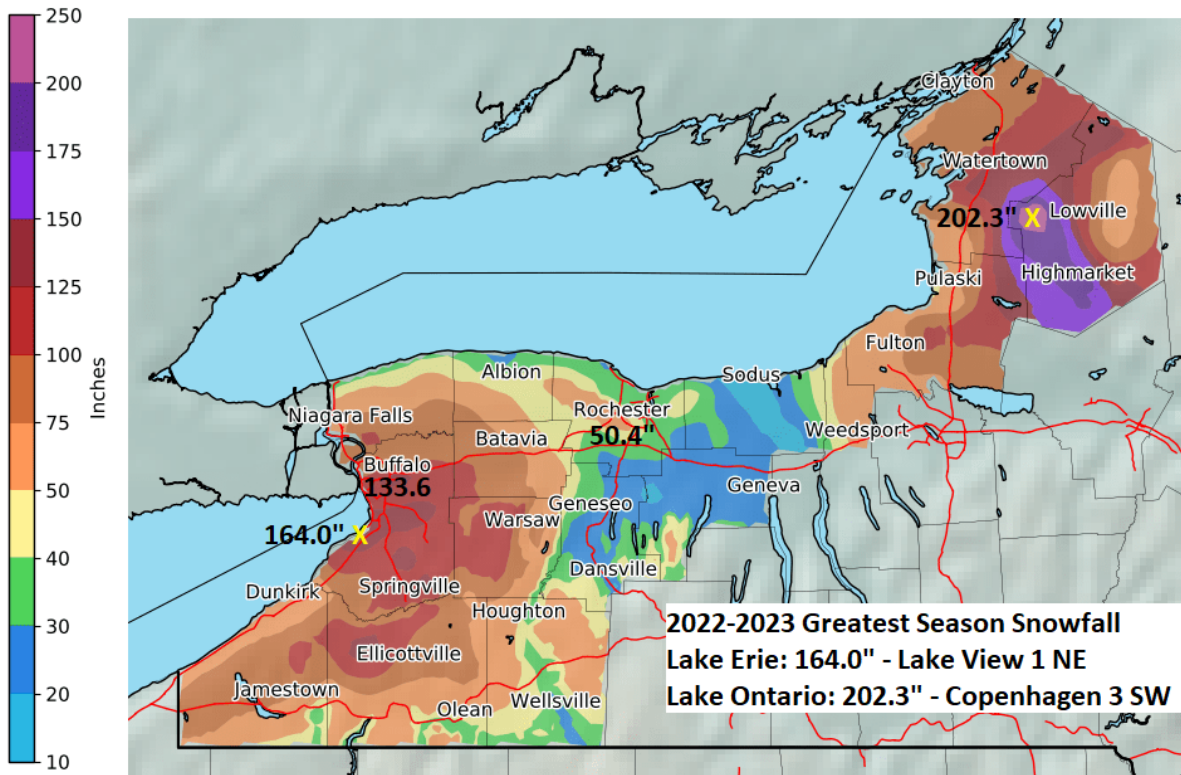


Season Observed Snowfall Valid: 2022-2023 Season



National Weather Service
Buffalo New York
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Winter Summary 2022-23

The winter of 2022-23 featured several large and impactful lake effect snow events that overshadowed an otherwise quiet winter in terms of snowfall. It was also a mild winter with each winter month around or well above its monthly temperature normal. Precipitation ranged from the greatest ever over a winter season (November through March) in the lake belts

northeast of the eastern Great Lakes to around normal through the Genesee Valley and Finger Lakes region.

