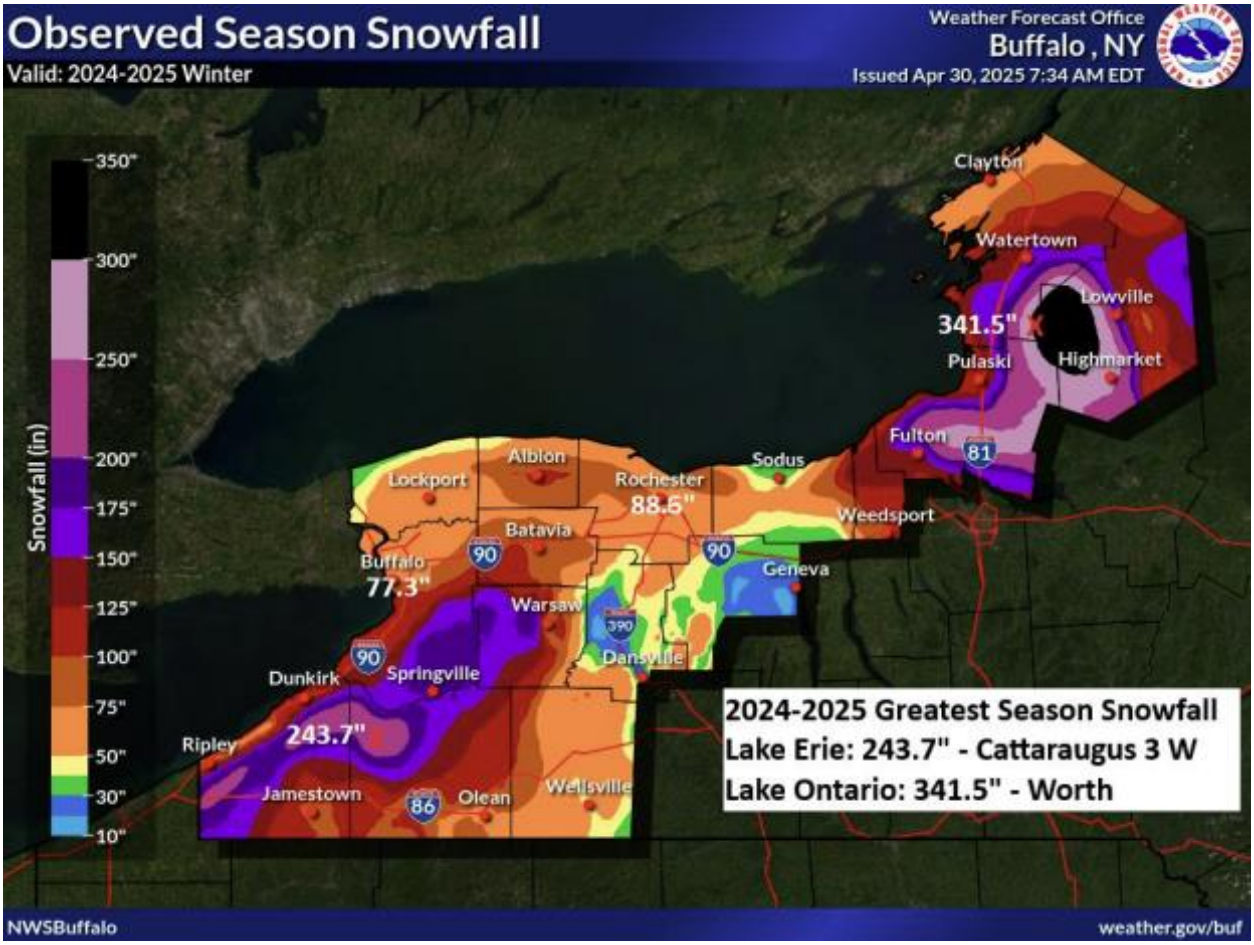
Winter Season Summary 2024-2025



The winter of 2024-25 returned the days of arctic chill and snow to Western New York and eastern Lake Ontario region. For many, this winter felt moderately harsh. This feeling was influenced by recent mild winters but in actuality the average winter temperature over the months of December, January, and February was near to only slightly below normal. A high percentage of the snow that fell was lake effect, with a notable absence of significant synoptic snowfall through the entire winter.

