Freeze-up and breakup times are changing, and northern communities are worried about the consequences.

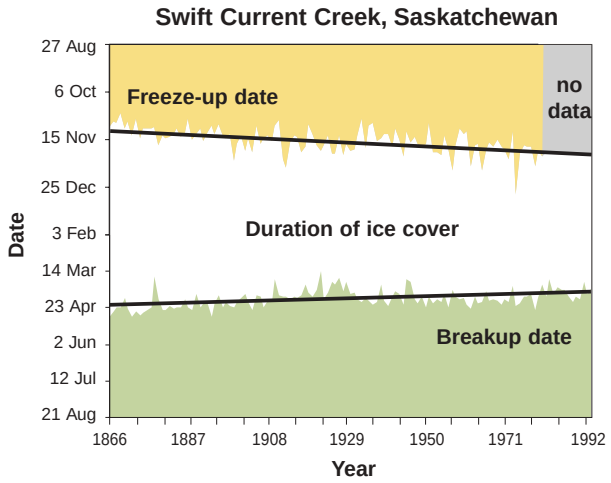
The formation and breakup of ice on rivers and lakes marks not only the changing of the seasons but also a change in the way that water can be used for travel, fishing, and recreation. It has important consequences for fish and other aquatic life too, because ice blocks the transfer of oxygen from the air to the water. In addition, changes in the duration of ice cover can affect the food supply for aquatic life, while changes in freeze-up and breakup times can cause birds to change their migration patterns. Spring breakup on rivers also brings a risk of floods caused by ice jams and damage to bridges and other structures from floating ice and debris.

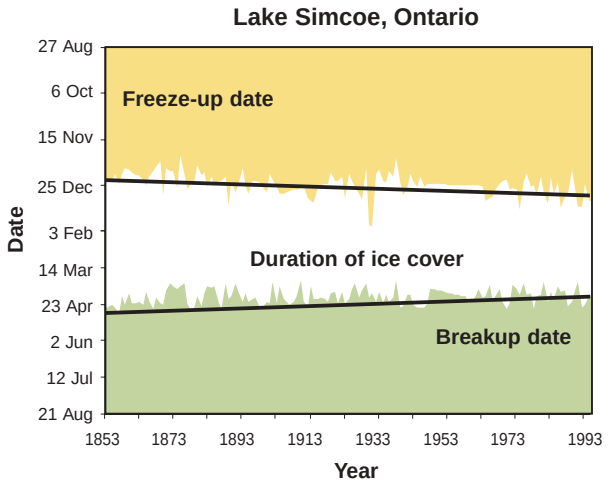
The timing of freeze-up and breakup depends on a number of things, including precipitation, wind, sunshine, and various features of the water body itself, such as its size and the characteristics of its currents. Spring breakup times are more variable because they are also influenced by the amount of snow cover and the coldness of the preceding winter. Air temperature, however, is particularly important for both freeze-up and breakup, and changes in the timing of these events provide a good reflection of trends in fall and spring temperatures.

FOCUS: Saskatchewan and Ontario

Over the years, many people other than scientists have kept surprisingly good records of freeze-up and breakup dates. Where such records are available, freeze-up and breakup times can sometimes be traced back a century or more. In the case of the two locations shown here – Swift Current Creek in southwestern Saskatchewan and Lake Simcoe in south-central Ontario – the records date from the 1860s and 1850s respectively. They show that the average freeze-up date for Lake Simcoe is now about 13 days later than it was 140 years ago, and the average breakup date is about 4 days earlier. For Swift Current Creek, over a period of about 115 years, the change is more dramatic. Freeze-up is now about 24 days later and breakup about 14 days earlier.

These results are what might be expected from the temperature record of the past century, which shows more warming in southern Saskatchewan than in southern Ontario.





Source: *M. Futter/Ecological Monitoring and Assessment Network*

Over the past century and a half, Swift Current Creek and Lake Simcoe have been freezing later in the fall and breaking up earlier in the spring.

THE BIGGER PICTURE

An international team of scientists recently used various historical records to compile freeze-up and breakup dates for 39 rivers and lakes in Europe, Asia, and North America. They found that over the past 150 years, these lakes and rivers were freezing later in the fall and breaking up earlier in the spring. They concluded that across the Northern Hemisphere freeze-up is now occurring an average of 5.8 days later than it did a century ago, while breakup is happening 6.5 days earlier. In Canada the few rivers and lakes for which we have long historical records – like Swift Current Creek and Lake Simcoe – tend to fit the pattern of later freeze-up and earlier breakup.

