that it was not felt to have a significant impact on the measurements.

Based on nearby reports from Automated Surface Observing System or ASOS sites as well as other reports from trained spotters and the public, snow began to fall and accumulate across northeast Pennsylvania on the afternoon of 16 December 2020. The observer first reported a measurement of 36.0 inches in through CoCoRaHS and to the Binghamton office at 0445 LST on 17 December 2020. In correspondence with the observer, they stated the snowboard was not cleared off during the event at all with measurements taken only intermittently. The following report day, ending on 18 December 2020 the observer measured an additional 7.3 inches of snow and reported it through CoCoRaHS. In reviewing Public Information Statements issued by the Binghamton office the additional 7.3 inches was measured between 0445 and 0700 LST on 17 December 2020. Although the snow fell prior to 0700 LST on 17 December 2020, the report for that day was already entered in CoCoRaHS by 0445 LST. As a result, the observer's 7.3" snowfall report for 18 December 2020 covers the period from 0445 on 17 December 2020 to 0700 LST on 18 December 2020. Once the snow ceased, the observer cleared the board and placed it on the ground in the area where the snowboard had been at and not level with the snowpack. This does not follow National Weather Service Snow Measurement Guidelines, however, it did not impact the readings from this particular event based on the correspondence from the observer as the snowboard remained in its original position through the event.

No liquid equivalent or snow water equivalents were taken by the observer during this event. The observer did report a 43.0 inch snow depth initially on 18 December 2020. However, the SCEC elected to set this value to missing in CoCoRaHS feeling it was unrealistic based on almost a day of compaction. No other snow depth reports were taken on the day prior to the event, during or after the event. It was believed based on nearby reports that no snow was on the ground before this event unfolded in this area.

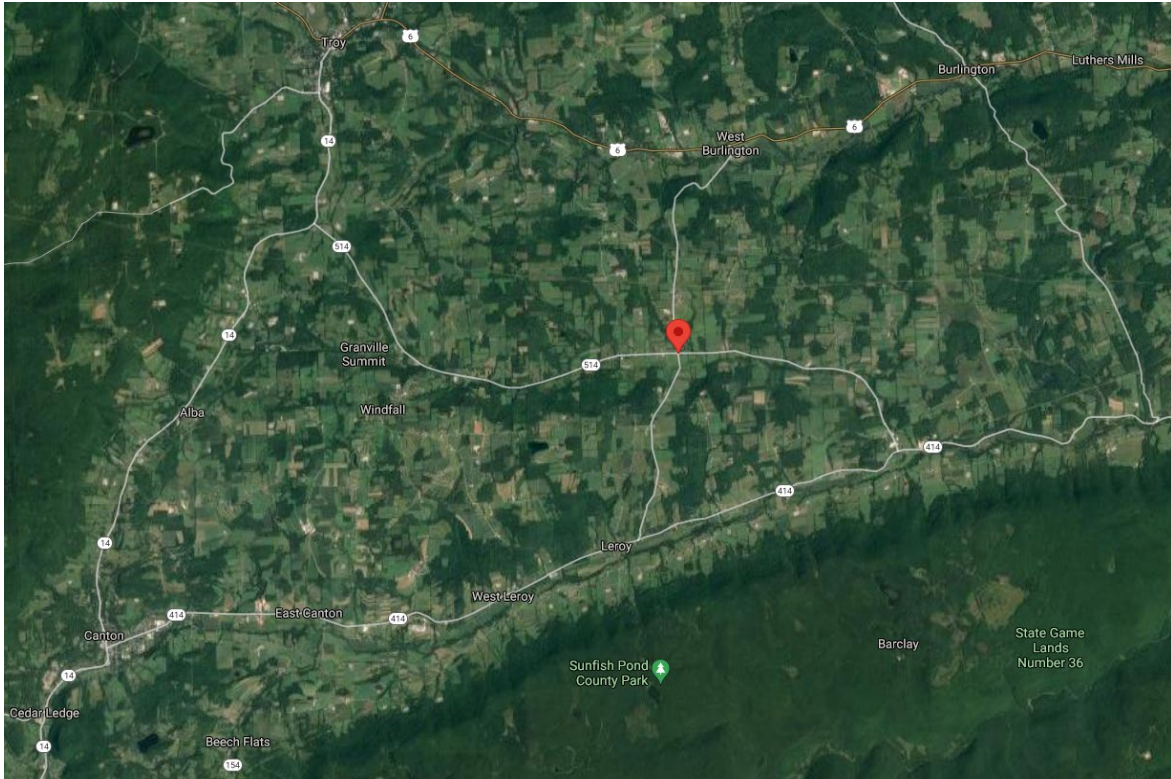


Figure 1. General area of northeast Pennsylvania showing the point of the Burlington 6.1SW CoCoRaHS station as denoted by the red marker. Map credit: Google.

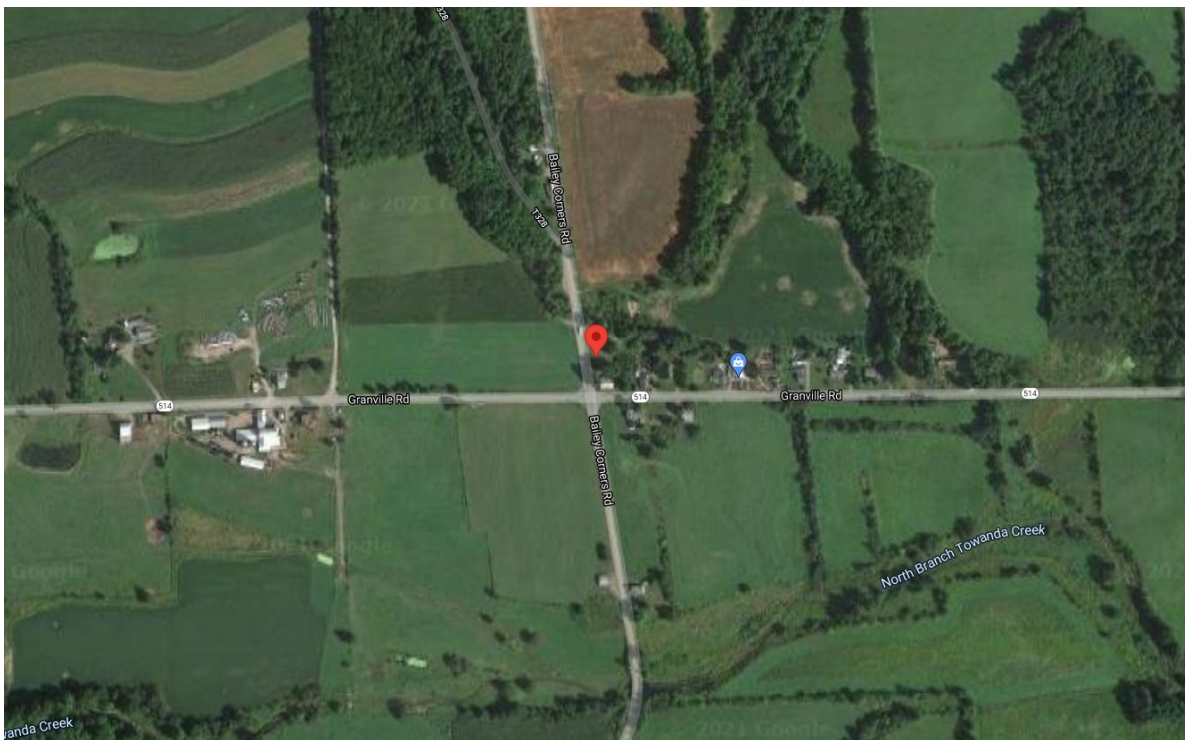


Figure 2. Close-in map showing the location of the Burlington 6.1SW CoCoRaHS station as denoted by the red marker. Map credit: Google.



Figure 3. Photo of the snow measurement area, facing south, at the Burlington 6.1SW CoCoRaHS station with the snowboard and markers seen just to the right of center in this photo taken days after the event.
Photo courtesy of the observer.



Figure 4. Burlington 6.1SW CoCoRaHS snow measurement area, facing southwest. Photo courtesy of the observer.



Figure 5. Close-up of the snowboard and measuring yardstick used by the Burlington 6.1 SW CoCoRaHS observer. Photo courtesy of observer.

Meteorological Plausibility of the 24 Hour Burlington 6.1 SW Snowfall Observation

A classic set up for a winter storm over the Northeast existed from 15 December 2020 through 17 December 2020. An area of surface high pressure was centered over western Quebec and helped to drive cold air southward across the Northeast and into the Mid-Atlantic. Meanwhile with a trough in the mid and upper levels of the atmosphere over the central United States, energy moving northeast from the base of the trough over the Southeastern United States resulted in an area of low pressure developing along the Carolina coast which rapidly moved up the East Coast from near the Outer Banks of North Carolina on the evening of 16 December 2020 to just off Cape Cod, Massachusetts by the evening of 17 December 2020. The low helped to spread moisture into the Northeast over a sufficiently cold enough atmosphere to result in snow falling across interior western New England with a changeover to sleet or rain confined to the immediate coast of southern England.

A look back at observed data from this event shows that the area of surface low pressure only dropped to 995 millibars at 0700 LST (1200 UTC/Coordinated Universal Time) on 17 December 2020 south of Long Island, New York based on surface maps analyzed by NOAA's Weather Prediction Center. This is not considered a 'deep' low pressure for a Nor'easter as many historic storms contain surface low centers below 980 millibars. Additionally, the 1200 UTC sounding launched at Albany, New York at ALY only computed 0.44 inches precipitable water. This value is only slightly above the daily mean for the Albany area of 0.35 inches computed by the sounding climatology created by the Storm Prediction Center based on area soundings back to January 1948.

A review of National Weather Service WSR-88D radar imagery shows that snow spread across northeastern Pennsylvania during the early to mid-afternoon hours of 16 December 2020 and became heaviest between roughly 1900 LST on 16 December 2020 and 0300 LST on 17 December 2020 before tapering off in the mid-morning of 17 December 2020. Between these hours, at least two distinct snowbands passed across the area, with the second band being the longer lasting and more persistent band as indicated by radar. The second band produced snowfall rates of 3 to 6 inches per hour based on snowfall reports from various sources in the area.

Despite a low pressure that was not incredibly deep but had sufficient moisture and moving rapidly through the region, heavy snowfall did take place in north-central and northeast Pennsylvania and interior central New York largely as a result of these snowbands. A combination of favorable vertical motion and moisture in the dendritic growth zone helped enhance snowfall rates in these bands which were generally located just to the east and east-northeast of the 700 millibar low associated with this system. The area just east of the 700 millibar low was also an area where frontogenesis took place. The combination of these factors produced effective rates to accumulate large amounts of snow in a relatively short time period as the heaviest snow largely fell in most areas in 8-12 hours or less based on surface observations.

