Quarterly Climate Impacts and Outlook

December 2021

National Significant Events – September–November 2021



The contiguous U.S. had its third-warmest autumn on record at 3.1°F above the 20th-century average. Average temperatures for September, October, and November were 3.0°F above average (fifth warmest), 2.9°F above average (sixth warmest), and 3.5°F above average (seventh warmest), respectively. Globally, it was the fifth-warmest September, the fourth-warmest October, the fourth-warmest November, and the fourth-warmest autumn. Autumn precipitation for the contiguous U.S. was 0.07 inches below average, in the middle third of all years. September, October, and November precipitation were 0.16 inches below average, 0.95 inches above average (ninth wettest), and 0.95 inches below average (eighth driest), respectively.

ies Highlights for the Northeast

- On September 1, the remnants of Hurricane Ida dropped unprecedented amounts of rain on parts of the Northeast, resulting in historic flooding. The storm also produced multiple destructive tornadoes. Ida's rainfall led to Newark, NJ, having its wettest
 September on record. There were a few other notable storms and severe weather events, including two tornado outbreaks, during autumn. See Regional Impacts for details.
- The first fall occurrence of a <u>temperature of less than 50°F</u> was the **latest on record** for several sites. Caribou, ME, did not have its **first fall frost** until October 25, the **latest date on record**. For the **first time** since at least 1900 no weather stations in New Jersey recorded a freezing low temperature in September or October. A New Jersey station finally reached the freezing point on November 2, the **latest first freeze** in New Jersey since at least 1900.
- It was the warmest October on record for Maryland and several sites including Syracuse, NY; Dulles Airport, VA: Newark, NJ; and Harrisburg, Williamsport, and Scranton, PA.
- It was the **warmest autumn on record** for **Maine**, as well as Newark, NJ.
- Gulf of Maine **autumn sea surface temperatures** were extremely warm, with **October** and **November** being the **warmest on record** in the high-resolution satellite data (1985 to 2021).
- Abnormal dryness and **drought persisted but shrank in coverage** in northern New England during **autumn**.

Regional Climate Overview – September–November 2021

0

-2

-3

Temperature Departure from Normal (°F) September 1–November 30, 2021



Precipitation Percent of Normal (%) September 1–November 30, 2021



The Northeast had its **third-warmest autumn** at 2.4°F above normal. It was **record warm** for Maine and among the 16 warmest for the other 11 Northeast states. The region had its **15th-warmest September** at 1.6°F above normal. It was among the 20 warmest for 10 states. The region had its **warmest October** at 5.7°F above normal. It was record warm for Maryland and among the three warmest for the other states. November was 0.3°F below normal, in the middle third of all years. Maine had its 19th warmest November. The Northeast saw 110% of normal **autumn** precipitation, in the **wettest third** of all years. It was among the 20 wettest for four states. The region had its **12th-wettest September** with 144% of normal precipitation. It was among the 20 wettest for seven states. **October** precipitation was 116% of normal, in the **wettest third** of all years. It was among the 20 wettest Octobers for two states. The region had its **16th-driest November** with 62% of normal precipitation. It was among the 20 driest for eight states.



Climate normals based on 1991–2020 data; rankings

based on 1895-2021.

Regional Climate Overview – September–November 2021



Drought in the Northeast

In early September, the U.S. Drought Monitor showed 2% of the Northeast in severe drought, 9% in moderate drought, and 6% as abnormally dry. Above-normal September precipitation eased dryness in several locations. In far northern New England, drought persisted but overall coverage shrank. The October 5 U.S. Drought Monitor showed 1% of the Northeast in severe drought, 2% in moderate drought, and 7% as abnormally dry. Drought and abnormal dryness expanded during the first half of October but contracted during the second half of October, lingering in northern New England and part of West Virginia. The November 2 U.S. Drought Monitor showed 1% of the Northeast in severe drought, and 5% as abnormally dry. During November, below-normal precipitation and declining soil moisture led to the expansion of abnormal dryness in West Virginia and parts of Maryland. Drought and abnormal dryness persisted in far northern New England. The November 30 U.S. Drought Monitor showed 1% of the Northeast in severe drought, 1% in moderate drought, and 8% as abnormally dry. In early December, dryness persisted in New England and expanded in southern parts of the region. For current conditions, see the Northeast DEWS Dashboard.

Regional Impacts and Updates - September-November 2021



Remnants of Hurricane Ida Ida's remnants moved through the Northeast from **September 1–2**. The storm interacted with a stationary front, dropping **6–11 inches of rain** on an area from eastern Pennsylvania and northern/central New Jersey through the New York City metro area and into southern New England. In many areas, the rainfall amounts <u>qualified as a 100-year storm event</u>, having a 1% chance of occurring in a given year. Newark, NJ, and LaGuardia Airport, NY, had their **all-time wettest day** with 8.41 inches of rain and 6.80 inches, respectively, on September 1. Bridgeport, CT, had its **wettest September day** with 5.77 inches. Rain fell at a rate of 3–5 inches per hour, with most of the daily rainfall accumulating in a six-hour period. Newark and Central Park had their **all-time wettest hours** with 3.24 inches of rain and 3.15 inches, respectively.

