
13) Winter Storms Hazard Analysis for New York City

a) Hazard Profile

i) Hazard Description

New York City winters often usher in heavy snow, and ice. Heavy snow generally means snowfall accumulating to four inches or more in depth in 12 hours or less, or snowfall accumulating to six inches or more in depth in 24 hours or less. A blizzard has winds of 35 miles per hour or more with snow and blowing snow, reducing visibility to less than 1/4 mile for at least three hours.

Ice storms occur when damaging accumulations of ice accompany freezing rain. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulations are usually 1/4 inch or greater.

The winter months can also bring frigid temperatures that pose a hazard to public health and safety, especially for people who work outdoors, people who are homeless, and at-risk populations, such as seniors and children. See Extreme Temperatures Hazard Analysis on page 116 for more information.

ii) Severity

The severity of a winter storm depends on several factors including temperature, wind speed, type of precipitation, rate of deposition, and time of day and/or year the storm occurs.

The severity of a winter storm can be classified by meteorological measurements and by evaluating societal impacts. The Northeast Snowfall Impact Scale (NESIS) characterizes and ranks high-impact northeast snowstorms. These storms have large areas of 10-inch snowfall accumulations and greater. NESIS has five categories: extreme, crippling, major, significant, and notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS gives an indication of a storm's societal impact. This scale was developed because of the transportation and economic impacts northeast snowstorms can have on the rest of the country.

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The distribution of snowfall and population information are combined in an equation that calculates a NESIS score, which varies from around one for smaller storms to over 10 for extreme storms. The raw score is then converted into one of the five NESIS categories. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

Since 1798, New York City has experienced 23 snowstorms with 16 inch or greater snowfall totals. According to NESIS, of these 23 storms, one was extreme, five were crippling, three were major, and three were significant. The remaining 11 historical snowstorms did not qualify for a NESIS rank. See Historic Occurrences in Table 44.

iii) Probability

Snowstorms and severe winter weather are frequent occurrences in New York City. Based on historical frequency, New York City can expect a major snowstorm of 16 inches or more approximately once every nine years.

iv) Location

All areas of New York City are susceptible to winter storms. Roads and bridges are especially vulnerable because of transportation accidents and disruptions related to severe winter storms.

v) Historic Occurrences

According to NWS, the three biggest snowstorms in New York City were:

- (1) 26.9 inches on February 11–12, 2006
- (2) 26.4 inches on December 26–27, 1947
- (3) 21.0 inches on March 12–14, 1888

Historic Occurrences of Winter Storms in New York City				
Date	Name	Total	NESIS	Comments
Nov. 19–21, 1798	The Long Storm	~18"	N/A	• Snow from Maryland to Maine
Jan. 26–28, 1805	N/A	~24"	N/A	• 48 hours of continuous snow
Jan. 14–16, 1831	The Great Snowstorm	~15"	N/A	• Rivalled Superstorm of 1993 for expansiveness of coverage
Jan. 26–28, 1836	The Big Snow	~15"	N/A	• Interior sections saw widespread 30-40 inch tallies
Mar. 12–14, 1888	The Blizzard of '88	21.0"	4	• Extreme blizzard conditions left behind more than 50 inches of snow in some areas of Connecticut and the Hudson Valley
Mar. 16–18, 1892	St. Patrick's Day Snowstorm	15.4"	N/A	• Largest snowstorm on record for many areas of the South
Feb. 17–18, 1893	N/A	17.8"	N/A	• Followed a warm spell when temperatures reached as high as 54° F
Feb. 25–27, 1894	N/A	15.2"	N/A	• Before the storm, temperatures started out around 0°F, before rising to just above freezing
Feb. 12–13, 1899	The Blizzard of 1899	16.0"	4	• Temperatures in the single digits for most of the storm
Feb. 4–7, 1920	N/A	17.5"	N/A	• Parts of Westchester received more than 20 inches of snow
Jan. 22–24, 1935	N/A	17.5"	N/A	• Snow from Gulf Coast to Maine

