Quarterly Climate Impacts and Outlook

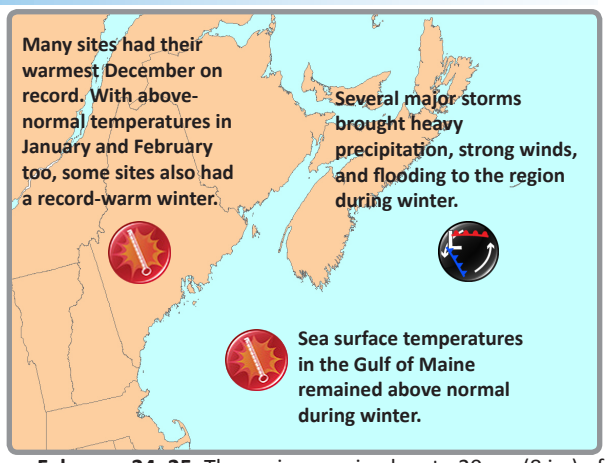
Gulf of Maine Region

March 2016

Gulf of Maine Significant Events - *December 2015–February 2016*

Atmospheric drivers such as El Niño and the Arctic Oscillation played a role in the region's mild and stormy weather this winter. Numerous significant storms impacted the region, with four of the most powerful described below. There were two main storm tracks: an offshore track near Massachusetts and Nova Scotia and a track northwest of Maine and New Brunswick.

- **January 13:** A rapidly intensifying storm brought up to 51 cm (20 in.) of snow and wind gusts of up to 92 km/h (57 mph) to Maine and the Maritimes. Southern Maine experienced thundersnow, with snowfall rates of up to 15 cm (6 in.) per hour. A storm surge of more than 100 cm (3 ft.) resulted in minor flooding along the east coast of New Brunswick. Many federal, provincial, and city services were closed. In Nova Scotia, the Trans-Canada Highway was partially shut down and more than 12,000 customers lost power.
- **February 8–9:** A strong Nor'easter brought blizzard conditions to parts of Massachusetts and southern sections of the Maritimes. Winds gusted to 102 km/h (63 mph), and snow totals were up to 43 cm (17 in.), with the highest amounts in Nova Scotia. Many schools and government offices closed. Transportation services, ferry crossings between New Brunswick and Nova Scotia, and numerous flights were cancelled. Minor to moderate coastal flooding occurred in Massachusetts, with some roads temporarily impassable. The storm further eroded beaches damaged by storms in January.
- **February 15–17:** Up to 15 cm (6 in.) of snow and 51 mm (2 in.) of rain fell in the region. Up to 6 mm (0.25 in.) of ice accumulated in parts of Maine. Wind gusts to 124 km/h (77 mph) downed trees and powerlines, and damaged houses. More than 20,000 customers lost power in Maine. Rain and snowmelt flooded roads, while ice jams caused flooding along the Kennebec River in Augusta, ME, and along the Salmon River in Truro and Bible Hill, NS. Lightning also accompanied the storm. Several stations in New Brunswick broke daily maximum temperature and/or precipitation records.

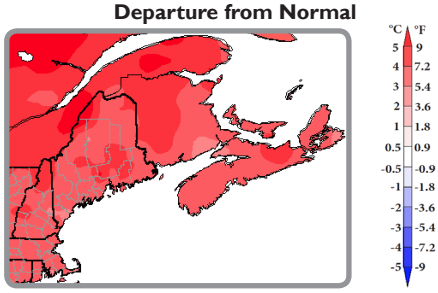


- **February 24–25:** The region received up to 20 cm (8 in.) of snow and up to 50 mm (2 in.) of rain. Freezing rain fell for up to 19 hours in parts of New Brunswick, and up to 1.8 cm (0.7 in.) of ice accumulation was reported in Maine. The storm also produced frequent lightning over parts of New England and New Brunswick. Wind gusts of up to 134 km/h (83 mph) downed trees and wires, resulting in tens of thousands of power outages and closed roads. Many sites set daily high temperature records on the 25th. Yarmouth, NS, and Saint John, NB, set a new record for warmest day in February. Several sites also set new highest daily precipitation records for February.

