



### Gulf of Maine Significant Events – September–November 2023

Autumn ranked among the **five warmest** on record for Charlo, N.B., and Caribou and Portland, ME. Gulf of Maine **sea surface temperatures** were **warmer than normal** during each month and for the autumn season.

#### September

September 4 to 9 was **unusually warm and humid**, with highs reaching 35°C (95°F) and lows as warm as 24°C (75°F). During this time, Caribou, ME, had its **warmest low for September** with 19°C (67°F), while other New England sites had lows that were among their 10 warmest for September. The early-month heat helped push some sites including Caribou and Portland, ME, Fredericton, N.B., and Halifax, N.S., to have one of their **five warmest Septembers**. Meanwhile, Earth had its **hottest September on record**, following record warmth in [June, July, and August](#). New Brunswick experienced strong thunderstorms with frequent lightning from **September 7 to 9**, pushing the province to see its **greatest number of lightning strokes for September** since records began in 2002. In mid-September, strong winds, heavy rain, and high waves from **Post-Tropical Storm Lee** produced **power outages and flooding** in parts of Maine, New Brunswick, and Nova Scotia. **Smoke from wildfires** burning in western Canada affected parts of New England and the Maritimes in September and early October, producing [hazy skies](#) and, in some spots, [reduced air quality](#).

Several locations experienced one of their 10 warmest Septembers and/or Octobers on record.

Two tropical systems brought rain and gusty winds to the region.

#### October

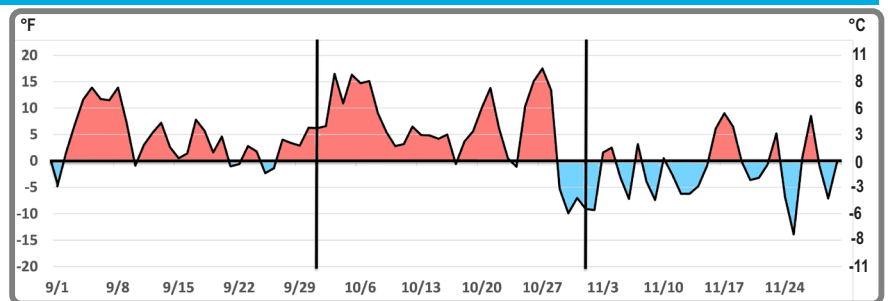
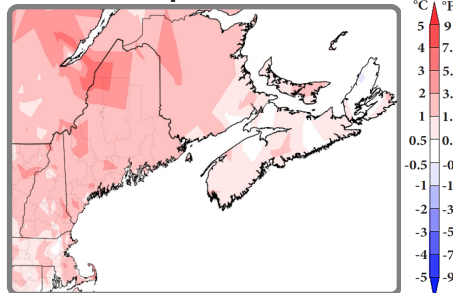
The region experienced a **warm spell** during the first week of October. For instance, Caribou, ME, tied its second warmest high temperature for October with a high of 26°C (79°F), while a temperature of 16°C (60°F) at Caribou and Portland, ME, ranked among their 10 warmest lows for October. The unusual warmth ended when a frontal system and **Post-Tropical Storm Philippe** brought rain and gusty winds to the region. The **first autumn frosts** were **later than average** by as much as a month, with temperatures not falling below freezing until October 23 or later in much of New Brunswick, Maine, and New Hampshire. In fact, for Caribou and Concord, it was the second-latest first autumn frost on record. Around month's end, parts of Maine and [the Maritimes](#) also experienced their **first snowfall** of the season. This **October** was **record warm** for Bas-Caraquet and Woodstock, N.B., and among the 10 warmest for multiple sites including Halifax, N.S., Charlottetown, P.E.I., Boston, MA, and Concord, NH.

#### November

November's **cool temperatures** were in contrast to the warmth of September and October. **November 1 to 21** was **notably dry** in New England, with Boston, MA, having its fifth driest such period with 8.6 mm (0.34 in.) of precipitation and **abnormal dryness** introduced in [southeastern Massachusetts](#). A storm on **November 22** brought New England its **first significant precipitation** of the month, [disrupting travel](#) on the day before American Thanksgiving, one of the busiest travel days of the year in the U.S. The storm dropped up to 20 cm (8 in.) of snow on [parts of New Brunswick](#) and brought up 100 mm (4 in.) of rain and wind gusts of up to 80 km/h (50 mph) to parts of Nova Scotia. With limited storms, **monthly precipitation and snowfall totals** were **below-normal** for most areas.

