

### **3.7 - Winter Storm Hazard Profile**

Though not as highly ranked as a number of other hazards at the State level, winter storms and blizzards constitute an important hazard of Local concern because of their frequency and drain on Local response resources.

The profile outlined in this section has been developed from the following sources:

- *Northeast Regional Climate Center (NRCC) based at Cornell University.* A review of the climatic conditions of New York State, and their effects upon persons, property, and economics. This document was obtained from the following Cornell University web site [http://nysc.eas.cornell.edu/climate\\_of\\_ny.html](http://nysc.eas.cornell.edu/climate_of_ny.html). The center is a partner of the National Climatic Data Center. The NRCC contact person is Keith Eggleston.
- *NOAA Satellite and Information Services and National Climate Data Center.* <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms> . This web-based database maintains the records for many types of disasters dating back to 1950, and allows users to make queries by state, disaster type, and time period, etc.
- *Situation Reports issued by the NYS Emergency Management Office (SEMO).* These reports outline the occurrence of significant winter storms as they have occurred within the State.
- *Erie County All-Hazard Mitigation Plan*

The following chart provides the definition of a winter storm:

| Term                | Definition   |
|---------------------|--|
| <b>Winter Storm</b> | Includes ice storms, blizzards, and can be accompanied by extreme cold. The National Weather Service characterizes blizzards as being combinations of winds in excess of 35 miles per hour with considerable falling or blowing snow, which frequently reduces visibility. |

Winter storm hazards in New York State are virtually guaranteed yearly since the State is located at relatively high latitudes resulting winter temperatures range between 0 degree F and 32 degree F for a good deal of the fall through early spring season, that is from late October until Mid-April. In addition, the State is exposed to large quantities of moisture from both the Great Lakes and the Atlantic Ocean. While it is almost certain that a number of significant winter storms will occur during the winter – Fall season, what is not easily determined is how many storms will occur during that time frame. For example, during the calendar year 1997, three (3) significant winter storms occurred. During the calendar year 2000, sixteen (16) such storms were noted.

A secondary consideration is the occurrence of an *ice storm*. Ice storms deposit layers of ice upon roadways, sidewalks, trees, power, and telephone lines generally causing major damage, and often some deaths. Luckily, ice storms occur far less frequently than storms that deposit significant quantities of snow and/or sleet. Also, they generally do not last for more than one or two days. However, in the recent past there have been two major ice storms that lasted longer – one in 1991, and one in 1998. Both storms caused major power outages, property damages, and deaths. As with other winter storms the frequency of occurrence cannot be predicted.

**Geographic Location/Extent/Severity:**

Communities in New York receive more snow than most other communities in the Nation. Syracuse, Buffalo, Rochester, and Albany are typically in the top 10 cities in the Nation in annual snowfall. These municipalities are located in Onondaga, Erie, Monroe, and Albany Counties. Although the entire State is subject to winter storms, the Easternmost, and West-Central portions of the State are more likely to suffer under winter storm occurrences than are other locations. The six (6) million-acre Adirondack Park in Northeast NY including mainly Hamilton and Essex counties, also receives extensive annual snowfall; however, this is the least populous region of the State. Eastern N.Y., which includes New York City and Long Island, are vulnerable to storms known as “Nor’easters”. These storms usually form off the U.S. East Coast near the Carolinas then follow a track northward along the coast until they blow out to sea, hence the term “Northeaster”. Occasionally these storms are large enough to encompass almost the entire State. One such storm was the Blizzard of 1993. Most often however, Nor’easters affect primarily eastern and southern New York. Nor’easters are most notable for snow accumulations in excess of nine (9) inches, accompanied by high, sometimes gale force, winds, and storm surges which cause severe flooding along the Long Island coastline. Major property damage and power outages are not uncommon.

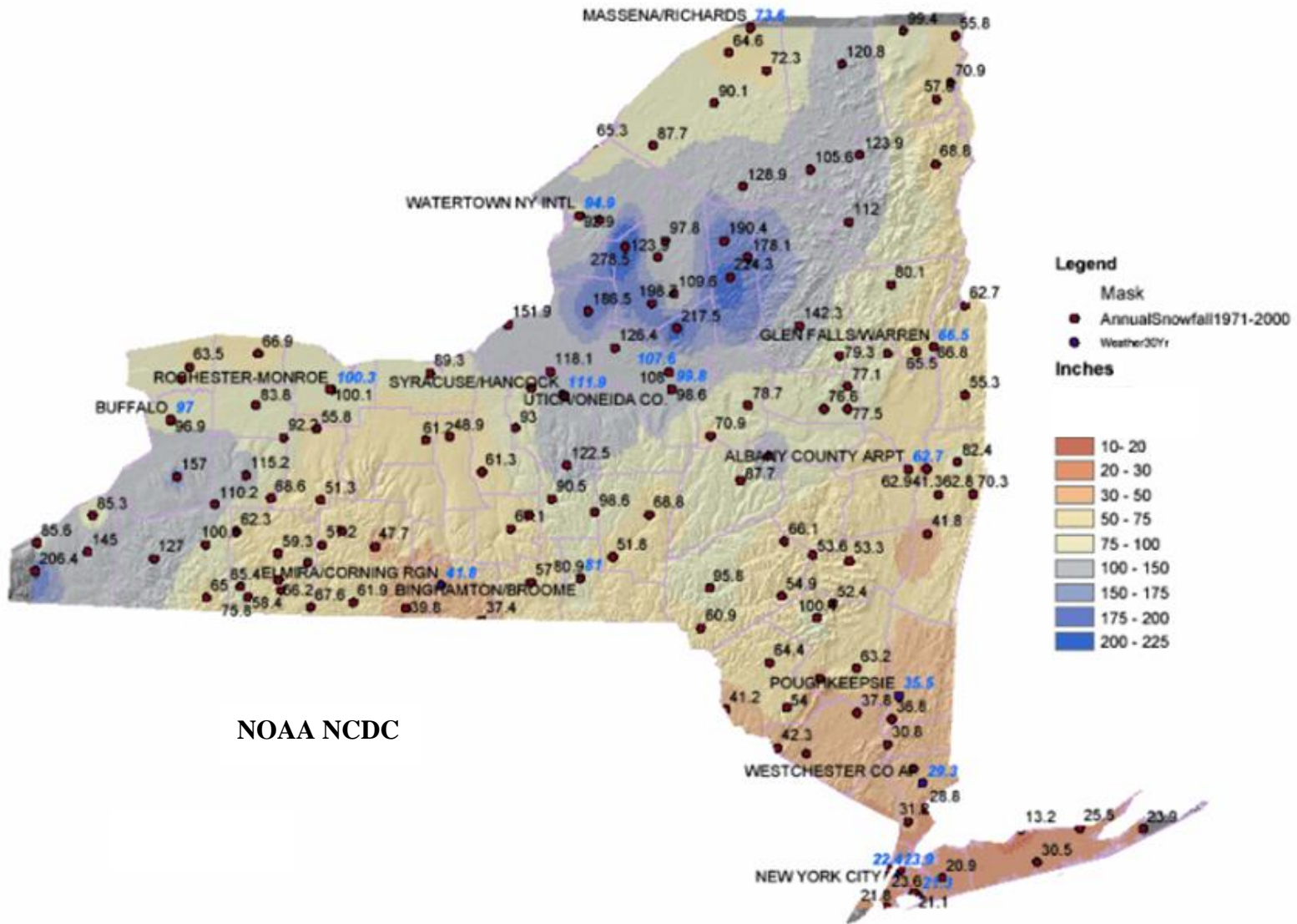
The other winter storm that generally has major effects is what is known as a “Lake Effect” storm. Moisture is picked up from the Great Lakes and then blown across the western - central portion of the State often leaving huge quantities of snow in its wake. The major effect of lake effect storms are large snow accumulations, and high winds. One lake effect storm during February 2004 left a community with over 90 inches of snow in only a few days. Lake effect storms usually occur in the west-central portion of the State, but have been known to affect the eastern portion if the storm becomes large enough.

