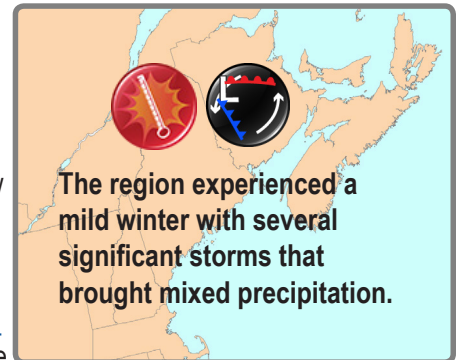




Gulf of Maine Significant Events – December 2019–February 2020

December

A **December 2 to 4** storm dropped up to 90 cm (36 in.) of snow on New England, with snowfall rates exceeding 5 cm (2 in.) per hour. Coastal Maine had up to 50 mm (2 in.) of **sleet** and 6 mm (0.25 in.) of ice from **freezing rain**. The storm caused difficult travel, flight cancellations, and school closures. The region saw more than 50 mm (2 in.) of **rain** from a **December 9 to 10** storm. Flooding and road and culvert washouts occurred in southern New Brunswick. **Wind gusts** in excess of 90 km/h (55 mph) damaged roofs and **knocked out power** to more than 50,000 customers in Nova Scotia. **Record-setting mild temperatures** of 10–14°C (50–58°F) accompanied the storm. From **December 13 to 15**, southern Maine and New Hampshire saw 75–125 mm (3–5 in.) of **rain**, leading to flash flooding and a pileup on Interstate 95. December 14 was Portland's **third wettest December day** on record. In the Maritimes, there were flight and ferry cancellations and **record warm temperatures** of 10–17°C (50–63°F).



January

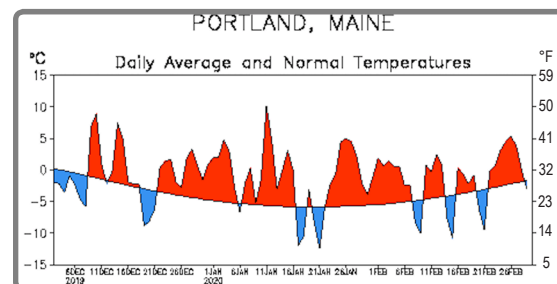
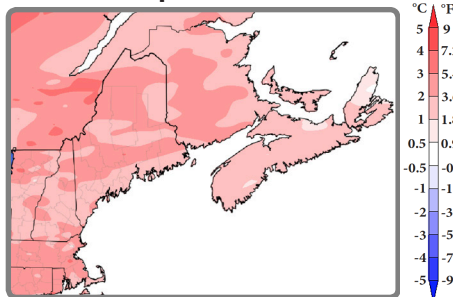
Many areas saw unusually **mild temperatures** of 10–21°C (50–70°F) on **January 11**. It was among Boston's and Portland's ten warmest January days on record. On **January 12**, southern New England remained mild. Boston's high of 23°C (74°F), which was 21°C (38°F) above normal, made it the site's **warmest January day**, while Concord had its fourth warmest. In northern/central Maine and the Maritimes, where it was colder, a storm brought snow, ice pellets, and freezing rain. **Snow totals** were up to 37 cm (15 in.), with Caribou having its eighth snowiest January day. The storm created poor road conditions and disrupted air travel. A storm on **January 16** brought up to 30 cm (12 in.) of **snow** and **wind gusts** of up to 105 km/h (65 mph) to the region. **Whiteout conditions** caused the Cobequid Pass, which connects Nova Scotia to the rest of Canada, to be shut down for 14 hours. A storm from **January 25 to 26** dropped up to 50 mm (2 in.) of **rain** on much of the region. Northern Maine and parts of New Brunswick saw **freezing rain**, with **ice accumulations** of over 10 mm (0.40 in.) creating hazardous travel conditions.