The highest totals in this storm occurred in the areas that were impacted by these bands for several hours which extended from north-central Pennsylvania northeast towards Central New York and across north-central New England. The National Operational Hydrologic Remote Sensing Center (NOHRSC) Snow Analysis shows a continuous band of snow producing accumulations in excess of 18 inches across these areas with several maximums in excess of 36 inches in north-central and far northeast Pennsylvania. Based on the snowfall totals and snow depth totals from a variety of sources it is evident a large area observed heavy snowfall, in some cases close to the climatological extreme for a 24-hour period or single-storm record for their respective area.

Snowfall measurements can become challenging during heavy snowfall and long duration events. Exact

precision starts to become more challenging due to the volume of snow, especially in storms depositing multiple feet of snow. But, it is important to remember that National Weather Service snow measurement guidelines should be followed including the location of a snowboard and clearing frequency of a snowboard. It should be noted that initial NOHRSC analysis pulls snowfall values from a variety of products and also uses values that are preliminary and have not undergone further scrutiny for following measurement techniques. Therefore while it captures the idea that a large snowfall occurred in this area, it does not validate that an exact amount fell at a specific location.

Reports from the storm from various sources to the National Weather Service Office in Binghamton indicate that storm totals exceeded 40 inches in areas of Bradford County, Pennsylvania as well as just over the state line in Broome and Tioga Counties in New York and in a pocket of Delaware County, New York. All of these areas were impacted by the same snowbands at various times and areal scales. The Binghamton office, however, being located in Broome County affords for more detailed reports given the on-site staff continuously through the event at the National Weather Service Office and staff who live in the area and were at their residences during the event. Although the Binghamton office is roughly 55 miles northeast of the CoCoRaHS observer, the similar terrain and meteorological features of the bands make comparisons to two snow measurements in the Binghamton area important. The National Weather Service Office at the Greater Binghamton Airport measured 40.0 inches from this event. The meteorologists at the office use a standard snowboard issued by the agency and clear it every 6 hours. The former Science and Operations Officer at the office, who has since moved to a new position in the agency, lived south of the City of Binghamton and measured 41.0 inches at his residence during the storm, based off a snowboard that was not cleared during the event and additional nearby readings on the ground on non-paved surfaces. Both of these measurements were taken in areas that radar imagery shows were under the second snowband longer than the Burlington 6.1 SW CoCoRaHS, especially during the closing hours of the heaviest snowfall. The Science and Operations Officer specifically measured 8.5 inches between 0330 and 0700 LST on 17 December 2020. This 8.5 inches was consistent with radar imagery noting banding at the time. The CoCoRaHS observer measured 7.3 inches between 0445 and 0700 LST and was not under as heavy of intensity of returns as shown by WSR-88D imagery and was on the edge of the snowband during the late part of the event. Additionally, the observation site of the CoCoRaHS observer sits in a valley where additional orographic lift is minimal.

Winds were generally 20 mph or less during the event from the northeast or east-northeast based on nearby ASOS reports. Given the location is sheltered from this direction by vegetation and trees and based on post-event photographs of the measurement area showing a fairly uniform snowpack, it is believed drifting was minimal during the event.

The 43.3 inches measured by the Burlington 6.1 SW observer was the highest total received from any source in Bradford County, PA. Based on other reports, no other location recorded anything near this value in this area of the county and amounts were analyzed to have been nearly as high as in the northeastern part of the county. The second highest total was 36.0 inches at Troy, located about 5 miles northwest of the Burlington site and also in a valley. The next highest total was 34.8 inches at Rome, located in the northeast part of the county and closer to the areas in Broome and Tioga Counties in New York where amounts were consistently higher at stations. A reliable National Weather Service-trained cooperative observer is located in the community of Towanda about 10 miles east-northeast of the Burlington observer, also in a valley, and measured 28.0 inches. While no in-depth surveys or correspondence were done with any of these other locations in Bradford County, they are believed to be reasonable. The highest total reported in the National Weather Service Binghamton area was 44.0 inches from the public in Tioga County, NY near Newark Valley.

Based on nearby reports at similar valley elevations and the observed nature of the snowbands on radar, the SCEC had concerns over the 7.3 inches of snow measured after 0445 LST on 17 December 2020. The

initial report from the Burlington 6.1 SW observer of 36.0 inches ending at 0445 LST on 17 December 2020 was felt to be reasonable. Some concern was raised about cratering of the snowboard in the late part of the event despite the observer stating they did not clear it during the event based on the post-event photos showing the observer placing it in the depression rather than level with the snowpack. Unfortunately the lack of any photos in the measurement area during or immediately after the event further hamper efforts to substantiate the greater snow amount at this site.

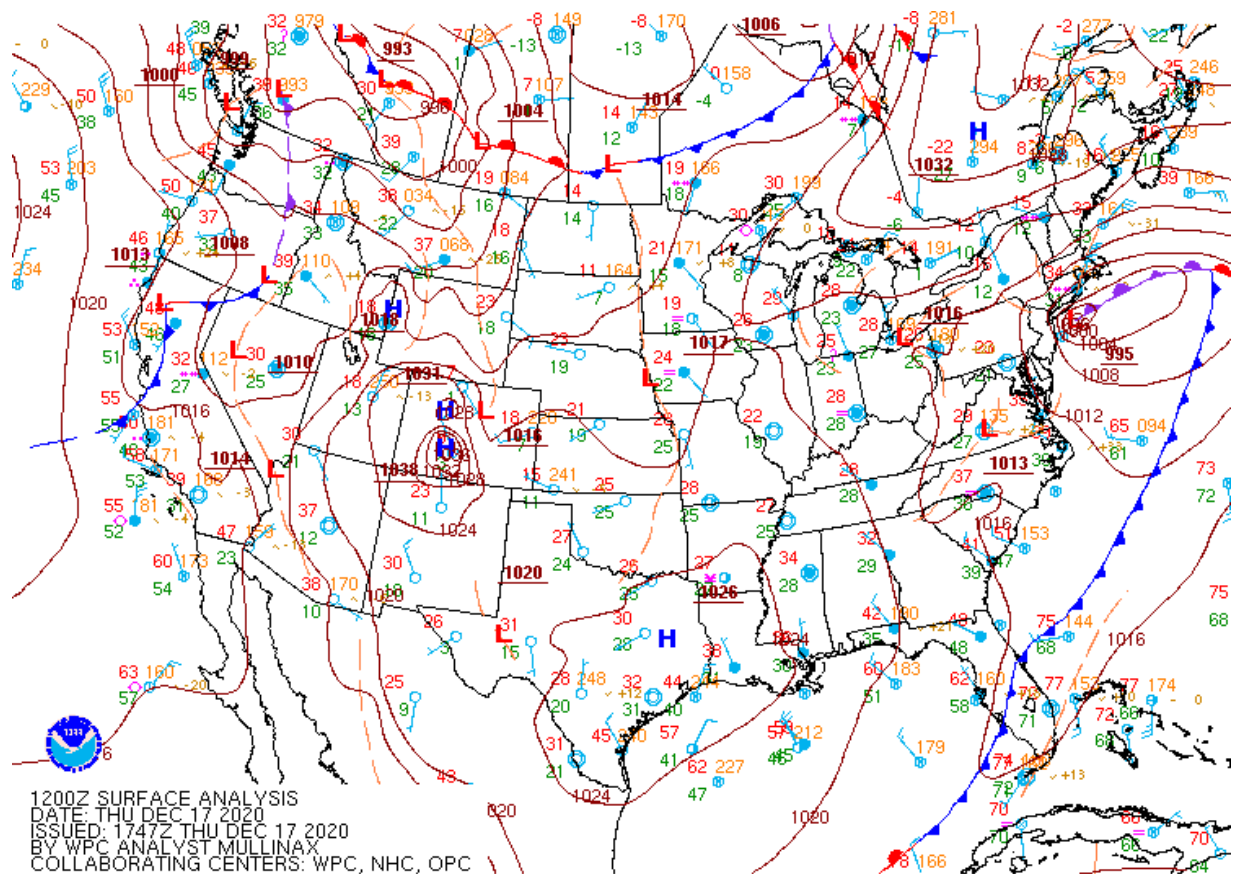


Figure 6. Surface map produced by the Weather Prediction Center for 0700 LST on 17 December 2020 when the storm reached peak intensity south of Long Island based on surface pressure.