The temperature overall for the five winter months (November through March) averaged above normal. This was the mildest winter (November through March) since the winter of 2015-16 (Buffalo, Watertown) and 2016-17 (Rochester). A mild November led into a near normal temperature month of December. One of the coldest stretches occurred on the 23rd - 24th of December, with much of the region's high temperatures only in the teens on the 24th. These temperature readings are not as harsh as a typical cold winter stretch. The new year turned even milder with January and February averaging well above normal. All three of the main climate stations (Buffalo, Rochester and Watertown) had a top 10 warmest January on record, with February not that far behind in warm departures from normal. There was one push of very cold arctic air on the 3rd and 4th of February. This sent the temperature in much of Western and north Central New York to zero or below on the 4th of February. For the first time on record, the meteorological months of December, January and February all averaged at or above freezing (32°F) for Buffalo. Though not as extreme, March was also a mild month though several periods of below normal temperatures occurred as we transitioned from winter to early spring. The winter season featured a low total of days that remained below freezing. Buffalo had just 27 such days (5th-tie fewest), Rochester 25 days (2nd-tie fewest), and Watertown 26 days (2nd fewest) that remained freezing or colder. Though a mild winter, extreme temperatures were few in number. Buffalo had 3 record high temperatures established and all three of these records occurred in early November. Rochester also had three such days, two in November and one in February, and Watertown with a shorter climatic period of record had 5 new record maximum temperatures, two in November, one in December and two in February.

Snowfall was dichotomous this winter, with areas northeast of the eastern Great Lakes totaling well above seasonal averages, while the inland Southern Tier, Genesee Valley and Finger Lakes region were sparse of snow. Synoptic snow storms were rare, and generally contained a wintry mix of precipitation. The number of lake effect snow events was well below normal, with the 6 events 4 less than typical. However there were two significant lake effect snow events with these occurring November 17-20, 2022 and December 23-27, 2022. The November 17-20th event featured some of the greatest snow amounts from a single lake effect event east of Lake Erie, with several locations in the Boston Hills, and Buffalo Southtowns totaling 5 feet or more of snow. The December 23-27th event was the great pre-Christmas Blizzard that hit areas northeast of the eastern Great Lakes. The Buffalo area was especially hit hard with crippling heavy snow that totaled near 4 feet, near hurricane force wind gusts to 72 mph and devastating impacts. Heavy, windswept snow occurred across Watertown and well inland across Jefferson and northern Lewis counties as well with the axis of 4 feet of snow stretching across Jefferson County to near the Saint Lawrence County border. While synoptic snowstorms tended to feature mixed precipitation, the synoptic event on the 10th-11th of March featured mainly snow for the region, with a half a foot of snow falling across Western New York, but very little snow fell east of Lake Ontario. Buffalo had a top 5 snowiest winter season on record, but contrary, the number of days with snow cover of at least 2 inches was below normal with just 47 such days. This is 9 days below the long term average. Meanwhile several locations south of Lake Ontario recorded very little snow this winter. Rochester had the least amount of snow since the winter of 1952-53. Oswego and Sodus finished in the top 5 least amount of snow measured on record, and Geneva NY finished within the top 10 least amount of snow.

While snowfall was below normal for portions of Western and north Central New York, those same areas had precipitation near normal, or for areas northeast of the Great Lakes, near or at record levels. There were several events this winter that featured primarily rainfall. The Veterans Day storm brought one to two inches of rainfall to our region and set daily precipitation records at all three of our main climate stations. Rainfall events nearing an inch in liquid for our region also occurred on November 30th, December 15th-16th, January 3rd-4th and February 9th. The wet winter was near record territory for areas such as Buffalo and Watertown. The added liquid from melted snow brought November to March precipitation to 23.56 inches for Buffalo, more than an inch greater than the previous wettest November to March timeframes on record. For Watertown, the 20.15 inches of precipitation over the November to March timeframe was also the wettest on record by several tenths of an inch. Overall for the winter months of November through March the number of days with a half inch of precipitation (rain or melted snow) or more were 18 days Buffalo (Greatest on record), 9 days Rochester (16th greatest on record) and 10 days Watertown (5th-tie greatest on record).

