IV. Natural Hazards

Moderately High Ranking Hazards

Hazard Rankings of 241 through 320

The following is a profile of each of the moderately high-ranking hazards in order of their rank by the Planning Committee.

1. SEVERE STORM

According to FEMA, a severe storm is defined as a hail storm, windstorm, or severe thunderstorm with associated high winds. The threat of a severe storm was the top ranking hazard according to the HIRA model with a score of 300, using available data.

a. Location of Affected Area

A severe storm may occur anywhere within the County. The scope of a severe storm may impact a large region. A typical severe storm may be a mile to several miles in width or diameter, and it would typically travel along a path that would extend many miles before losing strength. Once a severe storm forms, it could impact a significant portion of the County.

b. Magnitude/Severity of Hazard

By its very definition, a severe storm has the potential to cause significant damage within the County. Severe storms include severe thunderstorms, wind storms, hail storms and rain storms, all of which may cause significant damage to structures and cause injuries to people. In addition to damages to buildings and other structures, severe storms could damage crops and agricultural products and impact transportation and aviation.

Lightning results from the buildup and discharge of electrical energy between positively and negatively charged areas. Rising and descending air within a thunderstorm cloud separates the positive and negative charges. A cloud to ground lightning strike (the most dangerous) begins as an invisible channel of electrically charged air moves toward the ground. A powerful surge of electricity moves upward from the ground to produce the lightning strike due to the air approaching an object on the ground.

Storms such as Northeasters (locally called Nor'easters) are frequently occurring events during September through April. Northeaster is the term given to a cyclone (low pressure center), which develops near the Atlantic Coast of North America. The counterclockwise circulation around the low pressure causes winds to pass across the eastern coast of the United States from the northeast, pulling in moisture and strength inland from the Atlantic Ocean. The wind velocities are generally not as high and the center pressures are not as low as in a hurricane. The wind field of a northeaster is generally less symmetrical than in a hurricane, covers a greater area, and has a slower forward motion that may even cease. Thus, while the intensity of a northeaster is generally less than that of a severe hurricane, its period of activity tends to be longer. Due to the slower movement of the storm, greater amounts of precipitation are common, compared to other storms.

A severe storm generally lasts less than an hour, but may extend over a longer period, especially when multiple storms form within the area or in the case of a northeaster.

Damages due to severe storms may be caused by lightning strikes, by hail that may damage houses or personal property, and high winds that may cause fallen tree branches, structural damage to buildings and property, or downed utility poles or power lines. Potential cascade effects of severe storms include fire from lightning strikes or downed power lines, flood from heavy precipitation, landslides from heavy precipitation, tornadoes spawned by severe storm cells, traffic accidents caused by severe weather conditions and utility failure due to winds or lightning.

The sections of this report pertaining to flooding, hurricanes, tornadoes and severe winter storms include data regarding historical damages.

c. Past Hazard Events/Historical Damages

Severe storms occur frequently (at least once each year) and during any time of the year in the Albany County. According to NOAA data, there have been 45 hail storms within the County over a 50 year period. Hail storms historically have occurred from April through August. Typical damages for hailstorms have been reported at $1,000 to $5,000 per storm. However, the hail storm of May 28, 2001 caused $600,000 in crop damage.

According to NOAA, approximately 86 severe storms associated with high winds occurred within the County over a 10 year period from 1994 to 2004. Severe storms have historically occurred from May through September. Typical storms cause $5,000 in damages, but many are much higher. The data indicates the following significant damage amounts in dollars. The total amount of damages County-wide over the 10-year period is reported to be $3.3 million.

Date	Damage Amount, $
August 2, 1994	$50,000
July 15, 1995	100,000
July 15, 1995	1,000,000
August 13, 1999	115,000
June 2, 2000	45,000
August 9, 2000	200,000
August 14, 2002	975,000

Besides the above monetary damages, the following storm damages were recorded recently within Albany County recently.

- June 6, 2005: High winds from severe thunderstorms caused downed trees in Albany and Menands.

- June 9, 2004: High winds caused downed trees in Delmar and Bethlehem Center.

- May 23, 2004: ¾-inch hail was recorded in the Town of Berne, associated with a severe thunderstorm.

- July 21, 2003: High winds associated with severe thunderstorms downed trees and wires in the Towns of Colonie and Guilderland, and in Bethlehem Center.

- August 14, 2002: A severe thunderstorm and resultant cloudburst hit the heavily populated Lone Pines, Carmen Road, and Lidius Street areas of the Town of Guilderland. Hundreds of huge trees were downed, seriously damaging many homes in the process. A roof was partially blown off the Guilderland highway department building. The radius of extreme tree damage was approximately two to three miles wide. A wind gust of 68 mph was recorded at the Albany International Airport. The following day, winds caused downed trees in the Town of Colonie.

- June 16, 2002: High winds due to a thunderstorm caused downed trees onto Ravena Road in the Town of Coeymans.

- June 5, 2002: A series of severe thunderstorms cause widespread damage within the County. One-inch diameter hail was reported in Voorheesville, downed trees and power lines were reported in the Town of Colonie and wind damage was reported in Altamont.

- August 13, 1999: The National Weather Service estimated the winds at 80 to 100 mph from a supercell that caused large diameter trees to fall in Guilderland, Altamont and Colonie.

- July 3-6, 1999: Winds from severe storms caused large branches to fall from trees and power lines were downed in New Scotland, South Berne and Ravena.

- July 3,1997: 3/4 –inch diameter hail fell in the Town of Berne, and high winds caused planes to flip over in Selkirk.

- February 23, 1997: High winds were reported at 67 mph in Rensselaerville and in Berne, causing a roof to be removed from a building in Rensselaerville. Winds up to 54 mph in the City of Albany caused downed trees.

- April 23, 1996: Dime to quarter sized hail fell in Albany County

- February 23, 1996: A severe storm caused downed trees and wires

- February 17, 1996: 60 mph winds were recorded at the Albany County Airport, and the wind caused power outages in the Capital Region and surrounding areas for approximately five to seven hours from the mid morning through the afternoon leaving 120,000 National Grid customers in the Capital Region without electricity.