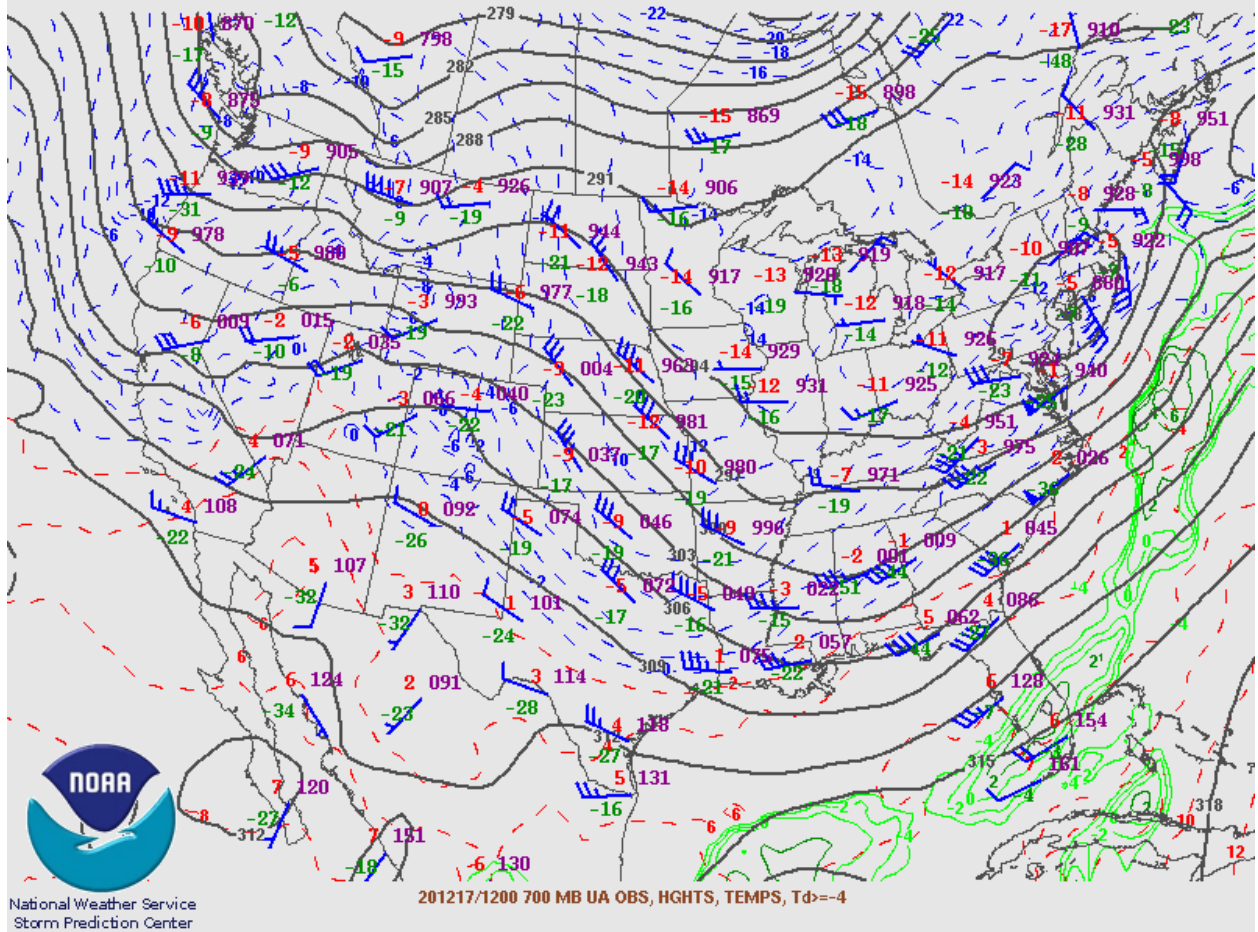


Figure 7. 700 millibar plot based on observed data of heights, temperature, dewpoint and wind for 1200 UTC on 17 December 2020 showing an area of low pressure near southeastern New York. Courtesy Storm Prediction Center.

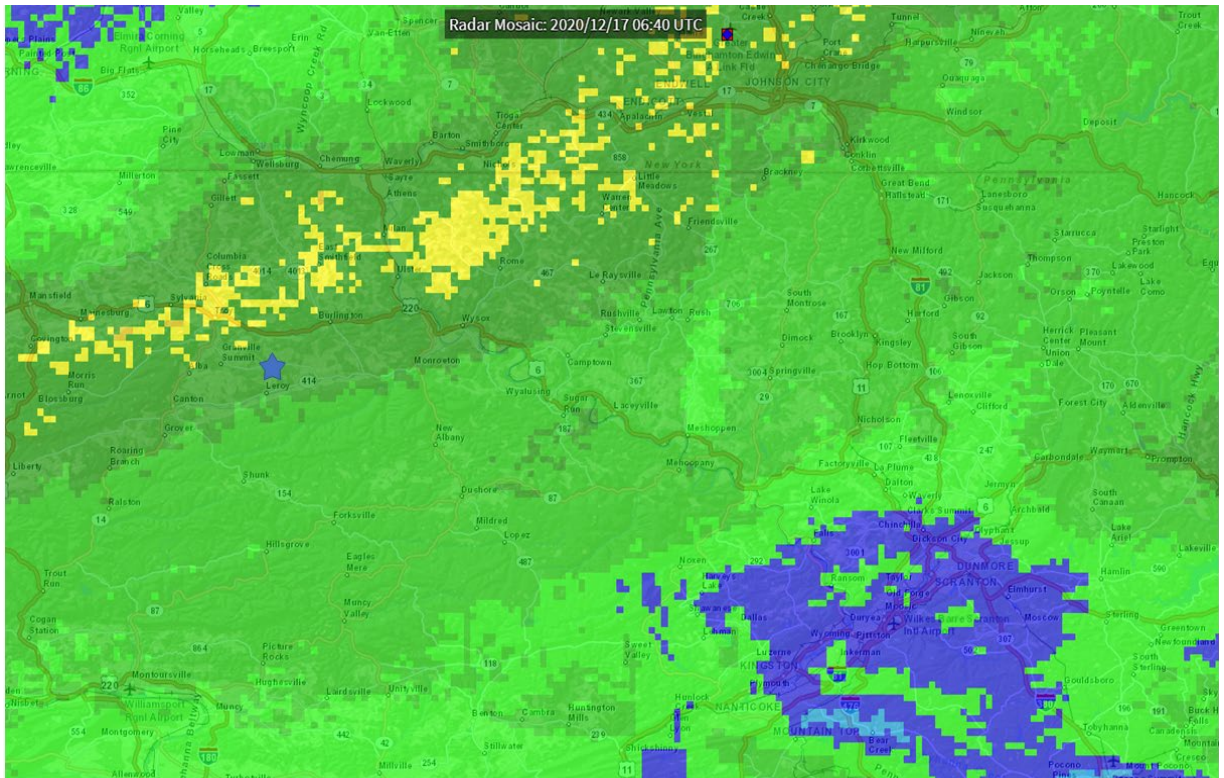


Figure 8. WSR-88D radar showing the Burlington, Pennsylvania area at 0640 UTC on 17 December 2020 as a heavy snowband was on the edge of the area. Image credit <https://gis.ncdc.noaa.gov/maps/ncei/radar>

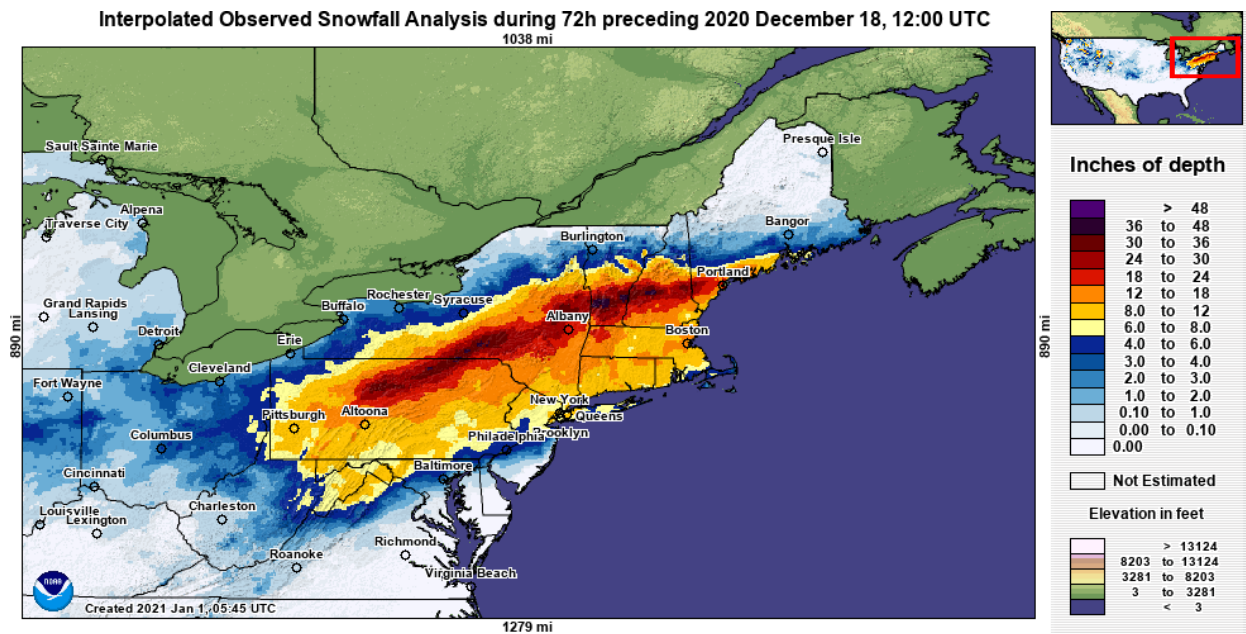


Figure 9. National Operational Hydrologic Remote Sensing Center (NOHRSC) Snow Analysis ending at 1200 UTC on 18 December 2020 noting a swath of heavy snowfall in the Northeast.

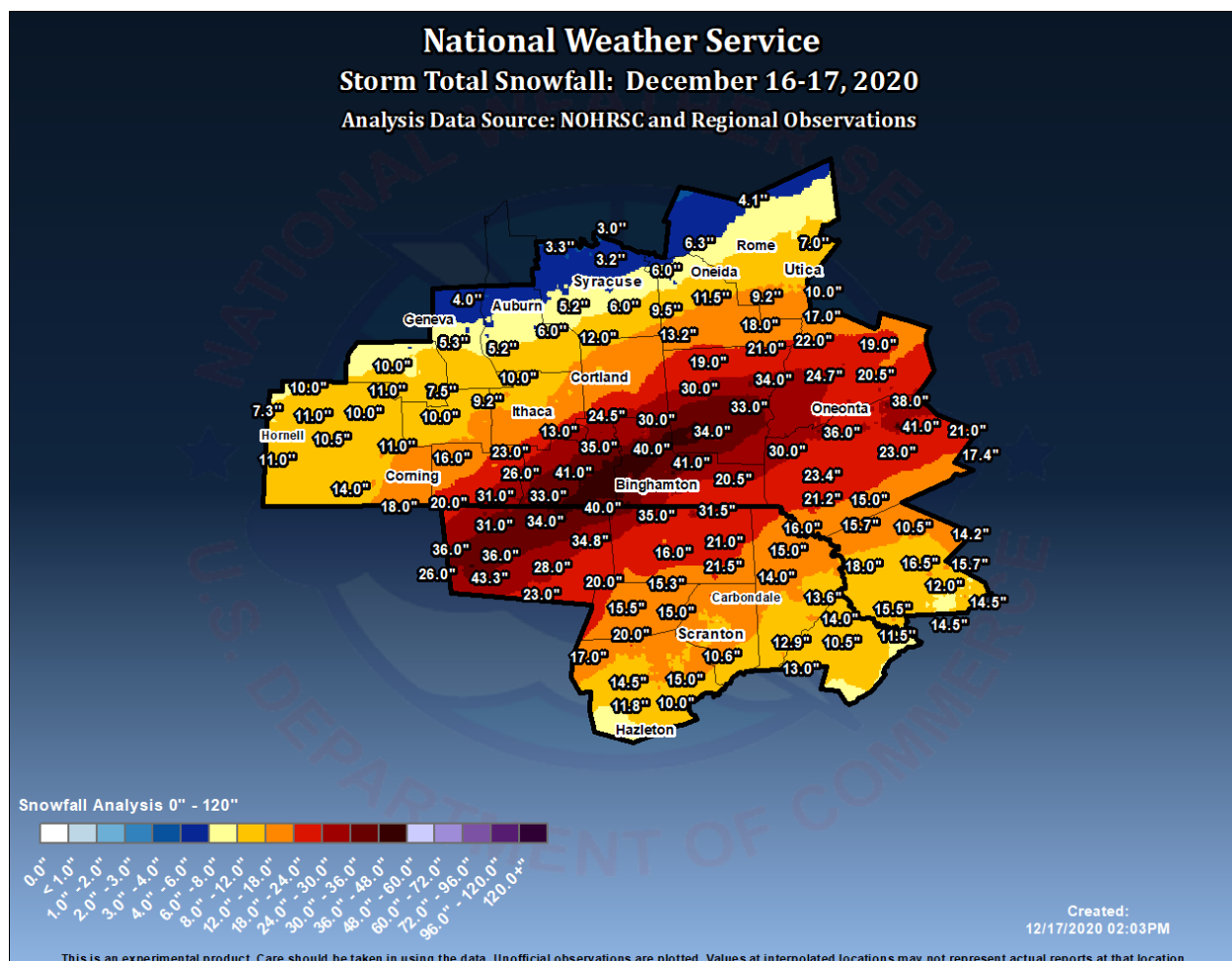


Figure 10. Local ground measurements from the event of 16-17 December 2020 from various sources reported to NWS Binghamton overlaid on NOHRSC snowfall analysis.

