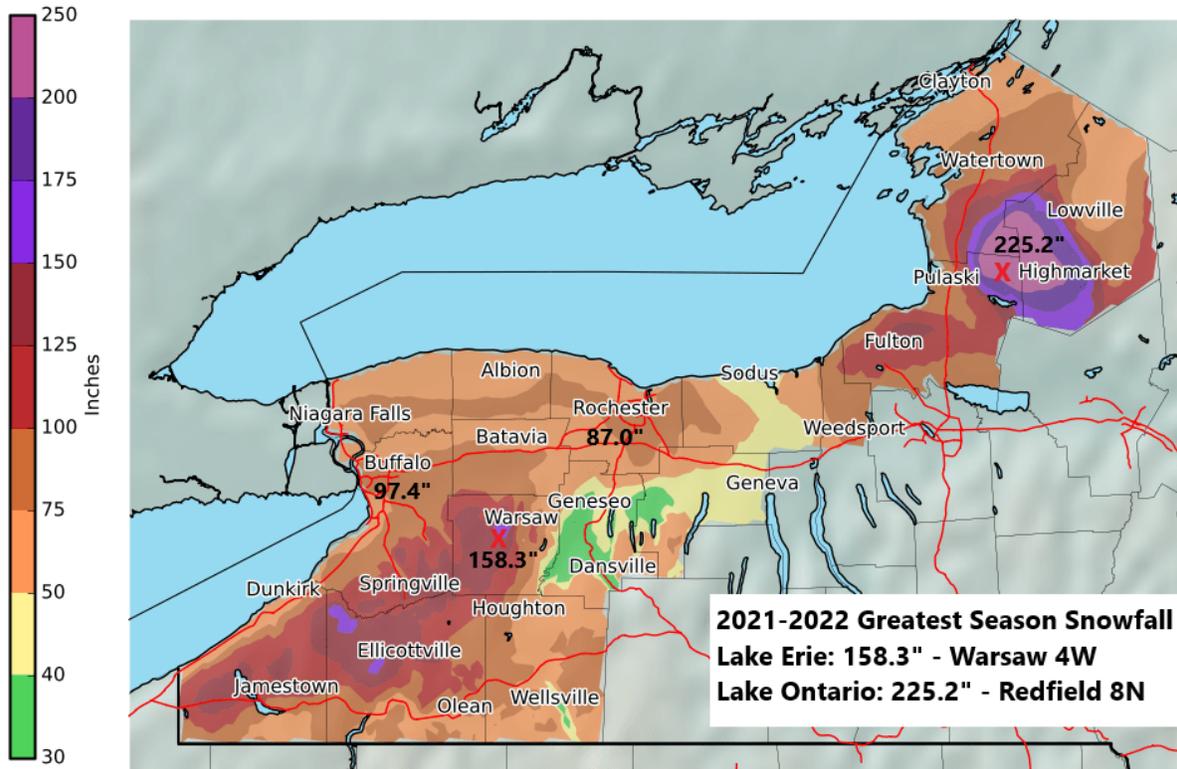


# Winter Summary 2021-22

## Season Observed Snowfall

Valid: 2021-2022 Season Snowfall



National Weather Service  
Buffalo New York

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## Winter Climate Monthly Summary

### – November –

The first snowflakes of the season at our two main climate sites of Buffalo and Rochester officially occurred at the beginning of November, as well as first widespread frost, freeze and eventually the first lake effect snow event. On the 3rd, the first snowflakes of the season occurred during the late morning and afternoon hours at both

Buffalo and Rochester. Lake effect snow accumulated a few inches on the hills across southwest NY, as well as east of Lake Ontario; this the first impactful snowfall of the season. Quiet weather then ensued across the region with several mornings of clear skies and light winds bringing a widespread thick frost to area vegetation. The temperature also dropped below freezing for the first time of the season on the 4th (Rochester) and the 5th (Buffalo). The North Country cooled earlier, with Watertown dropping below freezing on October 23rd. Fair and nice days continued into the 11th of the month. The tide turned on the 12th, when several storm systems brought rain and then accumulating snow to not only the hill tops, but also across lower elevations such as Buffalo. As the air mass cooled behind this storm system a little lake effect snow fell. Another system on the 14th and 15th brought rain and snow, along with the first accumulation, to the Rochester area. The 17th and 18th featured the warmest days this month, with back-to-back days in the upper 50s and 60s. The last 2 weeks of the month featured benign weather, with minor troughs becoming more frequent towards the end of the month with areas of rain and light snow. A minor lake effect event on the 22nd and 23rd of the month brought 4 to 8 inches of snow across the higher terrain east and southeast of Lake Erie and Lake Ontario. The first significant lake effect event of the season occurred on the 28th into the 29th of the month with a foot and a half snowfall accumulation across the Southern Tier. These snowfall amounts were enhanced by an upstream connection to Lake Huron. The greatest snowfall amount with this lake effect event was 16.8" near the town of Cattaraugus in Cattaraugus County. For this month the majority of our Cooperative Observer sites registered below normal snowfall, except for some of the higher terrain east of both eastern Great Lakes.