The mild winter allowed for very little ice formation on creeks, rivers as well as Lake Erie. There were no ice jams related flooding this winter, and area creeks and rivers remained in their banks. Only during a heavy precipitation event on February 9th did several creeks and rivers near bank full. Lake Erie did not have complete ice coverage, with the water temperature only dipping to 33F during the winter. This is the 9th such time since 1927 that Lake Erie did not freeze over, including 5 of the past 12 winter seasons.

Winter Statistics for Buffalo, Rochester and Watertown

(time period for all statistics is November through March 2022-23)

Buffalo and Rochester period of record 1871 - present for temperature;

1884 - present for snow and 1926 to present for snow depth-

Watertown period of record 1949 - present

Buffalo

Average Temperature: 35.1F (6th warmest on record)

Precipitation 23.83" (wettest on record)

* Snowfall: 133.6" (5th snowiest on record)

* Days with 1" or more snow on ground: 61 days (34th greatest on record)

Rochester

Average Temperature: 35.0F (7th warmest on record)

Precipitation: 14.72" (34th wettest on record)

* Snowfall: 50.4" (8th least on record)

* Days with 1" or more snow on ground: 53 days (8 fewest on record)

Watertown

Average Temperature: 31.3F (6th warmest on record)

Precipitation: 19.42” (3rd wettest on record)

Records

There were several records, daily temperature, precipitation and snowfall that were set or tied this winter season. The table below shows new records established at Buffalo, Rochester, and Watertown in the November through March timeframe.

Buffalo

Type	Date	New Record (°F, inches)	Old Date	Old Record (°F, inches)
High Maximum	November 4th	74°	November 4th, 2015	73°
High Maximum	November 5th	79°	November 5th, 1948	76°
High Minimum	November 5th	61°	November 5th, 1902	59°
High Maximum	November 6th	74°	November 6th, 1956	73°
High Minimum	November 11th	54°	November 11th, 2012	53°
Precipitation	November 11th	1.56”	November 11th, 1995	1.40”
Precipitation	November 19th	1.49”	November 19th, 2009	1.49”
Snowfall	November 19th	21.5”	November 19th, 2014	7.6”
Precipitation	December 23rd	1.98”	December 23rd, 1878	1.73”
Snowfall	December 23rd	22.3”	December 23rd, 1976	12.6”
Snowfall	January 27th	5.9”	January 27th, 1978	5.1”

Rochester

Type	Date	New Record (°F, inches)	Old Date	Old Record (°F, inches)
High Maximum	November 5th	77°	November 5th, 2015	75°
High Minimum	November 5th	62°	November 5th, 1994	58°
High Maximum	November 6th	72°	November 6th, 2015	72°
High Minimum	November 6th	54°	November 6th, 1948	54°
High Minimum	November 11th	53	November 11th, 1927	52°
Precipitation	November 11th	1.69"	November 11th, 2019	0.75"
High Minimum	December 30th	48°	December 30th, 1884	48°
Low Minimum	February 4th	-8°	February 4th, 1970	-8°
High Maximum	February 15th	67	February 15th, 1949	61°

Watertown

Type	Date	New Record (°F, inches)	Old Date	Old Record (°F, inches)
High Maximum	November 4th	73°	November 4th, 2015	73°
High Maximum	November 5th	77°	November 5th, 2015	71°
High Minimum	November 5th	63°	November 5th, 1959	55°
High Minimum	November 11th	58°	November 11th, 2014	53°
Precipitation	November 11th	1.33"	November 11th, 2006	0.73"
Precipitation	November 18th	1.92	November 18th, 2014	0.77"

