3.8 – Hail Storm Hazard Profile

The following information was obtained through the following sources

- http://www.nws.noaa.gov/
- www.fema.gov
- www.nssl.noaa.gov

The following chart provides a few terms to know regarding a hailstorm

Term	Definition
Hail	Showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud.
Hail Index	An indication of whether the thunderstorm structure of each storm identified is conducive to the production of hail.
Hail Size	Typically refers to the diameter of the hailstones. Warnings and reports may report hail size through comparisons with real-world objects that correspond to certain diameters

The following chart provides the typical description: diameter ratio regarding hail. Warnings and reports may report hail size through comparisons with real-world objects that correspond to certain diameters:

Table 3-40

Description	Diameter (inches)
Pea	0.25
Marble or Mothball	0.50
Penny or Dime	0.75
Nickel	0.88
Quarter	1.00
Half Dollar	1.25
Walnut or Ping Pong Ball	1.50
Golf ball	1.75
Hen's Egg	2.00
Tennis Ball	2.50
Baseball	2.75
Tea Cup	3.00
Grapefruit	4.00
Softball	4.50

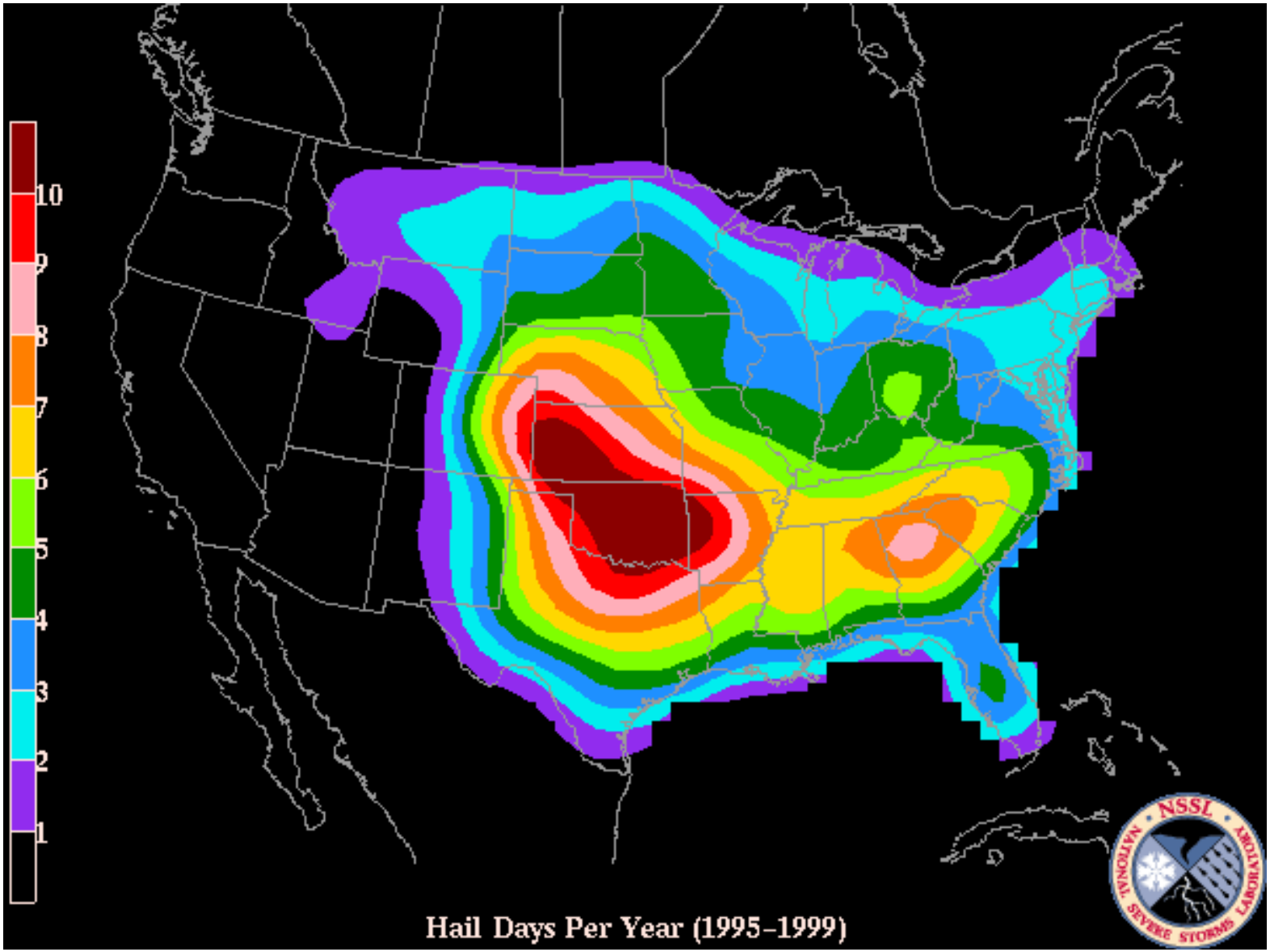
Hail can be produced from many different storm types. Typically hail is a cascading effect of a thunderstorm event. The following excerpt from the NOAA National Severe Storms Laboratory provides background information on the development of Hail.