## **– December –**

Fair weather started meteorological winter, December 1st, across our region. However as is almost always the case in winter, fair weather was short-lived as a storm system brought a wintry mix to the region later that evening that changed to plain rain on the 2nd of the month. A strong cold front passed through early on the 2nd with winds gusting to 40 to 50 mph northeast of the Lower Great Lakes. Cold air was lacking behind this front and mild weather remained through the 5th. On the 6<sup>th</sup>, another wind event occurred with gusts over 50 mph across the Lower Great Lakes. Also on the 6<sup>th</sup>, lake effect snow fell across the Southtowns with stronger bands of snow across Ski Country and the Southern Tier. Southeast of Lake Ontario, snow bands with greater intensity fell across Oswego and southern Lewis counties. Off both lakes, nearly a foot of lake effect snow accumulated. The southwest winds also produced a lake seiche on Lake Erie with the lake level rising to 8 feet at Buffalo. Wind damage with this event was minor with just a few branches littering Buffalo area neighborhoods. A deeper and much more powerful storm system passed by to the west and north of our region on Saturday

the 11th. Ahead of this system, temperatures soared into the 60s. As the front crossed through New York, the air temperature quickly dropped, and afternoon winds howled to 55 to 75 mph across Western and North Central New York with numerous power outages and wind damage. A seiche on Lake Erie reached 10.57 feet, the 6th highest crest since the mid-1970s. Mild days continued through the middle of the month before another wind system arrived on the 16th. Ahead of a cold front, temperatures again soared into the mid 60s across Western and North Central New York early on the 16<sup>th</sup>. Then behind the front, winds gusted 50 to 60 mph during the evening hours across Western New York and into the 40 mph range east of Lake Ontario. Several more cold fronts passed across the eastern Great Lakes the final days of December, but conditions were not aligned for any significant snow to develop off the Lakes. On the 22<sup>nd</sup>, there were several inches of snow that fell south of Lake Ontario. This minor snowpack held tough, but fell under an inch in the wee hours of Christmas morning at the Rochester airport. Mild and dreary days finished out the month of December, including areas of dense fog south of Lake Ontario that lowered visibilities to just under a few hundred feet late on the 31st. Regionwide, December snowfall was below normal across all our observing stations.

## – January –

In a carryover from December, mild weather started January with air temperatures on the 1st peaking into the lower 50s. Green grass around the region quickly became snow covered on the 2<sup>nd</sup>. This snowpack pretty much stayed across our region throughout this cold month. The 4th day of the year featured sunrise to sunset sunny skies, but a storm on the 5th brought winds gusting to over 50 mph during the afternoon hours northeast of the Eastern Great Lakes. These winds on Lake Erie also produced a seiche that peaked just above 8 feet during the early evening hours of the 5th. Though slow to develop, lake effect snow began later on the 5th, and especially the 6th to the east of the Lakes. One particular heavy band of snow off Lake Erie buried Buffalo to Alden with nearly 2 feet of snow. There were a few instances where 3 inch per hour snowfall rates made travel very difficult during the mid to late morning hours. The 17.8 inches of snow on the 6th at the Buffalo airport was the 2nd snowiest January day on record. Snow piled up greater east of Lake Ontario, with nearly 20 inches of snow accumulating near Watertown. The middle part of January featured several swings between above and below normal temperatures as well as several minor snow events. The exception was on the 10th and 11th of the month when a more significant lake effect snow event unfolded southeast and east of Lake Ontario. Coupled with upstream connections, a consolidated band of snow off Lake Ontario reached snowfall rates up to 4 inches per hour during the afternoon hours. This band of snow remained nearly stationary for about