February

A **rapidly strengthening storm** from **February 6 to 7** brought snow, ice, and **wind gusts** of up to 137 km/h (85 mph) to the region. The **greatest snow totals** of up to 58 cm (23 in.) were in northern Maine, where whiteout conditions occurred. The storm downed trees and wires and left nearly 155,000 customers in New England **without power**. Over 20 hours of **freezing rain** was reported in Nova Scotia where 135,000 customers lost power, a sports dome collapsed, and a historic building was damaged. A storm from **February 26 to 28** dropped up to 40 cm (16 in.) of **snow** in mountainous areas of New England and up to 45 mm (2 in.) of rain in Nova Scotia. **Wind gusts** of up to 120 km/h (75 mph) were reported, with **Les Suêtes winds** in Cape Breton reaching 229 km/h (142 mph). The storm downed trees and wires, left more than 40,000 Maritimes customers without power, and caused coastal flooding in Maine.

Regional Climate Overview – December 2019–February 2020

Temperature Winter Departure from Normal

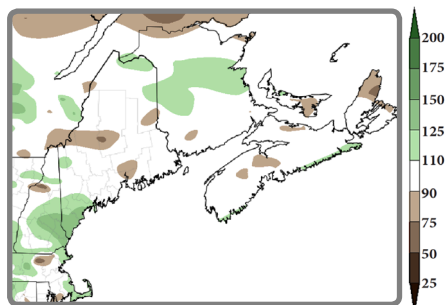


Temperatures were warmer than normal (shaded red) frequently during winter, with very few cold days (shaded blue). Credit: NOAA CPC.

Winter temperatures (averaged over December, January, and February) were as much as 4°C (7°F) **above normal**. This winter was Boston's **second warmest**, Caribou's fourth warmest, and Portland's seventh warmest. This is **only the second winter** on record that Boston's low temperature failed to drop below -11°C (12°F). **December temperatures** were near normal for most areas but up to 3°C (5°F) **above normal** in parts of New Brunswick, Maine, and northern New Hampshire. **January was mild**, with temperatures up to 5°C (9°F) **above normal**. This January ranked among the ten warmest on record for several sites. **February temperatures** were as much as 3°C (5°F) **above normal**. It was Boston's **third warmest February** and Yarmouth's eighth warmest. Temperature normals based on 1981–2010 data.

Regional Climate Overview – December 2019–February 2020

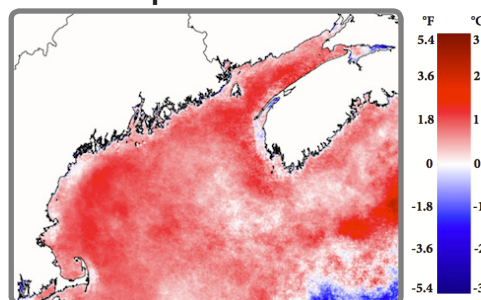
Precipitation Winter Percent of Normal



U.S. precipitation normals based on 1981–2010 data; Canadian precipitation normals based on 2002–2018 data.

Winter precipitation (accumulated from December to February) ranged from 50% of normal to 150% of normal. In Nova Scotia, this winter ranked among the ten driest for the Greenwood and Truro areas. In **December**, the Maritimes and northern/western Maine saw 50% to 110% of normal precipitation, while southern/eastern Maine and New England saw 110% to 200% of normal. Portland had its **fifth wettest December**. Much of the region saw 25% to 110% of normal precipitation in **January**. However, northeastern Maine and northwestern New Brunswick saw 110% to 150% of normal. **February precipitation** ranged from 50% of normal in parts of the Maritimes to 175% of normal in parts of Maine and New Hampshire.

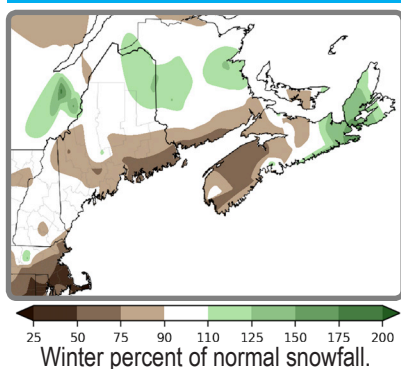
Sea Surface Temperature Winter Departure from Normal



Sea surface temperature anomalies over the entire Gulf of Maine region were above normal. These positive anomalies were strongest (1.4°C [2.6°F]) over deeper areas of the eastern Gulf and in the Bay of Fundy and weaker (less than 0.5°C [0.9°F]) in nearshore regions along the entire coast.

