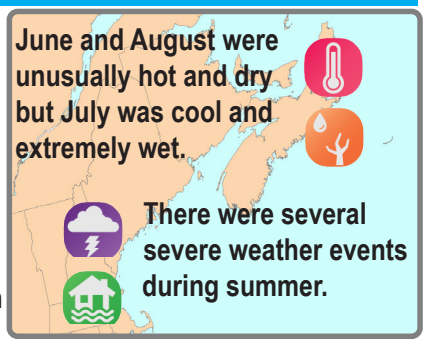
Quarterly Climate Impacts and Outlook

Gulf of Maine Region

September 2021

Gulf of Maine Significant Events – *June–August 2021*

Abnormal dryness and **drought** expanded during **June**. Conditions **eased** in some areas but **persisted** in other areas during **July** and **August**. There were many days during summer with **severe thunderstorms** or **flash flooding**. See Regional Impacts for details.



June

There were two periods of **unusually hot and humid** weather, **June 6 to 9** and **June 26 to 30**. High temperatures reached 38°C (100°F) while low temperatures were in the 17°C to 26°C (63°F to 79°F) range, setting many temperature records. Boston, MA, tied its **hottest June temperature** of 37.8°C (100°F). Following the unusual warmth, parts of the Maritimes saw low temperatures of 0°C (32°F) or colder on **June 10 and 11**, with **frost** impacting low bush blueberries in Nova Scotia and P.E.I. This June was the **hottest on record** for sites such as Boston; Caribou and Portland, ME; Saint John, N.B. Concord, NH, and Boston set/tied records for **greatest number of June days** with a high of at least 35.0°C (95°F). Concord set a record for greatest number of June days with a high of at least 32.2°C (90°F).

July

Tropical Storm Elsa and a frontal system produced up to 127 mm (5 in.) of rain, wind gusts of up to 108 km/h (67 mph), and rough surf in the region from **July 9 to 10**. Street flooding and downed trees and wires were reported in Massachusetts, while more than 50,000 customers lost power in the Maritimes. The rainfall eased drought conditions in parts of New England. **July** was **exceptionally wet** in some areas, with Massachusetts and Saint John, N.B., having their **wettest July on record**. This July not only ranked as the wettest July on record at Concord, NH, but as the site's **second all-time wettest month.** See Regional Impacts for details. In **late July**, the region experienced poor air quality and hazy skies due to smoke from western U.S. and Canada **wildfires**.

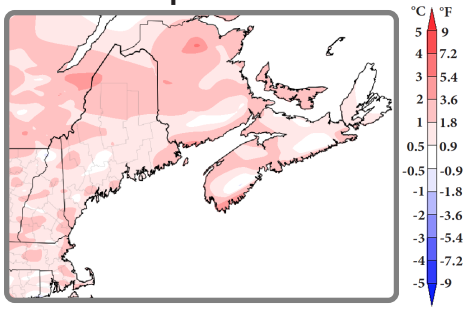
August

From **August 18 to 20**, the remnants of **Tropical Storm Fred** and a frontal system dropped up to 100 mm (4 in.) of rain in New England, particularly Massachusetts. From **August 22** to **24, Tropical Storm Henri** (or its remnants) produced up to 100 mm (4 in.) of rain, gusty winds, and three weak tornadoes in New England, with minimal impacts. Remnant moisture from Henri brought some rain to New Brunswick, somewhat alleviating dry conditions. There were three notable **heat and high humidity events** from **August 11 to 14, August 17 to 20,** and **August 23 to 26**. Highs up to 34°C (94°F) and lows above 17°C (63°F) set dozens of temperature records. This **August** was the **warmest on record** for several sites including Caribou, ME, and Bas Caraquet and Bathurst, N.B. Boston, MA, and Caribou had their **greatest number of August nights** with a low of 21°C (70°F) or higher. This **summer** was the **warmest on record** for some sites including Boston, MA; Saint John, N.B.; and Yarmouth, N.S. Boston also had their **greatest number of summer nights** with a low of 21°C (70°F) or higher. Warm weather likely contributed to **harmful algal blooms** on some New Brunswick waterways. The Gulf of Maine's average sea surface temperature for summer ranked as the **third warmest** since 1982.