Historic Occurrences of Winter Storms in New York City				
Date	Name	Total	NESIS	Comments
Mar. 7–8, 1941	N/A	18.1"	N/A	<ul style="list-style-type: none"> Quick drop-off toward the coast as parts of New Jersey and Eastern Suffolk reported less than 10 inches of snow
Dec. 26–27, 1947	Big Snow	26.4"	2	<ul style="list-style-type: none"> Worst blizzard since 1888 and record holder until 2006
Dec. 19–20, 1948	N/A	16.0"	N/A	<ul style="list-style-type: none"> 20 hour duration Widespread totals of 12-18 inches across the Metropolitan Area
Dec. 11–12, 1960	N/A	15.2"	3	<ul style="list-style-type: none"> 20.4 inches recorded at Newark 17.0 inches at The Battery
Feb. 3–4, 1961	N/A	17.4"	4	<ul style="list-style-type: none"> Storm followed prolonged cold period (16 days of tens and 20s) JFK Airport recorded 24.0 inches
Feb. 6–7, 1967	N/A	15.2"	2	<ul style="list-style-type: none"> Blizzard conditions produced totals of more than 20 inches in parts of New Jersey
Feb. 9–10, 1969	Lindsay Storm	15.3"	2	<ul style="list-style-type: none"> Mayor John Lindsay received criticism after sections of New York City remained unplowed for a week
Feb. 5–7, 1978	Blizzard of '78	17.7"	3	<ul style="list-style-type: none"> Long Island and New England hardest hit Near hurricane-strength winds, Rare thundersnow reported 36-hour storm duration
Feb. 11–12, 1983	Megalopolitan Snowstorm	17.6"	4	<ul style="list-style-type: none"> Occurred during one of the strongest El Niños of the 20th Century
Jan. 7–8, 1996	Blizzard of 1996	20.2"	5	<ul style="list-style-type: none"> Areas of more than 30 inches across portions of New Jersey New York City schools closed, first time since Blizzard of '78
Feb. 16–17, 2003	Presidents' Day Snowstorm II	19.8"	4	<ul style="list-style-type: none"> 25.6 inches of snow recorded at JFK Airport "Presidents' Day Snowstorm I" brought 12.7 inches on Feb. 19, 1979
Feb. 11–12, 2006	Blizzard of 2006	26.9"	3	<ul style="list-style-type: none"> Largest snowstorm in New York City history, surpassing Dec. 26–27, 1947 (26.4 inches) Rare thundersnow reported

Table 44: Historic Occurrences of Winter Storms in New York City
(Source: Weather 2000, 2007)

Between 1953 and 2007, there have been two presidential disaster declarations for winter snowstorms and blizzards in New York City. DR-1083 was declared on January 12, 1996. There were \$21.3 million in eligible damages for all counties. EM-3184 was

declared on March 3, 2003 for the incident period February 17–18, 2003. New York City has not had any presidential disaster declarations for ice storms.

b) Vulnerability Assessment

i) Impact on New York City

Heavy snow can paralyze the City, stranding commuters, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can cause roofs to collapse and knock down trees and power lines. The cost of snow removal, repairing damages, and the loss of business can have a severe economic impact on New York City.

Ice storms can also have a significant impact on New York City. Heavy accumulations of ice can bring down trees and topple utility poles and communication towers. Ice can disrupt communication and power for days while utility companies repair extensive damage. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces. In addition, ice accumulations affect rail beds and the public transit switch system.

The greatest danger during winter storms in New York City is the risk of automobile accidents. Snow and ice also have the potential to interfere with the public transit system if rail signals, switches, and tracks are affected. Commercial and financial business may see some revenue and productivity losses, although this is usually short-term. Government services may also be affected. A large snowstorm will significantly increase costs to City agencies. The Department of Sanitation, Department of Transportation, and Department of Parks and Recreation will incur additional costs related to snow and ice removal and pothole repair.

ii) Structural Vulnerability

Structural damage or building collapses because of snow are very rare in New York City. However, when snow accumulates on flat rooftops, it can cause damage, even to the point of jeopardizing the building's structural soundness. As the snow melts, it can collect in depressed or recessed areas, a condition commonly called ponding. This additional weight or load can lead to roof damage or even collapse.

Chapter 16 of the New York City Construction Code governs the structural design of buildings and provides minimum design loads, load combinations, and procedures for determining snow loads, among others. DOB bases snow loads on New York City regional climate value for ground snow load and incorporates thermal factors for heated and unheated buildings. There are also provisions for snowdrifts caused by parapets and adjacent buildings.

iii) Potential Loss Estimate

Unlike flood or earthquake hazards, there are no standard loss estimation models or methodologies for the winter storms hazard. Potential losses from winter storms are, in most cases, indirect and therefore difficult to quantify. In May of 1994, the New York City Office of the Comptroller conducted a study of the fiscal and economic impact of the winter of 1993-94. The study revealed the unseasonably cold and snowy weather of the 1993-94 winter cost the City about \$50 million more than a normal winter (\$76 million when adjusted for inflation to 2008 dollars). Of this, \$35.7 million was from additional costs to City agencies (the Departments of Sanitation, Transportation, and Parks and Recreation) and snow-related claims against the City. The other \$14.7 million was from lost City revenues, such as parking meters and towing fees, and lost savings from the City's energy plan. In addition to costs to City government, a major winter storm impacts the daily routine of more than eight million New Yorkers and causes significant economic losses for many of the City's businesses.