- February 25, 1996: Winds were recorded at 70 mph in Rensselaerville and 53 mph at the Albany County Airport. There was widespread damage to power lines and roofs.

- January 27, 1996: A storm blew the roof off a gas station in Albany County

- August 31, 1995: Thunderstorms downed numerous trees and wires

- August 4, 1995: Thunderstorms downed trees and wires

- July 15, 1995: Severe thunderstorms caused widespread wind damage and hail and 77 mph winds were recorded at the Albany County Airport.

d. Probable Future Events

According to the National Weather Service, approximately 20 to 25 thunderstorms occur in Albany County annually. Each year, a few of the storms are severe thunderstorms. The peak season for severe thunderstorms is June through August. Severe storms are caused by moisture that forms clouds (and precipitation), unstable air that can rise rapidly, and a source of lift that may come from cold or warm frontal activity, air movement (breezes) or heat from the sun. Albany County typically experiences severe thunderstorms during the afternoon and evening during summer months where conditions are right for the formation of storms.

e. Vulnerability Assessment/Estimate of Potential Losses

Since severe storms are a weather related event, all areas of the County are vulnerable. Severe storms have been known to occur in all parts of the County. Since much of the County is developed, the possibility of damage to public and private property is likely due to severe storms. Residential and commercial property is vulnerable, as well as agricultural property. The onset of a severe thunderstorm may be several hours, but many may be caught in a circumstance where they would not be fully prepared, or they may be in a situation where there is simply too little time to respond properly. The warning time for other severe storms may be longer.

The impact of a severe storm is the possibility of serious injury or death, but likely not in large numbers. According to the National Oceanic and Atmospheric Administration (NOAA), an average of 73 people are killed each year by lightning in the U.S. Other impacts include severe property damage, and damage to public facilities. The section of this report on Flood analyzes specific areas of vulnerability for severe weather events that contain heavy precipitation.

According to the Albany County Department of Public Works, severe storms have caused severe damage to infrastructure and property in the past. It may take up to one week for the County's emergency staff to recover from the impacts of a severe storm, including the removal of branches and debris that typically are left after a severe storm.

f. Land Use Analysis/Development Trends

Much of the County is developed, and severe storms in those areas would significantly impact people, property and services. Many of the residential areas, whether in the urban, suburban or rural areas, contain many mature trees that were either part of the former landscape or were planted as part of development. Additionally, typical utility lines (for power, telephone and cable) are located on poles that could be significantly impacted due to damage from severe storms. The severity and extent of damages could be greatly reduced by providing warnings that severe storms are imminent.

2. ICE STORM

An ice storm is freezing rain that accumulates in a substantial glaze layer of ice resulting in serious disruptions of normal transportation, dangerously slippery surfaces and possible downed power lines. The Planning Committee used available data to determine a score of 290 according to the HIRA model ranking system.

a. Location of Affected Area

An ice storm may occur anywhere within the County. The scope of a severe storm may impact a large region. A typical ice storm may impact a significant portion of the County.

b. Magnitude/Severity of Hazard

According to the definition of ice storm, it has the potential to cause significant damage within the County.

Damages due to ice storms may be caused by the weight of accumulated ice on power lines and other structures, fallen tree branches and due to slippery conditions. Damage to power lines may cause power outages that last for weeks. Other damages include the loss of crops due to ice storms, whether due to frozen conditions after the growing season has started or because of the physical damage of ice on the plants. Potential cascade effects of ice storms include flood from heavy precipitation after an icing condition that blocks drainage systems, structural collapse due to the weight snow or water that may accumulate if drainage systems are blocked with ice or due to fallen branches or utility poles, traffic accidents caused by slippery conditions and utility failure due to icing conditions.

c. Past Hazard Events/Historical Damages

Ice storms occur frequently (at least once each year) and during the period October through April in Albany County, according to NOAA. Research reported in Environmental Hazards (journal) indicates that Albany County would experience 5 ice storms of varying degrees (including sleet and freezing rain events) each year.

Significant ice storms are as flows:

- January 14, 15, 2007: According to the Associated Press, a man in Albany fell 90 feet from a bridge to a road below after climbing a railing to avoid being hit by a sliding car that was out of control due to severe icing conditions.

- December 15, 16, 2005: An accumulation of 3-inches of mixed precipitation caused problems with roads and traveling.

- April 3, 2003: An accumulation of ½-inch of ice formed on surfaces due to a late winter storm that hit the Albany region.

- November 16, 2002: A snow and ice storm hit Albany County.

- January 31, 2002: ¼ to ½-inch of ice accumulated on top of several inches of snow within the County.

- January 15, 1999: After an 8-inch snowfall the previous day, temperatures rose and rainfall caused an ice storm with ¼ to ½-inch of ice accumulation. There were scattered power outages and the Northway (I-87) had to be closed from exit 23 southward in the Towns of Bethlehem and Coeymans.

- January 4-9, 1998: Freezing rain fell within the area, causing slippery conditions over a widespread area.

d. Probable Future Events

Ice storms are a result of rainfall onto cold or frozen surfaces. This typically occurs when the temperature is hovering around the freezing mark (32^{o}F). Since ice storms occur frequently (at least once each year), it is likely that ice storms would continue to occur in the County. Research reported in Environmental Hazards (journal) indicates that Albany County would experience 5 ice storms of varying degrees (including sleet and freezing rain events) each year.