About the 24 Hour Snowfall Observation and Lakeville 1 NNE Station

Lakeville is located in far northeastern Pennsylvania in the southern portion of Wayne County. This immediate Lakeville area is largely wooded and mountainous in nature with some lakes and swamps in the general area of the community. Lakeville is located about 20 miles east-northeast of Scranton.

The National Weather Service, previously the United States Weather Bureau, operated a cooperative weather observer station in the Lakeville area of Pennsylvania starting on 1 January 1928. Over the years, due to station moves, the station name changed and, in later years prior to closure, was briefly assigned a new station identification number with a new name within the cooperative observer program. This initially caused some of the issues with oversight of data and recorded values at this station as the original observer forms were filed under one identification number during the period of interest but toward the end were filed under a new identification number and community name. As a result, although the value in interest came up in a searchable database, locating the original file took further investigation.

The Lakeville station's third observer ceased as the observer in June 1950 and, upon doing so, the station was moved to the third observer's mother's residence and commenced observations as Lakeville 1 NNE

beginning on 1 July 1950. Although the observer was part of the Weather Bureau's Cooperative Weather Program they were hired and paid by the Pennsylvania Power and Light Company to furnish them with observations in this area. The Weather Bureau provided some of the equipment used here. The Lakeville 1 NNE site operated until 30 September 1969 when the site moved another mile north-northeast and became known as Lakeville 2 NNE with a new observer. On 1 May 1972 the site again moved northeast and became known as Hawley 4 SW and was also given a new cooperative weather station identification number of 36-3764. The Hawley 4 SW site did not last long and was closed on 17 August 1972 and never replaced. Because the site was last known as Hawley 4 SW and was deemed acceptable years ago to be linked with the Lakeville data back to 1928, some datasets such as the ACIS dataset only identify the site and all data as Hawley 4 SW.

The observing site in use between July 1950 and September 1969 was located in an area northeast of the center of Lakeville that was heavily wooded with scattered residences. Clearing of woods for properties, including the one of use by the observer was limited. Lakeville itself is generally rolling to hilly mountainous terrain with elevations rising from 1300 to 1500 feet above sea level in the area northeast of the center of the community. A few small lakes dot the area including Locklin Pond about a mile west of the station and just north of the community center. The much larger Paupackan Lake lies to the northwest and the area's largest lake, Lake Wallenpaupack sits to the southeast.

Based on a sketch from the United States Weather Bureau of the station, the observer had a clearing in the area around their standard rain gauge which was placed about 30 feet northwest of their residence. It is presumed the observer likely measured snow in this area. Exact snow measurement areas were largely not documented by the Weather Bureau in records. The observer was equipped with an 8 inch standard rain gauge and support that was located over grass. The road to the observer's house at the time was dirt and about a mile to the north off Highway 590.

Since the observation site was precipitation only, no temperature data is included. The observer took readings of precipitation including melted snowfall, snowfall and snow depth at 0800 LST daily. The observer was quite detailed, though, in February 1958 at also providing the time of precipitation, denoting significant weather and including remarks. The observer noted precipitation began falling at 1530 LST on 15 February and continuing through 1330 LST on 16 February 1958. The 0800 LST observation on 16 February 1958 reported 1.81 inches of liquid precipitation with 41.0 inches of new snow and a 55 inch snow depth along with a remark "55 inch depth of snow very close but no sure way to measure". The SCEC felt the observer likely dealt with wind drifting the snow as the observer did mark the column that day as observing damaging winds but gave no further details. There was only one inch of snow lost from what was determined as snowfall as the depth on 14 February was 15 inches. Thus, it is evident the observer attempted a true fall measurement and clearly did not just subtract a change in depth to determine the fall. Additionally, the following day the observer reported 1.5 inches of new snow along with a 55 inch depth. The lack of a big drop in depth following the storm supports that the observer would have not taken frequent measurements during the event to overinflate the snowfall value. Additionally the liquid precipitation equivalent supports a large value of snowfall taking place.

During the process in reviewing this, the SCEC questioned why the value was initially overlooked and it was found to have been a flagged value in the legacy National Climatic Data Center datasets which blocked the value in appearing during any searches of datasets when the original SCEC values were determined in 2006. Around that time, monthly observer forms were also still in the process of being scanned for usage and thus not searchable remotely in electronic form. As a result, cross-checking original forms in many cases was difficult, if not impossible by remote parties. The flagged value may have fallen out of a keying error with the snow depth on 1 February 1958, which was initially miskeyed as zero instead of 8 inches and ultimately flagged subsequent values for the month.

It must be noted the observer's monthly snowfall and greatest snow depth values were published in the *Climatological Data* publication for Pennsylvania for the month in the extremes table above the monthly report from the State Climatologist. This added further evidence the value was felt to be reasonable at the time it took place by the climatology community. Once the current GHCN dataset was developed many of the original data flags from legacy datasets fell out due to improved quality control methods allowing some values to be restored in searchable datasets such as ACIS, which primarily populates off GHCN values over other databases.

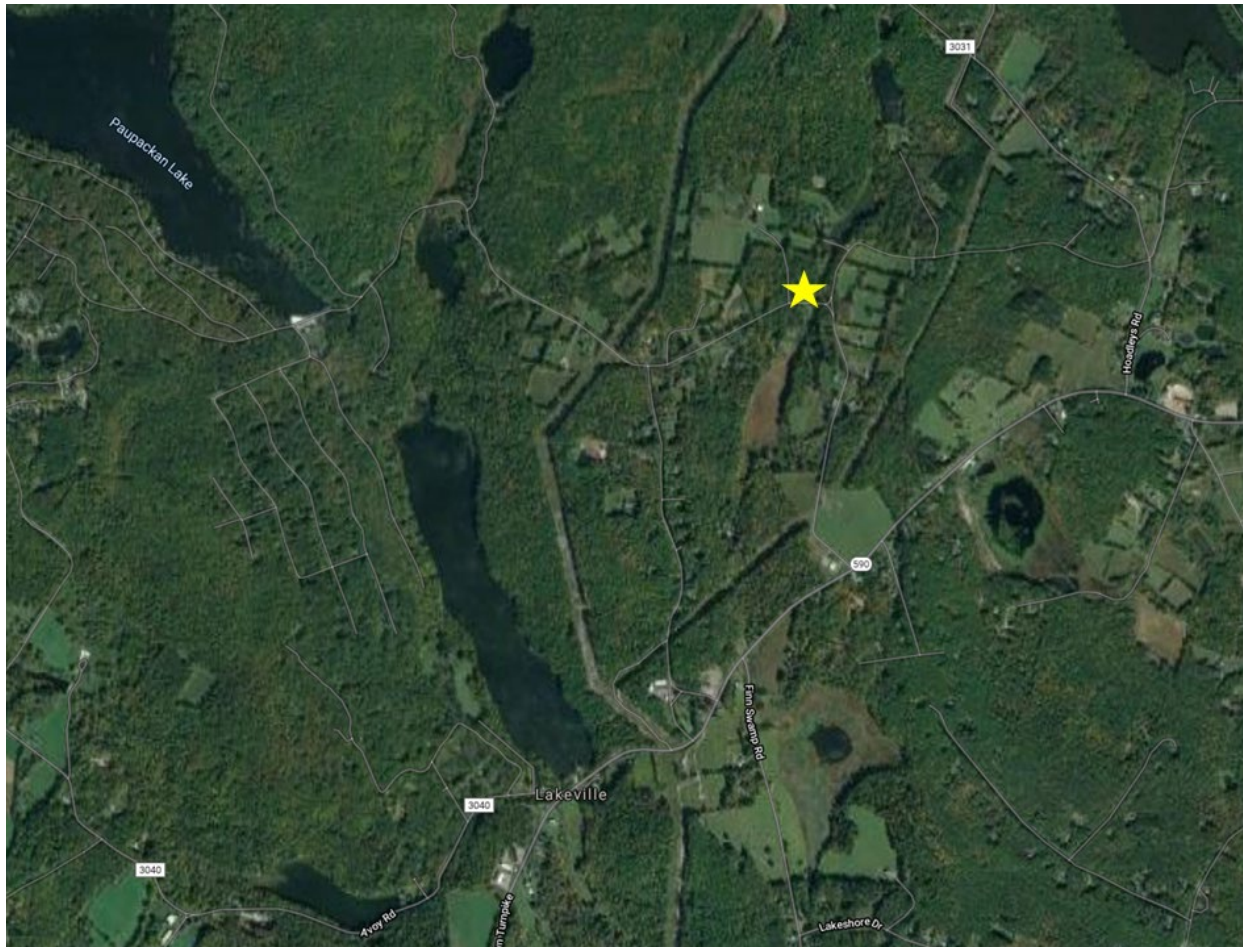


Figure 11. Lakeville area, with approximate location of station in February 1958 denoted by the yellow star. Map credit: Google.