Our most extensive and reliable source of scientific data for Canada, however, covers only the past 30 to 50 years and reveals a more complex pattern. It shows breakup starting earlier in the spring almost everywhere in the country except in the Atlantic region – but it also shows a widespread tendency towards earlier freeze-up dates in the fall. The net result is that there has been an increase during this period in the amount of time that most Canadian rivers and lakes remain ice-covered. The largest increase – more than a month – has been in Atlantic Canada.

These results match up well with the way that temperatures have changed in different seasons and different parts of the country over the past half century. Although they differ from the longer-term results, they don't contradict them. They merely reflect the fact that different patterns may show up when climate is viewed over shorter and longer periods.

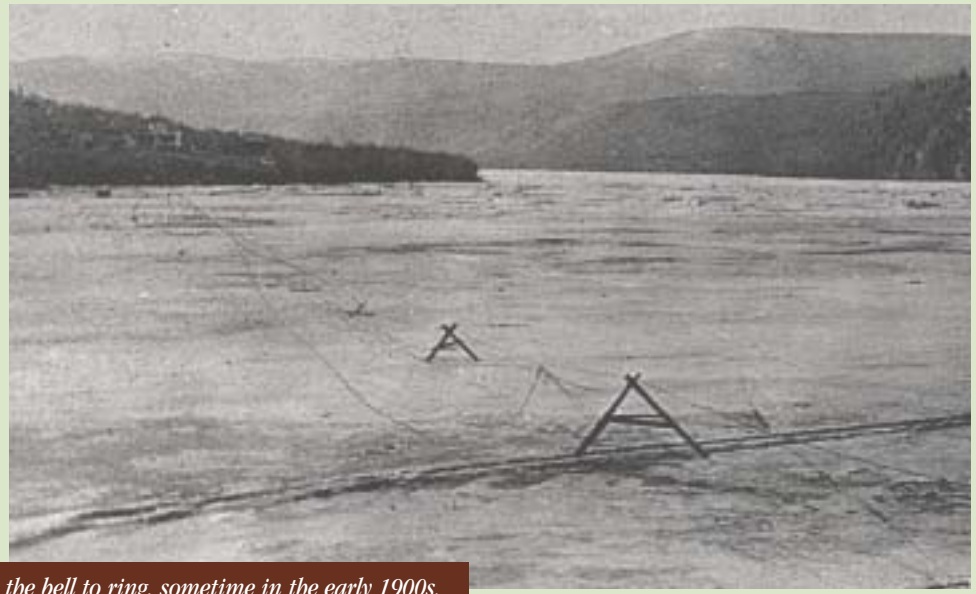
As a result of a recent string of warm years, there has been increasing concern about the difficulties that a shorter or more unpredictable ice season might bring to isolated northern settlements. Frozen lakes and rivers are essential to winter travel in the North. Hunters and trappers depend on them. So do whole communities whose supplies are trucked in from the south on winter roads that are built in part over frozen rivers, lakes, and bogs.

Manitoba, for example, builds about 2400 km of these roads every winter, and more than 25,000 people in 29 settlements rely on them. In 1997–1998, when the winter road season was unusually short, the provincial government had to supply these communities by air. The additional costs reached $14 million, or about three times the cost of building the winter road system. During the winter of 2001–2002 a number of the roads did not open until February, and one did not open at all.

BETS AND BELLS ON THE YUKON – SPRING BREAKUP AT DAWSON CITY

Thanks to the gambling instincts of a few prospectors, breakup records for the Yukon River at Dawson City go back to 1896. That spring, after betting on the exact minute when the breakup would start, the men set a series of wooden tripods across the middle of the river, ran a cord from them to a bell on the shore, and waited for it to signal the first shifting of the ice.

The bell has been set up every year since. It has rung as early as April 9 and as late as May 28. For most of the twentieth century, breakup was a May event, but since the mid-1980s April breakup dates have been more common. The average spring breakup date now arrives about 6 days earlier than it did a century ago.



Waiting for the bell to ring, sometime in the early 1900s.