Snowfall

The winter season had one of the latest starts of the snow season on record, with both climate sites of Buffalo and Rochester recording the latest ‘first flake’ of the year on

record, this occurring late November (Buffalo) and early December (Rochester). These first snowflakes of the season resulted from the first significant lake effect snow event. All lake effect snow events occurred within the meteorological winter months of December through February, with minor lake effect events thereafter. In total, there were 11 lake effect snow events, one more than average. While lake effect snow dominated the months of December and January, a mix of synoptic and lake effect snow events occurred through the month of February. Of all the synoptic events, none were particularly strong or eventful, with either minor snow accumulation or a wintry mix yielding up to a quarter of an inch of ice.

Single band heavy lake effect snow events tended to remain across the southern suburbs of Buffalo and the traditional snow belts of the western Southern Tier through the winter season, though east of Lake Ontario the heavy bands of snow did impact the entire Watertown metro area. These regions south of Buffalo (Erie) and Watertown and the Tug Hill region (Ontario) received above average snowfall for the winter season. Unlike the past several years, this winter season also featured multiple northwest flow lake effect snow events, with upstream connections to Georgian Bay and Lake Huron enhancing the seasonal snowfall. This allowed for counties along the south shore of Lake Ontario west of Rochester to receive above normal snowfall this winter. The greatest west-northwest flow event occurred over a week in February that dumped nearly six feet of snow across Oswego and southern Lewis counties. This resulted in the collapse of more than 50 structures in Oswego and Lewis counties due to excessive snow load.

Temperatures

Temperatures for all three climate sites of Buffalo, Rochester and Watertown averaged below normal for the three meteorological winter months of December through February. Adding in the bookend months of November and March, the five-month period finished with above normal temperatures. These three meteorological winter months (Dec-Jan-Feb) were the coldest since the winter of 2017-18 for Buffalo, and 2021-22 for Rochester and Watertown. Unlike prior winters, there were few temperature records established. The months of November and December finished with above normal temperatures for much of western and north central New York, but a pattern change in early January brought increasing lengths of arctic air over our region that persisted through much of February. For Buffalo and Rochester, January was the first below normal temperature month in 14 months. December was near average across the area, while the entire region featured below normal temperatures for January and February. Unlike recent winters, the number of days remaining at or below freezing was greater this winter, though still below the airport normal. Buffalo had 46 days at or below

freezing, which is five days fewer than normal. Rochester was six days below normal, with 42 days remaining at or below freezing.

The cold months of January and February brought thickened ice on area creeks and rivers as well as Lake Erie. This was the first winter since 2021-22 that ice formed on the entire waters of Lake Erie. The combination of rain and snowmelt, along with ice jams on area creeks and streams produced minor flooding 4-6 March 2025 for Western New York, and 16-19 March 2025 for rivers and creeks east of Lake Ontario. Cool spells in spring maintained ice on the eastern end of Lake Erie through mid-April, which is typical of the long term mean.

Winter Statistics for Buffalo and Rochester

Temperature records 1871 - present (155 years)

Snow records 1884 - present (142 years)

Buffalo

Average Temperature: November – March: 33.7°F (2.1°F above normal)

Snowfall: 77.3” (18.1” below normal)

Rochester

Average Temperature: November – March: 33.7°F (1.3°F above normal)

Snowfall: 88.3” (13.7” below normal)

Monthly Highlights

November

Mild air ruled much of November with just brief periods of below normal temperatures at the beginning, middle and end of the month. Highlighting this warmth was 5-6 November 2024, which featured minimum temperatures near or at record levels in the mid-50s to lower 60s. It was another dry month with precipitation below normal in most areas.