Average annual snowfall in the State is about 65", but it varies greatly in different parts of the State. Parts of Herkimer, Jefferson, and Lewis Counties receive the heaviest snowfall at well over 100", while Long Island has the lightest snowfall. Snow usually falls from October through April. The greatest average snowfall is in the month of February. **Figure 3-105**, the NY annual normal snowfalls map, depicts comprehensive overview of annual average snowfall totals over a 30 year period. The general indication of the average annual snowfall map shows areas that are subject to a consistent risk for large quantities of snow.

Both Nor’easters and Lake Effect storms cause major damages in their wake, usually by disrupting transportation, limiting communications, causing power outages, and under the most severe circumstances, requiring persons to abandon their homes and seek shelter in community centers.

Figure 3-105

# Annual Snowfall Normals 1971-2000



NOAA NCDC

**Previous Significant Occurrences:**

A significant winter storm generally occurs over more than a single day, two days being common, and three days being rare. Some lake effect storms have been known to continue for more than four (4) days. In the case of the ice storms of 1991 and 1998 the duration of the storm was in excess of four (4) days. Other significant winter storms in the recent past are as follows:

- 1997 – December
- 1998 – February
- 1999 – January
- 2000 – November and December
- 2001 – March
- 2002 – November and December
- 2003 – January, April and November
- 2004 – March
- 2006 – October
- 2007 – February

A variety of winter weather related events can cause significant damage to the tree resources of an area. For instance, in March 1991, in western New York, a severe winter storm caused heavy ice accumulation on tree branches, bending or breaking limbs and tree boles, or toppling trees. The resulting tree debris disrupted power lines, blocked roads, and damaged residential and commercial property. Subsequent disturbance can also occur when broken limbs or whole trees can suddenly break and fall. These "widow makers" are high priority for removal after the event to prevent personal injury.

Damage from the January 1998 ice storm event was extensive across northern New York, northern New England and Canada. Over 17 million acres were impacted; with 5 million acres experiencing severe damage. The combination of cold surface temperatures, warm air aloft, and several days of rain contributed to the accumulation of more than four inches of ice in some areas. Hardwoods suffered the greatest damage, as was evident in the areas with many sugar maple trees. The magnitude of power disruption, debris removal, emergency tree pruning and removal, and the resulting loss of the resource was unprecedented. Further, the weakening of tree limbs during the storm left open the possibility of similar damage from future weather related events.

**Table 3-35  
FEMA Historical Snow Related Disaster and Emergency Declarations**

| Disaster #     | Type/Location/Date Declared/Damages  |
|----------------|--|
| <b>DR-527</b>  | Snowstorms - Cattaraugus, Chautauqua, Erie, Genesee, Jefferson, Lewis, Niagara, Orleans, Wyoming Declared 2/5/77   |
| <b>DR-801</b>  | Snowstorm, East Central N.Y.S., Albany, Columbia Dutchess, Greene, Putnam, Rensselaer, Saratoga, Schenectady, Washington - declared 11/10/87<br>Total Eligible Damages: \$13.5 million |
| <b>EM-3107</b> | Statewide Blizzard, declared 3/17/93 Total Eligible Damages: \$8.4 million   |

|                |  |
|----------------|--|
| <b>DR-1083</b> | Southern New York Blizzard, Albany, Bronx, Columbia, Delaware, Dutchess, Greene, Kings, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester declared 1/12/96<br>Total Eligible Damages: \$21.3 million                                |
| <b>EM-3136</b> | Snow Emergency incl. Chautauqua, Erie, Genesee, Jefferson, Lewis, Niagara, Orleans, St. Lawrence, Wayne, and Wyoming - Incident period 1/1/99 – 1/15/99.   |
| <b>EM-3138</b> | Snow Emergency including Livingston, Monroe, Ontario Orleans, Wayne, and Wyoming, Incident period 3/3/99 – 3/6/99  |
| <b>EM-3157</b> | Snow Emergency including Erie, Cattaraugus, and Chautauqua Co.s, Incident Period 11/18/00 – 11/22/00   |
| <b>EM-3170</b> | Snowstorm. Erie, Niagara, Cattaraugus, Chautauqua, Wyoming, and Genesee. Incident Period: December 24, 2001 through December 29, 2001 Declaration Date: January 1, 2002  |
| <b>DR-1404</b> | Snowstorm, Erie County, declared 3/1/02 Total Eligible Damages: \$8.1 million  |
| <b>EM-3173</b> | Snowstorm. Albany, Chenango, Columbia, Delaware, Greene, Herkimer, Montgomery, Otsego, Schenectady, Sullivan, Ulster, Broome, Fulton, Oneida, Orange, Madison, Saratoga, and Schoharie Counties. Declaration Date: February 25, 2003. Incident Period: December 25-26, 2002, and January 3-4, 2003 |
| <b>EM-3184</b> | Snowstorm. Albany, Broome, Chenango, Columbia, Delaware, Dutchess, Greene, Nassau, Orange, Putnam, Rockland, Schenectady, Schoharie, Suffolk, Sullivan, Ulster and Westchester Counties, and New York City. Declaration Date: March 27, 2003. Incident Period: February 17-18, 2003                |
| <b>EM-3195</b> | Snow. Cayuga, Lewis, Oneida, and Oswego. Declaration Date: March 3, 2004. Incident Period: January 28-31, 2004.  |
| <b>EM-3268</b> | Snowstorm. Erie, Genesee, Niagara, and Orleans. Declaration Date: October 15, 2006. Incident Period: October 12, 2006, and Continuing  |
| <b>EM-3273</b> | Snow. Lewis, Oneida, and Oswego Counties. Declaration Date: February, 23 2007. Incident Period: February 2-12, 2007  |