Low Minimum	November 21st	4°	November 21st, 2018	5°
Precipitation	November 30th	0.79	November 30th, 1976	0.70"
Precipitation	December 23rd	1.28"	December 23rd, 2004	0.86"
Precipitation	December 25th	1.10"	December 25th, 1986	0.60"
High Maximum	December 30th	56°	December 30th, 1990	52°
High Minimum	December 30th	47°	December 30th, 1965	38°
Low Minimum	February 4th	-33°	February 4th, 1970	-26°
High Maximum	February 9th	52°	February 9th 2001	52°
Precipitation	February 9th	1.11"	February 9th, 1971	0.79"
High Maximum	February 15th	62°	February 15th 1954	56°
High Minimum	February 15th	43°	February 15th, 1954	42°
Precipitation	March 17th	0.42"	March 17th, 1993	0.26"
Precipitation	March 25th	0.46"	March 25th, 1956	0.43"

Hemispheric Discussion

While a pair of extraordinary snow events, including a devastating blizzard, took place in the Buffalo metropolitan area in November and December, most western New Yorkers would agree that the winter of 2022-23 was characterized by a lack of snowfall and temperatures that generally averaged well above normal. Outside of the Buffalo area, snowfall through March averaged 3 to 4 feet below normal with more than 5 foot departures for some sites in the lake snow belts. At first glance, one might equate these numbers to a winter that was dominated by a moderate to strong El Nino, when in fact, a weak La Nina was in place. Some climatologists would even argue that a neutral ENSO event would better define conditions that were over the equatorial Pacific. During a typical La Nina, particularly weaker ones, there is usually an amplified pattern

found across North America with frequent intrusions of arctic air into the western half of the country and a lesser influx of cold air across the Great lakes region. When this pattern is combined with repeated Greenland blocks (negative NAO), the core of the colder air can be directed into the Great Lakes region. While there was anomalous ridging in the vicinity of Greenland, it was mainly centered poleward of 70N and oriented Longitudinally, thus negating its effectiveness in creating a mid-latitude block. This can clearly be seen this past winter with the general lack of anomalously low heights near Hudson Bay, which is often host to the notorious polar vortex. Characteristics of a weak La Nina did show itself though in the general jet stream pattern with deeper than normal troughing over the western portion of the country, and this helped to support one of the colder winters in decades for the intermountain west where many sites noted record snowfall.

Not only was the general pattern not favorable for cold air moving into the Great Lakes region, it was not conducive for cross polar flows either. Mid latitude blocking, specifically deep closed lows parked near Hudson Bay with simultaneous West coast ridging, are key components for opening the door for bitter cold air in Siberia to cross the Pole to make their way into North America. Neither component was observed for any length of time this past winter, let alone persistent enough to be combined with the other to establish a cross polar flow. Using monthly 250mb wind anomalies, it seems as if the arctic jet was weaker for the bulk of the winter, while the sub-tropical jet was quite active. The latter was displaced further to the north and often supported intensifying cyclones that tracked from the southern plains to the Upper Great lakes. These are often referred to as 'Colorado' or 'cutter' lows and are responsible for surges of very mild air into our forecast area. This was especially the case during the latter portion of winter when temperatures throughout our region averaged roughly 6 degrees F above normal for much of January into early March. These particular storm systems can also be prolific high wind producers throughout the Great Lakes.

Monthly Highlights

November

Major shifts in warm and cold air this month brought a variety of weather to Western and north Central New York. The month began pleasantly warm, setting record high temperatures on the