SST normals based on 1985–2014 data

Regional Impacts – December 2019–February 2020



Winter Conditions

This winter's unusual warmth was tied to the [polar vortex](#) and an atmospheric circulation pattern called the [Arctic Oscillation](#). The polar vortex is an area of low pressure and extremely cold air at the Earth's poles. At the outermost edge of this cold air mass is the polar jet stream. When the **polar vortex is strong**, the **jet stream** (and storm track) is **farther north** and the **cold air is contained**. The strength of the polar vortex and the phase of the Arctic Oscillation are [closely related](#). When there is lower-than-average air pressure over the Arctic and higher-than-average air pressure over the mid-latitudes, the **Arctic Oscillation is positive**. Driven by a strong polar vortex, the Arctic Oscillation was **persistently positive** this winter. In fact, [in early February](#), the Arctic Oscillation reached its **highest daily value on record**.

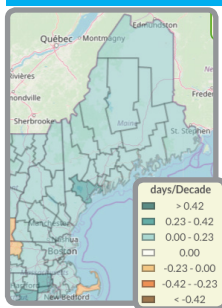
December snowfall in the Maritimes, western Maine, and northern New Hampshire was **below to well below normal**. Several Maine sites had a snowfall deficit of 30–60 cm (12–24 in.), including Fort Kent, which had its seventh least snowy December. However, snowfall was **above to much above normal** for southern Maine, southern New Hampshire, and Massachusetts, mostly due to a major snowstorm in early December. With **mild temperatures** in January, the few storms that moved through the region generally brought **mixed precipitation**. For many areas, **January snowfall** was **below to near normal**. Snowfall deficits in eastern Massachusetts and southern New Hampshire were up to 30 cm (12 in.). In contrast, northern Maine and parts of Nova Scotia saw a **snowfall surplus** of 30 cm (12 in.) or more. It was the **snowiest January** on record for Sydney. **February snowfall** was **below normal** in southern parts of New England and southwestern Nova Scotia. Snowfall deficits of up to 30 cm (12 in.) were found in Massachusetts, with Boston having its seventh least snowy February. However, snowfall was **above normal** in northern parts of New England, much of New Brunswick and P.E.I., and central/eastern Nova Scotia. Much of northern Maine saw a snowfall surplus of up to 30 cm (12 in.), and several Maritimes sites reported up to 60% more snow than normal.

Thinner than normal ice was reported on some of the region's lakes and rivers this winter, prompting warnings from officials. There were reports of [several people](#) and vehicles [falling through the ice](#). **Ice observations** have been taken on the Saint John River at Fredericton since 1825 and maintained by Environment and Climate Change Canada for many years. This year's freeze-up occurred on January 13, 2020, making it the **fifth latest freeze-up** on record (based on records since 1968 following the installation of the Mactaquac Dam west of Fredericton). Based on this record of ice observations in Fredericton, it is clear that there is long term trend toward later freeze-up and earlier break-up of the river ice due in part to gradually warming climatic conditions.



Ice and strong winds snapped power poles in Saint John, NB, on February 27. Credit: Roger Cosman CBC New Brunswick.

Regional Impacts – December 2019–February 2020



Trend in number of days with precipitation greater than 50 mm (2 in.), 1950 to 2013. Credit: [NRCC and CICSS](#)

Climate Change in the Gulf of Maine Region

A report found that **climate change** is [accelerating in Maine](#). The state has become **warmer and wetter** since 1895, with these changes **occurring faster** since 1960. Changes in Maine's winters include warmer temperatures, more precipitation **falling as rain, weather extremes, and earlier ice-out dates**. These changes have affected [Maine's natural environment and its people](#). The report noted an **increase in heavy rainfall events** and a **longer growing season** as the first fall frost occurs later, two things that present [challenges for potato growers](#).