**Table 3-36  
FEMA Historical Ice Related Disaster Declarations**

| <b>Disaster #</b> | <b>Type/Location/Date Declared/Damages</b>  |
|-------------------|---|
| <b>DR-898</b>     | Ice storm, West Central N.Y.S., declared 3/18/91<br>Total Eligible Damages: \$52.4 million        |
| <b>DR-1196</b>    | North Country Ice Storm, declared 1/10/98<br>Total Eligible Damages: \$68.1 million               |
| <b>DR-1467</b>    | April Ice Storm, declared 5/12/03 Central NYS<br>Total Estimated Eligible Damages: \$41.4 million |

Figure 3-106

# Presidential Disaster Declarations Winter Snow Storms and Blizzards 1953 - August 2007

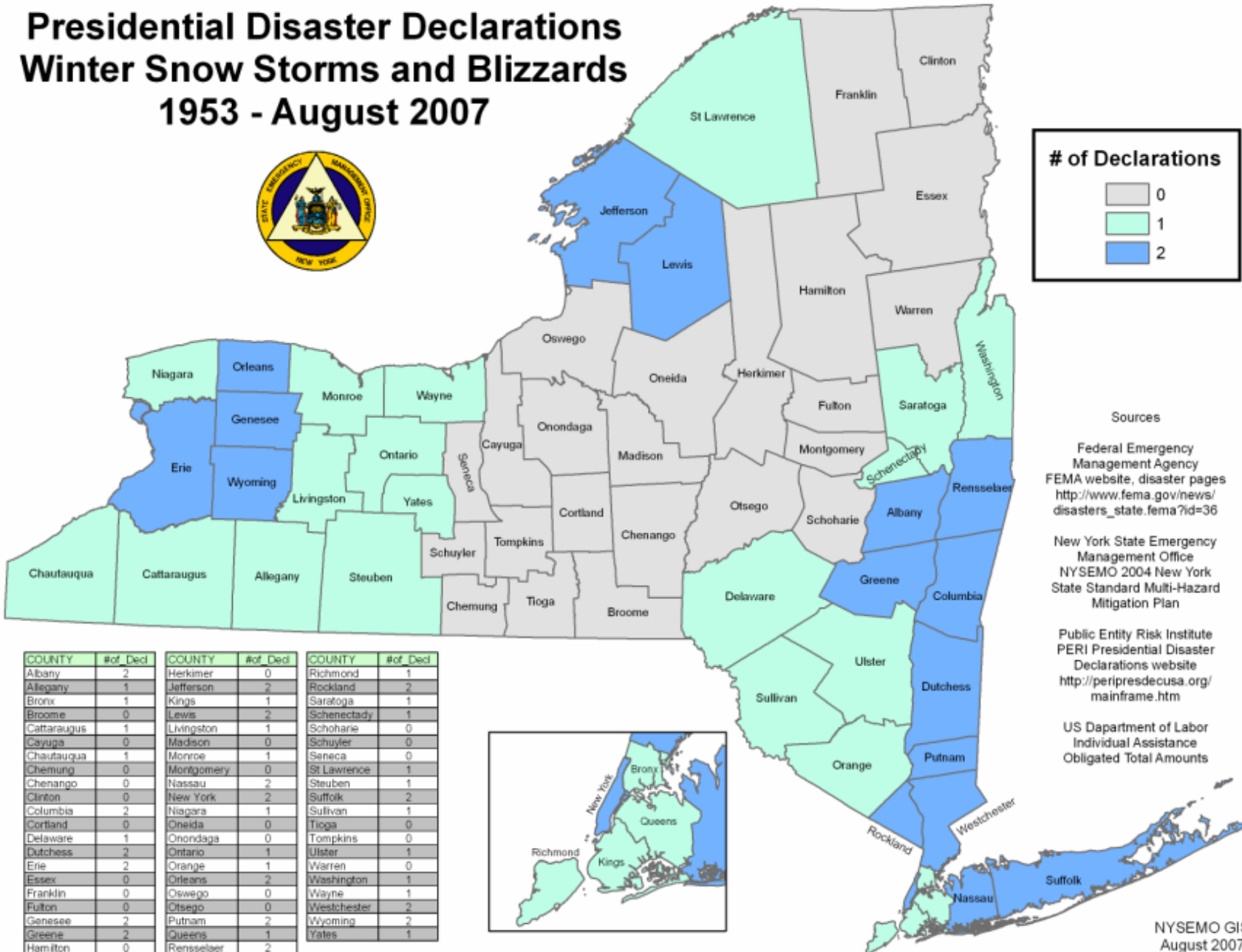
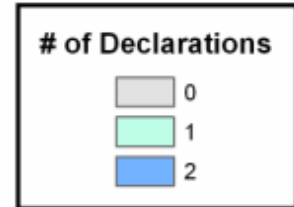
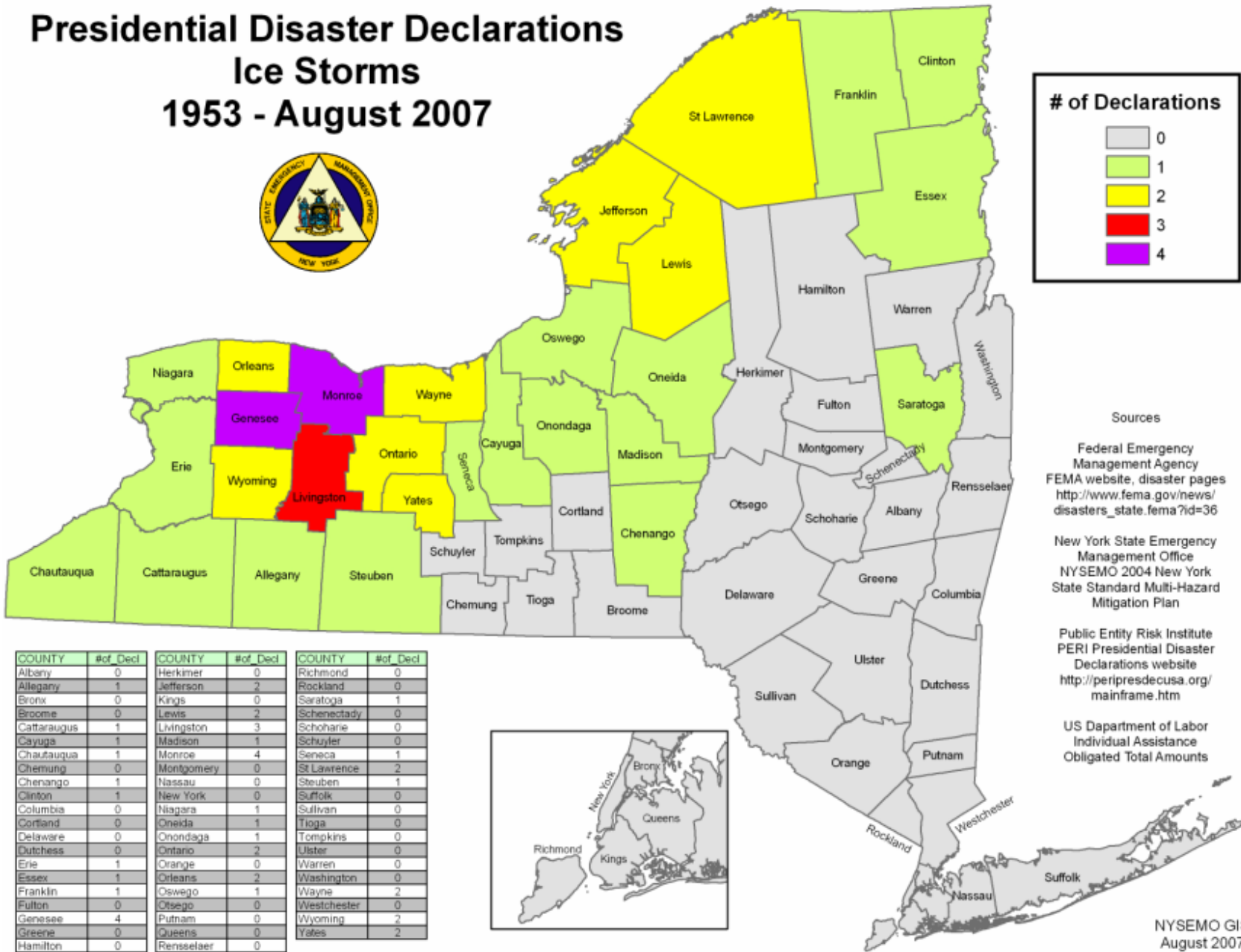
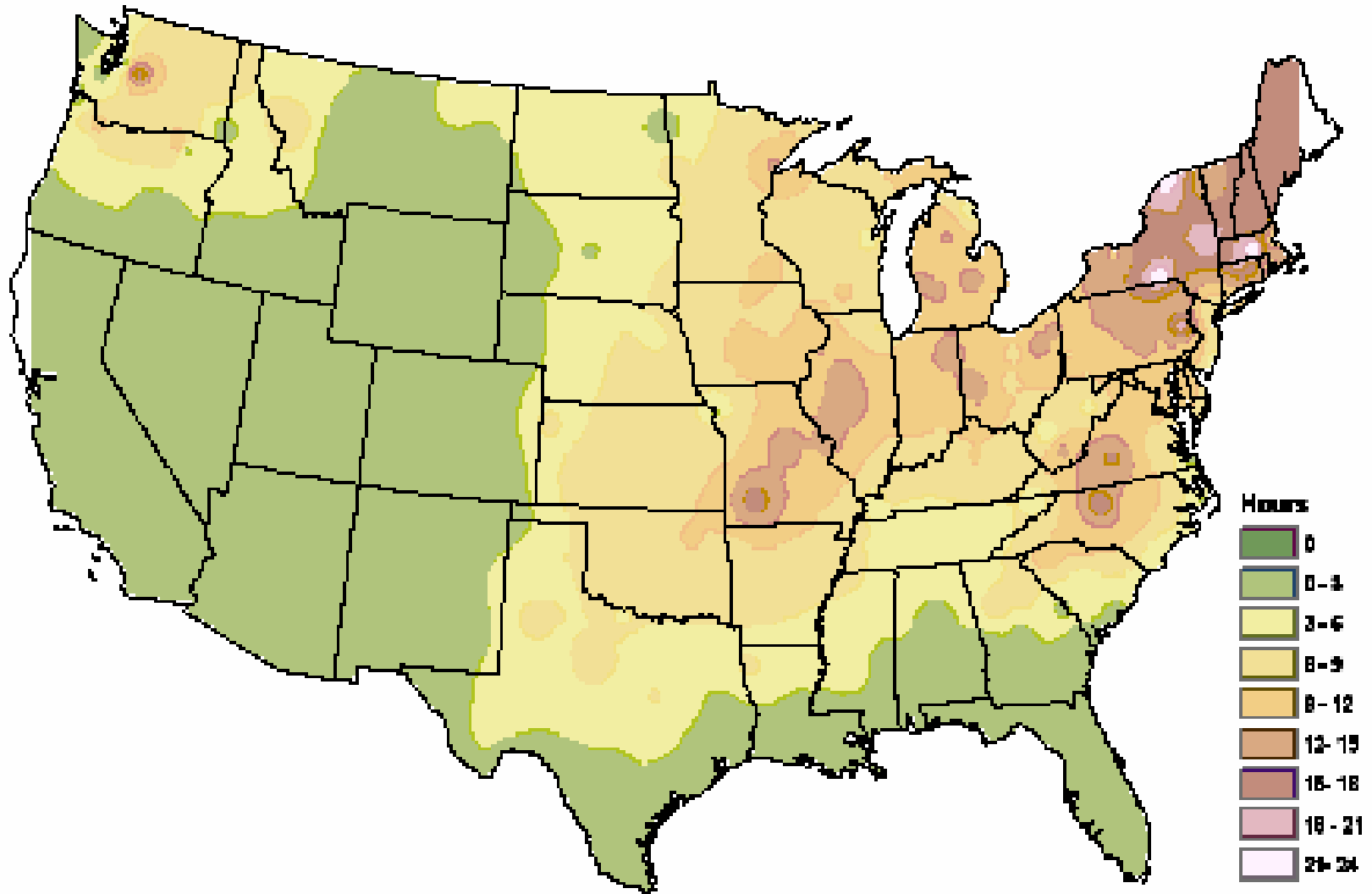