November was relatively quiet through the first four weeks of the month. A cold front with gusty southwest winds passed through the region early on 1 November 2024. Mild

patterns continued throughout the month, including on Election Day, which was the warmest on record for Buffalo and Rochester. Periodic cold fronts only lowered the temperature below normal for a few days. Behind one front, the first snowflakes of the year occurred for the higher terrain of southwest New York State as well as the Tug Hill on the night of 11-12 November 2024. There was one larger event 20-22 November 2024 that brought much needed precipitation in the form of higher elevation snow and lower elevation rain to Western New York. On 21 November 2024 along a cold front, southwest winds pushed water to the eastern end of Lake Erie with a meteotsunami forcing the lake level at Buffalo to rise to 9.5 feet. The quick rise and fall of the water level led to minor impacts. The final days of the month featured a major pattern change that culminated with a significant lake effect snow event. Thursday morning 28 November 2024 saw a little rain and snow mix for Western New York as a storm system passed by to the south of Buffalo and Rochester. As this system increased in strength over the warmer waters of the Atlantic, a colder air mass was pulled southward across the warm eastern Great Lakes. Bands of lake effect snow oscillated east of Lake Erie and Lake Ontario through the end of the month and into the beginning of December. All told, multiple feet of snow fell across the Southern Tier and Ski Country, while just an inch or two fell near the Buffalo Airport. Towns immediately south of the Buffalo Airport received a foot to a foot and a half of snow with a very tight northern gradient to the lake effect event. For the Buffalo Airport and the Northtowns, the first snowflakes did not occur until the final days of the month, with the first measurable snow for Buffalo on 30 November 2024.

December

Lake effect snow that started late in November carried over into December, with three significant lake effect snow events east of the lower Great Lakes but mainly south of the Buffalo Airport and near and south of the city of Watertown. Cold weather periods became a little longer in duration this month when compared to previous months this year, and this aided in monthly snowfall totaling near the monthly normal.

The first lake effect snow event was a carryover from November, with heavy bands of snow falling across the Boston Hills and Southern Tier and east of Lake Ontario upon the Tug Hill. One to two feet of snow did make it as far north as the Buffalo Southtowns, with a sharp gradient to no snow near the airport and points northward. East of Lake Ontario nearly five and a half feet of snow fell across communities such as Copenhagen and Worth. The second lake effect snow event started as synoptic snow, with a storm system passing by to our south. This produced a half a foot of wet snow across Western New York on 5 December 2024, with a transition to lake effect snow later that day through 8 December 2024 for locations again primarily south of Buffalo and Watertown.

In total, about a foot and a half of snow fell, centered upon the Boston Hills. East of Lake Ontario the greater amounts of snow were found across the southern Tug Hill. The third lake effect snow event occurred 11-13 December 2024. This was the final lake effect snow event within an active pattern that started just after Thanksgiving, and yielded three feet of snow east of Lake Erie focused upon the Buffalo Southtowns and Boston Hills. East of Lake Ontario, three feet of snow occurred on the Tug Hill. Like the first event, this third event had disruptions in commerce with the New York State Thruway closed for the heavy lake effect snow.

Overall, this month pushed the needle back to near normal, with colder temperature periods remaining a little longer, and lake effect snow near normal as well. In fact, the nine consecutive days featuring below normal temperatures from 29 November through 7 December 2024 was the longest stretch of consecutive days with below normal mean temperature since November of 2022 for Buffalo and October of 2023 for Rochester. The lake effect snow dominated the headlines through mid-month, then warmth was highlighted the final few days of the month. The final five days of the year were the warmest ever to close out a calendar year for Buffalo.

January

The new year brought changes with arctic air gripping the Great Lakes region through much of the month of January. These cold air masses sent bouts of lake effect snow, predominately on a west to northwest flow downwind of the eastern Great Lakes. The cold air, coupled with a breeze through the month allowed for Lake Erie to freeze over for the final week of the month. The average temperature for January finished below normal for the climate sites of Buffalo and Rochester for the first time in 14 months.

A weakening area of low pressure started the early hours of the new year with light rain, before colder air transitioned the rain to snow through the pre-dawn hours. This plunge of colder air brought the first of five lake effect snow events for the month. Initially, synoptic snow fell across Western New York through the afternoon on 1 January 2025 and into the evening hours east of Lake Ontario. As the cold air deepened bands of lake effect snow moved over the Southern Tier and slowly pushed northward towards the Buffalo Southtowns. Northwest flow maintained this lake snow into Sunday 5 January 2025, with up to two feet of snow accumulating on the hills well south of Buffalo and up to 5 feet across eastern Oswego County and southern Lewis County. The greatest snow fell on January 3-4 2025 off Lake Ontario where thundersnow was reported. An upstream connection to Georgian Bay and Lake Huron aided in snowfall rates up to 3 inches per hour.