e. Vulnerability Assessment/Estimate of Potential Losses

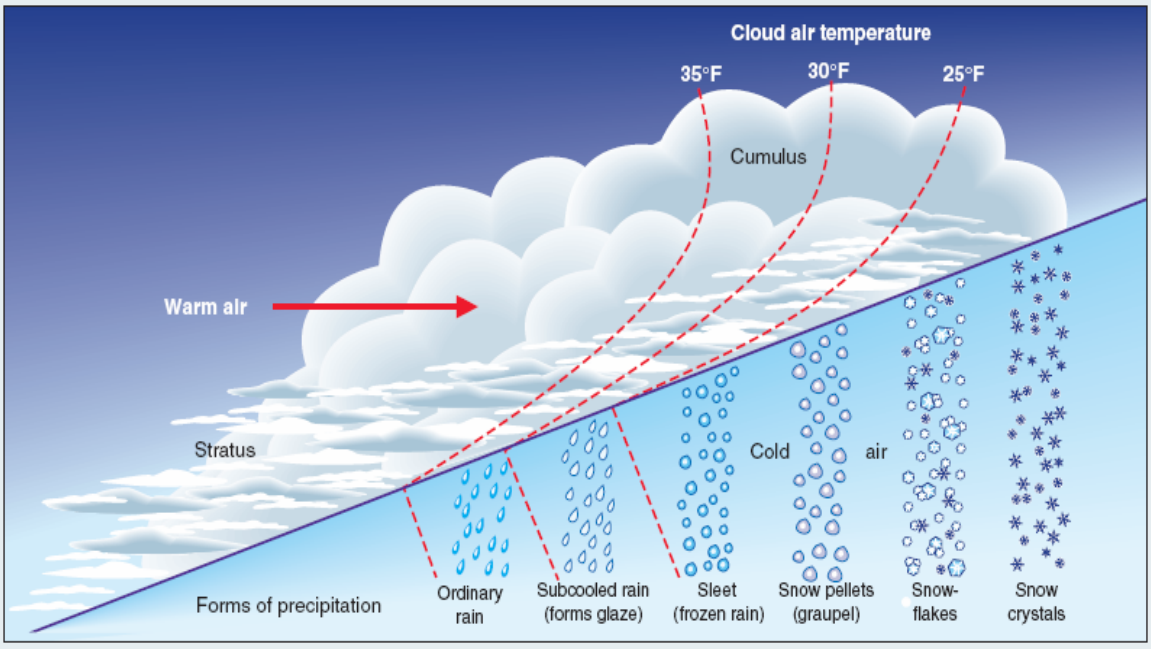
Since ice storms are a weather related event, all areas of the County are vulnerable. The County residents are dependent on personal vehicles, and transportation routes (including personal and public transportation), which are vulnerable and are impacted due to ice storms. The County DPW is responsible for the maintenance of 594 lane miles of road and 78 bridges within the County. All other roads are also vulnerable. The County airport is vulnerable to icing conditions that may cause flight delays and cancellations. Agricultural property is vulnerable to crop damage. Residential and commercial properties are vulnerable to tree and utility damage due to ice storms. Power may be disrupted for weeks due to ice storms. Since much of the County is developed, the possibility of damage to public and private property is likely due to ice storms. The onset of an ice storm may be one day. An ice storm generally lasts approximately one day. The impact of an ice storm is that serious injury or death is unlikely.

Past ice storms have caused severe damage to infrastructure and moderate damage to property. It may take up to one to two weeks for the County's emergency staff to recover from the impacts of a severe storm.

According to the Albany County Department of Public Works, a severe ice storm event historically costs approximately $70,000 to $100,000 for the County, not including other municipalities. A reasonable total municipal expenditure may reach $250,000 to $300,000 per event. This includes the cost of overtime for County personnel, equipment allowances, materials such as salt and sand (etc.), contractor's costs and maintenance. The County responds to an ice storm in much the same way as other severe winter weather. The County would use available DPW equipment including but not limited to sanders, haulers, sanitation trucks, pick-up trucks and other equipment.

f. Land Use Analysis/Development Trends

Much of the County is developed, including residential, commercial and industrial land. There is a road network that connects urban centers and suburban areas with the remainder of the County. Other rural areas contain a network of roads. Many of the residential areas, whether in the urban, suburban or rural areas, contain many mature trees that were either part of the former landscape or were planted as part of development. Additionally, typical utility lines (for power, telephone and cable) are located on poles that could be significantly impacted due to damage from ice storms. The severity and extent of damages could be reduced by requiring underground utility services for new development. Additionally, providing warnings that icing conditions exist would help mitigate adverse impacts.



How ice forms in the atmosphere

Annual mean number of days with freezing rain

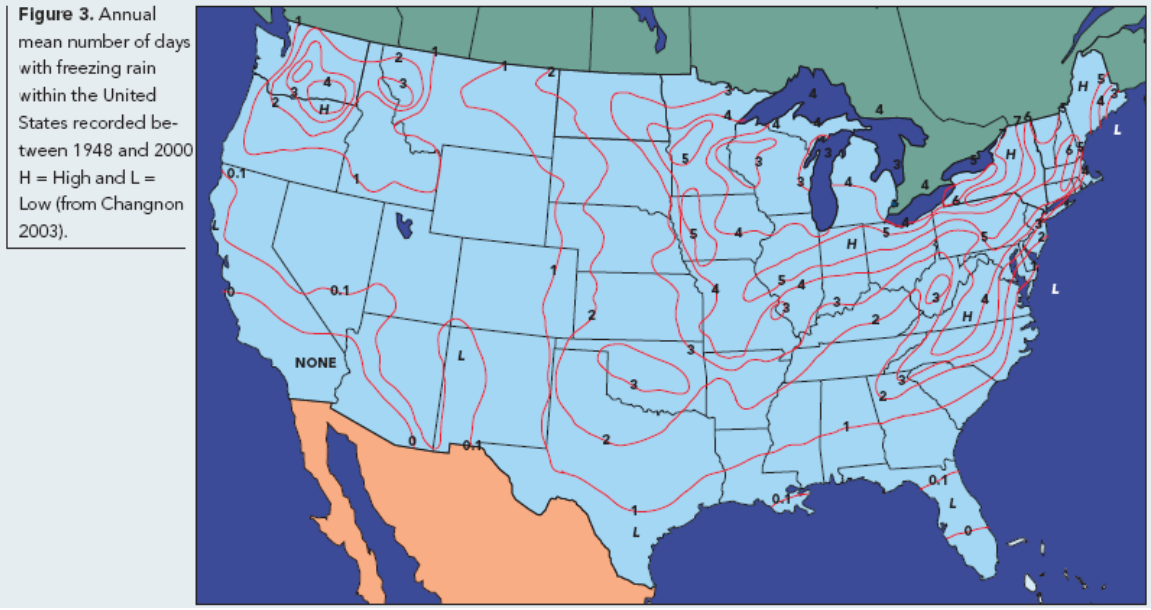


Figure 3. Annual mean number of days with freezing rain within the United States recorded between 1948 and 2000 H = High and L = Low (from Changnon 2003).