Figure 3-107

# Presidential Disaster Declarations Ice Storms 1953 - August 2007



**Figure 3-108**  
**Average number of hours per year with freezing rain in the United States.**



**Source:** "FREEZING RAIN EVENTS IN THE UNITED STATES", National Climatic Data Center, Asheville, North Carolina



### **Probability of Future Events:**

For the winter storm hazard including ice storms, this plan indicates the probability of future occurrences in terms of frequency based on historical events. According to the records at National Climate Data Center (NCDC) there were 399 winter storms occurring in the New York State during the past 10 years (1998-2007), with mean damages equal to 0.57 million dollars for each event. The amount of damages for a single event ranges from 5,000 dollars to 68.1 million dollars. Hence the probability of occurrence of storms with such damages in the future is roughly 40 times each year across the State. (See <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.)

Given the situation as outlined in **Table 3-35**, the probability of at least one winter snow storm of emergency declaration proportions, occurring during any given calendar year is virtually certain. The least likely scenario is that a significant winter storm event will not occur. Based on historical snow related disaster declaration occurrences, New York State can expect a snow storm of disaster declaration proportions, on average, once every 3-5 years. Similarly, for ice storms, based on historical disaster declarations (see **Table 3-36**), we project future ice storm occurrences of disaster proportions to occur, on average, once every 7-10 years.

### **Jurisdictions Most Threatened by and Vulnerable to Snow and Ice Storm Hazard and Estimating Potential Losses**

The following **Tables 3-37** and **3-38** present the results of our vulnerability assessment which indicate, based on a final rating score, the Counties most vulnerable to the snow and ice storm hazards. Counties accumulated points based on the value of each vulnerability indicator, the higher the indication for snow or ice storm exposure and overall vulnerability, the more points assigned for each County, which resulted in a final rating score (see scoring **Tables 3-37 & 3-38**). The results of our snow vulnerability assessment present a gross indication of Counties most threatened by and vulnerable to snow and ice storm hazards using readily available information. We acknowledge its limitations for total accuracy, especially at the Local level, and because of this we recognize that its applicability may not be appropriate beyond a general indication and is best used to guide towards targeting communities that would benefit from further analysis. Our snow hazard vulnerability analysis methodology included support by GIS technology. We created a snow hazard layer developed using National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center annual average snowfall data which allowed us to calculate an estimated average for Counties using a weighted average technique. Using GIS technology also allowed presentation of average annual snowfall amounts spatially. This spatial representation provided a visual indication of those Counties, and more importantly, the grouping areas, of the State typically receiving large amounts of snowfall. Analysis of the grouping has enabled a relationship to be drawn to the climate characteristics which lend to heavy snowfall, and in turn identify those Counties with a higher potential risk to receive extreme amounts of snow in a single event, (see **Table 3-37** indicates those Counties). Our mitigation strategy includes activities that will advance the accuracy of multi-hazard risk assessment through future more detailed analysis using local risk assessment information, better data, including historical loss information, as it becomes available, and continued application of GIS technology. In summary, **Tables 3-37 & 3-38** below identify jurisdictions by County most vulnerable to snow and ice storm hazards as determined using available vulnerability indicators including the average annual snow fall map.

**Table 3-37  
Jurisdiction Most Threatened by Snow and Vulnerable to Snow Loss**

| County               | Rating Score (Max 25) | Annual Average Snowfall (inches) | *Extreme Snowfall Potential (no/yes) | # of Snow Related Disasters | Population Density (per square mile) | Total # of Structures (HAZUS) |
|----------------------|-----------------------|----------------------------------|--------------------------------------|-----------------------------|--------------------------------------|-------------------------------|
| Erie                 | 19                    | 116.1                            | yes                                  | 7                           | 906.3                                | 277470                        |
| Chautauqua           | 17                    | 131.5                            | yes                                  | 5                           | 128.5                                | 45310                         |
| Albany               | 16                    | 56.2                             | no                                   | 5                           | 552.8                                | 83117                         |
| Niagara              | 16                    | 80.8                             | no                                   | 5                           | 416.7                                | 66394                         |
| Oswego               | 16                    | 144.9                            | yes                                  | 3                           | 120.7                                | 40083                         |
| Oneida               | 16                    | 132                              | yes                                  | 4                           | 187.4                                | 69590                         |
| Onondaga             | 15                    | 107                              | yes                                  | 1                           | 569.3                                | 132013                        |
| Monroe               | 14                    | 84.6                             | no                                   | 2                           | 1108.7                               | 210552                        |
| Cattaraugus          | 14                    | 105.2                            | yes                                  | 4                           | 63.4                                 | 29499                         |
| Dutchess             | 14                    | 42.3                             | no                                   | 4                           | 339.8                                | 79721                         |
| Nassau               | 14                    | 22.1                             | no                                   | 3                           | 4642.1                               | 395748                        |
| Orange               | 14                    | 40.1                             | no                                   | 4                           | 407.5                                | 92068                         |
| Bronx                | 13                    | 24.4                             | no                                   | 2                           | 31412.5                              | 89896                         |
| Jefferson            | 13                    | 123.7                            | yes                                  | 3                           | 86.8                                 | 37938                         |
| Kings (Brooklyn)     | 13                    | 22.2                             | no                                   | 2                           | 34951.2                              | 258603                        |
| Queens               | 13                    | 22.3                             | no                                   | 2                           | 20442.3                              | 343289                        |
| Rensselaer           | 13                    | 64.5                             | no                                   | 3                           | 229.4                                | 44593                         |
| Richmond (Staten Is) | 13                    | 22.4                             | no                                   | 2                           | 7633.8                               | 111561                        |
| New York (Manhattan) | 13                    | 22.7                             | no                                   | 3                           | 65309.3                              | 56385                         |
| Saratoga             | 13                    | 68.7                             | no                                   | 3                           | 699.5                                | 66122                         |
| Suffolk              | 13                    | 23.8                             | no                                   | 3                           | 1542.8                               | 461456                        |
| Westchester          | 13                    | 32.3                             | no                                   | 3                           | 1951.4                               | 211689                        |
| Broome               | 13                    | 72.6                             | no                                   | 3                           | 280.4                                | 60079                         |
| Genesee              | 13                    | 85.8                             | no                                   | 5                           | 121.8                                | 17646                         |
| Lewis                | 13                    | 158                              | yes                                  | 5                           | 20.9                                 | 11475                         |
| Ulster               | 13                    | 60.6                             | no                                   | 4                           | 153.2                                | 58343                         |
| St. Lawrence         | 12                    | 95.5                             | yes                                  | 2                           | 237.8                                | 36213                         |
| Wayne                | 12                    | 79.3                             | no                                   | 3                           | 154.7                                | 30592                         |
| Madison              | 12                    | 102.5                            | yes                                  | 2                           | 105.1                                | 21705                         |
| Orleans              | 12                    | 73.3                             | no                                   | 5                           | 112.3                                | 13110                         |
| Putnam               | 12                    | 34.5                             | no                                   | 4                           | 389.2                                | 32303                         |
| Rockland             | 12                    | 31.9                             | no                                   | 3                           | 1438.7                               | 73767                         |
| Schenectady          | 12                    | 67.6                             | no                                   | 4                           | 50.5                                 | 44729                         |
| Cayuga               | 11                    | 81.6                             | no                                   | 2                           | 111.7                                | 26291                         |
| Wyoming              | 11                    | 98.3                             | no                                   | 5                           | 72.8                                 | 12844                         |
| Columbia             | 11                    | 52.3                             | no                                   | 5                           | 97.4                                 | 23405                         |
| Greene               | 11                    | 55.2                             | no                                   | 5                           | 73.3                                 | 19884                         |
| Sullivan             | 11                    | 55.6                             | no                                   | 4                           | 74.3                                 | 33201                         |
| Ontario              | 10                    | 63.9                             | no                                   | 2                           | 151.2                                | 32618                         |
| Fulton               | 10                    | 84                               | no                                   | 2                           | 103.4                                | 20226                         |
| Chenango             | 10                    | 73.9                             | no                                   | 3                           | 57.2                                 | 18194                         |
| Delaware             | 10                    | 72.2                             | no                                   | 4                           | 32.8                                 | 21904                         |
| Chemung              | 9                     | 45.9                             | no                                   | 1                           | 221.6                                | 26831                         |
| Clinton              | 9                     | 77.9                             | no                                   | 1                           | 75.8                                 | 24229                         |
| Franklin             | 9                     | 107.5                            | yes                                  | 1                           | 30.2                                 | 17453                         |
| Livingston           | 9                     | 64.8                             | no                                   | 2                           | 100.4                                | 18476                         |
| Tompkins             | 9                     | 66.7                             | no                                   | 1                           | 196.4                                | 24171                         |