6 hours before an arctic front dropped across Lake Ontario, capturing the snow band and pushing activity southward. Off Lake Erie, the snow band was not nearly as intense as a drier air-mass resided over the Lake with surface high pressure nearby, resulting in only a maximum value of around a half a foot on the hills east of Lake Erie. After a brief reprieve, a widespread snow event occurred on the 16th and 17th of the month. Light snow began on Sunday evening the 16th with a few inches falling before midnight. Thereafter, a widespread foot to a foot and a half of snow fell on the MLK JR holiday of January 17th. The first hour alone on the 17th had 4.6 inches of snow at the Buffalo airport! Though light sleet fell during the early morning hours through the Genesee Valley and towards the Lake Plain, the heavy snow continued through much of the day, not ending until the mid-evening hours. There were minimal travel impacts due to the holiday. This snow storm, the largest synoptic snow event of the winter season, aided in pushing all our observing stations to above normal January snowfall. The final 12 days of the month featured winter's cold side, with several nights dipping down into the low single digits across the primary climate sites of Buffalo and Rochester, and well below zero inland. For many locations, the morning of the 30th featured the coldest air of the season, with nearly the entire region around or below zero Fahrenheit. The final lake effect snow event of the month occurred on the 22nd and 23rd of January with snow accumulating to a foot to a foot and a half just to the east of the lakes.

## **– February –**

Like the earlier winter months, the 1st of February started on a great note, with high pressure bringing fair weather and temperatures increasing well into the 40s across Western New York, and upper 30s east of Lake Ontario. A cold front slowly edged towards the region, bringing rain Wednesday afternoon, February 2nd, which then transitioned to snow later in the evening. This snow made for a slow commute on the morning of the 3rd, and final snow totals from this event ranged from 8 to 12 inches across the region. A light rain moved into the region during the late afternoon and evening hours of the 11th. This primed the deep snowpack with no hydrologic concerns. The combination of this rain, gusty winds that peaked overnight into the 40 mph range, and dew points above freezing allowed the snowpack to decrease several inches on the 11th and 12th. A more prolonged warm spell and rain on the 16th and 17th all but erased the snowpack across the immediate areas around Buffalo and Rochester, with only the higher terrain of SW NYS and the Tug Hill holding onto their snowpack. The combination of daily record rains along with the snowmelt produced widespread ponding of water in backyards, and also swelled rivers and creeks to bankfull and beyond on the 17th and 18th. Early on Saturday the 19th a sharp cold front passed

across the Lower Great Lakes, producing a snow squall that lowered visibility briefly to just a few hundred feet. This squall lasted around a half an hour at any given location and snowfall from the front totaled just a few inches. A minor lake effect snow event occurred later that day with snowfall rates of 2 to 3 inches per hour. This event deposited up to 9 inches of snow on the southern Tug Hill, and up to 6 inches east of Lake Erie. The 20th and 21st offered a reprieve from the unsettled weather, with sunshine and calm conditions. However another rain event occurred on the 22<sup>nd</sup>. While this one featured less rainfall, it still produced river flooding from streams and creeks that were already flowing high. Light lake effect snow ended the month.

## **– March –**

Unlike many months this winter season, March began unsettled with light rain on the 1st of the month transitioning to a light snow on the 2nd. As the cold air deepened on the 3rd and 4<sup>th</sup>, minor lake effect snow fell to the east and southeast of the eastern Great Lakes. High pressure brought a fair day on the 5th, with a notable warming trend on the 6th. This warming came with a price as very strong winds aloft mixed down to the surface. Gusts reached 58 mph during the afternoon hours of the 6th at the Buffalo Airport, 64 mph at Niagara Falls and 72 mph at the Rochester Airport. The most extensive damage occurred from Niagara Falls to Rochester with numerous trees snapped and power lines down. Mild temperatures then continued through a good portion of the month, with the exception of the 12th and 13th. A lingering mild and moist air-mass on the 16th brought widespread dense fog across the lake bordering counties across Western New York. A warm front crossed the region on the 23rd bringing widespread rain to Western New York as well as east of Lake Ontario. Within the warm sector of the storm, Thursday the 24th turned out to be a pretty nice day with temperatures well above normal. A cold front crossed the area on the 25th, with rain showers starting a cooling trend. A reinforcing cold air-mass on Sunday the 27th brought lake effect snow and also paved the way for one of the coldest periods for this late in the season. The maximum temperature of 23F on the 28th was the 2nd coldest high temperature at the Buffalo airport for this late in the season (March 28th onward). This cold snap was short-lived as temperatures rose back into the mid 60s to around 70F to close out the month of March.