### Regional Climate Overview – September–November 2023

#### Temperature Autumn Departure from Normal



Daily average temperature departure from normal during autumn at Caribou, ME. Warmer-than-normal days are shaded red and colder-than-normal days are shaded blue.

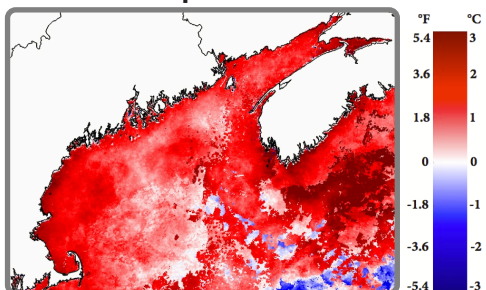
**Autumn** (averaged over September, October, and November) was as much as 3°C (5°F) **warmer than normal\***. It was among the five warmest autumns on record for Charlo, N.B., and Caribou and Portland, ME. **September** temperatures were up to 3°C (5°F) **warmer than normal**, ranking among the five warmest Septembers for several sites across the region. **October** was up to 4°C (7°F) **warmer than normal**, being **record warm** for two New Brunswick sites and among the 10 warmest for multiple sites in the region. **November** temperatures ranged from 2°C (4°F) below normal to near normal across the region.

\*Normals based on 1991–2020 data.

## Regional Climate Overview – September–November 2023

### Sea Surface Temperature

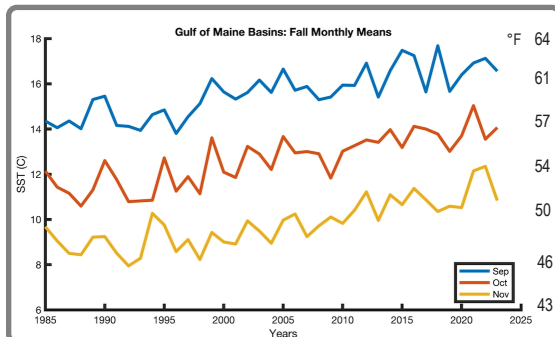
#### Autumn Departure from Normal



Autumn sea surface temperature anomalies over the Gulf of Maine were **above normal\*** in all regions. Anomalies were up to 0.5°C (1°F) over the central Gulf of Maine but were strongest along the Massachusetts and New Hampshire coasts at greater than 2.5°C (4°F) and over parts of the Scotian Shelf at around 3°C (5°F). The area of high variability in

the southeastern portion of the image is caused by lack of data and cloud cover.

Autumn **monthly mean sea surface temperatures**, averaged over the Gulf of Maine deep basins, showed September, October, and November to be the ninth, third, and seventh warmest of the 39 year record.



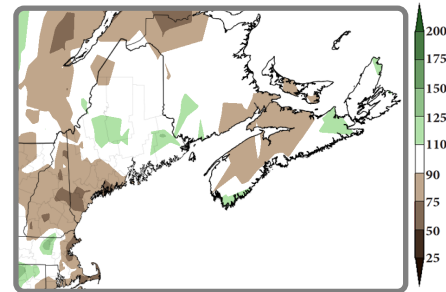
Monthly mean sea surface temperature averaged over the Gulf of Maine for September, October, and November (1985 to 2023). Credit: University of Maine School of Marine Sciences

\*SST normals based on 1991–2020 data.

These above-normal sea surface temperatures in the Gulf fit into the **larger trend** of the [North Atlantic Ocean](#) being unusually warm, [particularly this summer](#).

### Precipitation

#### Autumn Percent of Normal



**Precipitation for autumn** (accumulated from September to November) ranged from 50% of normal\* to 125% of normal.

**September** precipitation ranged from 25% of normal in parts of P.E.I. and Nova Scotia to more than 200% of normal in areas such as southwestern New Brunswick and eastern Maine. **October** precipitation ranged from 25% of normal in eastern Massachusetts to 200% normal in northeastern Nova Scotia. **November** precipitation ranged from 25% of normal to near normal for most areas except Cape Breton, N.S., which saw up to 150% of normal.

\*Precipitation normals based on 1991–2020 data.