> There are two ideas about hail formation. In the past, the prevailing thought was that hailstones grow by colliding with supercooled water drops. Supercooled water will freeze on contact with ice crystals, frozen rain drops, dust or some other nuclei. Thunderstorms that have a strong updraft keep lifting the hailstones up to the top of the cloud where they encounter more supercooled water and continue to grow. The hail falls when the thunderstorm's updraft can no longer support the weight of the ice or the updraft weakens. The stronger the updraft the larger the hailstone can grow.
>
> Recent studies suggest that supercooled water may accumulate on frozen particles near the back-side of the storm as they are pushed forward across and above the updraft by the prevailing winds near the top of the storm. Eventually, the hailstones encounter downdraft air and fall to the ground.
>
> Hailstones grow two ways: by wet growth or dry growth processes. In wet growth, a tiny piece of ice is in an area where the air temperature is below freezing, but not super cold. When the tiny piece of ice collides with a supercooled drop, the water does not freeze on the ice immediately. Instead, liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape resulting in a layer of clear ice.
>
> Dry growth hailstones grow when the air temperature is well below freezing and the water droplet freezes immediately as it collides with the ice particle. The air bubbles are "frozen" in place, leaving cloudy ice.
>
> Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are "balanced" in an updraft. One can tell how many times a hailstone traveled to the top of the storm by counting the layers. Hailstones can begin to melt and then re-freeze together - forming large and very irregularly shaped hail. (NOAA/NSSL)

Forecasting Hail

To forecast hail, deep moist convection is required, in addition to these three basic ingredients (1) Adequate updraft to keep the hailstone aloft for an appropriate amount of time, (2) Sufficient supercooled water near the hailstone to enable growth as it travels through an updraft, and (3) A piece of ice or snow for it to grow upon

