

3.6 - Tornado Hazard Profile

The Mitigation Plan Development Team researched the tornado hazard and its effects on New York State. Contents of this section resulted from research and outreach including the following sources:

- The National Oceanic and Atmospheric Administration, National Climatic Data Center web site, <http://www.outlook.noaa.gov/tornadoes/>
- The National Climatic Data Center, Storm Events Database website, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>
- TornadoProject.com, <http://www.tornadoproject.com/>

The following chart provides a few terms to know regarding a Tornado event

Term	Definition
Tornado	A local atmospheric storm, generally of short duration, formed by winds rotating at very high speeds, usually in counterclockwise direction. The vortex, up to several hundred yards wide, is visible to the observer as a whirlpool like column of winds rotating about a hollow cavity or funnel. Winds have been estimated to be in excess of 300 mph.
Tornado Watch	Tornadoes are possible. Remain alert for approaching storms. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information
Tornado Warning	A tornado has been sighted or indicated by weather radar. Take shelter immediately

It is common knowledge that New York State has a definite vulnerability to tornadoes. Research has indicated that over 350 tornadoes ranging from F0 to F4 on the Fujita-Pearson Tornado Intensity Scale have occurred in New York State since 1952.

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm or sometimes as a result of a hurricane and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally March through August, although tornadoes can occur at any time of year. They tend to occur in the afternoons and evenings: over 80 percent of all tornadoes strike between noon and midnight.

When a tornado threatens, individuals need to have a safe place to go and time to get there. Even with advances in meteorology, warning times may be short or sometimes not possible. Lives are saved when individuals receive and understand the warning, know what to do and know the safest place to go.

Tornadoes are one of nature's most violent storms. In an average year, 800 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. Tornadoes are capable of tremendous destruction with wind speeds from 40mph to 250mph and above. Damage paths can be in excess of one mile wide and 50 miles long.

Tornadoes come in all shapes and sizes and can occur anywhere in the U.S at any time of the year. In the southern states, peak tornado season is March through May, while peak months in the northern states are during the summer months of June, July, & August.

Geographic Location/Extent/Severity – Tornado Hazard

Tornadoes can occur in any state but are more frequent in the Midwest, Southeast, and Southwest. The states of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Mississippi, Missouri, Nebraska, Oklahoma, South Dakota, and Texas are at greatest risk. In New York State, tornadoes can occur in any area of the State.