**Table 3-37**  
**Jurisdiction Most Threatened by Snow and Vulnerable to Snow Loss**

| County     | Rating Score (Max 25) | Annual Average Snowfall (inches) | *Extreme Snowfall Potential (no/yes) | # of Snow Related Disasters | Population Density (per square mile) | Total # of Structures (HAZUS) |
|------------|-----------------------|----------------------------------|--------------------------------------|-----------------------------|--------------------------------------|-------------------------------|
| Warren     | 9                     | 75.6                             | no                                   | 1                           | 68                                   | 26234                         |
| Herkimer   | 9                     | 140.4                            | yes                                  | 2                           | 44.2                                 | 22928                         |
| Montgomery | 9                     | 87.1                             | no                                   | 2                           | 121.2                                | 14829                         |
| Otsego     | 9                     | 85.5                             | no                                   | 2                           | 60.8                                 | 21815                         |
| Schoharie  | 9                     | 71.3                             | no                                   | 3                           | 56.1                                 | 12026                         |
| Steuben    | 8                     | 54.8                             | no                                   | 1                           | 70.3                                 | 34710                         |
| Washington | 8                     | 62.5                             | no                                   | 2                           | 72.6                                 | 20361                         |
| Cortland   | 7                     | 95                               | no                                   | 1                           | 97                                   | 13599                         |
| Essex      | 7                     | 87.7                             | no                                   | 1                           | 21.2                                 | 17157                         |
| Hamilton   | 7                     | 129.2                            | yes                                  | 1                           | 3                                    | 6252                          |
| Schuyler   | 7                     | 53.9                             | no                                   | 1                           | 85.4                                 | 7378                          |
| Tioga      | 7                     | 61.5                             | no                                   | 1                           | 99.1                                 | 17232                         |
| Allegany   | 6                     | 68.4                             | no                                   | 1                           | 48.2                                 | 18096                         |
| Yates      | 6                     | 56.5                             | no                                   | 1                           | 65.5                                 | 9542                          |
| Seneca     | 5                     | 58.7                             | no                                   | 1                           | 40.6                                 | 11423                         |

\*Sources: National Climatic Data Center NCDC average snowfall data, FEMA disaster declaration data, and HAZUS. Analysis supported by GIS technology.

**Table 3-37**  
**Jurisdiction Most Threatened by Snow and Vulnerable to Snow Loss**

|  | Rating Score  | Annual Average Snowfall (inches) | Extreme Potential (no/yes) | # of Snow Related Emergencies or Disasters | Population Density (per square mile) | Total # of Structures |
|--|---------------|----------------------------------|----------------------------|--|--------------------------------------|-----------------------|
| <b>Rating Score – Variables Distributions and Point Values</b> | score value 1 | 1-40 inches                      |                            | 1  | 1 – 49                               | 1-17K                 |
|  | score value 2 | 41-70 inches                     | Yes                        | 2  | 50 – 99                              | 18-24K                |
|  | score value 3 | 71-100 inches                    |                            | 3  | 100 – 299                            | 25-40K                |
|  | score value 4 | 101-140 inches                   |                            | 4  | 300 – 1999                           | 41-80K                |
|  | score value 5 | 141 + inches                     |                            | 5+   | 2000 – 67,000                        | 81-462K               |

**\*Extreme snowfall potential areas:** We identified counties with extreme snowfall potential as they fit into 2 general categories as follows; 1. Those areas that are historically vulnerable to persistent heavy Lake Effect/Enhanced snow from Lakes Erie and Ontario and those with elevation and latitude snow vulnerability. Counties in these classification include; Erie, Cattaraugus, and Chautauqua counties lee of Lake Erie. Oswego, Jefferson Lewis, Onondaga, Madison, Oneida, and Herkimer, lee of Lake Ontario. Hamilton, also lee of Lake Ontario, is also in an area categorized as potentially vulnerable to extreme snow enhanced by elevation and/or latitude as are St. Lawrence and Franklin counties.

