

## 4-12: Hail

Hazard Impacts	Probability	Potential Impact					Score:
		Infrastructure	Life	Economy	Environment	Average:	
Hail	3	1	1	1	1	1	3

Score = Probability x Average Potential Impact

Hail is a form of precipitation composed of spherical lumps of ice. Known as hailstones, these ice balls typically range from 5-50 mm in diameter on average, with much larger hailstones forming in severe thunderstorms (see: Wind). The size of hailstones is a direct function of the severity and size of the thunderstorm that produces it. No matter the size, hail can damage property, young and tender plants, and cause bodily harm to those unfortunate enough to be caught outside.

**Table 38: TORRO Hailstorm Intensity Scale**

	Intensity Category	Typical Hail Diameter (mm)	Probable Kinetic Energy (J/m <sup>2</sup> )	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Destructive	25-40	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		Severe damage to aircraft bodywork
H9	Super Hailstorm	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorm	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: <http://www.torro.org.uk/hscale.php>

Hailstorms usually occur in Vermont during the summer months and generally accompany passing thunderstorms. While local in nature, these storms can be significant to area farmers, who can lose entire fields of crops in a single hailstorm. Large hail is also capable of property damage, to include both structures and vehicles. Hailstone size can range from the size of a pea to the size of a melon.

**Table 39: Hail Size and Diameter in Relation to TORRO Scale**

Size Code	Maximum Diameter (mm)	Description
0	5-9	Pea
1	10-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg > squash ball
5	41-50	Golf ball > Pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball > cricket ball
8	76-90	Large orange > Soft ball
9	91-100	Grapefruit
10	>100	Melon

Source: <http://www.torro.org.uk/hscale.php>

## Hail History

There have been 137 hail events in Vermont since 2000, causing over \$550,000 in property damage and \$261,000 in documented crop damage<sup>1</sup>. The largest recorded hail was 3.25" in Westford in July of 2009, with an estimated \$100,000 in damages. The second largest hail event was in June of 2011, with recorded hail of 3.25" and 2.75" in Shaftsbury.

**Table 40: Hail Events Summary: 2000-2017**

Hail Size	Days with an Event	Impacted Jurisdictions	Property Damage	Crop Damage
≥3"	2	2	\$50,000	\$50,000
2.5"	2	2	\$20,000	\$20,000
2"	7	7	\$45,000	\$20,000
1.75"	25	42	\$286,000	\$1,000
1.5"	19	26	\$100,000	\$0
1.25"	19	30	\$0	\$20,000
1"	88	239	\$43,000	\$150,000
0.88"	59	105	\$6,000	\$0
0.75"	63	130	\$2,000	\$0

Source: <https://www.ncdc.noaa.gov/stormevents/>

Hail is considered a relatively infrequent occurrence in Vermont. Those hail events that do occur tend to be highly localized and limited to a relatively small area. The below table is a summary of all hail events between 2000 and 2017.

## Hail Trends & Vulnerability

The Steering Committee considers the probability of hail to be Likely, given the frequency with which Vermont has some form of hail event. Relative to Vermont's other hazards, the impact from hail is considered to be negligible to infrastructure, life, the economy and the environment.

Although significant hailstorms occur relatively infrequently, they are still important to consider, given Vermont's primarily agrarian economy. As mentioned above, significant hail events can lead to extensive crop damage, which can negatively impact Vermont's many farms.

While hail can directly damage these crops, other aspects of Vermont's economy may be indirectly affected. There have been reports of hailstorms completely destroying entire hay fields and cornfields. These crops are usually used to feed animals, so dairy farms and other farms that breed livestock can also be affected. This can cause a domino effect increasing prices of feed for livestock, which in turn increases the price of milk and other dairy products, further impacting the economy.

According to the 2014 National Climate Assessment, though there is an observable increase in severity of winter storms, changes in the frequency or severity of hail events are still uncertain but are being extensively studied<sup>2</sup>.

## Hail Mitigation

Due to the unpredictability of hailstorms and the negligible impacts to infrastructure, life, the economy and the environment, there is little in the way of hail mitigation in Vermont. Most efforts related to hail are in the response and recovery sectors, not mitigation.

Implementation of certain actions within the plan will address hail (see: Mitigation Strategy), such as the strategy on resilient design and construction standards, including actions around developing sample building standards and educational resources for resilient design and construction.

1 <https://www.ncdc.noaa.gov/stormevents/>

2 <https://nca2014.globalchange.gov/report/our-changing-climate/changes-storms>