Figure 3-102

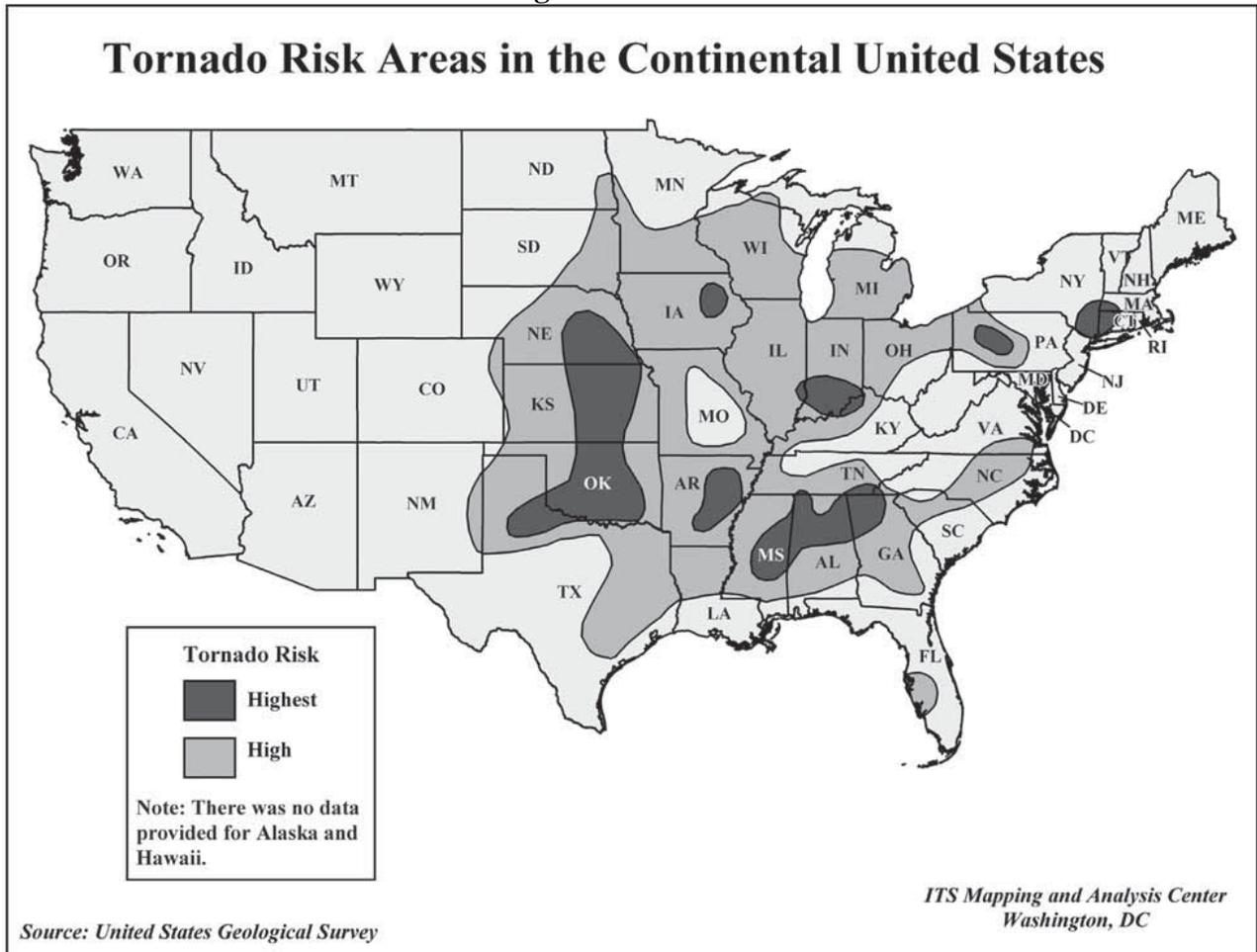
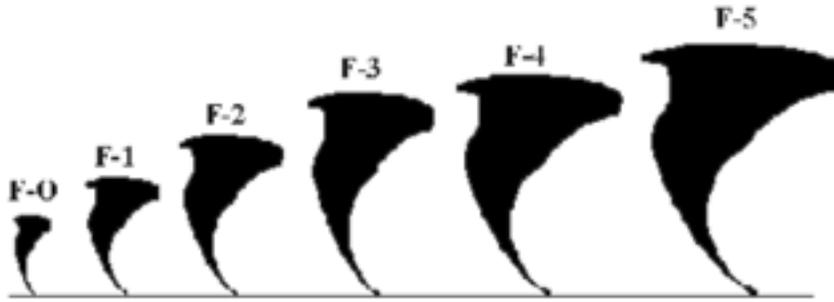


Figure 3-103
Fujita - Pearson Tornado Scale



- F-0:** 40-72 mph, chimney damage, tree branches broken
- F-1:** 73-112 mph, mobile homes pushed off foundation or overturned
- F-2:** 113-157 mph, considerable damage, mobile homes demolished, trees uprooted
- F-3:** 158-206 mph, roofs and walls torn down, trains overturned, cars thrown
- F-4:** 207-260 mph, well-constructed walls leveled
- F-5:** 261-318 mph, homes lifted off foundation and carried considerable distances, autos thrown as far as 100 meters

In February of 2007 a group of wind engineers and meteorologists implemented what is known as the Enhanced Fujita Scale. **Table 3-31** displays the most up-to-date version of this scale.

