

Major Hailstorms

Abstract

Hail is precipitation consisting of ice pellets with a diameter of 5 millimetres or more. Hailstorms can occur anywhere in Canada. The most common period when hailstorms occur is from May to July, usually occurring with afternoon thunderstorms. Hailstorm with large hail pellets is spectacularly damaging. Smaller storms during the summer growing season cause serious damage to crops.

What is hail?

Hail is precipitation consisting of ice pellets with a diameter of five millimetres or more which is formed in the core of thunderstorms in the following way: water vapour in warm, rapidly rising air masses (called convection currents) condenses to become water at higher, cooler altitudes. Normally, this just produces heavy showers. However, if the vapour or water is pushed up enough to meet sufficiently cold air, the product can be ice. Layers of ice can then form around minute particles such as dust whipped up from the ground. These nuclei increase in size as more water freezes to their surfaces. When the ice pellets are too heavy for the ascending air currents, they fall as hail. They may pick up more water on the way down, becoming larger, heavier and more threatening.

As mentioned, hail pellets have a minimum diameter of five millimetres (or half a centimetre). Below that size, droplets are defined as snow or ice pellets. Hail pellets can grow to be much bigger than the minimum: they can exceed ten centimetres in diameter - the size of a grapefruit.

When and Where they Occur

Hailstorms can occur anywhere in Canada, but happen most frequently in the west and in southwestern Ontario. Parts of the Prairies, particularly near Calgary, can expect up to ten hailstorms each year. The interior of British Columbia, southwestern Ontario and some other parts of the Prairies receive an average of three hailstorms per year. Storms with small hail pellets occur frequently in the Atlantic provinces, eastern Quebec and near the Pacific coast, but those with large pellets are more common in the continental interior (from the lee - eastern slope - of the Rockies to southernmost Saskatchewan). Hailstorms are most common in the May to July period, usually with storms occurring in the afternoon. The hail portion of a storm (the hailfall) usually lasts from six to ten minutes.

The Damage they Cause

For many Canadians, a hailstorm is an intriguing rarity, but for farmers whose crops are crushed, or for other Canadians whose homes and cars are damaged, a hailstorm is an unpleasant surprise, or even a disaster. A sudden violent hailstorm, with large hail pellets, is spectacularly damaging. But equally important are smaller storms during the summer growing season as these cause serious damage to crops. Because hail can hit the ground at up to 130 kilometres per hour, it can cause severe damage to crops, houses and vehicles, and can injure people and animals. To reduce the damage caused, governments and insurance companies have sponsored cloud seeding. This involves having aircraft release tiny particles into probable storm clouds with the aim of creating smaller, softer hailstones.

Descriptions for each of the hailstorms shown on the map are found below:

Edmonton-1901

Edmonton, Alberta; a hailstorm that produced 8-centimetre diameter hailstones caused extensive damage to tin roofs and lights.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Okanagan Valley-1946

Okanagan Valley, British Columbia (near Penticton); a 15-minute hailstorm caused \$2 million of damage to apple and pear crops.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Central Alberta-1953

Central Alberta; thousands of birds were crushed by golf-ball sized hailstones as a hailstorm moved across central Alberta, affecting an area of 1800 square kilometres.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Lambeth-1968

Lambeth, Ontario; a severe hailstorm caused extensive crop and property damage and left ice up to 17.5 centimetres deep on streets.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Edmonton-1969

Edmonton, Alberta; large hailstones caused \$17 million in damage to the city and surrounding area; \$3 to 5 million in insured damages over an area of 30 square kilometres.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Western Prairies-1971

Western Prairies; two days of severe weather caused \$20 million damage over a 500-kilometre long path.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Cedoux-1973

Cedoux, Saskatchewan; the largest documented hailstone in Canada was produced by this storm: 290 grams and 114 millimetres diameter; the storm caused an estimated \$10 million in damage.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Winnipeg-1978

Winnipeg, Manitoba; hail and heavy winds caused a total of \$20 million in damage.

Source: International Decade for Natural Disaster Reduction, Canadian National Report. Royal Society of Canada and Canadian Academy of Engineering, 1994.

Montréal-1979

Montréal, Quebec; a violent thunderstorm producing hail and heavy rains caused serious damage.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Calgary-1981

Calgary, Alberta; a hailstorm hit Calgary on Tuesday, July 28, 1981; insured damage was estimated at \$150 million over an area of 100 square kilometres.

Source: Charlton, R.B., B.M. Kachman, and L. Wojtiw. "Urban Hailstorms, A View from Alberta." Natural Hazards 12 (1995): 29 to 75.

Windsor-Leamington-1985

Windsor-Leamington, Ontario; \$30 to 40 million in damage was caused by hail.

Source: Environment Canada. The Climates of Canada. by D. Phillips, Supply and Services Canada Publishing Centre, Cat. No. EN56-1/1990E.

Montréal-1986

Montréal, Quebec; \$90 million in damage.

Source: International Decade for Natural Disaster Reduction, Canadian National Report. Royal Society of Canada and the Canadian Academy of Engineering, 1994.

Montréal-1987

Montréal, Quebec; \$125 million in damage.

Source: International Decade for Natural Disaster Reduction, Canadian National Report. Royal Society of Canada and the Canadian Academy of Engineering, 1994.

Edmonton-1987

Edmonton, Alberta; widespread heavy rainfall from a powerful tornado hit Edmonton on Friday, July 31, 1987; 300 millimetres of rain fell in 3 days; the Smoky, Wapiti, Simonette, and Kakwa Rivers rose up to 7 to 8 metres in some areas; hailstorms

were reported during the tornado; the hailstorms caused \$150 million in damages over an area of 270 square kilometres; none of the deaths (27 in total) during the tornado were attributed to hailstorms.