Regional Climate Overview - *December 2015–February 2016*

Temperature

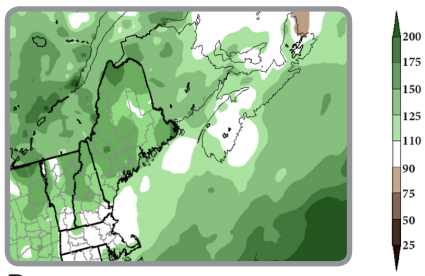
Departure from Normal



December was extremely mild for the entire region. Temperatures were up to 6°C (11°F) above normal. The three states had a record warm December, as did numerous sites. The entire region was warm again in **January**, with temperatures up to 5°C (9°F) above normal. The warmest areas were in northern New Brunswick and Maine. In **February**, with the exception of a brief Arctic outbreak, temperatures continued to be above normal. Most areas were 1°C (2°F) to 5°C (9°F) above normal, with the warmest spots in northern Nova Scotia and eastern Prince Edward Island. **Winter** (averaged over December, January, and February) was warm region-wide, with temperatures 2°C (4°F) to 5°C (9°F) above normal. The three states had their warmest winter on record, as did several sites, such as Caribou, ME, Concord, NH, Fredericton, NB, and Moncton, NB.

Precipitation

Percent of Normal

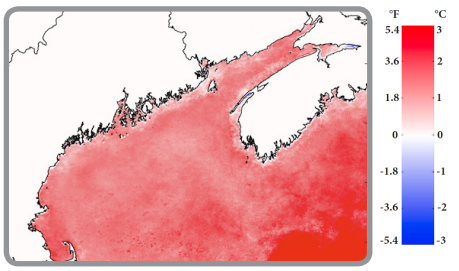


December precipitation ranged from 110–200% of normal for most of the region. Some areas of western Maine saw precipitation amounts in excess of 200% of normal, while parts of Cape Breton, NS, saw less, from 75–90% of normal. **January** was drier, with most areas seeing 50–90% of normal precipitation. A few spots in New Brunswick saw 25–50% of normal, while Cape Cod, MA, and parts of southern Maine saw 110–150% of normal. Numerous storms led to above-normal precipitation for most areas in **February**. Precipitation generally ranged from 110% to more than 200% of normal, with the wettest areas in northern Maine and New Brunswick. **Winter** precipitation ranged from near normal to 175% of normal.

Temperature and precipitation normals based on 1981–2010. Canada and ocean precip data: Canadian Precipitation Analysis. U.S. precipitation data: interpolated station data.

Sea Surface Temperatures

Departure from Normal



Winter sea surface temperature anomalies in the Gulf of Maine were substantially warmer than the winter long-term average over the entire study area. Temperatures over coastal areas of Maine, New Brunswick, and Nova Scotia were 0.5°C (1°F) to 1.0°C (2°F) above normal. Off the coast of Massachusetts, temperatures were up to 2°C (4°F) above normal. Temperatures were 1.0°C (2°F) to 2.0°C (4°F) warmer than normal over deeper basins in the central Gulf of Maine and the entire Scotian Shelf. These warm anomalies continue a region-wide continuous warm surface ocean period that began in September 2015.

Sea surface temperature anomalies based on 1985–2014. Mean SST anomalies from NOAA AVHRR data. Credit: University of Maine School of Marine Sciences and NERACOOS

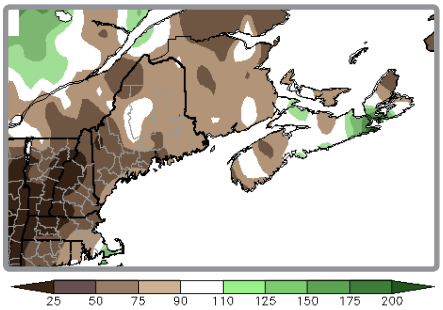
Environment and Climate Change Canada / Environnement et Changement climatique Canada

Gulf of Maine Council on the Marine Environment
Celebrating 25 years of action for a healthy environment

www.drought.gov/drought/content/resources/reports
www.ec.gc.ca/eau-water/default.asp?lang=En&n=F2BDD611

Regional Impacts - *December 2015–February 2016*

An ice jam in mid-February caused flooding along the Kennebec River in Augusta, ME. Ice out on the lower part of the river was earlier than usual. Courtesy: U.S. Geological Survey



Percent of normal snowfall for winter (accumulated from December to February).