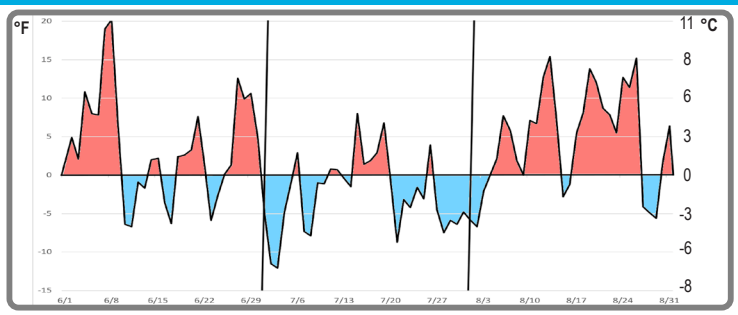
Regional Climate Overview – *June–August 2021*

Temperature

Summer Departure from Normal



*U.S. temperature normals based on 1991–2020 data; Canadian temperature normals based on 1981–2010 data.



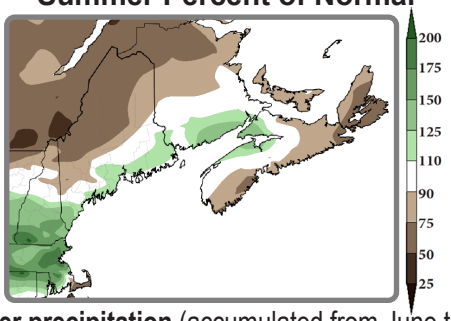
Daily average temperature departure from normal during summer at Caribou, ME. Warmer-than-normal days are shaded red and colder-than-normal days are shaded blue.

Summer (averaged over June, July, and August) was up to 2°C (4°F) **warmer than normal***, being record or near-record warm in some locations. **June** was up to 3°C (5°F) **warmer than normal**, with this June being record or near-record warm for several locations. **July** was as much as 2°C (4°F) **cooler than normal**, with many sites being warmer in June than they were in July. Boston, MA's high of 16°C (60°F) on July 3 tied as its **coolest July high temperature** on record. Miramichi, N.B., did not reach 30°C (86°F) in July for the **first time in 25 years**. **August** was up to 3°C (5°F) **warmer than normal**, being record or near-record warm for many locations. Caribou, ME, tied its warmest minimum temperature on record for August with a low of 21°C (70°F) on August 12 and 13.

Contact: Ellen Mecray (Ellen.L.Mecray@noaa.gov)
Samantha Borisoff (sgh58@cornell.edu)

Regional Climate Overview – *June–August 2021*

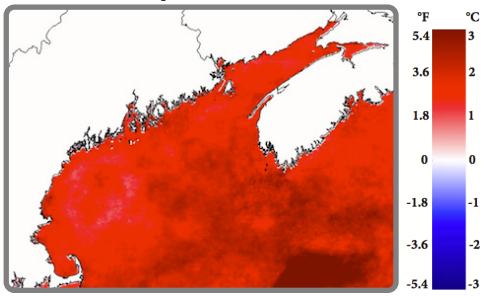
Precipitation
Summer Percent of Normal



*U.S. precipitation normals based on 1991–2020 data; Canadian precipitation averages based on 2002–2020 data.

SST normals based on 1985–2014 data

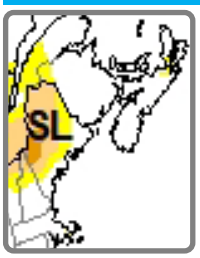
Sea Surface Temperature
Summer Departure from Normal



Summer precipitation (accumulated from June to August) ranged from 50% of normal to 200% of normal*. Boston, MA, had its third wettest summer. **June precipitation** ranged from 25% of normal to near normal. Moncton, N.B., had its third driest June. **July precipitation** ranged from 50% of normal in parts of Maine to more than 300% of normal in parts of New Hampshire and Massachusetts. This July was **record or near-record wet** for several locations. **August precipitation** ranged from 25% of normal to near normal in most areas; however, much of eastern Massachusetts was notably wetter.

Summer sea surface temperature anomalies over the Gulf of Maine and Bay of Fundy averaged **strongly above normal** (2.0°C [4°F]), strongest (2.5°C [4.5°F]) over parts of the eastern Gulf, the southern Scotian Shelf, and Georges Bank and weaker (1.0°C [2°F]) over deeper basins in the western Gulf. These patterns and anomalies were strongest in June and weakest in July. Some warm-water fish were added to the list of species monitored by Canada. **Ocean warming** has affected salmon, could cause great white sharks to become more common in the Maritimes, have been implicated in the sighting of blue crabs in Maine, and linked to the decline in North Atlantic right whales.