Table 3-31

Enhanced Fujita Scale
0 (65-85 mph)
1 (86-110 mph)
2 (111-135 mph)
3 (136-165 mph)
4 (166-200 mph)
5 (200-+ mph)

www.fema.gov

Previous Tornado Hazard Occurrences

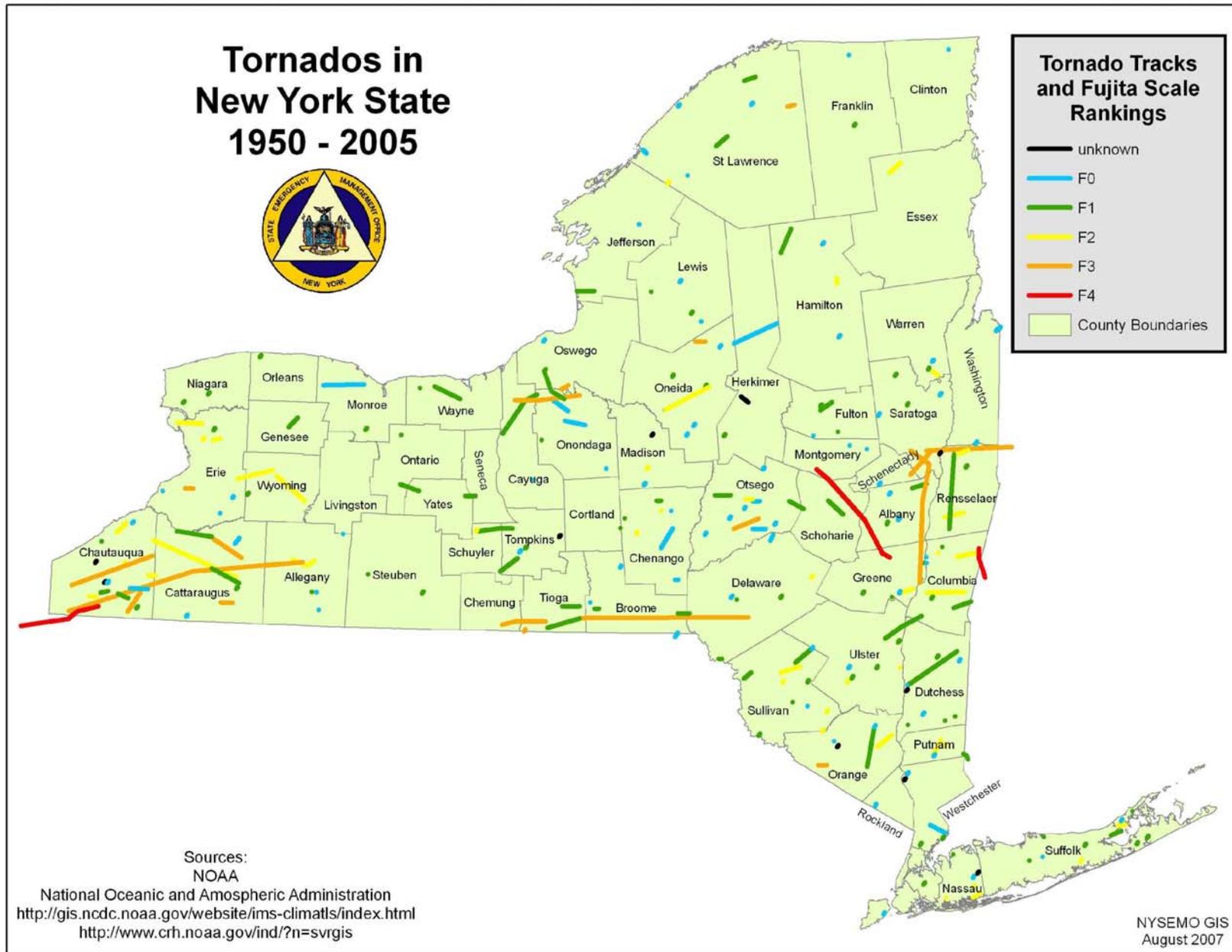
Between 1950 and 2007 New York State has seen a total of 359 Tornadoes, in all; these events have caused 21 deaths, 283 injuries, roughly \$270,000 in crop damages, and \$420,000,000 in property damages. **Table 3-32 and Figure 3-104** summarizes historical tornado events by County according to the NOAA NCDC, www.tornadoproject.com, and Local mitigation plans.