Figure 3-109



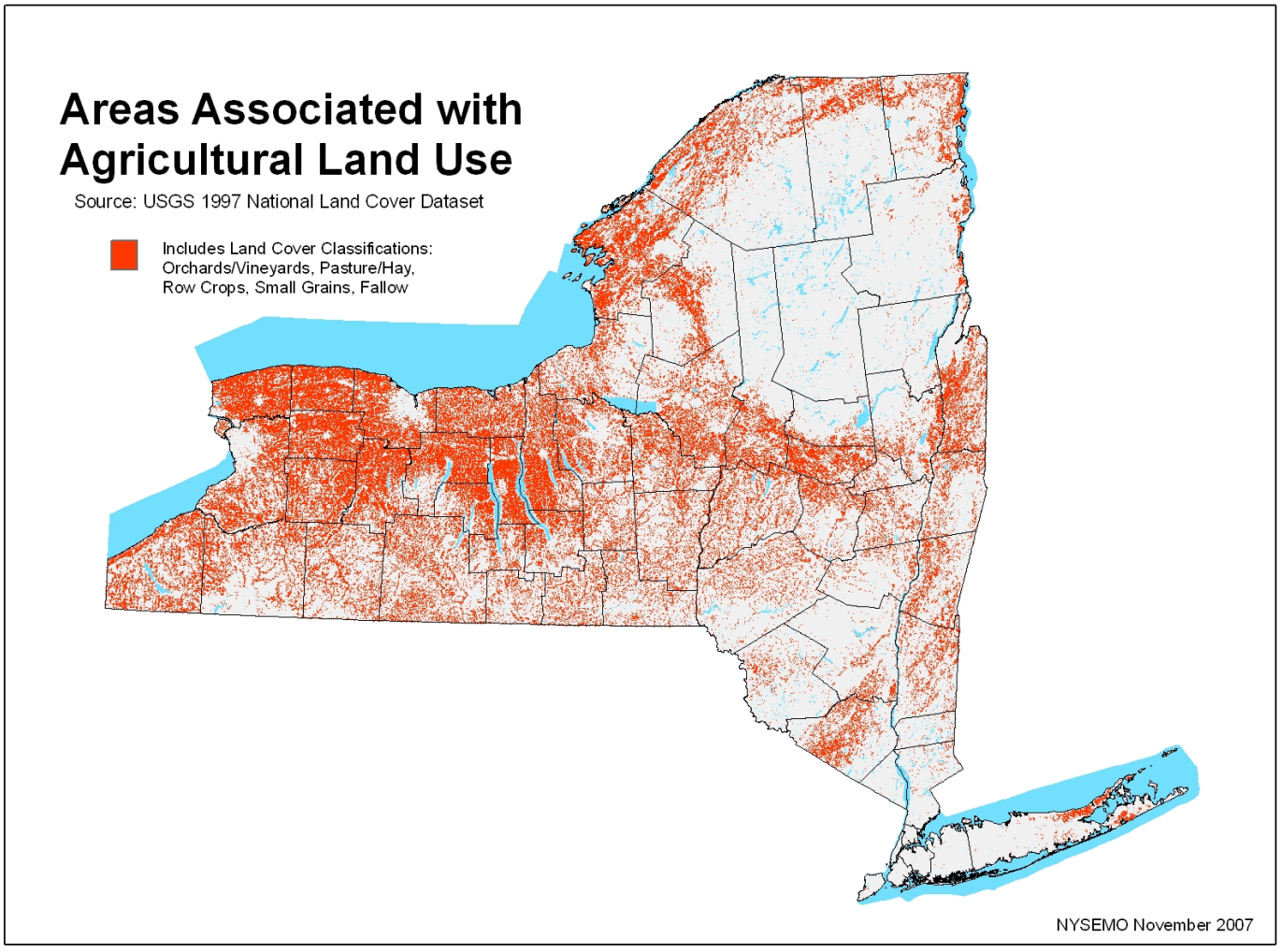
(The mean number of days per year with one or more events within 25 miles of a point is shown here. The fill interval is 1, with the purple starting at 1. For the significant (violent), its 5 days per century (millennium), Source: NSSL)

Many of the storms that hit New York State also produce varying amounts of Hail. As well, Hail has also been an aspect of many of the disasters that have been declared by FEMA with a Major Disaster Declaration within New York State.

Effects of Hail

It is estimated that damage from hail approaches $1 billion in the U.S. annually. U.S. Agriculture is typically the most affected by such hail storms, hail causes severe crop damage and even a minor storm with relatively small size Hailstones can have a devastating effect. As well, damage to vehicles, roofs (residential/commercial), and landscaping are the other things most commonly damaged by hail. **Figure 3-110** portrays the agricultural land use across New York State. It is recommended that jurisdictions that have agricultural markets and industries take into account the vulnerability of the Jurisdiction in regards to the affects of hail. Hail has also been known to cause injuries and occasionally has been fatal. The most deadly hailstorm on record occurred in India on April 30, 1988, killing 246 people and 1600 domesticated animals.

Figure 3-110



Hail Storm Events within New York State

The following chart provides a detailed description of previous occurrences of Hail throughout New York State between 2005 and 2007. Note that the chart is limited to not only the time period but also the Hail size which is that of at least 1 inch. For more detailed information regarding Hail storms within New York State please visit the following website at http://www4.ncdc.noaa.gov/cgi-

win/wwcgi.dll?wwevent~storms . The NOAA National Climatic Data Center provides information on Hail events throughout New York State dating back to 1950. Since 1993 there have been approximately 7 million dollars in property damage as the result of hail storms and roughly 13 million dollars in crop damage since 1994. As well, since 1984 there have been roughly 89 reported injuries as the result of hail events.