4-6th across the region. On the 5th the 77°F degree reading at Watertown was the warmest November temperature on record. The 63°F reading for Watertown, and 62°F reading for Rochester were the lowest temperatures recorded for the 5th, marking the warmest minimum temperatures for the month of November as well. A cold front ended this warmth later on the 6th, but deep cold air was lacking behind this front, and mild temperatures continued into the holiday of Veterans Day. A storm system, enhanced by remnant moisture from hurricane Nicole, brought 1 to 3 inches of rain across Western and north Central New York on November 11th including daily records at all three primary climate stations (Buffalo, Rochester and Watertown). While impacts across the Buffalo and Rochester metro area were minor, numerous road closures were reported towards the Southern Tier. Quiet, but still damp weather continued for the next few days of the month, until a deeper and colder airmass settled across the eastern Great Lakes on the 16th. Air temperatures aloft of around -10c pushed across a record warm Lake Erie, and Lake Ontario on the 16th of November. This began a very long duration lake effect snow event that left multiple feet of snow across much of Metro Buffalo. Lake snows on the 16th primarily focused on the Southern tier and Southtowns, and southern Tug Hill east of Lake Ontario. The winds backed on the 16th into the 17th allowing the snowband to shift northward impacting the Buffalo and Watertown areas. This lake snow event was long duration, with snowfall rates of 1 to 3 inches per hour (and as high as 6 inches per hour near the tail end of the event). This, combined with the heavy snow accumulations near the metro areas of Buffalo and Watertown made for high impacts. The New York State Thruway (I-90) from Rochester to the Pennsylvania line was shut down for a period, and there were numerous local and state emergency declarations. In total over 2 and a half days, six to six and a half feet of snow fell across the southern Buffalo suburbs of Hamburg, Blasdell and Orchard Park, and nearly 4 feet of snow fell near Carthage and Croghan east of Lake Ontario. The snowpack slowly melted through the remainder of the month, with a snow depth down to zero at Buffalo on the last day of the month. Several rain events helped with the melting on the 25th and 27th, but in all there were minimal hydrologic issues with the steady and contained snowmelt. To close out the month winds gusted to over 50 mph across Western New York on the 30th, with just a few isolated power outages.

December

December 2022 will long be remembered for a historic blizzard that will rival infamous blizzards of 1977 and 1985. The 37 consecutive hours of blizzard conditions that included heavy snow and winds gusting to over 70 mph from early on December 23rd and into the late evening hours of December 24th paralyzed the Buffalo metro area. Preceding this blizzard was a lake effect event mid-month that primed December 2022 for the third snowiest December on

record for Buffalo. The first half of December was quiet with no notable systems impacting Western and North Central New York. On the 1st, lake effect snow from late November ended in the early morning hours just to the south of Buffalo, and by early afternoon across the Tug Hill region. Around a foot of snow fell across far southern Lewis County from this event. A few mild days in the 50s on the 2nd and 3rd gave way to a slightly cooler regime through the end of the 2nd week. A stalled frontal boundary on the 7th yielded very little temperature fluctuation, with just a few degrees spread between high and low temperatures. A complex storm system brought a wintry mix of precipitation to the eastern Great Lakes region on the 15th. An icy glaze coated sidewalks on a frozen ground before warmer air produced just plain rain during the afternoon hours. Behind this storm system a much colder airmass poured over the eastern Great Lakes with a band of lake effect snow forming during the early morning hours of the 17th. Over the weekend upwards to two feet of snow fell across southern and central Erie County, while the southern Tug Hill region recorded nearly three and a half feet of snow. Temperatures rose to near the freezing mark the 17th through the 21st, with the 21st being the first day of astronomical winter. A storm system carved a very deep trough that brought with it a large plume of cold air over the eastern half of the United States on the 22nd. A rapidly deepening surface low on the 23rd moved just to our west and north -- a classic track for high winds across Western New York and Jefferson County and the Saint Lawrence Valley. Although rain initially fell during the morning hours of the 23rd, a sharp cold front associated with the low changed the rain over to snow mid-morning. The rapidly cooling airmass created a flash freeze on area roads making travel difficult as snow and blowing snow increased. Lake effect snow quickly followed the changeover. The band of lake effect snow extended from the City of Buffalo to the Buffalo Airport and remained stationary for over a day. Southwest winds increased quickly and gusted over 65 mph at 8:39 am on the 23rd, heralding the onset of a historic blizzard at the Buffalo Airport. Travel conditions quickly became poor, and by mid-morning, travel was banned due to the blinding snow. By the early afternoon hours, those that did venture back home from work or attempted last minute Christmas shopping found their travel impossible. Eventually thousands of vehicles were abandoned on the roads by the blizzard's end. Strong winds and temperatures plunging to the low single digits through the early evening of December 23rd created wind chill values below negative 20F in the Buffalo area. High winds also brought numerous power outages across Western New York. Zero visibility made snow removal unsafe, forcing snow removal to be halted on the 23rd and 24th. Unfortunately, this storm claimed the lives of nearly four dozen people. Not until the early morning hours of the 25th did the lake snows finally shift south of the airport, which along with subsiding winds allowed the visibility to improve, displaying the natural disaster across the landscape. Many side streets throughout northern Erie County were not completely plowed until the 26th and 27th of the month. East of Lake Ontario blizzard conditions began at 1:44 pm at the Watertown airport on Friday, December 23rd. The strong winds shredded the snow flakes into fragments, which along with the blowing snow made for very poor visibility. The backing winds Friday night and into Saturday maintained the snowband across the Saint