**Table 3-38**  
**Jurisdiction Most Threatened by Ice Storms and Vulnerable to Ice Storm Loss**

| County       | Rating Score | # of Ice Storm Related Disasters | Total # of Structures |
|--------------|--------------|----------------------------------|-----------------------|
| Monroe       | 9            | 2                                | 210552                |
| Onondaga     | 8            | 1                                | 132013                |
| Jefferson    | 7            | 2                                | 37938                 |
| Oneida       | 7            | 1                                | 69590                 |
| Ontario      | 7            | 2                                | 32618                 |
| Oswego       | 7            | 1                                | 40083                 |
| Schenectady  | 7            | 1                                | 44729                 |
| St. Lawrence | 7            | 2                                | 36213                 |

| <b>Table 3-38</b>  |                     |   |                              |
|--|---------------------|---|------------------------------|
| <b>Jurisdiction Most Threatened by Ice Storms and Vulnerable to Ice Storm Loss</b> |                     |   |                              |
| <b>County</b>  | <b>Rating Score</b> | <b># of Ice Storm Related Disasters</b> | <b>Total # of Structures</b> |
| Wayne  | 7                   | 2                                       | 30592                        |
| Cayuga   | 6                   | 1                                       | 26291                        |
| Clinton  | 6                   | 1                                       | 24229                        |
| Livingston   | 6                   | 2                                       | 18476                        |
| Steuben  | 6                   | 1                                       | 34710                        |
| Yates  | 6                   | 3                                       | 9542                         |
| Albany   | 5                   | 0                                       | 83117                        |
| Allegany   | 5                   | 1                                       | 18096                        |
| Bronx  | 5                   | 0                                       | 89896                        |
| Chenango   | 5                   | 1                                       | 18194                        |
| Erie   | 5                   | 0                                       | 277470                       |
| Essex  | 5                   | 1                                       | 17157                        |
| Franklin   | 5                   | 1                                       | 17453                        |
| Genesee  | 5                   | 1                                       | 17646                        |
| Kings  | 5                   | 0                                       | 258603                       |
| Madison  | 5                   | 1                                       | 21705                        |
| Nassau   | 5                   | 0                                       | 395748                       |
| Orange   | 5                   | 0                                       | 92068                        |
| Orleans  | 5                   | 2                                       | 13110                        |
| Queens   | 5                   | 0                                       | 343289                       |
| Richmond   | 5                   | 0                                       | 111561                       |
| Suffolk  | 5                   | 0                                       | 461456                       |
| Westchester  | 5                   | 0                                       | 211689                       |
| Broome   | 4                   | 0                                       | 60079                        |
| Chautauqua   | 4                   | 0                                       | 45310                        |
| Dutchess   | 4                   | 0                                       | 79721                        |
| Lewis  | 4                   | 1                                       | 11475                        |
| New York City  | 4                   | 0                                       | 56385                        |
| Niagara  | 4                   | 0                                       | 66394                        |
| Rensselaer   | 4                   | 0                                       | 44593                        |
| Rockland   | 4                   | 0                                       | 73767                        |
| Saratoga   | 4                   | 0                                       | 66122                        |
| Seneca   | 4                   | 1                                       | 11423                        |
| Ulster   | 4                   | 0                                       | 58343                        |
| Wyoming  | 4                   | 1                                       | 12844                        |
| Cattaraugus  | 3                   | 0                                       | 29499                        |
| Chemung  | 3                   | 0                                       | 26831                        |
| Putnam   | 3                   | 0                                       | 32303                        |
| Sullivan   | 3                   | 0                                       | 33201                        |
| Tompkins   | 3                   | 0                                       | 24171                        |
| Warren   | 3                   | 0                                       | 26234                        |
| Columbia   | 2                   | 0                                       | 23405                        |
| Delaware   | 2                   | 0                                       | 21904                        |
| Fulton   | 2                   | 0                                       | 20226                        |
| Greene   | 2                   | 0                                       | 19884                        |

**Table 3-38**  
**Jurisdiction Most Threatened by Ice Storms and Vulnerable to Ice Storm Loss**

| County     | Rating Score | # of Ice Storm Related Disasters | Total # of Structures |
|------------|--------------|----------------------------------|-----------------------|
| Herkimer   | 2            | 0                                | 22928                 |
| Otsego     | 2            | 0                                | 21815                 |
| Tioga      | 2            | 0                                | 17232                 |
| Washington | 2            | 0                                | 20361                 |
| Cortland   | 1            | 0                                | 13599                 |
| Hamilton   | 1            | 0                                | 6252                  |
| Montgomery | 1            | 0                                | 14829                 |
| Schoharie  | 1            | 0                                | 12026                 |
| Schuyler   | 1            | 0                                | 7378                  |

**Table 3-38**  
**Jurisdiction Most Threatened by Ice Storms and Vulnerable to Ice Storm Loss**

|   | Rating Score  | # of Ice Storm Related Disasters | Population Density (per square mile) (previous declaration counties only) | Total # of Structures (previous declaration counties only) |
|---|---------------|----------------------------------|---|--|
| Rating Score -<br>Variables Distributions<br>and Point Values | score value 1 | 1                                | 1 - 49  | 1-17K  |
|   | score value 2 | 2                                | 50 - 99   | 18-24K   |
|   | score value 3 | 3                                | 100 - 299   | 25-40K   |
|   | score value 4 | 4                                | 300 - 1999  | 41-80K   |
|   | score value 5 | 5                                | 2000 - 67,000   | 81-462K  |

### Winter Storm (Severe) in Erie County

The geographic location of the City of Buffalo on the eastern shores of Lake Erie makes it a prime target for lake effect snowstorms. The probability of this hazard occurring is moderately high. In the last decade as a result of winter events, Erie County has been the recipient of seven Federal emergency winter storm declarations plus one New York State declaration which did not receive a Federal declaration. According to the last 120 years of snowfall data, four of the top five ranking 24-hour snowfalls have occurred in the last seven years. One-fifth of all hazards receiving Federal declarations throughout New York State between 1995 and 2001 have been for winter storms in Erie County. In addition to lake effect storms, winter storms can take on other meteorological forms such as blizzards, ice storms, and synoptic winter storms. Winter emergencies need not involve heavy snow. For example, the Blizzard of 1977 crippled Western New York with bitter cold temperatures and high winds bringing existing snow into the County off Lake Erie, yet deposited very little new snow.