Winter's chill remained after this event with light snow through mid-month. The second lake effect event of the month occurred 13-15 January 2025 that featured primarily westerly flow. This again directed the higher snow totals south of Buffalo and Watertown with around two and a half feet of snow accumulating over the Boston Hills and southern Tug Hill during this three-day stretch. The third lake effect snow event of the month featured a meso-low over the western waters of Lake Ontario. This feature formed along a lake aggregate trough which is common in arctic air masses, and brought an initial foot of snow in the early morning hours of 20 January 2025 from Niagara to Monroe counties. Later on, westerly flow brought a foot of snow across the Buffalo Southtowns and Boston Hills, while a stronger single band of snow east of Lake Ontario pummeled southern Jefferson and western Lewis counties with up to three and a half feet of snow. As a surface high pressure moved over western New York in the early morning hours of 22 January 2025, the skies cleared and allowed for temperatures to drop to values not seen in several years for the Buffalo metro area. The -5°F reading was the coldest temperature at the airport in nearly six years, which more than doubled the former greatest period of time between below zero temperatures. These cold temperatures also allowed for the ice coverage on Lake Erie to increase over 50 percent with solid ice on the far northeast end of the Lake. The fourth lake effect snow event of the month impacted the Buffalo metro area during the late evening hours of 24 January 2025. This snowband dropped southward and deposited a half to one foot of snow across southern Erie County. Snow along the southern Lake Ontario shoreline amounted to close to a half a foot in Monroe County and surrounding areas, while the greatest totals were found across northern Oswego County. The persistent flow of colder air over Lake Erie created additional ice coverage. As such, the last lake effect snow event of the month, with temperatures aloft just marginally cold enough to support lake effect snow produced only minor snow accumulations east of Lake Erie. A foot of snow fell east of Lake Ontario where the water temperature was a few degrees warmer and the lake was ice free.

February

Cold, northwest flow that began the new year continued through the month of February. This brought day-to-day snow along with freezing rain events through the first three weeks, before temperatures began to increase past the freezing mark for the last week. Lake effect snow became less frequent this month off Lake Erie, while a northwest flow mid-month brought heavy lake effect snow to Oswego and southern Lewis counties. Additionally, light to moderate synoptic snow systems impacted the region every few days or so.

The first half of February started with light synoptic and lake effect snow, with day-to-day snow continuing through 10 February 2025 for Western New York. However, off Lake Ontario a different story played out. The open Lake Ontario waters combined with an upstream connection to the upper Great Lakes to bring a single band of heavy lake effect snow. Initially, the first lake effect snow event of the month 9-11 February 2025 brought a solid two feet of snow, centered upon western Oswego County. A second lake effect snow event just days later on 13-14 February 2025 brought an additional three feet of snow to some of the same areas that the first event of the month produced.

15-16 February 2025 brought a wintry mix to Western New York with snow changing to freezing rain and plain rain. A few tenths of an inch of ice developed on Sunday morning 16 February 2025 to areas south of Lake Ontario, including Buffalo, Batavia, and Rochester to portions of Central New York. Behind this system, a bitter cold air mass dropped across the eastern Great Lakes region sending temperatures down into the single digits near the lakes and below zero inland. Cold temperatures along with brisk winds sent wind chills to -10F or colder for Western New York on 18 February 2025. Lake effect snow also fell within this arctic airmass from 17-19 February 2025 with daily accumulations of a few inches along the southern Lake Ontario shoreline. East of Rochester and towards Oswego County, day-to-day snow totaled over six feet from 14-19 February 2025. Together, these two lake effect snow events in less than a week timeframe brought heavy lake effect snow that toppled more than 50 structures due to excessive snow load, most of which were in Oswego County.