3. LANDSLIDE

A landslide is the downward movement of a slope and materials under the force of gravity. According to the HIRA ranking, landslides scored 288 in Albany County.

a. Location of Affected Area

A landslide may impact several individual locations within Albany County.

b. Magnitude/Severity of Hazard

Damages caused by landslides include the closing of roads due to soil and rock material that has been deposited within the roadway, and the blocking of a watercourse due to deposited soil and rock. Potential cascade effects due to landslides include flooding, structural collapse, transportation accidents and utility failures.

The consequences of landslides include the potential loss of life and damage to property and businesses.

c. Past Events/Historical Damages

In May 2000, a landslide occurred along State Route 443 near the Normans Kill Bridge, north of Delmar. Tons of soil that was saturated due to heavy rains slid from Route 443 and below into Normans Kill, forming a dam 90 feet wide and 250 feet long. The dam cause flooding and threatened the bedding material below a 48-inch water main that supplied drinking water to 100,000 residents in Albany. A state of emergency was called because Route 443, a main route between the Town of Bethlehem and Albany had to be closed, affecting more than 19,000 daily commuters. It took months and $1.6 million to redirect the water main open the stream and repair the road. One business was lost due to the landslide.

In 2001, County Road 6 in the Town of Berne (near a tributary to Switz Kill) and County Road 306 (near Normans Kill) in the Town of New Scotland were damaged due to landslides associated with stream side slopes, causing more that $0.5 million in repairs.

Landslides have happened recently in the Albany County area. In February 2007, a large piece of construction equipment was buried due to a landslide along I-890 near the Michigan Avenue exit, located approximately 2 miles north of the Albany County line. This is an area that contains similar soils and similar conditions to those in Albany County where the landslide occurred on Route 443.

d. Probable Future Events

Soils in the area are susceptible to slides due to their makeup, steeply sloping land and the geologic structure below the soil. The Landslide Susceptibility Map indicates landslide prone areas. There is an area designated as a high landslide incidence (the highest risk category) that includes eastern, northeastern and central Albany County. This indicates the likelihood of landslides occurring in the area. According to this map and the examples of occurrences given above, it is likely that landslides would occur in the County in the future.

e. Vulnerability Assessment/Estimate of Potential Losses

The vulnerable areas for landslides overlook roads and watercourses. Since much of the County is developed, the possibility of damage to public and private property is likely due to a landslide. A landslide happens without warning. The duration of the landslide is two to three days. The impact of a landslide is that serious injury or death is likely, but not in large numbers.

Past landslides have caused severe damage to infrastructure and to property. It may take more than two weeks for the County's emergency staff to recover from the impacts of a landslide.

The following are areas that are prone to landslide hazards.

- On existing or former landslides.
- Areas that are on or at the base of slopes.
- Areas that are in or at the base of minor drainage hollows.
- Areas that are at the base or top of an old fill slope.
- Areas that are at the base or top of a steep cut slope.
- Developed hillsides where leach field septic systems are used.

The following are areas that generally considered safe from landslide hazards, according to the USGS.

- On hard, non-jointed bedrock that has not moved in the past.
- On relatively flat-lying areas away from sudden changes in slope angle.
- At the top or along the nose of ridges, set back from the tops of slopes.