A [recent study](#) indicated that birds are [migrating earlier](#) in spring due to climate change, particularly in areas that have seen greater warming. This could be a problem if the **timing of migration does not align** with the emergence of plants and insects that some birds rely on. Similarly, **warming waters** in the Gulf of Maine have **changed the availability of certain fish** that some birds feed on, which can [severely impact species](#) such as the endangered Northeast population of the Roseate Tern. Ocean warming has also been linked to a [shift in the feeding locations](#) of right whales. Scientists believe a **lack of food** stressed the whales' bodies, causing females to [give birth less frequently](#). The Canadian government implemented [additional measures](#) to protect right whales in the North Atlantic.

NOAA Fisheries Ecosystem Report

According to scientists at NOAA's Northeast Fisheries Science Center, "The **changing position of the Gulf Stream north wall** directly influences oceanic conditions in the Gulf of Maine (GOM). Since the mid-2000s, **warmer, saltier slope water** associated with the Gulf Stream has dominated the input into the GOM at the Northeast Channel, with 2017 and 2019 consisting of 99% warm slope water, the **highest estimated** in the time series. The changing proportions of source water affect the **temperature, salinity, and nutrient inputs** to the system. While further study is needed to determine if these short-term trends are related to climate change, analyses of global climate models suggest that these trends are evident in long-term (century-scale) **climate change projections**."

Regional Outlook – Spring 2020

Temperature and Precipitation

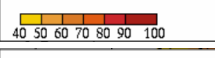
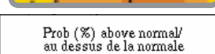
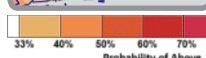
For **March–May**, [NOAA's Climate Prediction Center \(CPC\)](#) and [Environment and Climate Change Canada \(ECCC\)](#) favor increased chances of **above-normal temperatures**

for New England, New Brunswick, parts of Nova Scotia, and western P.E.I. **Near-normal temperatures** were predicted for central and eastern P.E.I. and eastern sections of Nova Scotia. An increased likelihood of **above-normal precipitation**

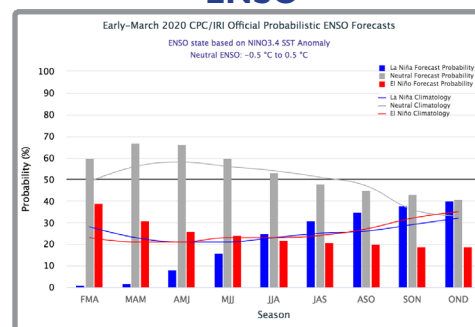
is forecast for New England for **March–May**. ECCC predicts an increased chance of **below-normal precipitation** for southwestern New Brunswick and **equal chances** of below-, near-, or above-normal precipitation for the rest of the Maritimes.

CPC temperature map (above left) produced February 20.

ECCC temperature map (above right) produced February 28.



ENSO



During February, El Niño-Southern Oscillation (**ENSO**)-**neutral conditions** were observed in the equatorial Pacific Ocean. NOAA's Climate Prediction Center indicates that [ENSO-neutral conditions are expected to persist](#), with a 65% chance they will continue through spring and a 55% chance they will continue through summer.

Spring Flood Potential

[NOAA indicates](#) the **flood risk** during spring is **normal** for Maine and northern New Hampshire, where normal snow water equivalent conditions exist, and **below normal** for southern New Hampshire and Massachusetts, where snow cover is below normal. The **ice jam flooding potential** in interior Maine and northern New Hampshire is also **normal**. Very heavy rain can cause flooding at any time of the year, even in areas that have little to no snow cover.

The [New Brunswick River Watch app](#) for the Saint John River basin has been enhanced to provide **real-time and forecast water levels** for more communities, with forecasts out to six days.

Contacts

[National Oceanic and Atmospheric Administration](#)

[Environment and Climate Change Canada](#)

[Northeast Regional Climate Center](#)

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