Cold air on 17-23 February 2025 maintained light lake effect snow across Western New York with the greatest accumulation for Buffalo during this stretch occurring on 20 February 2025 with almost five inches of very fluffy snow. The final week featured a warming trend which eroded the deep snowpack that was building through the month. Warm gusty winds on 24-25 February 2025 did much of the snowpack ablation across the region. Light rain showers the final four days of the month ripened the snowpack across Western New York. Minor ice jams occurred the final two days of the month with little impact as creeks and rivers maintained low flow.

March

March came in like a lion this year. Gusty winds remained through the month with the average wind speed for the month above normal. It was a mild month as well, which limited the accumulation of snow. The month featured rather dry conditions with the total precipitation well below normal for Western New York, though around normal east of Lake Ontario.

A cold front plowed across western New York to start the month of March, with brisk westerly winds driving clusters of light snow across Western New York. Late winter's chill remained through 3 March 2025 before a very deep storm system featuring near record low pressure intensity for this time of year tracked across the central plains and the central Great Lakes on 4 March 2025. A surge of mild air ahead of this storm system sent temperatures well above normal for 4-5 March 2025. This storm system brought an all-day soaking rainfall to Western New York on 5 March 2025 with rainfall totals around a half an inch measured across far western New York and over an inch of rain east of Lake Ontario. The rain and snowmelt swelled area creeks and rivers to bank-full on 5 March 2025, though ice jam flooding was minor with much of the ice flushed from the creeks and rivers just before they swelled. Following this system, quiet weather prevailed right through the middle of the month. Though there were light flurries and sprinkles 6-9 March 2025, precipitation was lacking. The first widespread severe weather outbreak occurred on Sunday 16 March 2025. Thunderstorms through the afternoon produced wind damage from the Southern Tier northeastward across the Genesee Valley and Finger Lakes region. A significant drop in temperatures occurred from 16-17 March 2025 with the thermometer falling from the mid-70s on 16 March 2025 down to highs in the upper 30s to lower 40s on 17 March 2025. A few flurries of snow started the third week of the month. A closed upper-level low passed over Western New York on 26 March 2025 with bursts of snow quickly coating the ground, only to be melted soon after with the reemergence of sunshine. An active final four days of the month featured a stalled frontal boundary over Western New York on 28-30 March 2025. Intervals of rain starting late afternoon of 28 March 2025 became light freezing rain during the overnight hours of 29-30 March 2025. A tenth of an inch of ice accumulated in Niagara County and upwards of a quarter of an inch of ice accumulated in the Rochester metro area. The temperature remained just a degree or two above freezing for the Buffalo metro area, with no reports of freezing rain.

April

Following a near snowless March, April continued with just flurries and light snow showers. The northwest winds did bring light snow to areas south of Lake Ontario with an inch or so accumulating through the month, while weak lake effect snowbands and upslope snow showers brought a foot of snow to the southern Tug Hill region.

Hemispheric Discussion

It’s been several years since the bulk of the region has experienced much snowfall and sub-zero temperatures, but for many areas the winter of 2024-25 proved to be more typical of a ‘good ol’ fashioned’ western New York winter. This was especially the case in the lake snowbelt areas where some of the coldest air in years made its way south from the Canadian arctic, courtesy of a relatively prolonged coupled negative North Atlantic Oscillation (NAO) and positive Pacific North American (PNA) pattern that supported several episodes of cross polar flow. These very cold outbreaks have been generally absent the past few winter seasons.

The change back to a harsher winter was well advertised though by global teleconnections, including a well forecasted weak La Nina. During recent winters, stronger ENSO (La Nina / El Nina) events in the Equatorial Pacific favored milder conditions throughout the Great Lakes. This was largely due to a less amplified jet stream pattern over the Lower 48, one that typically floods the country with Pacific dominated air while cutting off frequent intrusions of arctic air. In the case of this past winter, a weak La Nina supported a much more amplified pattern over North America. This allowed our office to confidently forecast more frequent incursions of arctic air, which in turn would likely lead to a higher number of impactful lake effect events.