**Table 3-32
TORNADO EVENTS (by County) - 1950 to 2007**

County	Number of Events	County	Number of Events
Albany	7	Oneida	13
Allegany	6	Onondaga	8
Broome	7	Ontario	2
Cattaraugus	10	Orange	8
Cayuga	4	Orleans	1
Chautauqua	24	Oswego	9
Chemung	1	Otsego	11
Chenango	11	Putnam	4
Clinton	1	Queens	1
Columbia	13	Rensselaer	9
Cortland	3	Richmond	3
Delaware	8	Rockland	2
Dutchess	11	Saratoga	8
Erie	17	Schenectady	2
Essex	3	Schoharie	2
Franklin	2	Schuyler	4
Fulton	8	St. Lawrence	9
Genesee	1	Steuben	3
Greene	8	Suffolk	20
Hamilton	4	Sullivan	9
Herkimer	5	Tioga	6
Jefferson	4	Tompkins	7
Lewis	4	Ulster	11
Livingston	2	Warren	2
Madison	2	Washington	4
Monroe	2	Wayne	2
Montgomery	4	Westchester	8
Nassau	8	Wyoming	3
Manhattan	1	Yates	4
Niagara	4		
			Total = 359

<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

Figure 3-104



According to statistics nearly 3 in 4 tornadoes occurring in New York State are classified as magnitude F0 or F1 on the Fujita-Pearson scale. A significant number, approximately one 1 in three 3, are classified as F0. Magnitude F0 indicates a tornado wind speed range of 40-72 mph. F0 wind velocity typically produces only minor damage to property. A slim majority of tornadoes occurring in NYS produce winds ranging from 73-112 mph (F1 on Fujita scale), strong enough to move mobile homes from foundations. **Table 3-33** provides a summary of the number of tornadoes in New York State for each Fujita scale classification. **Table 3-34** lists those tornadoes on record resulting in loss of life to 2 or more people.

Table 3-33
Frequency and Magnitude of Past Tornado Events in New York State

Fujita Scale	Number of Events
F0 (40-72 mph)	125
F1 (73-112 mph)	145
F2 (113-157 mph)	46
F3 (158-206 mph)	24
F4 (207-260 mph)	6
Magnitude not determined	29

NOAA/NCDC

Table 3-34
Tornadoes in New York State Causing Two or More Deaths

DATE/TIME	RESULTS
JUN 13, 1857 4:00 pm	2 dead; 1 injured What was called a "funnel-shaped black moving body of nebulous character" hit the edge of Utica.
SEP 28, 1884 5:20 pm	3 dead; 31 injured A balloon-shaped tornado ripped apart the east half of Shongo, Allegany County.
SEP 15, 1912 5:25 pm	3 dead; 40 injured This tornado moved from the outlet of Onondaga Lake, and passed just north of the Syracuse city limits.
JULY 19, 1935 3:30 pm	2 dead; 2 injured A mother and daughter were killed as their farmhouse was destroyed near Philadelphia, Jefferson County.
MAY 2, 1983 4:05 pm	2 dead; 2 injured A tornado destroyed 100 buildings after moving over Chautauqua Lake.
NOV 16, 1989 12:05 pm	9 dead; 18 injured 9 children were killed at the Coldenham School in Orange County when a cafeteria wall was blown over.
SEP 03, 1993 1:15pm	2 dead, 0 injured Near Batavia, a delivery van was dropped onto an oncoming tractor trailer. Both drivers were killed. The following event was called a tornado by the NWS. However, experts in severe storm analysis later concluded that it was a microburst, not a tornado. The event continues to be erroneously listed as a tornado by the NWS.