Lawrence Valley and southern Canada. The shorter fetch, along with the loss of the upstream connection to Lake Erie weakened the snowband. By Saturday night winds shifted the snowband back southward across Jefferson County. Along with this movement the snow band intensified. Snow totals surpassed 2 feet across Jefferson County by Sunday evening. Sunday evening this snowband intensified, with snowfall rates of 3 to 4 inches per hour across southern Jefferson and Lewis Counties. This intense snow band continued into Monday morning before it weakened throughout the day as it lifted back northward across Jefferson County. In all, over four feet of snow fell across central Jefferson County, with the greatest totals centered just south of the Fort Drum air base. Gradual warming through the end of the month brought the December average temperature back to around normal across the region. The peak of the warmth occurred on the 30th with temperatures reaching into the lower 60s across Western New York and upper 50s east of Lake Ontario. Though warm the melting of the lake effect snow was controlled with again little hydrologic impacts after the heavy lake effect snow event. Light rain occurred on the final day of the month as the new year was rung in.

January

The first month of the year started very mild, with all but several days averaging above daily normal temperature. Measurable snowfall was hard to come by to start the new year until the middle part of the month. For much of this month anomalous positive heights to our north, combined with anomalous lower heights and a stronger pacific jet over California kept our region from experiencing true January cold. This pacific pattern also maintained clouds for much of the month, with a fair amount of light precipitation days. Dreary conditions began January with temperatures in the low to mid 40s for highs and overnight lows consistently in the mid to upper 30s through the night for the first 5 days of the month. A slow moving wavy frontal boundary brought around an inch of rain to Western and north Central New York on the 3rd and 4th. Quiet weather then ensued for the following week through the 11th, with an occasional cold front passage with light rain or snow. An area of low pressure tracked out of the Ohio Valley on the 12th and brought widespread rain across the eastern Great Lakes region. Following this surface low the rain changed to snow on the 13th. Later on the 13th the snow band settled across Ski Country with several inches of snow. Little snow fell east of Lake Ontario. The cold air was brief behind this system with just the 14th and 15th for Western New York, and through the 16th for the Eastern Lake Ontario region remaining below freezing. The 15th also featured mostly sunny skies for part of the day, with the sun also shining upon us on the 16th. These were two of only three days this month where sunshine predominated. Starting with the 17th we had measurable precipitation through the 30th at some place for the western half of New York State. For Buffalo, These 14 consecutive days tied for the 16th greatest

streak of consecutive days with precipitation on record. The longest stretch was 24 days ending January 1, 1986. The 17th to the 24th featured mild weather with several light systems of either rain or snow. A stronger system on the 25th brought several inches of snow, sleet and even thundersnow to the Buffalo Area. Greatest snowfall accumulations of 3 to 5 inches were found just south of Lake Ontario where the change over to plain rain was later. Behind this system lake effect snow again formed, but was light across ski country on the 26th and then the snow lifted back up towards Buffalo on the 27th. This disorganized snowband was strongest across Jefferson County east of Lake Ontario Up to a half a foot fell from this event. Light lake effect snow fell on the 30th of the month, and the final day of the month started with a sunny sky and cold temperatures.