Regional Impacts – *June–August 2021*



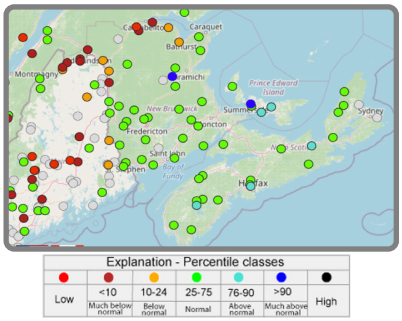
North American Drought Monitor from September 10, 2021.

Summer Precipitation

June: **Severe drought** was **introduced** and **moderate drought** and **abnormal dryness expanded** in New England, where some locations set daily **low streamflow** and/or **groundwater level records,** some wells ran dry, and **water restrictions** continued. **Increased wildfire risk** lingered in New England, with more fires than usual. New Hampshire fire officials purchased new equipment and planned to perform controlled burns to help **prevent and fight wildfires**. Farmers in Maine and New Hampshire experienced some water shortages, slow crop growth, and **some crop losses**. The dry conditions allowed ant colonies to thrive and **large populations** of caterpillars to proliferate in New England, including an outbreak of browntail moth caterpillars in Maine. While areas of **abnormal dryness** were present in the **Maritimes**, overall crop yields were good, with the warm, dry **conditions were favorable** for hay and strawberry crops in P.E.I.

July: Many areas experienced a **very rainy July**, ranking as the **wettest** or among the five wettest **Julys on record** and **drought** and abnormal dryness **contracting** in New England. Sites such as Boston, MA, and Concord, NH, saw their **greatest number of July days** with measurable precipitation and/or at least 25 mm (1 in.) of precipitation, which also ranked among the greatest on record for all months. In parts of New England, the rain eased wildfire risk, allowed some **water restrictions to be lifted**, reduced the need for irrigation, and revived crops**.** Some farmers went from dealing with drought conditions to overly wet conditions. The wet weather created challenges for hay farmers in Maine and Nova Scotia and led to reduced tourism in New Hampshire. **Drought and abnormal dryness persisted** in Cape Cod, western/northern Maine, and northern New Hampshire, where less rain fell. In mid-July, daily **record low streamflow** was measured in northern New Hampshire, while daily **record high flows** were measured in southern New Hampshire. Some Maine waterways continued to be unusually low, causing recreational dam releases to be cancelled. **Groundwater levels remained low** on Cape Cod, MA.

August: Much of the region saw **below-normal precipitation** in **August**. **Drought and abnormal dryness** persisted in Cape Cod, parts of Maine, and northern New Hampshire, with a few locations continuing to see daily **record or near-record low** streamflow and/or groundwater levels and **water restrictions**. Several wells ran dry in Maine. The Stonington, ME, municipal water supply, which relies on wells, ran low, due in part to drought conditions earlier this summer. The town **trucked in water** at a cost of around $20,000. In western/northern Maine, **trees experienced drought stress** and hay and corn crops were stunted. Only two small areas of **abnormal dryness** were present in the **Maritimes**, where crop conditions were good. Conversely, most of eastern **Massachusetts** was much **wetter than normal**.



August 31, 2021, daily streamflow. Credit: North American Water Watch

Contact: Ellen Mecray (Ellen.L.Mecray@noaa.gov)
Samantha Borisoff (sgh58@cornell.edu)