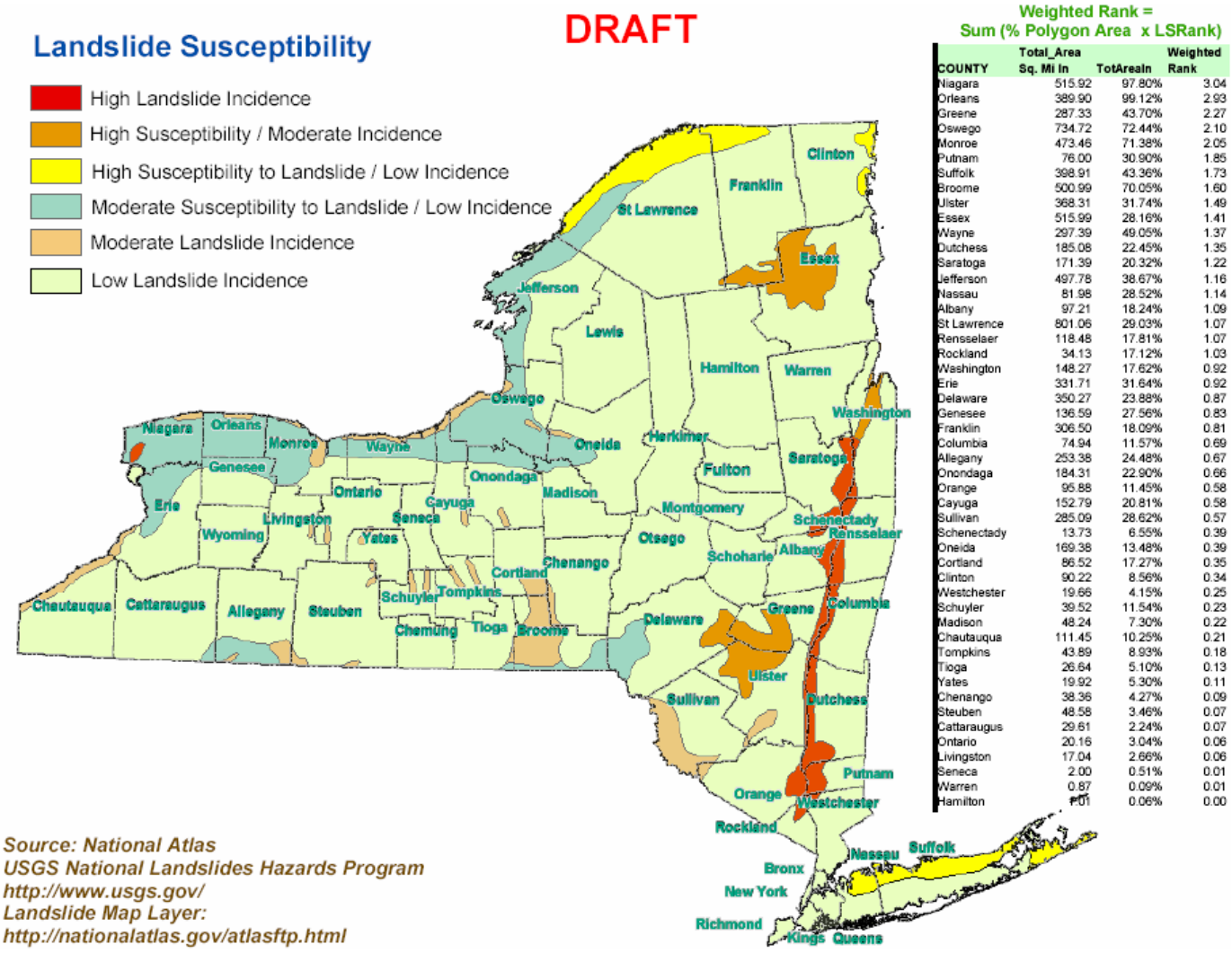
f. Land Use Analysis/Development Trends

The following are warning signs of landslides that should be noted, according to the USGS.

- Springs, seeps, or saturated ground in areas that have not typically been wet before.
- New cracks or unusual bulges in the ground, street pavements or sidewalks.
- Soil moving away from foundations.
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house.
- Tilting or cracking of concrete floors and foundations.
- Broken water lines and other underground utilities.
- Leaning telephone poles, trees, retaining walls or fences.
- Offset fence lines.
- Sunken or down-dropped road beds.

- Rapid increase in creek water levels, possibly accompanied by increased turbidity (soil content).
- Sudden decrease in creek water levels though rain is still falling or just recently stopped.
- Sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb.
- A faint rumbling sound that increases in volume is noticeable as the landslide nears.
- Unusual sounds, such as trees cracking or boulders knocking together, might indicate moving debris.

There are a number of areas within the County that are susceptible to landslides, including areas overlooking roads. The County is developed as a typical modern area where the residents are dependent on transportation by way of the local road system. In order to protect the traveling public, steep land above roads (and watercourses) that are potential landslide areas should be protected from development and disturbance by ordinances.



Weighted Rank = Sum (% Polygon Area x LSRank)

COUNTY	Total_Area Sq. Mi In	TotAreaIn	Weighted Rank
Niagara	515.92	97.80%	3.04
Orleans	389.90	99.12%	2.93
Greene	287.33	43.70%	2.27
Oswego	734.72	72.44%	2.10
Monroe	473.46	71.38%	2.05
Putnam	76.00	30.90%	1.85
Suffolk	398.91	43.36%	1.73
Broome	500.99	70.05%	1.60
Ulster	368.31	31.74%	1.49
Essex	515.99	28.16%	1.41
Wayne	297.39	49.05%	1.37
Dutchess	185.08	22.45%	1.35
Saratoga	171.39	20.32%	1.22
Jefferson	497.78	38.67%	1.16
Nassau	81.98	28.52%	1.14
Albany	97.21	18.24%	1.09
St Lawrence	801.06	29.03%	1.07
Rensselaer	118.48	17.81%	1.07
Rockland	34.13	17.12%	1.03
Washington	148.27	17.62%	0.92
Erie	331.71	31.64%	0.92
Delaware	350.27	23.88%	0.87
Genesee	136.59	27.56%	0.83
Franklin	306.50	18.09%	0.81
Columbia	74.94	11.57%	0.69
Allegany	253.38	24.48%	0.67
Onondaga	184.31	22.90%	0.66
Orange	95.88	11.45%	0.58
Cayuga	152.79	20.81%	0.58
Sullivan	285.09	28.62%	0.57
Schenectady	13.73	6.55%	0.39
Oneida	169.38	13.48%	0.39
Cortland	86.52	17.27%	0.35
Clinton	90.22	8.56%	0.34
Westchester	19.66	4.15%	0.25
Schuyler	39.52	11.54%	0.23
Madison	48.24	7.30%	0.22
Chautauqua	111.45	10.25%	0.21
Tompkins	43.89	8.93%	0.18
Tioga	26.64	5.10%	0.13
Yates	19.92	5.30%	0.11
Chenango	38.36	4.27%	0.09
Steuben	48.58	3.46%	0.07
Cattaraugus	29.61	2.24%	0.07
Ontario	20.16	3.04%	0.06
Livingston	17.04	2.66%	0.06
Seneca	2.00	0.51%	0.01
Warren	0.87	0.09%	0.01
Hamilton	1.01	0.06%	0.00

Source: National Atlas
USGS National Landslides Hazards Program
http://www.usgs.gov/
Landslide Map Layer:
http://nationalatlas.gov/atlasftp.html

4. WINTER STORMS (severe)

A winter storm is a storm system that develops in late autumn to early spring and deposits wintry precipitation, such as snow, sleet, or freezing rain, with a significant impact on transportation systems and public safety. For this analysis, the following meets this definition:

Heavy Snow: Six inches in 12 hours or less.

Blizzard: Characterized by low temperatures, winds 35 mph or greater, and sufficient falling and/or blowing snow in the air to frequently reduce visibility to 1/4 mile or less for a duration of at least three hours.

Severe Blizzard: Characterized by temperatures near or below 10^{o} F, winds exceeding 45 mph, and visibility reduced by snow to near zero for a duration of at least three hours.

The Planning Committee used available data to determine a score of 288 according to the HIRA model ranking system.

a. Location of Affected Area

A severe winter storm may occur anywhere within the County. A typical severe winter storm would impact a large region and may impact a significant portion of the County, and likely the entire County.

b. Magnitude/Severity of Hazard

According to the definition of severe winter storm, it has the potential to cause significant damage within the County.

Damages due to severe winter storms may be caused by the weight of accumulated ice or snow power lines and other structures, fallen tree branches and due to snow covered, drifted or slippery conditions. Potential cascade effects of severe winter storms include flood from heavy precipitation after an icing condition that blocks drainage systems, ice jams, structural collapse due to the weight snow or water that may accumulate if drainage systems are blocked with ice or due to fallen branches or utility poles, traffic accidents caused by drifted or slippery conditions and utility failure due to icing conditions and fallen tree branches.

c. Past Hazard Events/Historical Damages

Severe winter storms occur frequently (at least once each year) and during the period November through April in Albany County, according to the NOAA statistics. According to NOAA, Albany County has experienced snow storms of 12-inches or more 50 times within a 120 year period of record. The following tables show the statistics of the major snowfalls for Albany County, with snowfall amounts reported at various locations, according to NOAA and the CBS6 News in Albany.