The seriousness of winter storms goes beyond stalled transportation, business interruptions, and school closures. The most serious consequence of winter storms is the potential for loss of life. Despite the relatively low number of fatalities and injuries from winter storms in Western New York, the potential for damage to human health is significant.

### State Facilities – Assessing Vulnerability and Estimating Loss for Snow Hazard:

**Table 3-39** presents the result of our snow hazard vulnerability assessment and loss analysis for state facilities. The results present a gross estimate of potential snow losses to those identified vulnerable State facilities in terms of dollar value of exposed property. Our snow hazard vulnerability analysis and loss estimation methodology was supported by GIS technology and involved collaboration with key State agencies. Collaboration resulted in the identification of two (2) State databases that provided key facility information. The NYS Offices of General Services (OGS) fixed asset data base and Cyber Security Critical Infrastructure Coordination (CSCIC) database included fields that provide coordinate location information and building replacement value in dollars. The analysis involved creation of a GIS layer for State facilities using the coordinate information and overlay onto a snow hazard layer developed using National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center annual average snowfall data. The intention of this analysis is to assess vulnerability and provide an aggregate exposure of State facilities as a proxy for potential loss estimate. The analysis methodology has its limitations for complete accuracy and applicability of results may not be appropriate beyond a general indication. Instead, the analysis results may best be used as a guide to help target those facilities that might benefit from further analysis. We have established activities in our mitigation strategy that will advance the accuracy of the State risk assessment through further analysis. Future analysis may include expressing potential loss based on historical snowstorm loss information, continued application of GIS technology, and data gathering to include building attribute information which will allow targeting of high vulnerability facilities.

**Table 3-39  
Snow Hazard Exposure New York State Agency Facilities**

| NY State Agency                              | Total Facilities       | Total # and % in area 100-150 inches avg. annual snowfall | Critical facilities total # and % in area 100-150 inches avg. annual snowfall | Total # and % in area >150 inches avg. annual snowfall | Critical facilities total # and % in area >150 inches avg. annual snowfall | Total # and % in *extreme snowfall potential areas | Critical facilities total # and % in *extreme snowfall potential areas |
|--|------------------------|---|---|--|--|--|--|
| Department of Environmental Conservation     | 1880                   | 570 (30.3%)   | 0   | 147 (7.8%)   | 0  | 593 (31.5%)  | 0  |
|  | \$104,611,361          | \$25,622,654 (24.50%)                                     | 0   | \$11,963,361 (11.4%)                                   | 0  | \$33,241,955 (31.8%)                               | 0  |
| Department of Transportation                 | 908                    | 212 (23.3%)   | 0*  | 8 (0.9%)   | 0*   | 92 (10.1%)   | 0*   |
|  | \$232,514,852          | \$44,881,463 (19.3%)                                      | 0*  | \$1,012,223 (0.4%)                                     | 0*   | \$15,875,151 (6.8%)                                | 0*   |
| Office of General Services                   | 130                    | 11 (8.5%)   | 11 (8.5%)   | 0  | 0  | 2 (1.5%)   | 2 (1.5%)   |
|  | \$2,133,659,048        | \$59,418,328 (2.8%)                                       | \$59,418,328 (2.8%)   | 0  | 0  | \$13,611,701 (0.6%)                                | \$13,611,701 (0.6%)  |
| State Emergency Management Office            | 4                      | 0   | 0   | 0  | 0  | 0  | 0  |
|  | \$3,365,434            | 0   | 0   | 0  | 0  | 0  | 0  |
| <b>Number of facilities Total</b>            | <b>2922</b>            | <b>793 (27.1%)</b>  | <b>11 (.4%)</b>   | <b>155 (5.3%)</b>                                      | <b>0</b>   | <b>687 (23.5%)</b>                                 | <b>2 (.1%)</b>   |
| <b>~ Replacement Value of Structure (\$)</b> | <b>\$2,472,819,244</b> | <b>\$129,522,445 (5.3%)</b>                               | <b>\$59,418,328 (2.4%)</b>  | <b>\$12,975,584 (0.5%)</b>                             | <b>0</b>   | <b>\$62,728,807 (2.5%)</b>                         | <b>\$13,611,701 (0.6%)</b>   |

Source: NYS Fixed Asset information -Offices of General Services and Cyber Security Critical Infrastructure Coordination data bases, National Climatic Data Center (NCDC) data. **\*Extreme snowfall potential areas:** We identified counties with extreme snowfall potential as they fit into 2 general categories as follows. 1. Those area that are vulnerable to Lake Effect/Enhanced snow from Lakes Erie and Ontario and those with elevation and latitude snow vulnerability. Counties in these classification include; Erie, Cattaraugus, and Chautauqua counties lee of Lake Erie. Oswego, Jefferson Lewis, Onondaga, Madison, Oneida, and Herkimer, lee of Lake Ontario. Hamilton, also lee of Lake Ontario, is also in an area categorized as potentially vulnerable to extreme snow enhanced by elevation and/or latitude as are St. Lawrence and Franklin counties.

## **Estimating Potential Loss for Snow Hazard by Jurisdiction**

This version of the NYS Hazard Mitigation Plan does not include a description of potential dollar loss estimations to structures by jurisdiction for the snow hazard because of the absence of certain essential information as described in the following text. Additionally, unlike flood or earthquake hazard, there are no standard loss estimation models or methodologies for the snow hazard. A preliminary dollar loss estimate could have been calculated based on known information such as total structures for general occupancy class, indicated higher snow hazard areas (average annual and extreme snowfall potential map and data) as determined earlier in this plan, and use of residential structure dollar value estimates. However, many assumptions and generalization would need to be made for several unknowns. Unknowns or data that are available but not prepared or analyzed include; inventory estimates of the more vulnerable structures such as those pre-code structures, flat roof structures, and historical or critical structures and the type of and dollar damage figures. The many generalizations and guess work would result in figures with little accuracy, and potentially misleading indications of a jurisdictions vulnerability and potential loss to the snow hazard. Therefore, this version of the NYS risk assessment instead, includes an identification of needed data and establishes actions necessary to gather data needed to estimate potential losses. As local mitigation plans with snow hazard risk assessment data becomes available, this information will be incorporated into a State risk assessment repository for integration into the State vulnerability analysis. Additionally, application of GIS technology will continue, including exploring the possibility of obtaining and incorporating certain data that may better define the high hazard areas characteristics such as more comprehensive snowfall extremes data, and real property data layers in support of future snow hazard vulnerability analysis.