## Regional Impacts – September–November 2023



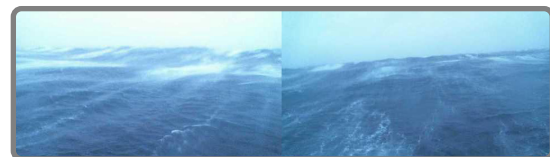
Satellite image of Post-Tropical Storm Lee over the region on September 16. Credit: NOAA

### Tropical Systems

**Hurricane Lee** produced rough surf and rip currents along the U.S. East Coast as it moved north in the Atlantic Ocean from **September 13 to 16**. Lee [made landfall](#) as a post-tropical cyclone over Long Island, N.S., on **September 16**, with the most impacts in Maine, New Brunswick, and Nova Scotia. The **greatest wind gusts** of 80 to 117 km/h (50 to 73 mph) were in southern New Brunswick and parts of Nova Scotia, with gusts of 64 to 97 km/h (40 to 60 mph) in Maine and coastal Massachusetts. The ground was saturated due to wet antecedent conditions, causing trees to be more easily uprooted. During the storm, [277,000 customers](#) in Nova Scotia, [at least 126,000 customers](#) in Maine, and [over 90,000 customers](#) in New Brunswick lost power. The **greatest rainfall totals** generally ranged from 50 to 100 mm (2 to 4 in.), with locally higher amounts in eastern Maine and southern New Brunswick. For instance, Perry, ME, saw 154 mm (6.06 in.) of rain, while Fredericton, N.B., saw 121 mm (4.76 in.)

of rain, both qualifying as a **50-year storm event** with a 2% chance of occurring in any given year. The heavy rain led to [some road closures](#) and washouts, as well as [flooded basements](#). **Large waves and pounding surf** during high tide along Nova Scotia's southern shoreline produced [coastal flooding](#), pushed rocks and debris onshore, and damaged some breakwaters and a seawall. The storm churned up the waters in the Gulf, causing a sharp drop in sea surface temperatures from record/near record down to the climatological mean for a few weeks. Other storm impacts included [school and park closures](#), flight and ferry cancellations, and [itinerary changes](#) for cruise ships. [One storm-related death](#) and a few injuries were reported in Maine.

From **October 7 to 8**, Post-Tropical Storm **Philippe** and a frontal system brought **rain and gusty winds** to the region. Rainfall totals were less than 80 mm (3 in.) in most areas but reached up to 150 mm (6 in.) in coastal and eastern Maine where a [few roads sustained flood damage](#). Wind gusts of up to 90 km/h (55 mph) resulted in downed trees and **power outages** in Maine and parts of the Maritimes, with a maximum Les Suêtes wind gust of 116 km/h (72 mph). Additionally, the Maritimes experienced **travel disruptions** over the Canadian Thanksgiving weekend, including [ferry cancellations](#) and schedule changes.

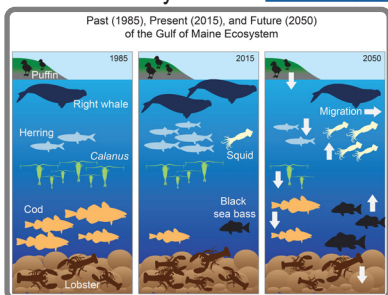


Images from September 16 as Lee approached a buoy off the coast of Jonesport, ME. The buoy reported wind gusts of up to 101 km/h (63 mph) and seas of up to 6 m (20 ft.) that day. Credit: [NOAA National Weather Service Caribou](#) and [NOAA National Data Buoy Center](#)

## Regional Impacts – September–November 2023

### Hurricane Season Summary

The [2023 Atlantic hurricane season](#) was **above average**, ending with 20 named storms of which seven became hurricanes including three major hurricanes. The season produced the **fourth greatest number of named storms** in a year since 1950. This was driven by **record warm ocean temperatures**, which overcame typical impacts from El Niño. [Reports indicate](#) that parts of Maine and Nova Scotia were in the U.S. National Hurricane Center's storm track forecast cone **more frequently** than typical areas like Florida. Despite this, only two named storms produced notable impacts in the Gulf region: Post-Tropical Storm Lee in early September and Post-Tropical Storm Philippe in early October. As Lee was in the **warm waters** of the open Atlantic, well before reaching the Gulf region, it underwent **rapid intensification**, going from a Category 1 hurricane with winds of 80 mph to a Category 5 with winds of 165 mph in 24 hours. Repairs, **recovery efforts**, and **damage clean up** continue from **Hurricane Fiona**, which struck the Maritimes in September 2022. The storm likely caused **at least \$385 million** in insured damages in Cape Breton, N.S. and eroded away as much as 25 m (80 ft.) of



Credit: [NCA5 - adapted from Pershing et al. 2021](#)