Regional Impacts – *June–August 2021*

Damage from a microburst in Maine on June 30. Credit: NWS Gray

Summer Storms

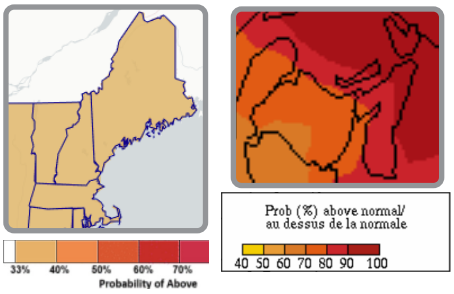
There were several severe weather or flash flooding events during summer. On **June 9**, **flash flooding** from as much as 127 mm (5 in.) of rain in Downeast Maine washed out roads, isolating residents. **Straight-line winds** of up to 177 km/h (110 mph) damaged barns and snapped trees in Aroostook County, ME, on **June 21**. An EF-1 tornado and a microburst with winds of up to 115 km/h (71 mph) downed trees and caused **structural damage** in central Nova Scotia on **June 30.** On the same day, **thunderstorm winds** of up to 145 km/h (90 mph) in Maine, New Hampshire, and New Brunswick damaged structures and uprooted/snapped trees, some of which fell on buildings and cars. Storm reports noted large hail, thousands of power outages, and multiple houses struck by lightning. Up to 178 mm (7 in.) of rain fell in southern New Hampshire from **July 17 to 18**, washing out roads, flooding basements, and leading to evacuations. Severe storms from **July 21 to 22** produced a funnel cloud or possible tornado in Nova Scotia and thousands of lightning strikes in the Maritimes. On **July 29**, heavy rain caused **significant damage** to roads and bridges in more than a dozen towns in western New Hampshire, while a waterspout was spotted off the Maine coast.

June Heat

There were two periods of **unusually hot and humid** weather, **June 6 to 9** and **June 26 to 30**. High temperatures reached 38°C (100°F) while low temperatures were in the 17°C to 26°C (63°F to 79°F) range, setting many temperature records. Boston, MA, tied its **hottest June temperature** of 37.8°C (100°F). It was the **first time on record** that Portland, ME, recorded three consecutive days with a high of at least 35°C (95°F) during June, tying the site's all-time streak. Portland; Caribou, ME; and Concord, NH, set/tied their **warmest minimum temperatures for June**. Fredericton, N.B., recorded three consecutive nights with a low temperature above 20ºC (68°F) for the **first time on record** in June. Impacts from the heat included poor emergence of seed potatoes, early dismissals from school, and more insects. **Heat waves** and **warm nights** have become more common and are expected to increase in the future.

Regional Outlook – *Autumn 2021*

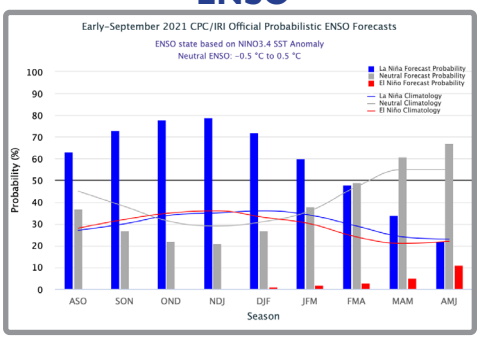
Temperature and Precipitation



For **September–November**, NOAA's Climate Prediction Center (CPC) and Environment and Climate Change Canada (ECCC) favor **above-normal temperatures** for the entire region. ECCC favors **above-normal precipitation** for New Brunswick and western P.E.I., with equal chances of below-, near-, or above-normal precipitation predicted for the rest of the Gulf of Maine region.

CPC temperature map (above left) produced August 19.
ECCC temperature map (above right) August 31.

ENSO



During August, **ENSO-neutral conditions** continued in the equatorial Pacific Ocean. NOAA's Climate Prediction Center indicates a transition to La Niña is likely during the next few months, with a 70% to 80% chance of La Niña during winter 2021–22.

Atlantic Hurricane Season

NOAA's updated 2021 Atlantic hurricane season outlook from early August indicates an **above-average season is most likely** due to factors such as warm sea surface temperatures, reduced vertical wind shear, and an enhanced west Africa monsoon. There have been 14 named storms as of September 12. While Elsa was the **earliest fifth named storm** on record on July 10, there was one full month of no active storms in the Atlantic between Elsa and Fred which formed on August 9. The 13th named storm, Mindy, formed on September 8, **well ahead of the average date** of October 24. The season runs from June 1–November 30, peaking from mid-August–late October. For more information on the hurricane outlook, see the NOAA Eastern Region webinar recording from August 2021.

	2021 Atlantic Season Updated Outlook	1991-2020 Average Season	2021 Atlantic Season Storms Through Sep. 12
Number of Named Storms	15-21	14	14
Number of Hurricanes	7-10	7	5
Number of Major Hurricanes	3-5	3	3

Contacts

National Oceanic and Atmospheric Administration

Environment and Climate Change Canada

Northeast Regional Climate Center

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Contact: Ellen Mecray (Ellen.L.Mecray@noaa.gov)
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