Source: Charlton, R.B., B.M. Kachman, and L. Wojtiw. "Urban Hailstorms, A View from Alberta." *Natural Hazards* 12 (1995): 29 to 75.

Edmonton-1988

Edmonton, Alberta; \$48 million in damage.

Source: International Decade for Natural Disaster Reduction, Canadian National Report. Royal Society of Canada and the Canadian Academy of Engineering, 1994.

Calgary-1988

Calgary, Alberta; \$30 million in damage.

Source: International Decade for Natural Disaster Reduction, Canadian National Report. Royal Society of Canada and the Canadian Academy of Engineering, 1994.

Calgary-1990

Calgary, Alberta; insured loss \$16 million.

Source: Emergency Preparedness Canada, Canadian Geographic and National Atlas of Canada. *Natural Hazards Poster Map*, 1996.

Red Deer-1991

Red Deer, Alberta; a hailstorm hit Red Deer on Wednesday, July 3, 1991; insured loss was estimated at \$50 million covering an area of 30 square kilometres.

Source: Charlton, R.B., B.M. Kachman, and L. Wojtiw. "Urban Hailstorms, A View from Alberta." *Natural Hazards* 12 (1995): 29 to 75.

Calgary-1991

Calgary, Alberta; Saturday, September 7, 1991 (Labour Day); over \$400 million dollars in damage over an area covering 130 square kilometres.

Source: Charlton, R.B., B.M. Kachman, and L. Wojtiw. "Urban Hailstorms, A View from Alberta." *Natural Hazards* 12 (1995): 29 to 75.

Calgary-1992

Calgary, Alberta; losses were estimated at \$22 million.

Source: Emergency Preparedness Canada, Canadian Geographic and National Atlas of Canada. *Natural Hazards Poster Map*, 1996.

Alberta-August 1992

Alberta; hail caused \$5 million in damage.

Source: Press.

Alberta- September 1992

Alberta; hail caused \$7 million in damage.

Source: Press.

Alberta-1993

Alberta; insured loss of \$8 million.

Source: Emergency Preparedness Canada, Canadian Geographic and National Atlas of Canada. Natural Hazards Poster Map, 1996.

Prairie provinces-1994

Prairie provinces; several hailstorms result in insured losses of \$200 million in crop damage.

Source: Emergency Preparedness Canada, Canadian Geographic and National Atlas of Canada. Natural Hazards Poster Map, 1996.

Salmon Arm-1994

Salmon Arm, British Columbia; insured loss of \$15 million.

Source: Emergency Preparedness Canada, Canadian Geographic and National Atlas of Canada. Natural Hazards Poster Map, 1996.

Prairie provinces-1995

Prairie provinces; several hailstorms result in insured losses of \$250 million, where \$200 million was in crop damage insurance and \$50 million was as a result of residence and vehicle damage.

Source: Emergency Preparedness Canada, Canadian Geographic and National Atlas of Canada. Natural Hazards Poster Map, 1996.

Calgary-1996

Calgary, Alberta; July 16; The hailstorm caused flooding; heavy rains and tornadoes were also reported. 911 service was knocked out, causing emergency crews to use regular lines. No injuries were reported. Many vehicles were damaged. Gale-force winds, and torrential rains swept across the area. There were no reported injuries, however extensive damage was done to homes and gardens.

Source: Insurance Bureau of Canada.

Winnipeg-1996

Hailstones the size of tennis balls pounded down on the city; crops were flattened south of Winnipeg, trees were stripped, gardens destroyed and windows shattered. Gale-force winds, torrential rains, funnel clouds and one tornado were reported. There were no reported injuries.

Source: Insurance Bureau of Canada.

Calgary-1996

Calgary, Alberta; July 24; insured cost reached \$40 million.

Source: Insurance Bureau of Canada.

Calgary-1998

Two separate hailstorms occurred on July 4 to 5 and July 8. On July 4, 43.2 millimetres of rain also fell on Calgary. The July 8 storm included winds of up to 100 kilometres per hour, which tore apart greenhouse roofs. Hailstones ranging from pea to baseball size caused waist high flooding which forced many people to abandon their cars at intersections. Snowplows were brought out to clear the roads. Roads were destroyed by the hail, a warehouse collapsed and a store had to be closed

because of a burst storm sewer. Mudslides forced boulders and mud across roads and railroads.

Source: Emergency Preparedness Canada.

Map Sources

Major Hailstorms in Canada

Disaster Database, Emergency Preparedness Canada, 1999.

References

Phillips, David. 1990. The Climates of Canada. Cat. No. En56-1/1990E. Ottawa: Environment Canada.

Phillips, David. 1993. The Day Niagara Falls Ran Dry ! : Canadian weather facts and trivia. Toronto: Key Porter.

Related Web sites (1999 – 2009)

Federal Government

Government of Canada. Public Safety

<http://www.safecanada.ca/>

The Public Safety Portal is your one-window entry to all public safety information from the Government of Canada.

Other

Institute for Catastrophic Loss Reduction

<http://www.iclr.org/>

Canada's property and casualty insurers founded the Institute in 1998. ICLR is a coordinated effort to reduce disaster losses involving member insurance companies, The University of Western Ontario and other partners.

United States Government. Department of Commerce. National Oceanic and Atmospheric Administration. National Severe Storms Laboratory

<http://www.nssl.noaa.gov/>

The mission of the National Severe Storms Laboratory (NSSL) is to enhance the National Oceanic and Atmospheric Administration's (NOAA) capabilities to provide accurate and timely forecasts and warnings of hazardous weather events (such as blizzards, ice storms, flash floods, tornadoes, lightning.)