LAKE-EFFECT SNOWFALL IN BUFFALO
AND A LOOK AT THE RECORD BREAKING
1976-77 SNOWFALL SEASON

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ABSTRACT

It is the purpose of this paper to describe the 1976-77 record breaking snowfall season in Buffalo, NY. Because most of the snowfall comes from lake-effect storms, the synoptic pattern responsible for these storms and several examples of storms from previous winters are presented. The paralyzing effect of several of this season's snowstorms in Buffalo is described and the new snowfall records which were established are listed.

1. INTRODUCTION

When the snowfall climatology of Buffalo, New York is described, the term "lake-effect" must be included. Lake-effect snowfall occurs to the lee of each of the Great Lakes during the fall and winter seasons when cold Arctic air passing over the relatively warmer lake surface initiates vertical transport of heat and moisture. This mass transfer of energy can, and often does, result in the formation of clouds and resulting precipitation. Although these lake-effect precipitation systems are mesoscale in dimensions, normally extending inland less than 100 miles from the shoreline of the lake, the precipitation amounts can be quite large within the affected area. Adams, New York, for example (located 10 miles downwind of Lake Ontario) received over 68 inches of snow within a 24-hour period on January 9, 1976 from a lake-effect storm. There are numerous cities as well as several major transportation corridors which are located in these lake-effect snowbelts and during many of the lake-effect storms normal activities come to a complete standstill.

Buffalo, New York, at the eastern end of Lake Erie, plays host to numerous lake-effect snowstorms each year. The typical synoptic pattern responsible for lake-effect storms is illustrated in Fig. 1 for November 30, 1976. A large unseasonably cold arctic air mass had moved down into the eastern half of the United States lowering temperatures at 7:00 A.M. E.S.T. to 7°F at Kansas City, MO, -22°F at International Falls, MN, and 10°F at Detroit, MI and Cleveland, OH. The satellite photograph for November 30, 1976 (Fig. 2) dramatically illustrates the clouds forming over the lower Great Lakes and streaming inland under the influence of West-Southwest-erly winds. The southern shoreline of Lakes Erie and Ontario and the western shoreline of Lake Michigan stand out clearly due to the adjacent snow covered land. The ice-free Finger Lakes region can also be clearly seen in the cloud free (but snow covered) region south of Lake Ontario. Buffalo was underneath the center of the clouds streaming in off Lake Erie on this day and received a 24-hour total of 19 inches of snow.

These synoptic conditions were repeated on numerous occasions during the winter of 1976-77. Ironically, although it was a drier than normal winter in much of the east (Wagner, 1977) the colder than normal synoptic pattern (with attendant frequent incursions of Arctic air) was ideal for the formation of lake-effect snowstorms.

2. NOTABLE LAKE-EFFECT SNOWSTORMS IN THE WEATHER RECORDS OF THE BUFFALO, NEW YORK AREA

With help from the media, much attention this past winter was centered on the frequent snowstorms striking Buffalo, New York. It is significant to note that it was the frequency of lake-effect storms and not the lake-effect phenomenon itself which was unusual for this portion of the country. In fact, an examination of weather records for Western New York reveals that there have been numerous lake-effect storms over the years which have paralyzed the Buffalo, New York area.

The first lake-effect snowfall of the season in the vicinity of Buffalo, New York usually occurs in mid-November. However, in 1930, a lake-effect snowstorm struck the region as early as October 18-19. Over four feet of snow occurred in the southern and western
suburbs of Buffalo during this weekend storm stranding many tourists who had been out enjoying the colorful autumn foliage.

Wiggin (1960) described two examples of a severe lake-effect storm occurrence in Buffalo. The first memorable storm noted by Wiggin occurred during December 8–10, 1937. A fall of three feet of snow was observed in North Buffalo and over four feet of snow in the northern suburbs. The second lake-effect storm described by Wiggin occurred on December 14–18, 1945. The airport measured 36.6 inches in this particular storm and falls in excess of 70 inches were reported just four to six miles to the south. The governor of New York declared a state of emergency for the western portion of New York and once again, activities slowed to a standstill.

A Lake Erie induced lake-effect snowstorm on November 22–23, 1956, which produced up to 48 inches of snow just to the south and west of Buffalo, repeated itself exactly one year later (November 22–23, 1957) in the same area and with similar magnitudes of observed snowfall. Perhaps the most intense lake-effect storm ever to hit the Buffalo, New York area lasted from December 5–11, 1958. A storm total of six feet (with some unofficial measurements of over eight feet) of snowfall was observed in the snowbelt just south of Buffalo. A lake-effect snowstorm November 23–24, 1970 produced only 24 inches of snow, however, the most memorable aspect of this storm was the extensive 12-foot drifts throughout the southern suburbs of Buffalo. 