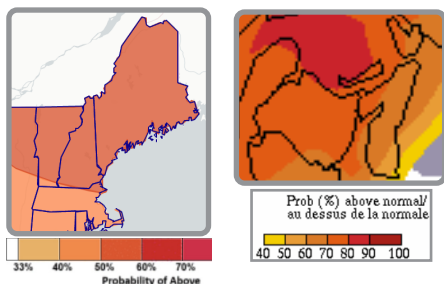
[shoreline in parts of P.E.I.](#)

### U.S. Fifth National Climate Assessment

The [U.S. Fifth National Climate Assessment](#), which was released in November, reported that New England is getting **warmer and wetter**, the number of days with **extreme precipitation** has increased, and there have been **fewer cold days** but more warm nights. These trends are expected to continue under future scenarios. Also, **ocean waters continue to warm**, which has been linked to an **increased flood risk**, more frequent heavy snowfalls, shifting distributions of ocean species (left image), and **more rapid intensification** and slower decay of tropical cyclones. Under future scenarios, warmer ocean temperatures are expected to lead to stronger tropical cyclones, while increased sea level rise is expected to result in higher water levels during flooding from storms.

## Regional Outlook – Winter 2023–24

### Temperature and Precipitation

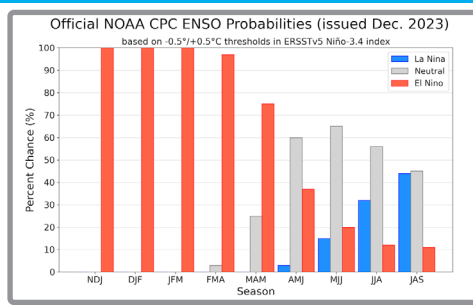
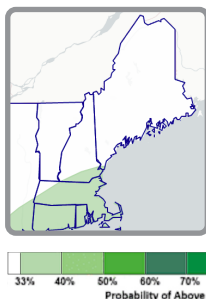


CPC temperature map (left) and precipitation map (bottom) produced November 16. ECCC temperature map (right) produced November

For **December–February**, [NOAA's Climate Prediction Center \(CPC\)](#) and [Environment and Climate Change Canada \(ECCC\)](#) favor **above-normal temperatures** for the entire Gulf of

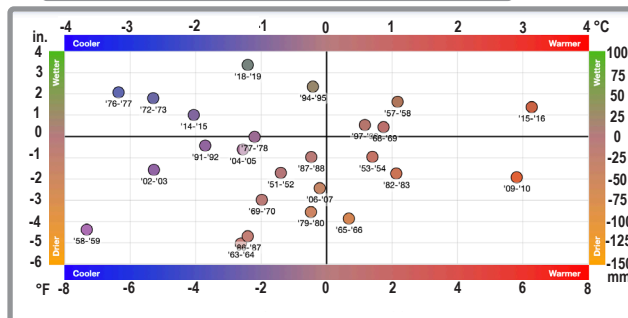
Maine region due in part to long-term climate trends and above-normal sea surface temperatures. CPC favors **above-normal precipitation** for winter in eastern Massachusetts and southern New Hampshire, tied

to the favored El Niño storm track along the U.S. East Coast. **Equal chances** of below-, near-, or above-normal precipitation were forecast for the rest of the region.



### ENSO

**Strong El Niño conditions** were present in the equatorial Pacific Ocean during November. NOAA's [Climate Prediction Center indicates](#) there is a 54% chance of this event becoming **historically strong** for the November–January period. El Niño was expected to persist through winter, with a 60% chance of ENSO-neutral conditions



Temperature (horizontal axis) and precipitation (vertical axis) departures from normal in Caribou, ME, [during El Niño winters](#). Credit: Northeast Regional Climate Center

during April–June 2024. El Niño winters [tend to be stormier](#) along the U.S. East Coast, generally leading to **above-normal precipitation** and possibly snowfall and enhancing the likelihood of [more high-tide flooding days](#). NOAA's Eastern Region Climate Services

[November webinar](#) focused on El Niño and the winter outlooks.

### Gulf of Maine Partners

- [Gulf of Maine Council on the Marine Environment, Climate Network](#)
- [University of Maine, School of Marine Sciences](#)
- [State Climatologists](#)
- [National Integrated Drought Information System](#)
- [Northeast Regional Association of Coastal Ocean Observing Systems](#)
- [Gulf of Maine Research Institute](#)

### Contacts

- [National Oceanic and Atmospheric Administration](#)
- [Environment and Climate Change Canada](#)
- [Northeast Regional Climate Center](#)

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