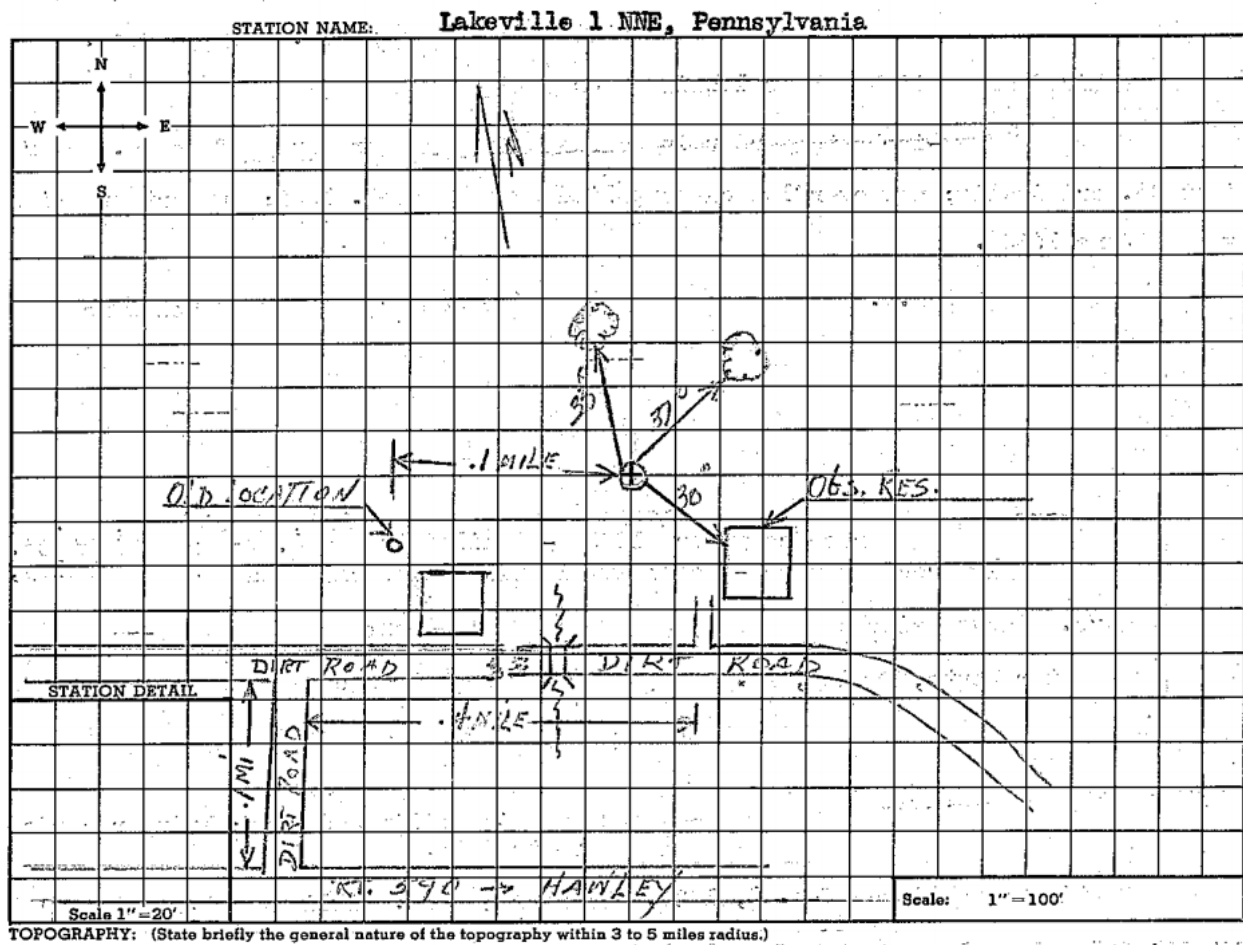


Figure 12. United States Weather Bureau sketch of station in 1950 taken from a station report.

36-4733-1

U.S. FORM 512-14 (FORMERLY 500)
U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
RECORD OF CLIMATOLOGICAL OBSERVATIONS
(Revised 1958)

Station LAKEVILLE 1 NNE
County PLAINE
State PA
Time of observation (local time) if once daily 2:00 AM
Month FEBRUARY
Standard time in use E.S.T.

Date	TEMPERATURE - °F		Precipitation Give a straight line through hours precipitation was observed, and a wavy line through hours precipitation probably occurred unobserved.	24-hr amounts		At about		Weather (calendar day)		Important weather conditions not included in weather block, remarks, etc.
	Max	Min		Rain	Snow	Time	Place	Clouds	Wind	
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
Sum										
Ann										
Obs										

Observer Miss Gladys Keim
Post Office LAKEVILLE 1 NNE
Station LAKEVILLE 1 NNE
Date FEBRUARY 1958

36-4733-1

Figure 13. Original observer form from February 1958.

Meteorological Plausibility of the 24 Hour Lakeville 1 NNE Snowfall Observation

The middle of February 1958 featured two significant winter storms of note in the eastern United States that produced snow from the Gulf Coast to the Northeast within a week. This was the second of the two storms. A pair of northern and southern branch jetstream troughs in the middle and upper levels of the atmosphere approached the eastern half of the United States on 15 February while an area of low pressure was noted at the surface over the eastern Gulf of Mexico. As these troughs moved east and the branches of the jetstream phased, this helped to lift the surface low northeast and move it north-northeastward off the eastern coast of the United States rapidly on 16 February. By 17 February the surface low was off the coast of Maine with a broad mid and upper level trough over the eastern third of the United States. The low departed to the northeast toward the Canadian Maritimes by 18 February.

Temperatures at the nearby Weather Bureau station at the Wilkes-Barre/Scranton Airport never surpassed 25 degrees during this event and were in the teens for much of the time snow fell. Therefore, the liquid equivalent of 1.81 inches in 24 hours at the Lakeville cooperative observer station was the result of very high snow ratios due to the subfreezing and relatively cold air temperatures at the time snow fell. Additionally, on 15 February and into the early portion of 16 February surface winds at Wilkes-Barre/Scranton were from the northeast, which would have aided in a low-level flow supporting upslope

enhancement off the Pocono Plateau to the south over Lakeville. Surface winds were mainly under 10 mph while winds were from the northeast but increased in speed as the wind shifted to the north and especially northwest by the afternoon hours of 16 February. One minute wind values reached 27 mph at Wilkes-Barre/Scranton but unofficial estimates from media reports and other publications note gusts in the area were as high as 60 mph. Numerous remarks of drifting snow accompanied the hourly observations on 16 February at Wilkes-Barre/Scranton. Based on these observations, the observer's remarks at Lakeville along with nearby observers and media reports of drifting snow, it is likely measurements taken later on 16 February would have been more greatly impacted by the wind and more difficult to measure. But, the observer's report time of 0800 LST would place the measurement of 41.0 inches prior to the onset of the strongest winds which would have likely contaminated the measurement area and readings more significantly.

Nearby and across Lake Wallenpaupack, the next closest cooperative observer to Lakeville located at Paupack 1 SW, reported 1.91 inches of precipitation for the 24 hour report period ending on 16 February. No snow observations were available at this site. The next closest observation site to the northeast of Lakeville at Hawley 1 S Wallen Dam reported 1.14 inches of liquid precipitation for the 24 hour report period ending on 16 February with 35 inches of new snow and a 48 inch snow depth, an increase of 35 inches from the previous day. The Wallen Dam location was roughly 200 feet lower in elevation than Lakeville, however, given snow banding and elevation differences the readings appear reasonable and consistent with Lakeville's observation.

The Northeast Snowfall Impact Scale (NESIS) developed by Dr. Louis Uccellini and Paul Kocin characterizes and ranks high-impact Northeast snowstorms starting in 1950. NESIS gives an indication of a storm's societal impacts. The snowstorm of 14-17 February 1958 ranks as the 12th-highest impact storm dating back to 1956 and has a score of 6.25, ranking it as 'crippling'. The Climatological Data publication for Pennsylvania for February 1958 dubbed this snowstorm the worst in the Commonwealth in 32 years with the entire eastern third of the state observing over 10 inches of snow from this event. The highest totals were analyzed in far northeast Pennsylvania. Drifts in some areas reached upwards of 20 feet and lightning was seen during the snowstorm near Reading and Lancaster according to the publication.

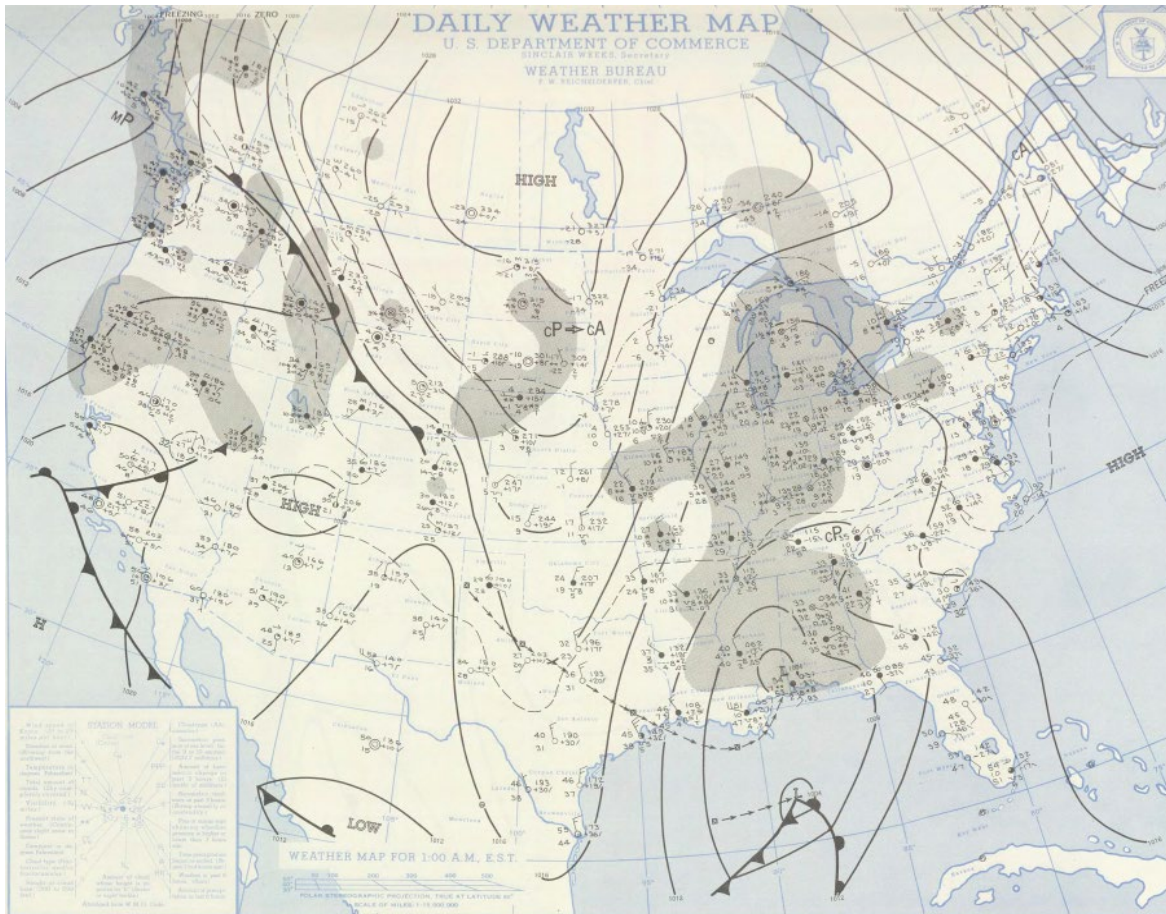


Figure 14. Morning weather map of observed conditions on 15 February 1958 by the U.S. Weather Bureau.