GREATEST SNOWSTORMS

ALBANY NY

(from National Climatic Data Center and CBS6 News in Albany)

Amount (inches)	Month	Date(s)	Year
46.7	March	11-14	1888
32	March	22	1914
29.3	March	13-14	1993
29.0	December	25-26	2002
28.0	February	14	2007
26.4	December	25-28	1969
26.0	March	31	1997
24.7	December	13-15	1915
24.5	January	15-16	1983
23.5	March	4-6	2001
23.5	February	14	1914
23.5	December	18-22	1887
22.5	November	24-25	1971
21.0	December	6-7	2003
20.8	January	3-4	2003
19.6	December	14-18	1981
18.8	March	13-14	1984
18.3	December	24-25	1966
18.2	February	22-25	1893
18.0	February	17	2003
18.0	January	6-7	2002
18.0	December	30-31	2000
17.9	February	15-16	1958
17.9	January	18-20	1936
17.8	March	8-12	1941
17.7	April	6-7	1982
17.6	January	14-19	1958
17.3	March	5-8	1996
17.0	January	22-23	2005
17.0	March	16-17	2007
16.0	January	25-26	2000
16.0	February	24-25	1998
15.0	April	9	2000
14.0	Feb - March	28-2	2005
14.0	February	17	2003
Records beginning 1874			

The following is an account of a recent snowfall within the County.

February 14, 2007: A nor'easter with heavy snowfall that fell at rates of 4 to 6-inches per hour. Local government offices, schools, malls, shops, and restaurants were shut down, as well as the County Airport, and Amtrak. Total snowfall for the County is as follows:

Town	County	Snowfall Report	Town	County	Snowfall Report
Albany (NWS)*	Albany	16.8"	Albany (Pine Bush)*	Albany	21.0"
Knox	Albany	23.0"	Colonie	Albany	20.5"
Delmar	Albany	16.0" - 17.0"	Menands	Albany	16.0"
Preston Hollow	Albany	22.5"	Cohoes	Albany	22.0"
Potter Hollow	Albany	28.0"	Westerlo	Albany	19.0"
East Berne	Albany	22.0"	Green Island	Albany	18.0"
South Berne	Albany	28.0"			

There was a severe snowstorm that occurred in the early fall on October 4, 1987, when heavy rainfall turned to heavy snow. Large tree branches (that still contained leaves) had fallen under the weight of the snow on the branches. Power lines were downed and roads were blocked. According to the Times Union news, many people were without power for as many as ten days in areas. Parts of the State east of the Hudson River received up to 19 inches of snow from the storm.

d. Probable Future Events

Severe winter storms are a common occurrence in Albany County and happen frequently (at least once each year). It is likely that severe winter storms would continue to occur in the County.

e. Vulnerability Assessment/Estimate of Potential Losses

Since severe winter storms are a weather related event, all areas of the County are vulnerable. The elderly and infirmed are particular vulnerable. The County road system and the County airport are also vulnerable. As previously mentioned, the County DPW is responsible for the maintenance of 594 lane miles of road and 78 bridges within the County. Heavy snow could cause road and airport closings and cause significant delays in travel time. Since much of the County is developed, the possibility of damage to public and private property is likely due to winter storms. The onset of a winter storm may be one day. A severe winter storm generally lasts one or two days, and many have lasted 2 to 4 days. The impact of a winter storm is that serious injury or death is unlikely.

Past winter storms have caused moderate damage to infrastructure and to property. It may take up to one week for the County's emergency staff to recover from the impacts of a severe storm.

According to the Albany County Department of Public Works, a severe winter storm event historically costs approximately $ 225,000. This includes the cost of overtime for County personnel for plowing and snow removal, equipment allowances, materials such as salt and sand (etc.), contractor's costs and maintenance. The County responds to severe winter weather in that it would use available DPW equipment including but not limited to sanders, haulers, plow trucks, pick-up trucks and other equipment. The projected cost County-wide for all roads is estimated to be $1.5 to $2 million.

f. Land Use Analysis/Development Trends

The County contains a large percentage of developed area and there is a significant population within the County. There is a road network that connects urban centers and suburban areas with other areas of the County. Other rural areas also contain a network of roads. The residents within the County are dependent on the local road system and the airport for transportation, which are impacted due to severe winter weather. The severity and extent of impacts could be mitigated by providing warnings that severe winter weather is imminent.

5. TORNADO

A tornado is a local atmospheric storm, generally of short duration formed by winds rotating at very high speeds. 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 of funnel that extends from a storm cloud. Wind speeds in tornadoes may range from approximately 40 miles per hour to an estimated 300 miles per hour. The Planning Committee used available data to determine a score of 280 according to the HIRA model ranking system.

a. Location of Affected Area

Tornadoes are formed when winds from different directions and velocities that vary with height cause a horizontal spinning effect in the lower atmosphere. Rising air due to updrafts (typically in storm clouds) lifts the rotating air into a vertical position. If the rotation is strong enough a tornado could form. These conditions could form anywhere within the County. A typical tornado may be relatively narrow, however, it would typically travel along a path that would extend from a fraction of a mile to many miles before losing strength. A tornado may impact a local neighborhood or a small region or portion of the County.

b. Magnitude/Severity of Hazard

Damages due to tornadoes are likely caused by tree branches and wind borne debris. The high winds associated with tornadoes may cause structural damage to buildings and property, or utility poles and power lines. Potential cascade effects of tornadoes include explosions caused by damage to combustible materials, fire from lightning strikes or downed power lines, flood from heavy precipitation, hazardous material releases due to damage to chemical storage facilities, oil spills caused by damage to storage facilities, severe storms associated with tornadic activity, structural collapse, traffic accidents caused by severe weather conditions, poor visibility, or debris and utility failure caused by damage to utility poles due to winds or lightning.

