

*Some of Canada's worst weather disasters occurred in the past decade. Do they signal a trend?*

**E**xtrême weather is weather that is unusual and often destructive. It includes events such as heat waves and cold spells, floods, droughts, severe thunderstorms, blizzards, ice storms, hurricanes, and tornadoes. For some kinds of events, however, what is considered extreme for one location may be quite normal for another. A 20 cm snowfall may be exceptional in Victoria, but not in Quebec City or St. John's.

Because different weather extremes have different causes, climate change could affect these extremes in a variety of ways. Although climate change could moderate some extremes, there are also concerns that it could lead to an increase in some of the most dangerous and destructive weather extremes. Some of these concerns are based on scientific arguments about how the processes that cause these extremes will be affected by a warmer climate. One such argument, for example, suggests that heavy rainstorms could become more common because a warmer atmosphere can hold more moisture to fuel these storms.

What is generally accepted, however, is that the warm season will get longer in most parts of Canada and that warm conditions will extend farther northwards. As a result, the risk of severe hot weather events such as heavy thunderstorms, hail, and tornadoes would extend over a longer period and affect a wider area. On the other hand, the time span in which severe winter weather may occur is likely to become shorter. Nevertheless, winter storms could still be quite intense.

Weather phenomena are very complicated, and unusually destructive events in particular are often the result of chance combinations of several factors. Consequently, there is still much to learn about how these events might be affected.

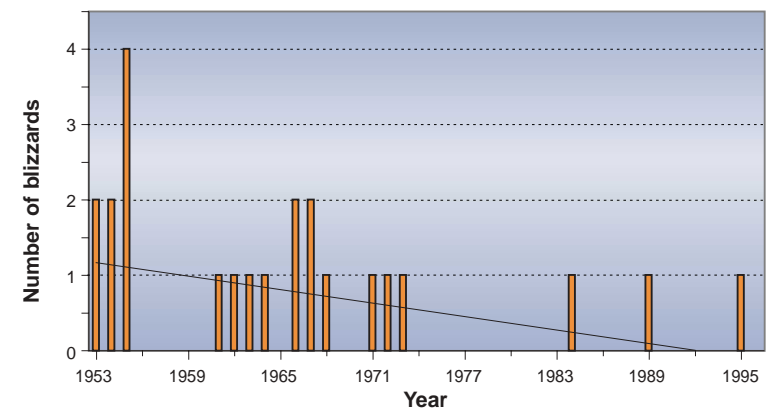


## FOCUS: Prairie Blizzards

Blizzards combine bone-chilling temperatures, strong winds, and dense, blowing snow to pack one of winter's heaviest punches. They occur in almost every part of Canada, but Prairie blizzards are legendary for their ferocity. One that struck the Regina area in 1947 lasted 10 days and buried an entire train in a kilometre-long snowdrift.

Climate change could affect the intensity and frequency of these storms as well as the paths that they follow. As a result, blizzard patterns may be changing. In fact, a recent study shows that the number of blizzards has decreased significantly in southern Saskatchewan over the past half century. In Manitoba, however, there has been no change in blizzard frequency – possibly because the storm systems that affect Saskatchewan are not entirely the same as those that affect Manitoba.

Blizzard Frequency, Saskatoon



Source: Adapted from Lawson, 2003

*In Alberta, Saskatchewan, and Manitoba, a winter storm is a blizzard if it lasts at least 4 hours and has winds of 40 km/hour or more, a wind chill of  $-24.4^{\circ}\text{C}$  or lower, and blowing snow with visibility less than 1 km. Over the past half century, the number of blizzards hitting Saskatoon has declined significantly. Regina has shown a similar trend, but Winnipeg has had no change in blizzard frequency.*

## THE BIGGER PICTURE

The 1990s witnessed a clustering of unusually severe weather events in both Canada and other parts of the world, including such disasters as the 1996 Saguenay flood in Quebec, the 1997 Red River flood in Manitoba, and the 1998 ice storm in Ontario, Quebec, and New Brunswick. The pattern continued in 2000, when the village of Vanguard, Saskatchewan, was flooded by

333 mm of rain in 10 hours – one and half times as much as it normally receives in a year.

Economic losses from weather events have also climbed sharply in recent years. However, the size of these losses also mirrors the growth of our society and economy: an extreme event today will affect more people and more

property than it would have a few decades ago. That makes it harder to determine how much of the increase in losses is actually due to an increase in severe weather.

A similar problem also makes it difficult to judge whether tornadoes are occurring more frequently. Although the number of tornadoes reported over the past century has increased, climatologists note that the increase closely tracks the growth of the country's population. That makes it difficult to conclude whether more tornadoes are actually occurring or whether more are simply being reported.

We are on more solid ground in dealing with widely measured climate variables such as temperature and precipitation, and here, so far, there is little evidence of an increase in extremes. Canadian temperature records show that most of the country, except for the eastern Arctic, has seen a significant decrease in extremely cold weather over the past half century. At the same time, there has been no consistent increase in extremely hot weather.

There has also been no trend towards more frequent heavy rainfalls in Canada, even though precipitation has increased across the country during the past century. Since the 1940s most weather stations in southern Canada have recorded fewer heavy rainfalls, but the number of rainy days has increased. In some other parts of the world, however, such as the United States, Japan, and Australia, there has been a trend towards more intense precipitation.

It is hard to tell, therefore, whether many kinds of extreme weather events are becoming more common or not. Since extreme events are usually rare, it could take decades to detect a pattern of change.

### THE GREAT ICE STORM OF 1998

Episodes of freezing rain are common in most of Canada, and occasionally they develop into major ice storms that are notable both for their sparkling beauty and the crushing weight of ice they leave on power lines and trees. But none had ever been as persistent or destructive as the storm that struck much of eastern Canada in January 1998.

Over a period of six days, freezing rain fell intermittently over an area extending from central Ontario to Prince Edward Island. Millions of trees, including valuable sugar maples, were toppled or damaged, and downed power lines left more than 4 million people without electricity. The Montreal area was affected the worst. Up to 100 mm of freezing rain fell south of the city, and some localities were without power for as long as five weeks. More than 600,000 people in Quebec and eastern Ontario sought refuge in emergency shelters, while 16,000 troops worked with utility crews from six provinces and eight American states to restore power and clean up the damage.

The storm was blamed directly for 28 deaths, and with damage estimated at over \$5 billion, it was by far the costliest weather disaster in Canadian history. It is impossible to say that a single event such as this is the result of climate change. However, it does represent the kind of extreme event that some fear could become more common as climate change continues.