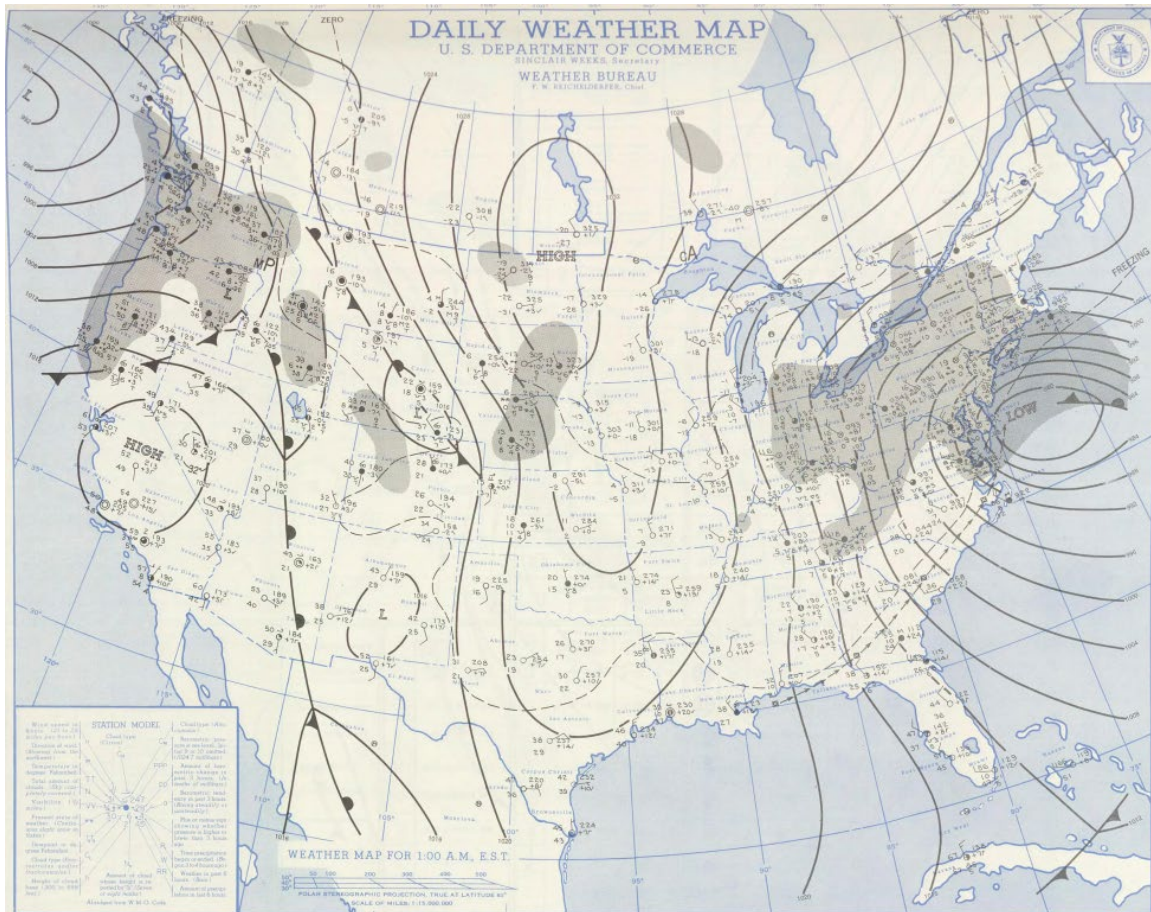


Figure 15. Morning weather map of observed conditions on 16 February 1958 by the U.S. Weather Bureau.

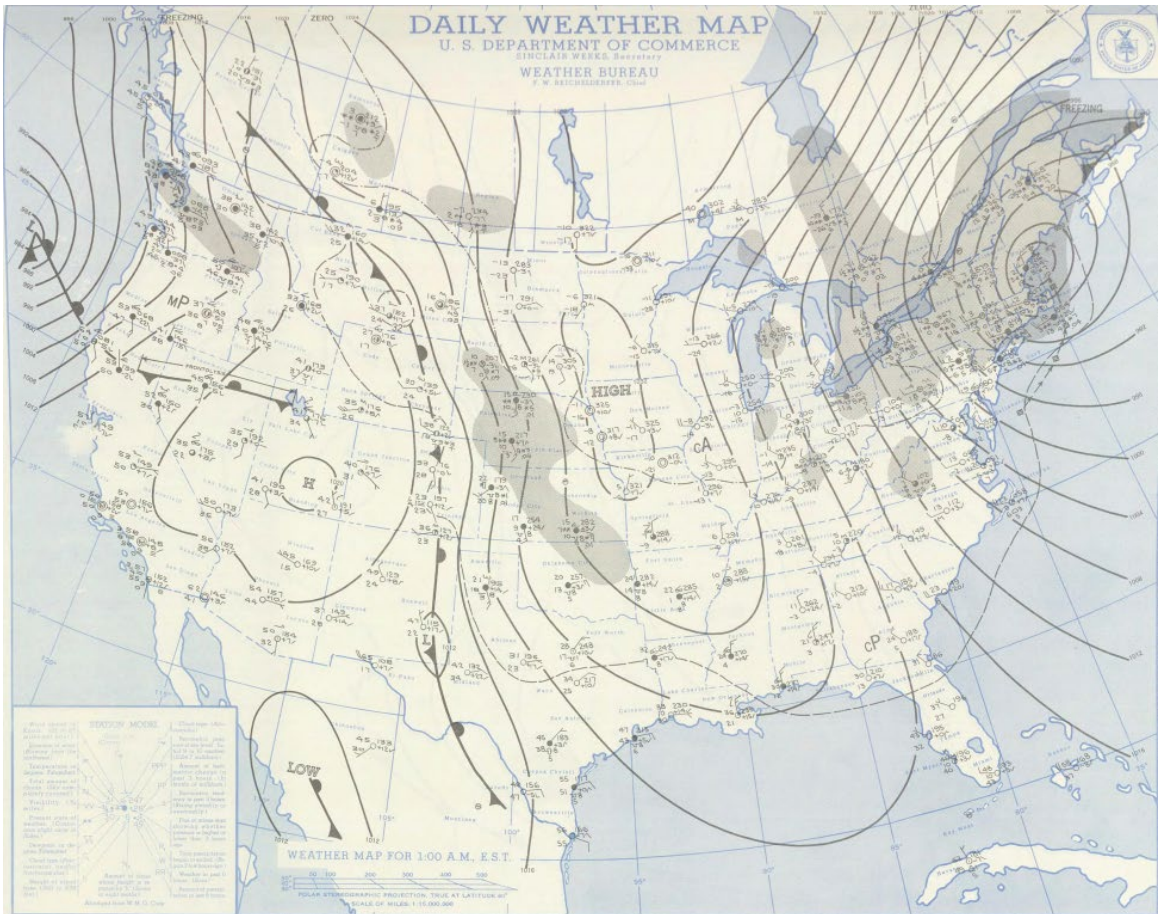


Figure 16. Morning weather map of observed conditions on 17 February 1958 by the U.S. Weather Bureau.

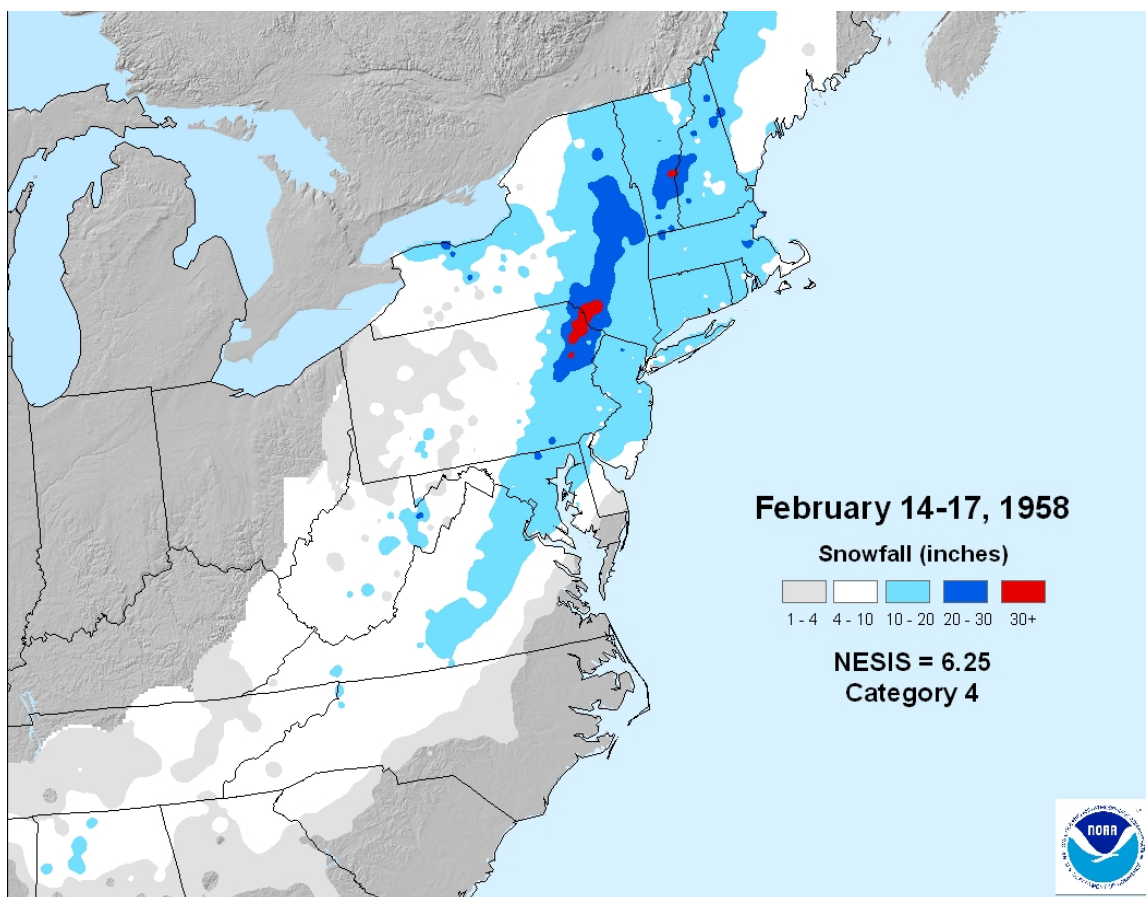


Figure 17. Observed snowfall totals across the region from the 14-17 February 1958 storm based on observations in the GHCN database.