Tornadoes are classified according to the Fujita scale. The Fujita scale ranges from F0 (weakest) to F5 (strongest conceivable), as shown and described in the following table. It should be noted that beginning on February 1, 2007, NOAA starting using what is called the Enhanced F-Scale (EF). The EF scale was developed to more accurately estimate wind speeds of tornadoes that are not measured, but based on damages, using 28 damage indicators with varying degrees of damage based on experimental data and research.

c. Past Hazard Events/Historical Damages

Tornadoes occur infrequently (once every 8 to 50 years according to FEMA definitions) and generally during the spring and summer months in Albany County, according to the National Climatic Data Center at NOAA (National Oceanic and Atmospheric Administration). According to NOAA, seven tornadoes have been confirmed in Albany County during the period between 1950 and 2006. The tornadoes and their magnitude and damages are given in the table following the Fujita Scale.

Enhanced Fujita Scale for Tornado Severity

F0 Very Weak Tornado 65-85 mph winds

Damages chimneys or TV antennae; breaks branches off trees; pushes over trees; shallow-rooted old trees with hollow inside break or fall; sign boards damaged.

F1 Weak Tornado 86-110 mph winds

Peels surface off roofs; windows broken; trailer houses pushed or overturned; trees on soft ground uprooted; some trees snapped; moving autos pushed off the road.

F2 Strong Tornado 111-135 mph winds, 100-200 yards wide

Roof torn off frame houses heaving strong upright walls standing; weak structure or outbuildings demolished; trailer houses demolished; railroad boxcars pushed over, large trees snapped or uprooted; light-object missiles generated; cars blown off highway; block structures and walls badly damaged.

F3 Severe Tornado 136-165 mph winds, 200yds-1/4 mile across

Roofs and some walls torn off well-constructed fame houses; some rural mi across buildings completely demolished or flattened; trains overturned; steel framed hangar-warehouse type structures torn; cars lifted off ground and may roll some distance; most trees in a forest uprooted, snapped, or leveled; block structures often leveled.

F4 Devastating Tornado 166-200 mph winds, 1/4-1 mile across

Well constructed frame houses leveled, leaving piles of debris; structures with weak foundation lifted, torn, and blown off some distance; trees debarked by small flying debris; sandy soil eroded and gravels fly in high winds; cars thrown some distances or rolled considerable distances.

F5 Incredible Tornado 201 (and above) mph winds, 1/2-2 miles across

Strong frame houses lifted clear off foundation and carried considerable distance; steel reinforced concrete structures badly damaged; automobile-sized missiles fly through the distance of 100 yards or more; trees debarked completely.

The Fujita Scale, named for Dr. T.T. (Ted) Fujita, is a classification model that equates tornado wind speeds with potential damage.

ALBANY COUNTY TORNADO DATA

7 TORNADO(s) were reported in **Albany County, New York** between **01/01/1950** and **10/31/2006**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

New York								
Location or County	**Date**	**Time**	**Type**	**Mag**	**Dth**	**Inj**	**PrD**	**CrD**
1 ALBANY	06/30/1973	1615	Tornado	F1	0	2	25K	0
2 ALBANY	06/16/1974	1215	Tornado	F3	0	0	0K	0
3 ALBANY	07/11/1980	1500	Tornado	F0	0	0	3K	0
4 ALBANY	05/12/1984	1325	Tornado	F0	0	13	25K	0
5 ALBANY	07/10/1989	1257	Tornado	F4	0	0	25.0M	0
6 ALBANY	08/28/1990	1930	Tornado	F0	0	0	250K	0
7 Colonie	05/31/1998	03:37 PM	Tornado	F1	0	0	25K	0
				TOTALS:	**0**	**15**	**$25.328M**	**0**

Besides the above, a funnel cloud was sighted along Fuller Road on May 18, 2000, according to the National Weather Service.

The data from NOAA indicates that there has been one F4, one F3, two tornadoes classified as F1 and three F0.

According to data provided by NOAA, there were no deaths recorded due to past tornadoes. There were 15 injuries reported, and 13 of them were due to an F4 magnitude tornado that occurred on July 10, 1989. Total damages for tornadoes in Albany County are reported at $25.328 M.

d. Probable Future Events

Seven confirmed tornadoes occurred within a 56 year period in Albany County. However, all seven occurred between 1973 and 1998, a 25 year period. It is likely that tornadoes would continue to occur in the County. Due to the nature of tornadoes, they could form over adjacent counties and travel from one county to another to impact areas within the County.

Conditions within the area are right for the formation of tornadoes, albeit on a small scale. Low level humid air can be drawn from the Atlantic Ocean into the Hudson/Mohawk River valleys via southerly winds, common within the area during warm spells. Southwesterly winds at 4,000 feet or so would typically pass over the Catskill Mountains to the west and southwest. This situation results in instability that can cause rotating air masses that can result in a tornado when an overriding trough (such as a cool front or cold front) passes. The New York State SEMO wind zone map indicates that most of Albany County is within zone 2 and the southwest portion of the County is within zone 3. Zone 2 is the 160 mph zone and Zone 3 is the 200 mph zone.

e. Vulnerability Assessment/Estimate of Potential Losses

Since tornadoes storms are a weather related event, all areas of the County are vulnerable. Since much of the County is developed, the possibility of damage to public and private property is likely due to tornadoes. Residential and commercial property is particularly vulnerable, especially certain types of home construction such as trailer parks (there are four within the County, listed in Part I of this report). Agricultural land is also vulnerable to tornado damage, which could completely destroy crops. Tornadoes occur with little or no warning. Usually warnings are given once a tornado is known to have touched down. Given that, it is likely that people may be caught in a circumstance where they would not be fully prepared.

According to NOAA, over two-thirds of all tornadoes are considered weak, have a lifespan of one to ten minutes, and winds of less than 110 miles per hour. Strong tornadoes may last 20 minutes or longer and have wind speeds up to 200 miles per hour. Less than 2% of all tornadoes are classified as violent tornadoes that may have a lifespan of an hour or more and winds greater than 200 miles per hour. It is likely that future tornadoes would be weak, according to the historical data.