## **– April –**

Light snow fell at both Buffalo and Rochester on the 1st of April. This continued a 139 year streak for April snow in Buffalo. Meanwhile, in Rochester, snow has now fallen 138 out of 139 times during the month of April. For Rochester, this was the first of 10 days

with a trace of snow during the month, but yet there were zero days with any measurable snow. Buffalo woke up to nearly an inch of snow Easter Sunday morning, and 10 days later on the 27th, two to four inches of snow accumulated across areas west of the Genesee Valley. For Buffalo, the 1.4 inches of snow on the 27th was the 7th greatest snow event of this magnitude for this late in the season. This snow was also the final snow event for the 2021-22 season.

## Hemispheric Discussion

Despite a weak, to at times moderately strong, La Nina, western and north central New York experienced mainly above normal temperatures during the winter of 2021-22. Unlike the previous winter when a similar strengthened La Nina failed to produce an amplified pattern over North America, this past winter featured a relatively high amplitude pattern, albeit changeable enough to prevent well entrenched arctic air-masses from invading the Great Lakes region. This variability also led to a lack of significant lake effect snow events, as general snowfall in the lake snow belts averaged below normal. Interestingly, a higher number of synoptic storms crossing between our region and the coast helped to boost snowfall totals across the Niagara Frontier. Breaking this down on a month to month basis...

After a very mild October when temperatures averaged 5 to more than 7.5 deg F above normal (pending your location), November proved to be much more in line with climatology. A persistent trough over the west coast gave way to a +PNA pattern that featured a ridge over the western third of the country. While this was coupled with ridging over the northern Atlantic (-NAO signature), the corresponding trough between the two ridges was not deep enough to allow for any semblance of a cross polar flow. This was enough though to support a fairly typical November with temperatures averaging within a degree or so from normal. While most areas picked up their first measurable snowfall, values for the month generally fell below 30 year averages.

Unimpressive snowmaking conditions not only remained in place for the month of December, but became even worse. De-amplification in the overall pattern was accompanied by a transition back to ridging in the eastern half of the country. This allowed Pacific modified air to flood the vast majority of the United States where temperatures averaged SOLIDLY above normal. This outcome was exacerbated by the average position of the arctic jet along the Canadian border that essentially blocked any significant cold air intrusions. December is typically one of the more impressive months for lake snows. But in this case, only one real lake effect event took place and that did not produce more than a foot of snow for either of the lake snow belts. A broader look across western and north central New York revealed that snowfall for the month was generally one to two feet BELOW normal.

As the calendar changed to 2022 and we moved into the heart of winter, a dramatic pattern change took place across North America. A coupled +PNA / -NAO pattern with ridges along the west coast and over the North Atlantic became established in January and lasted into early February. Unlike the start of the season (Oct) when only weak troughing was found between the aforementioned ridge positions, a more typical deep closed low took up residence just east of Hudson Bay. In fact, this was a reflection of the polar vortex that had drifted well south and east of from the previous months when it oscillated around the Pole. This allowed surges of arctic air to move south of the Canadian border with several episodes of cross polar flow recharging what had been displaced to the south. This included an anomalously strong southerly component (monthly avg) to the overlying jet over the center of the country which only reinforced the general cold advective pattern. As a result, temperatures for the month averaged some 5 to 10 degrees below normal. This was even more significant given that January is already the coldest month of the year (ie. the month when temperatures are climatologically at their lowest).

The very cold weather in January finally allowed for significant instability over the Lower Great Lakes. The ensuing lake snows helped the monthly snow totals average more than two feet above normal in some areas, particularly in the lake snow belts east of both lakes.

The polar vortex east of James Bay at the start of February slowly retreated to the north and east during the course of the month, as ridging over the North Atlantic broke down. Just for clarification, the latter was not a classic Greenland block but rather a relatively flat west to east ridge that usually has a shorter residence time. While this allowed for a general rebound in heights along the East coast, an amplified flow over the western half of the country was still able to tap into a wealth of very cold air over Canada. Some of this cold air was directed into the plains and across the Upper Great Lakes with the Lower Great Lakes being on the edge of the much colder air to the north and west, and abnormally mild air just off the coast. This translated into a somewhat typical weather for our region during the month of February with temperatures averaging within a degree or two from normal and snowfall totaling just above 30 year means.

The last month of winter generally went out with a whimper, as above normal temperatures helped to limit snowfall across the region. While a +PNA pattern remained in place, the west coast ridge was considerably weaker than the previous months ridge and the bulk of the real cold air in Canada had been tapped out. Even if there had been cold air in place, significant ridging over Europe was too far to the east to allow for significant troughing over eastern Canada. The axis of the main longwave trough was centered over the Labrador Sea instead, so any residual cold air was directed across Quebec.