These are just a few of the lake-effect snowstorms which have hit the Buffalo region. It is significant to note that these storms which were described above were the most spectacular and that there have been many other (albeit, less dramatic) lake-effect snowstorms in this area since meteorological observations were first recorded.
3. THE 1976-77 SNOWFALL SEASON IN BUFFALO, NEW YORK

The 1976-77 winter season in western New York is equaled by none in the history of meteorological observations for that region. The first snowfall occurred as early as mid-October and the last snowfall as late as mid-May. Three aspects of the past winter season are most noteworthy and will be described in this paper: (i) the lake-effect storm of November 29-December 2; (ii) the snowstorm of January 28-February 1; and, (iii) the new snowfall records which were set at Buffalo.

The lake-effect snowstorm originating over Lake Erie during November 29-December 2 paralyzed activities in the portions of the seven western counties of New York State. Snowfall amounts exceeded 48 inches in Hamburg, New York and at Buffalo International Airport (15 miles to the Northeast) the official storm total was 40.5 inches of snow. A satellite view of the storm during its second day is shown in Fig. 2. The New York State Thruway was closed for most of this storm period as plows struggled to remove the deep snow drifts.

The most devastating blizzard ever to strike Buffalo hit during the period January 28-February 1. By the end of this storm, President Carter had officially declared western New York to be a "Major Disaster Area" eligible for federal funding. This is the first time in the history of the United States that an area has been declared a federal disaster area based solely on the volume of snow which it has received.

The blizzard began on the morning of January 28th as a cold front moved across the area. The visibility dropped to zero at 11:38 A.M. and remained at zero for over 13 hours when it increased to only 3/8 of a mile. Winds gusting up to 85 miles per hour generated a numbing chill factor of -60°F. The winds gusted to over 50 miles per hour every day of this five day storm. When the storm hit the metropolitan area of Buffalo, thousands of motorists were forced to take any shelter they could find in churches, fire halls, restaurants, and private homes. Because the storm struck during the middle of the day, many workers were trapped in their offices. Buffalo International Airport reported a total of only 12.2 inches of new snow but the snow which had been deposited on the land and the frozen surface of Lake Erie during several earlier snowstorms quickly became airborne. This blowing and drifting snow created snow drifts in excess of 25 feet high, totally burying thousands of cars and many single-story buildings. Twenty-nine persons lost their lives in this storm with nine victims found in snow covered automobiles. The Mayor of the City of Buffalo and the Mayors of several nearby communities issued a total ban on vehicle operation (except for emergency vehicles) which was extended for a week after the storm ended (Fig. 3). The driving ban was issued so that the clean-up operations would not be hindered by the movement of private vehicles.
It's ok to drive—3 to a car

Makowski Lifts Ban But Imposes Some Restrictions

By MAU FORD
Buffalo Mayor Stanley M. Makowski on Monday lifted the city driving ban but restricted traffic to vehicles carrying at least three persons and imposed other limitations.

Effective at 10:00 Midnight the mayor allowed prohibited parking on all bus routes and increased the speed limit on all roads outside the 500 block on a trial basis 15 miles per hour.

In announcing the new restrictions at a City Hall press conference, the mayor explained that they were an attempt to 1. Help the economy. 2. Control the traffic. 3. Reduce the amount of snowfall. And 4. Put the ban back in force.

Rules for City Driving Listed

1. The ban is now limited only under the City of Buffalos requirements that the street be under the control of mayor Stanley M. Makowski any time when a declared storm is in effect.

2. No cars with passenger vehicles, and the same persons could be exempted for the driving ban.

3. The ban will now last from 8:00 a.m. to 6:00 a.m. 72 hours after the end of the storm.

4. The ban will be enforced at all city boundaries.

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Snow Fighters Glimpse 'Some Sort of Normalcy'

By DAVID S. NITZEN

The last problem is that the snow is now over. The snow has been cleared, the roads are open, and the city is back to normal.

In looking back over the entire winter season at Buffalo, several new snowfall records were established (Table 1). The snowfall amounts observed during the three successive months, November-January, were new records for Buffalo (observations go back to the 1870's). The annual snowfall record which was established in 1909-10 was exceeded by 73 inches during this past winter setting a new record of 199.4 inches of snow. Finally, the 53 consecutive days of observed snowfall at the Buffalo forecast office (December 20, 1976 through February 10, 1977) exceeded the old record (which had been 1909-10) by 20 inches.
Figure 5. Lake Erie Shore, Near Buffalo, NY -- Note resident had to dig out from attic to clear snow from the front door. (NOAA photo by Ken Dewey.)

Figure 4. The Digging Out of Urban Streets Following the Jan. 28-Feb. 1 Snowstorm. (NOAA photo by Ken Dewey.)

Figure 6. Buffalo, NY, Residential Area After the Blizzard -- Driveway had to be cleared of 10-foot snowdrifts. (NOAA photo by Ken Dewey.)
equalled on several occasions) by some 23 days. The amount of snowfall at Buffalo could have been even greater were it not for the fact that Lake Erie had frozen over (limiting the vertical transport of heat and moisture) by late January virtually ending this season's lake-effect snowfall. Although, it is no consolation for the residents of Buffalo, snowfall amounts just to the south and west of Buffalo were 75 inches greater for the 1976-77 snowfall season.

REFERENCES