Table 3-41
National Climatic Data Center:
New York State Hail Information 05-07, 1 Inch or Greater

Location or County	Date	Size (in)	Property Damage	Crop Damage
1 Bradford	5/27/2005	1.25 in.	0	0
2 Monterey	5/27/2005	1.25 in.	0	0
3 Reading Center	5/27/2005	1.00 in.	0	0
4 Saratoga Springs	6/6/2005	1.00 in.	0	0
5 Cambridge	6/6/2005	1.00 in.	0	0
6 Barton	6/6/2005	1.75 in.	10K	0
7 Pine Bush	6/8/2005	1.00 in.	0	0
8 Port Jervis	6/22/2005	1.00 in.	0	0
9 Livingston Manor	7/1/2005	1.00 in.	0K	0
10 Colliersville	7/1/2005	1.00 in.	0K	0
11 Plattsburgh	7/22/2005	1.00 in.	0	0
12 Sackets Harbor	8/1/2005	1.00 in.	5K	0
13 Clarence Center	8/1/2005	1.00 in.	10K	0
14 Tully	8/8/2005	1.00 in.	0K	0
15 Endicott	8/13/2005	1.25 in.	0K	0
16 Newton Falls	9/20/2005	1.75 in.	0	0
17 Pompey	11/6/2005	1.75 in.	0K	0
18 Panama	11/9/2005	1.00 in.	10K	0
19 Batavia	4/13/2006	1.00 in.	10K	0
20 Greece	4/13/2006	1.00 in.	8K	0
21 Wolcott	4/15/2006	1.75 in.	15K	0
22 Port Byron	5/13/2006	1.75 in.	5K	0
23 Port Byron	5/13/2006	1.75 in.	5K	0
24 Rochester	5/13/2006	1.00 in.	3K	0
25 Schroon Lake	5/30/2006	1.75 in.	0	0
26 Bridgewater	5/30/2006	1.00 in.	0	0
27 Maine	5/30/2006	1.00 in.	0	0
28 North Creek	5/31/2006	1.00 in.	0	0
29 Indian Lake	5/31/2006	1.00 in.	0	0
30 Lakewood	6/28/2006	1.75 in.	5K	10K
31 Penfield	6/28/2006	1.50 in.	10K	0
32 Henrietta	6/29/2006	1.50 in.	10K	0
33 Seneca Falls	6/29/2006	1.25 in.	0	0
34 Marathon	6/29/2006	1.00 in.	0	0
35 Auburn	6/29/2006	1.00 in.	0	0
36 Elmira	6/29/2006	1.00 in.	0	0
37 Spencer	6/29/2006	2.00 in.	0	0
38 Stratford	6/29/2006	1.00 in.	0	0
39 Hope Falls	6/29/2006	1.00 in.	0	0
40 Davenport	6/29/2006	1.00 in.	0	0
41 Cheektowaga	6/30/2006	1.00 in.	10K	0
42 Limerick	6/30/2006	1.00 in.	8K	0
43 Watertown	6/30/2006	1.00 in.	5K	0

44 Chippewa Bay	6/30/2006	1.00 in.	0	0
45 Ulster Hgts	7/3/2006	1.00 in.	0	0
46 Mt Kisco	7/11/2006	1.00 in.	0	0
47 Chester	7/11/2006	1.00 in.	0	0
48 Yorktown	7/18/2006	1.00 in.	0	0
49 Little Vly	7/22/2006	1.00 in.	10K	0
50 Ellicottville	7/22/2006	1.00 in.	10K	0
51 North Tonawanda	7/23/2006	1.00 in.	10K	0
52 South Colton	7/29/2006	1.00 in.	0	0
53 Vestal	8/3/2006	1.00 in.	0	0
54 Vestal	8/3/2006	1.25 in.	3K	0
55 Binghamton	8/3/2006	1.00 in.	0	0
56 Conklin	8/3/2006	1.00 in.	0	0
57 Vestal	8/3/2006	1.00 in.	0	0
58 Chazy	8/7/2006	1.50 in.	0	400K
59 Troupsburg	8/25/2006	1.00 in.	0	0
60 Watervliet	9/9/2006	1.75 in.	0	0
TOTALS:			**162K**	**410K**

Source: NOAA, National Climatic Data Center

Mitigation Activities

FEMA recommends the following Mitigation Approaches regarding Hail; the approaches are very similar to that of a thunderstorm or windstorm. They include:

1. Building Codes
2. Public Awareness
3. Weather warning system improvements and modernization

It is recommended that Local Jurisdictions do ample research into the affects a Hail storm may have on their residents and property.