The impact of a tornado is the possibility of serious injury or death, but not likely in large numbers. A tornado would cause severe damage to infrastructure and property. It may take up to one week for the County's emergency staff to recover from the impacts of a tornado. Protection from a tornado, and prevention or limitation of damages from a

tornado, like any severe storm, would depend on the length of warning time given to prepare.

Typical tornadoes of the F0 and F1 magnitude have caused $25,000 in property damage. The F4 tornado of 1989 caused $25M in property damage.

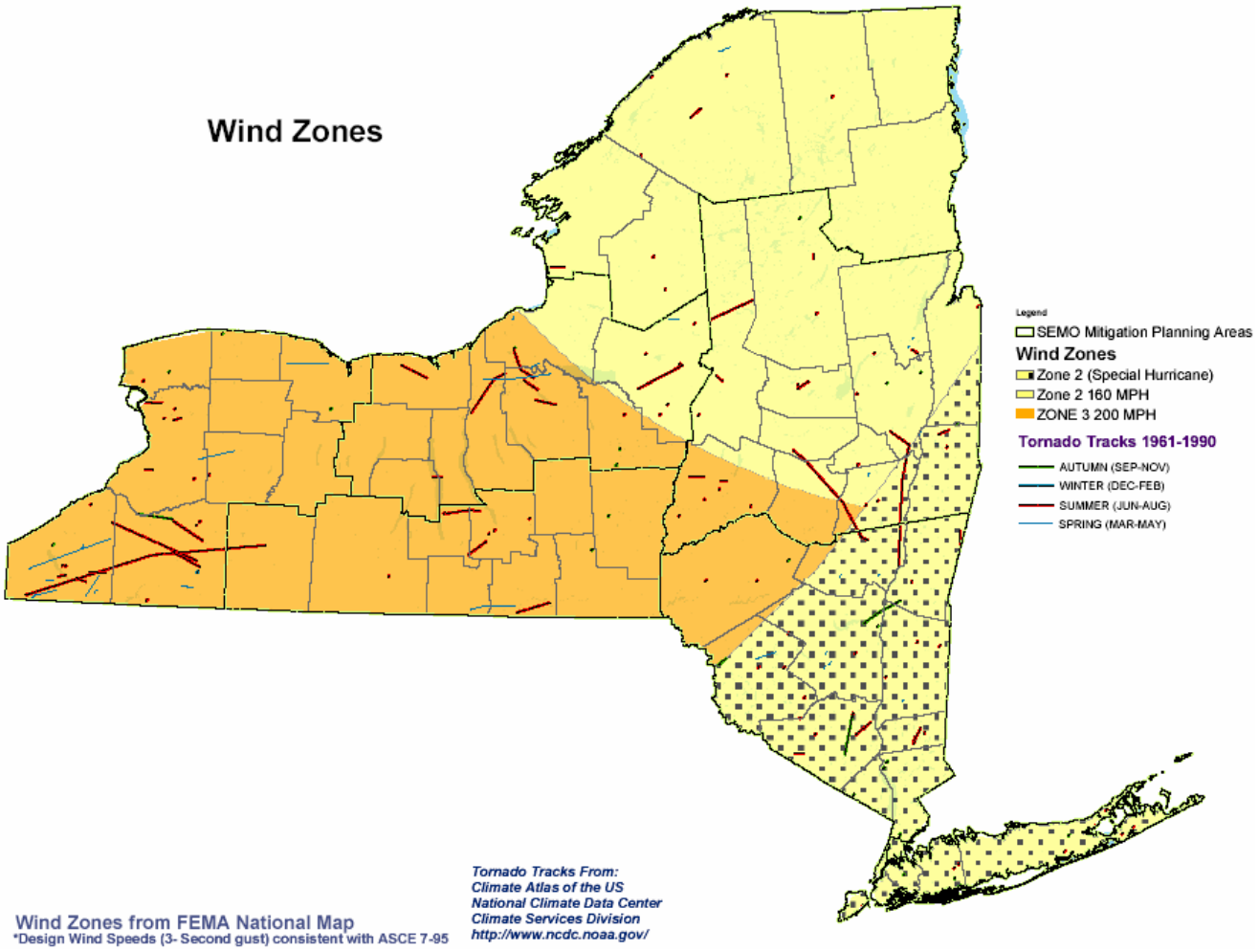
An estimate of potential damages from tornadoes is provided in the descriptions that are included with the Fujita Scale table. Based on past data, it is likely that a tornado would be in the F0 to F2 range on the scale. Damages that could be expected due to an F2 tornado include uprooting of trees, blown-off roof tops, broken windows, destruction of weak structures and scattered debris.

According to NOAA, weak tornadoes would be on the ground for 1 to 10 minutes, and tornadoes typically move at 30 mph. According to the Fujita Scale, an F2 tornado is 100 to 200 yards wide.

Assuming an F2 tornado that is on the ground for 5 minutes (in the middle of the range given above), and is 150 yards wide (in the middle of the range given above), the path of destruction would be 2.5 miles long by 150 yards wide. If this were to pass through a densely developed residential area, approximately 600 homes would be damaged (assuming a typical lot size of 60 feet by 100 feet). Using the description of typical damages associated with F2 tornadoes (according to the Fujita Scale and outlined above), approximately $10,000 damage could be possible per home, which is a total of $6,000,000.

f. Land Use Analysis/Development Trends

The County contains a large percentage of developed area and there is a significant population within the County. The severity and extent of impacts could be mitigated by providing warnings that severe weather including tornadoes is imminent. If conditions in the atmosphere are detected early enough, adequate warnings may be provided given modern weather forecasting models and telecommunication media.


Wind Zones
Legend
SEMO Mitigation Planning Areas
Wind Zones
Zone 2 (Special Hurricane)
Zone 2 160 MPH
ZONE 3 200 MPH
Tornado Tracks 1961-1990
AUTUMN (SEP-NOV)
WINTER (DEC-FEB)
SUMMER (JUN-AUG)
SPRING (MAR-MAY)
Tornado Tracks From:
Climate Atlas of the US
National Climate Data Center
Climate Services Division
http://www.ncdc.noaa.gov/
Wind Zones from FEMA National Map
*Design Wind Speeds (3- Second gust) consistent with ASCE 7-95