February

A few flurries from weakening lake effect snow flew on the 1st of the month. The coldest air of the season to date arrived by Friday the 3rd of the month. The daytime highs on the 3rd were in the teens and at night temperatures dropped to zero or below for much of Western and north Central New York. The arctic blast was brief as the temperature rose back above freezing on the 5th. Combined with a little rain on the 5th, the minor snowpack that started the month was completely erased across lower elevations, though snow continued in wooded areas of higher terrain. During the early morning hours of the 6th a 3.8 magnitude earthquake shook the Buffalo metro area awake. On Thursday the 9th a deep storm system passed by to our west and north. Initial widespread rain and warmth (upper 50s) on the 9th was replaced by gusty winds and temperatures falling into the lower 30s on the 10th. Mid-month was extremely quiet for February with each day rising to around the freezing mark or above and very little snowfall. A weak wave of low pressure passed by Buffalo on the 17th with a little rain and freezing rain that changed to snow. Accumulations were minor around Buffalo, though some of the hills to the south measured several inches of fresh snow. On the 22nd a heavy wintry mix arrived across Western New York, with heavy sleet occurring north of the New York State Thruway. Friday the 24th started sunny across Western New York, aiding in some ice melting. Another weak wave brought light snow to our region on the 25th. A much heavier snow fell during the late afternoon and early evening hours of the 27th slowing the evening commute. A wet 4 to 5 inches of snow fell across the Buffalo metro area before changing to a little freezing rain, and eventual rain during the overnight hours into the 28th. The 2.4 inches of snow on the 27th was the largest calendar snow event to date for the Rochester area.

March

March began mild across the region with a southerly flow sending temperatures to the lower 50s during the afternoon across lower terrain. However to the south across the hills of Southwest New York State a light mix of sleet and freezing rain fell mid-morning before becoming plain rain showers. A storm system tracked just south of Western New York March 3rd-4th, with a mix of long duration rain and wet snow. This system pulled away to the east later on the 4th, with brilliant blue skies filling the afternoon hours. Mostly sunny conditions also occurred from the 7th through the 9th. A storm system moved out of the Ohio Valley and across our region on the 10th, bringing an all snow synoptic event to Western New York. A solid half foot to one foot of snow fell over Western New York, while farther away from the storm just a few inches of snow fell east of Lake Ontario. The 10th was also the start of nearly a week with below daily normal temperatures. A weak wave brought a little snow, followed by the final lake effect snow event of the winter season. Northwest flow brought narrow bands of snow, with up to a foot of snow southeast of Lake Erie, and a foot and a half east and southeast of Lake Ontario March 13th through 15th. Moderating temperatures for the 17th through the 21st, though each day was breezy with winds gusting in the 30 to 40 mph range each day. A warm front lifted across Western New York on the 23rd with a half inch to three quarters of an inch of rain across far Western New York, and a quarter to half inch of rain across the Genesee Valley and east of Lake Ontario. After a brief dry spell on the 24th another cold front on the 25th whipped strong winds and thunderstorms across the region. Winds increased during the early evening hours, peaking in the 60 mph range during the late evening hours of the 25th. Scattered power outages resulted from these winds, though the worst damage was across Niagara County with numerous trees down. These winds also produced a seiche on Lake Erie with the lake rising to 8 foot 10 inches during the evening hours of Saturday, March 25th. Another strong cold front passed through the Eastern Great Lakes during rush hour on Wednesday, March 29th. Ahead of the front winds gusted to near 50 to 60 mph, and as the front passed a snow squall, with brief but blinding snow fell. The month ended with light rain showers and a thunderstorm during the final hour of the month.