Two ‘smaller’, more transitory, tele-connective patterns also played important roles in the weather this past winter. The PNA pattern, which focuses on the presence/ amplitude of a west coast ridge, and the NAO, which keys on pressure differences within the lower troposphere across the North Atlantic, combined to allow for several cases of cross polar flow. These will be specifically addressed during the course of this discussion.

As we opened the winter season during the month of November, a low amplitude flow was in place across the United States. This near zonal jet stream pattern flooded the country with modified Pacific based air, and with the help of a strong, northward displaced sub-tropical jet, temperatures in the Ohio valley and Great Lakes regions averaged well above normal. Temperatures across our forecast area averaged 3 to 5 degrees above normal, and this helped to hold snowfall amounts 6 to 12 inches below normal with greater early season deficits being found in the lake snow belt areas.

In December, the weak La Nina started to impact North America in the form of a more amplified jet stream pattern. Notable ridging and the onset of a +PNA developed off the west coast, while an anomalously strong east Asian jet was found over the northern Pacific. This led to significant positive temperature departures throughout the western

half of the country, and in particular the Rockies. Since there were no blocking downstream ridges over Greenland and the North Atlantic though, the overall pattern across the country was still fairly progressive. While this was still not favorable for a true onset of winter in the lower Great Lakes, it was enough to temper the anomalous warmth from the previous month and to allow for the first lake effect snow storms of the season. Unlike the past couple years, the lake effect was focused more on the traditional snow belts from the Buffalo Southtowns to the western Southern Tier off Lake Erie, and from near Watertown to the Tug Hill Plateau and Oswego County off Lake Ontario. Despite a couple of impactful lake effect snow events in December, winter up through New Years Day was generally uneventful with temperatures that averaged above normal. That all changed during the month of January.

As the calendar flipped to 2025, ridging developed across the North Atlantic into Greenland. This blocked up the progressive flow that was largely in place from the previous month and was a leading factor that led to significant amplification in the upstream ridge along the west coast. The result was a coupled +PNA / -NAO pattern that is highly correlated to a southward push of the polar vortex to Hudson Bay. This not only allows cold air in the Canadian archipelago to move southward into the Lower 48, but it often opens the door for a cross polar flow to direct a reinforcement of Siberian glacial air across the pole and the Canadian arctic towards the United States.

The anomalously amplified jet stream pattern over North America in January supported temperatures that averaged below normal throughout the country with only southern Florida escaping the negative departures. The near continuous feed of very cold air feasted on the still ice-free waters of the lower Great Lakes to generate numerous lake effect snow storms. Most areas received above normal snowfall for the month, particularly across southern Erie County and on the Tug Hill plateau where monthly departures exceeded two feet. Meanwhile, temperatures across western New York averaged solidly below normal, while readings east of Lake Ontario barely hung on to normal levels.

During the month of February, the Greenland block that had been in place gave way to a more typical Icelandic low, while the strong ridge off the west coast retrograded to the Gulf of Alaska. The resulting de-amplification over the Lower 48 allowed for a more progressive pattern with a pronounced zonal mid-level jet across the center of the country blocking the penetration of mid wintry cold weather to areas north of 40 degrees latitude. While temperatures remained below normal from the northern Plains and Great Lakes to New England, the cold weather significantly eased by the end of the month. The cold weather continued to favor additional lake effect snow events with most of the region once again experiencing above normal snowfall for the month. The pinnacle of this snowfall was found over southern Oswego County where some spots totaled eight feet of snow in less than two weeks.

After seven solid weeks of winter throughout our region, a pronounced pattern change took place across North America. The pronounced, long-lived ridge along the West coast substantially weakened during the month of March, while the once phased arctic jet over the center of the United States retreated north to the Canadian border. The noteworthy flattening of the overall mid-level pattern, combined with an anomalously strong East Asian jet, laid the foundation for a wealth of Pacific modified air to overwhelm the country. Just as temperatures in January averaged below normal from coast to coast, the mercury in March ended up being equally ABOVE normal. This included readings over western and north central New York that averaged roughly six degrees above typical values. The notably warmer weather combined with significant ice cover (especially Lake Erie) essentially shut down the lake effect snow machines with only nuisance events being experienced. Snowfall for the month averaged more than a foot below normal, with up to two-foot departures found east of Lake Ontario.