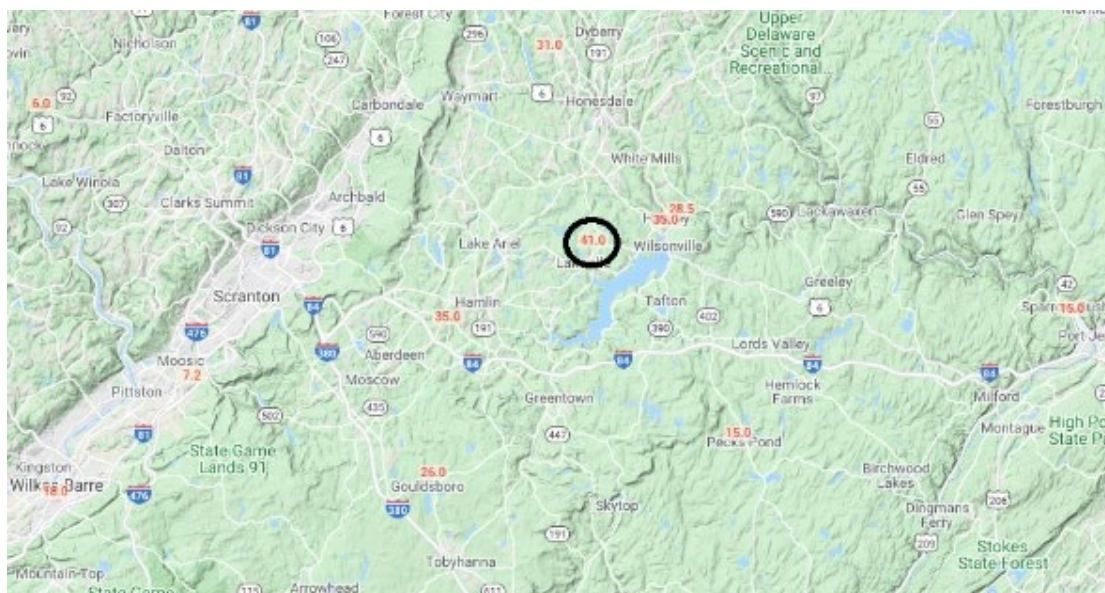


Figure 18. Plot of snowfall observations for 16 February 1958 based on GHCN values. Circled is the Lakeville 1 NNE observation.

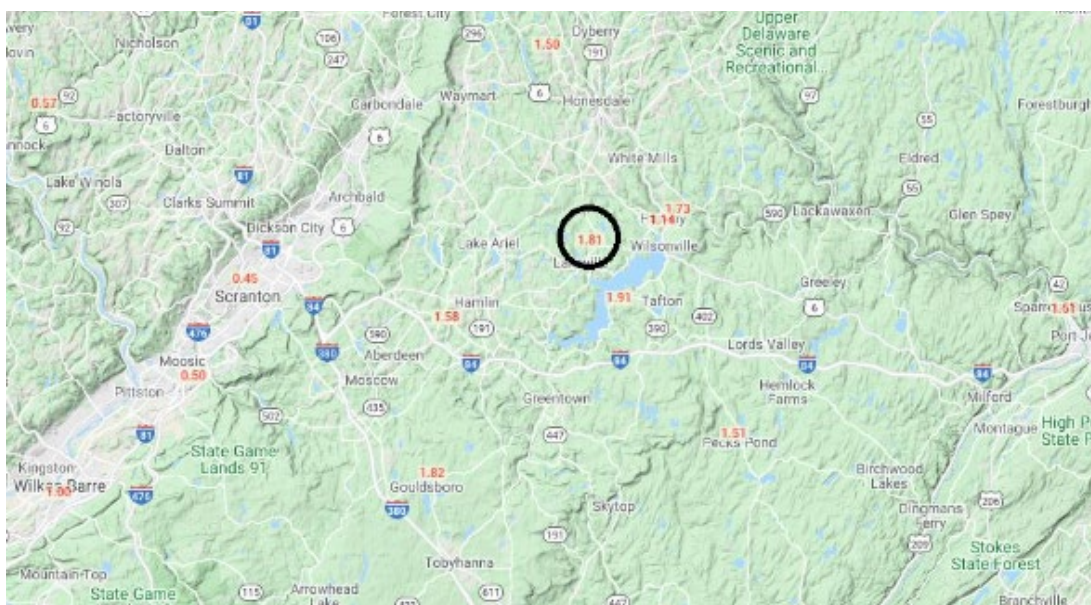


Figure 19. Plot of observed precipitation totals from 16 February 1958 based on GHCN values. Circled is the Lakeville 1 NNE observation.

Previous 24 Hour Snowfall Total Record

When the initial list of state extremes was compiled, the 24-hour state snowfall record for Pennsylvania was cited as 38.0 inches at Morgantown, Berks County, recorded at 2359 LST on 20 March 1958. This value took place during a significant late-season snowstorm from 18-21 March 1958. The reading was considered reliable. It is worth noting the event total of 50.0 inches over the years was referenced colloquially and in several meteorological, but not official government, publications as well as news articles as a state snowfall record. But, the references were all in respect to the event total of 50.0 inches and not the 24-hour highest value of 38.0 inches. As with many state records prior to modern digital datasets, these were often passed down anecdotally or in internal documentation that lacked direct sources of information. Since many references have cited the 50.0 inch figure over the years, little doubt was cast over the 38.0 inch value in 24 hours since it was from the same station and the event that took place was well-documented. It is worth noting that a search of the ACIS database and scans of original observer forms reveals as of the time of this report that an even higher 52.4 inches of snow is noted as having fallen in a 3 day period in Pennsylvania at a cooperative observer weather station near Coatesville, in Chester County, in the Blizzard of February 1899. Snow fell from the 12th through the 14th, with an additional 0.6 inch on the 11th and 35.3 inches measured on the 13th in a 24-hour period. The SCEC does not review multi-day snowfall values for statewide records.

The Morgantown cooperative weather station was initially established in June 1951 as part of a network of stations with the Pennsylvania Turnpike commission and was located near a toll plaza facility in Morgantown south of the Turnpike at an entrance ramp about 36 feet to the east. The area is generally rolling hills. The station operated here through February 1986 when it became inactive due to difficulty in the staff at the site being able to provide observations and later closed in 1988. The observation form remarks in March 1958 that the observers were unable to take temperatures during this event due to the high amount of snow that fell as access was blocked. It is likely the snow was measured in the area near the temperature and precipitation equipment.

The 18-21 March 1958 winter storm was a significant event that occurred relatively late in the cold

season. An area of low pressure moved north off the Eastern Seaboard and spread abundant moisture into the Mid-Atlantic region. Temperatures were near freezing during this event, and this combined with two to three inches of liquid precipitation produced a heavy, wet snow that crippled transportation in much of southeastern Pennsylvania, also causing one of the most widespread power outages on record. The Pennsylvania Turnpike was closed from Harrisburg eastward for several days with multiple vehicles buried or stranded in the snow. Some 800 people rode the storm out at a restaurant by the Turnpike in Morgantown. Although the Morgantown snowfall total was the highest reported, another cooperative weather station operated by the Turnpike Commission for the Weather Bureau at Devault, in Chester County, reported 49.0 inches from this event in the same 4-day period, with a maximum of 22.0 inches in 24 hours. Several pockets in excess of 30 inches of snow are noted in this event in official records in southeastern Pennsylvania.

It should be noted the findings of the Morgantown value do not in any way reverse or impact the decision of a prior SCEC for Pennsylvania regarding a significant lake-effect snow event in the Erie area in December 2017. For specifics on that decision, please refer to the SCEC report on that event.

WB FORM 612-14 (FORMERLY 600) U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
 Station MORGANTOWN RECORD OF CLIMATOLOGICAL OBSERVATIONS
 County BERKS Time of observation (local time) if once daily _____ Month MARCH 19 1958
 State Pa. Station number 36-59563 Date of observation _____ Standard time in use 11:59 PM

Date	TEMPERATURE °F		At obs.	PRECIPITATION Draw a straight line (—) through hours precipitation was observed, and a wavy line (---) through hours precip. probably occurred unobserved.	24-hr. amounts Rain, melted snow, etc. Hail, sleet, or ice pellets	WEATHER (CALENDAR DAY)							Important weather conditions not included in "Weather" block.	REMARKS
	MAX.	MIN.				Fog	Smoke	Clouds	Thunder	Hail	Sleet	Snow		
1	42	36	37		0.00									
2	50	30	40		0.00									
3	44	34	34		0.12								RAIN	
4	43	30	33		0.00									
5	44	28	28		0.00								SNOW FLURRIES	
6	46	26	39		0.00									
7	46	31	32		0.00									
8	45	28	30		0.00									
9	41	24	32		0.01								WET SNOW	
10	49	30	34		0.00								LIGHT SNOW	
11	49	25	35		0.00									
12	40	31	33		0.00									
13	39	23	31		0.17	2.0 2"							SNOW	
14	38	30	36		0.40	4.0 3"							SNOW & RAIN	
15	44	31	32		0.00									
16	41	28	30		0.00									
17	42	25	28		0.00									
18	44	22	35		0.00									
19	38	30	32		0.40	6.0 6"							LIGHT DRIZZLE + SNOW FLURRIES	
20	SNOW BOUND				2.40	38.0 41"							WET SNOW	
21	43	28	35		0.35	6.0 50"							SNOW TO DEEP CAN FOR SNOW WAS FILLED	
22	43	28	35		0.00	36"							AND RUNNING OVER	
23	46	27	32		0.00	26"							COULD NOT GET TEMP READING TO MUCH	
24	48	22	34		0.00	16"							SNOW	
25	40	34	37		0.80	10"							LIGHT RAIN	
26	40	35	38		0.14	8"							LIGHT DRIZZLE	
27	40	33	40		0.08	6"							LIGHT RAIN & SNOW	
28	50	26	33		0.00	2"								
29	50	30	38		0.00									
30	45	35	37		0.10								RAIN	
31	40	34	38		0.46								RAIN	
Sum					4.93	53.0								
Obs.	Observer <u>MORGANTOWN</u>													
Post	Post Office <u>MORGANTOWN</u>													
Station	Station <u>36-59563</u> Month <u>MARCH</u> 19 <u>58</u>													

WB Form 612-14

Figure 20. Observer form from March 1958 for Morgantown, PA station.