Source: NOAA NCDC

Most Tornadoes are unpredictable and move erratically. The following is the detailed account of a tornado which occurred during the morning hours of May 31, 1998 when a strong low pressure system over the upper Great Lakes pushed a warm front across eastern New York and western New England. This set the stage for a major severe weather outbreak in eastern New York. In this highly sheared environment several lines of severe thunderstorms formed ahead of an approaching cold front. This resulted in three tornadoes and severe thunderstorm damage causing widespread damage across the state. The most significant tornado occurred in Saratoga County

and northern Rensselaer County. This tornado touched down at Ushers Road in the Town of Halfmoon and moved due east into the City of Mechanicville. Here, the tornado intensified to an F3 and destroyed the DiSiena Furniture Company. The tornado tracked over Viall Hill where several housing developments were devastated. It continued east into the Riverside area in the Town of Stillwater, where many homes, businesses and several warehouses including DeCrescente Distributing Company were destroyed or heavily damaged. The tornado then crossed the Hudson River into Rensselaer County and decreased to an F2. The tornado tracked across the Town of Schaghticoke and just brushed the Village of Schaghticoke to the north. Czub Grain Farm on Verbeck Avenue was heavily damaged. It then followed the Hoosic River as it crossed the Village of Valley Falls and into the northern portion of the Town of Pittstown to Millertown. At this point the track became discontinuous and the intensity decreased to an F1. In the Town of Hoosick the path became continuous again and increased to an F2. Several farms received extensive damage including Lukeland Dairy Farm where a 60 ton silo and barn were leveled. The tornado then tracked from extreme northeast Rensselaer County to Bennington County in southern Vermont where it quickly decreased to an F1 after crossing the border.

Governor George E. Pataki declared a State of Emergency in Saratoga and Rensselaer Counties. The National Guard was called in by the Governor to assist in the clean up. In Saratoga County approximately 55 homes were destroyed and 230 were damaged. In Rensselaer County approximately 50 to 60 homes and businesses were damaged or destroyed. Power was not restored to parts of this region for three to four days. Approximately 70 injuries occurred with this tornado but no one was killed. Another tornado tracked across southern Rensselaer County. This tornado first touched down on Palmer Road about two miles east of Interstate 90 in the Town of Schodack. The tornado moved due east and passed just south of North Schodack then tracked east northeast to Millers Corners on the south shore of Burden Lake. The damage path continued in this direction to Pike Pond before it dissipated at Alps Mountain. This tornado destroyed three barns, damaged several homes and produced extensive tree damage along its path. The last tornado tracked across the Albany International Airport. It began southwest of the airport about one-half mile west of Memory Gardens Cemetery. The damage path continued east northeast to the Albany ASOS unit where an 82 mile an hour gust was reported. Next it tracked near the Air National Guard facility at the Albany Airport before it crossed Interstate 87 and dissipated. The most widespread damage occurred near the Hilton Hotel where several trees were uprooted or sheared off. At Easton in Washington County, a microburst producing winds of 100 miles an hour took the roof off the fire house and leveled a barn after it was carried 60 yards. South of the Village of Herkimer in Herkimer County, a powerful downburst took the roof off a hangar at a small private airport and damaged two airplanes. A couple of out buildings and a small trailer office were also rolled off their foundations. The severe weather caused widespread power outages across all of eastern New York. The damaging winds downed power lines, power poles, and trees in many locations. Structural damage occurred to several homes and garages due to downed trees. Damage to crops was also quite extensive especially in the mid Hudson Valley and Capital District. Resources from the State Department of Agriculture and Markets were made available to many counties in this region. Approximately 25 cows were killed across the area due to either electrocution or collapsed barns.

Jurisdictions Most Threatened by and Vulnerable to Tornado Hazard and Estimating Potential Losses

At the local level, jurisdictions have recognized their susceptibility of the occurrence of a Tornado event. Although some Counties seem to have higher occurrences than others the mitigating trend appears to be strictly enforcing building codes and instituting new measures that

would call for the use of high wind resistant materials, hurricane clips, and wind shutters. For Instance Nassau County has assessed their risk and exposure and although the likelihood of a Tornado hitting Nassau is low their exposure is very high. They plan to limit their exposure to wind damage by strictly enforcing their building codes. Another step they are considering is requiring safe rooms in mobile home parks.

The tornado hazard was included in the severe wind hazard vulnerability assessment. See the associated Hurricane section narrative for jurisdiction and state facility vulnerability assessment and loss estimation results.