Warm Winter

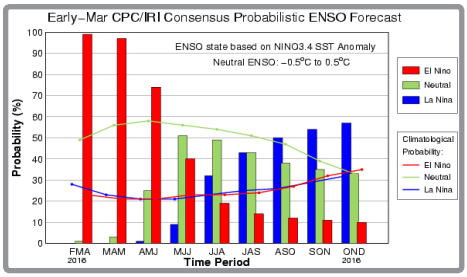
Mild temperatures during winter had numerous impacts. Some U.S. golf courses saw an increase in business in December, while a few Maritime courses opened earlier than usual this spring. Business slowed for winter recreation venues and winter gear retailers. In fact, several ski resorts opened late or had limited trails open. The Mount Washington Auto Road in New Hampshire opened for guided auto tours in late December for the first time in (at least) 35 years. In the U.S., the warmth allowed some crops to be harvested later into December, but caused other plants to bloom early. The warm temperatures also caused maple sap to start flowing, leading to an early start for syrup production. In early February, ice development around Prince Edward Island (P.E.I.) was about three weeks behind normal, which was good for marine shipping. Outdoor ice rinks in Charlottetown and Stratford, P.E.I. were closed in early February, while only one of eight rinks in Fredericton, NB, was operating. The above-normal temperatures left many lakes and waterways unfrozen or with unsafe ice conditions. Several ice fishing tournaments were cancelled or postponed in New Hampshire and Maine. Ice on the Saint John River at Fredericton broke up on February 21, which was the second earliest break up since 1825. In the three states, transportation departments performed roadwork and continued construction projects longer into the season, as well as saved money on snow removal, fuel, and personnel costs. Home heating costs were also down, in part due to the warm weather.

Seasonal Snowfall

December snowfall ranged from less than 75% of normal in Massachusetts, New Hampshire, and southern Maine to more than 150% of normal in parts of New Brunswick and P.E.I. At the end of December, average snow on the ground in the Maritimes was near to above normal. **January** snowfall was 25–90% of normal for most of New England, New Brunswick, and P.E.I. However, Cape Cod, MA, and much of Nova Scotia saw more than 125% of normal. Snow on the ground at the end of January was below normal in New Brunswick and P.E.I, but above normal in Nova Scotia. In **February**, coastal New England and much of the Maritimes saw more than 110% of normal snowfall, while inland areas of New England saw less than 90% of normal. While snowfall was above normal, it did not remain on the ground for extended periods of time due to warm temperatures. In the Maritimes, snow on the ground at the end of February was below normal. **Winter** snowfall ranged from 50–90% of normal for most of New England. In New Brunswick and P.E.I., winter snowfall ranged from 75–125% of normal, while Nova Scotia and Cape Cod, MA, saw 50–175% of normal.

Regional Outlook - *Spring 2016*

El Niño



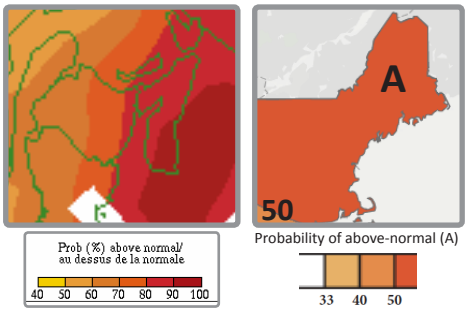
While sea surface temperatures in the equatorial Pacific Ocean peaked in late 2015, atmospheric and oceanic observations during February indicated that the strong El Niño event continues. El Niño conditions and impacts will weaken during spring, with a transition to ENSO-neutral conditions by early summer. An El Niño is frequently followed by a La Niña. Most computer models indicate a transition to La Niña is somewhat likely by winter 2016-17. (Above graphic courtesy: International Research Institute for Climate and Society/NOAA).

Spring Flood Potential

The potential for river flooding during spring is near to below normal for most of New England. In mid-March, river levels and soil moisture were near to above normal, but snowpack and snow water equivalent were below normal. In northwest Maine, where snowpack and river ice lingered, the river flood and ice jam flood potential is near to above normal. Very heavy rain can cause flooding at any time of the year, even in areas that have little to no snow on the ground.

Temperature and Precipitation

For March through May, NOAA's Climate Prediction Center and Environment and Climate Change Canada are both calling for an increased chance of above-normal temperatures for the entire Gulf of Maine region. Both groups are predicting equal chances of below-, near-, or above-normal precipitation in the region for spring.



Environment and Climate Change Canada map (above left) produced on February 29. U.S. Climate Prediction Center map (above right) produced on February 18.

Map produced March 17 by NOAA.

Gulf of Maine Region Partners

Environment and Climate Change Canada
www.ec.gc.ca
Northeast Regional Climate Center
www.nrcc.cornell.edu
National Oceanic and Atmospheric Administration
www.noaa.gov
National Centers for Environmental Information
www.ncei.noaa.gov
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Northeast River Forecast Center
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State Climatologists
www.stateclimate.org
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www.drought.gov
Cooperative Institute for the North Atlantic Region
www.cinar.org
Gulf of Maine Council on the Marine Environment, Climate Network
www.gulfofmaine.org/climatenetwork
Northeastern Regional Association of Coastal and Ocean Systems
www.neracoos.org
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