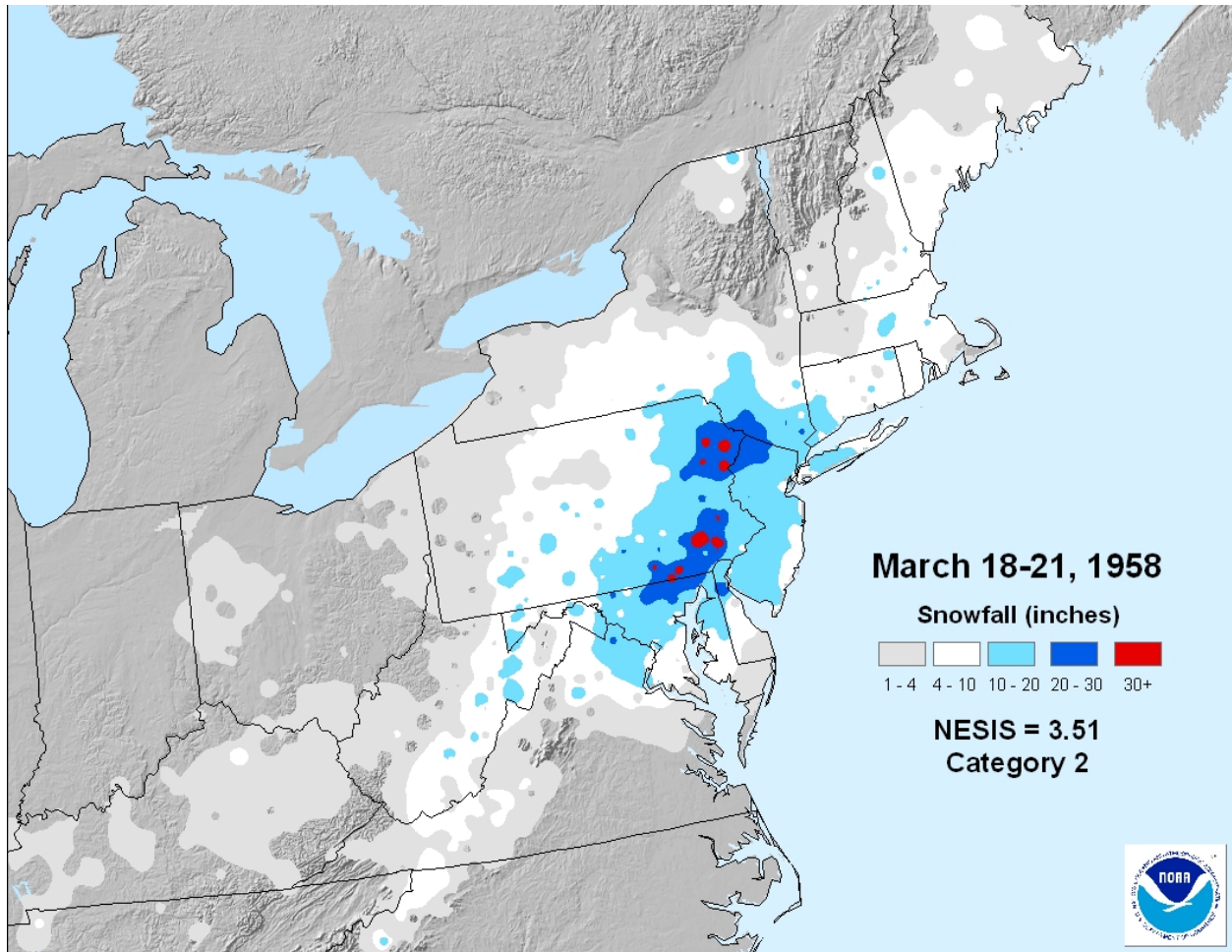


Figure 21. Snowfall accumulation map from the 18-21 March 1958 snowstorm from NCEI. Note the multiple spots in excess of 30 inches of snow in southeastern Pennsylvania.

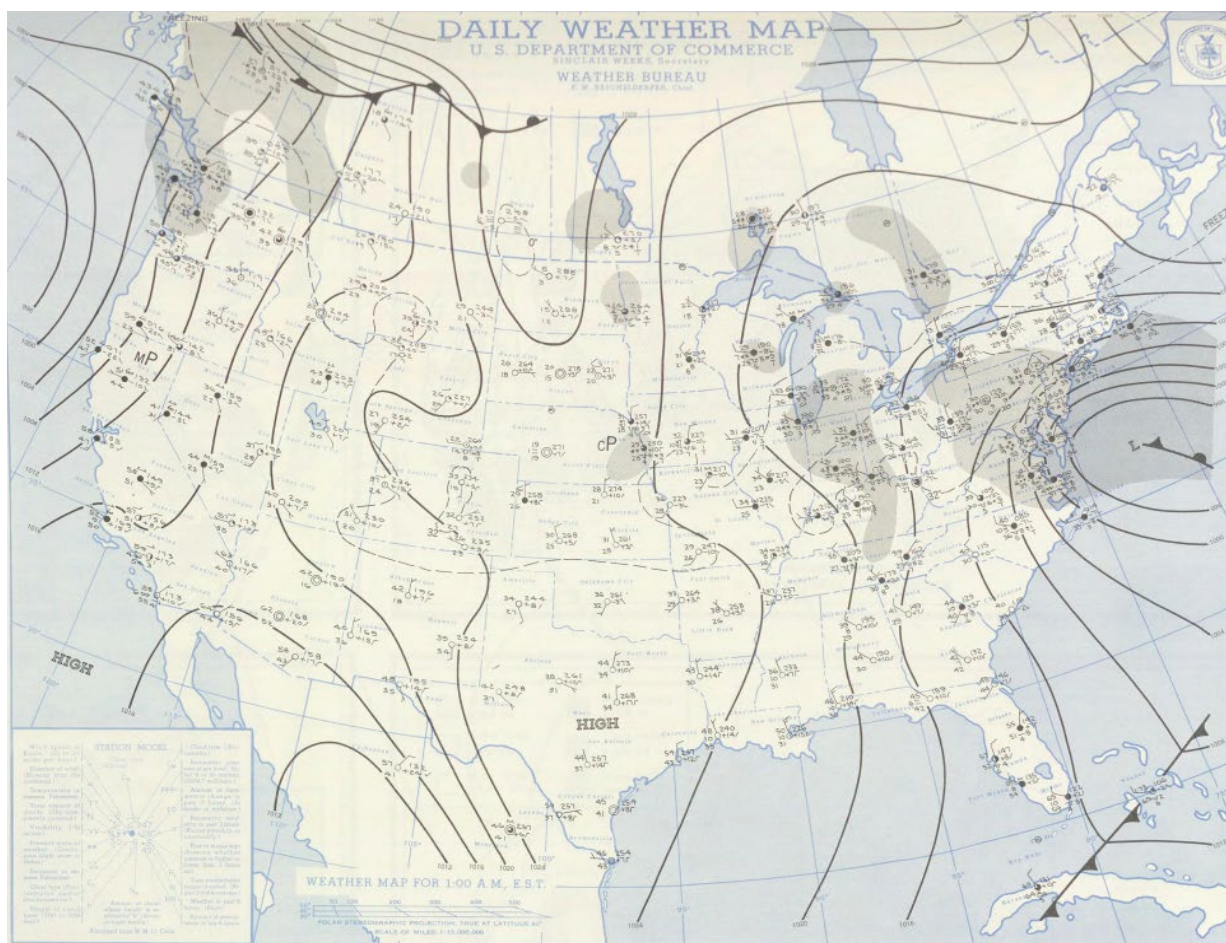


Figure 22. Morning weather map of observed conditions on 20 March 1958 by the U.S. Weather Bureau.

Finding of Committee on 24 Hour Snowfall Record

The SCEC voted 0-5 to accept the Burlington 6.1 SW CoCoRaHS observer report, thus rejecting the value of 43.3 inches as a new 24 hour snow record for the Commonwealth of Pennsylvania. Based on nearby reports at similar valley elevations and the observed nature of the snowbands on radar, the SCEC had concerns over the 7.3 inches of snow measured after 0445 LST on 17 December 2020. The initial report from the Burlington 6.1 SW observer of 36.0 inches ending at 0445 LST on 17 December 2020 was determined by the SCEC to be meteorologically reasonable. But, there was a lack of evidence to support the late event reading of 7.3 inches. It was recommended by the SCEC that the initial 36.0 inch report entered into the CoCoRaHS database would stand for 17 December 2020, but the 7.3 inches on 18 December 2020 should be removed and marked as not available. Further discussion led to the finding that the observer did not enter the original reported value for 18 December, but the value was added at the request of the area coordinator by the NWS Binghamton office after the 43.3 inch report was received from this observer as a ‘spotter’. It was questioned further by the SCEC in how this was really measured based on the snowboard not being cleared during the event. Additionally, the lack of any liquid precipitation for this storm from the new snow, lack of snow-water equivalent of the snow depth in the time after the event and lack of any snow depth further complicated the event measurement. No photographs also hampered substantiating any local variance that may have taken place.

Given the Burlington 6.1 SW observation of 43.3” was rejected as the new state daily snowfall record, and the discrepancy in the records found with the higher Lakeville 1 NNE value over the Morgantown value, the Lakeville 1 NNE value was put forth for a vote as the new 24-hour snowfall record for Pennsylvania. Surrounding reports from the area and well-documented meteorology of the event support it as a reasonable and plausible measurement and record-setting 24 hour snowfall value.

The 5-0 vote of the SCEC, based on evidence as stated above, has determined that the 41.0 inches measured at Lakeville 1 NNE on 16 February 1958 should be accepted as the record for 24-hour snowfall for the Commonwealth of Pennsylvania and the 0-5 vote in support of the 43.0 inches at Burlington 6.1 SW resulted in a rejection of that observation as a new record 24-hour snowfall value, respectively. The SCEC made their determination on the calls held on 31 March 2021 and 24 February 2021, respectively.

NCEI Climate Monitoring Chief Decision:

Approved

as recommended in boldface above:

Not approved

returned to SCEC with no action taken:

--	--

Committee Members (Voting):

- Joanne Labounty, Observing Program Leader, NWS Binghamton, NY
- Chris Stachelski, Observing and Climate Program Leader, NWS Eastern Region
- Keith Eggleston, Regional Climatologist, Northeast Regional Climate Center
- Kyle Imhoff, Pennsylvania State Climatologist
- Karin Gleason, National Centers for Environmental Information, Asheville, NC

Additional teleconferences participant:

- Bryant Korzeniewski, National Centers for Environmental Information, Asheville, NC