September 1–3 rainfall totals from Ida's remnants. Credit: NRCC

The sites' two-hour and six-hour rainfall amounts were

also **record setting**. At some New Jersey sites, the <u>two-hour, three-hour, and six-hour rainfall</u> <u>amounts</u> exceeded the **500-year storm**, having only a 0.2% chance of occurring in a given year.

Wet antecedent conditions and Ida's deluge caused dozens of streamgages to <u>reach major</u> flood stage. In some cases, waterways reached historic levels. For example, Brandywine Creek at Chadds Ford, PA, with records to the early 1900s, surpassed its previous record by nearly four feet. Other long-term sites reached near-record water levels, including the Schuylkill River at Philadelphia, PA, with its second-highest crest since 1869. Several <u>rare Flash Flood</u> <u>Emergencies</u> were declared, including the **first ever** for New York City. **Devastating flooding** occurred in multiple locations in the Northeast. Hundreds of **roads were impassable**, including parts of major highways such as the <u>Vine Street Expressway</u> through downtown Philadelphia



Record flooding along Brandywine Creek at Chadds Ford, PA. Credit: NOAA

and FDR Drive along New York City's east side. Countless **vehicles were stranded**. Floodwaters poured into New York City's subway system, and the lower levels of Newark International Airport took on water. Some residents sheltered in place, while thousands of others were evacuated due to concerns about dams being overtopped. Numerous **structures were inundated** by floodwaters. Between <u>flooded roads and buildings</u>, hundreds of <u>water rescues were performed</u>, with the Philadelphia National Weather Service office noting

that "crews are running out of resources to rescue people stuck in flood waters."

Ida produced **11 tornadoes**, <u>most in Pennsylvania</u>. The strongest tornado, a **rare EF-3** with winds of up to 150 mph, tossed vehicles and caused <u>significant structural damage</u> to dozens of homes as it traveled 12.6 miles across southern New Jersey. **Three EF-2 tornadoes**, two in southeastern Pennsylvania and <u>one in Annapolis, MD</u>, tore off roofs, blew out walls, ripped off siding, and caused considerable tree damage. All three tornadoes were on the ground for more than 6 miles. Early estimates indicated the storm caused <u>\$117 million in damage</u> in Pennsylvania and <u>more than \$50 million in damage</u> in New York. There were **at least 50 deaths** <u>due to Ida</u> in the Northeast, including at least 13 in New York City and at least 30 in New Jersey, making it the **state's second deadliest weather event**.



Damage from an EF-3 tornado in Mullica Hill, NJ. Credit: NWS Philadelphia



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Damage from an EF-2 tornado in western Pennsylvania on October 21. Credit: NWS Pittsburgh

Autumn Storms and Severe Weather

In western Pennsylvania, three tornadoes touched down on **October 16** and nine touched down on **October 21**. The strongest, an EF-2, was on the ground for more than 15 miles. With 12 tornadoes in western Pennsylvania during October, this October and 2021 rank **among the most active Octobers/years for tornadoes** in the Pittsburgh National Weather Service office's area. The tornadoes caused structural damage and downed trees and wires.

From **October 25–27**, a **rapidly intensifying nor'easter** produced wind gusts of 40–90 mph in coastal areas, particularly southern New England where <u>trees and wires were downed</u> and over 485,000 customers lost power. Nantucket, MA, recorded its **lowest October pressure** on record. The storm dropped 4–7 inches of rain on parts of New York, Connecticut, and New Jersey, with flash flooding leading to <u>road closures</u>, water rescues, some evacuations, and <u>water</u> <u>entering homes</u>. With water levels already elevated from the departing nor'easter and persistent

onshore winds from another storm moving into the region, <u>near-record</u> to **record high water levels** were experienced along the Delaware and <u>Chesapeake bays</u> and their tidal tributaries on **October 29– 30**. Flooding led to many <u>road closures</u>, structures taking on water, and some evacuations.

A rare tornado outbreak occurred on November 13 in Connecticut, Rhode Island, and New York's Long Island, with 11 tornadoes touching down. These were the **first tornadoes in November** and the **latest tornadoes** in the calendar year for these locations since 1950. The tornadoes snapped/uprooted trees, some of which fell on homes and vehicles, and caused roof, siding, and wall damage.

Regional Outlook – Winter 2021–22



ENSO

During November, **La Niña conditions** continued in the equatorial Pacific Ocean. NOAA's Climate Prediction Center indicates there is a 95% chance **La Niña** conditions

will **continue through winter** 2021–22, with a 60% chance of a transition to **ENSO-neutral** conditions during spring 2022 (graph left). A **moderate strength** La Niña is favored for the November through January period.

For more information on potential impacts from La Niña in the Northeast, see the <u>NOAA</u> <u>Northeast Winter Climate Patterns and Outlook</u> from November 2021 and the NOAA Eastern Region Climate Services <u>webinar recording</u> from November 2021.



Temperature and Precipitation

<u>NOAA's Climate Prediction Center (CPC)</u> favors **above-normal temperatures** for the entire Northeast for **January–March** (map left). Normal January–March average temperatures range from the teens in northern New England and northern New York to the 40s in parts of the Mid-Atlantic and southern West Virginia.

Above-normal precipitation is favored for interior locations from western West Virginia to northern New York for **January–March**, while **below-normal precipitation** is favored for part of the Delmarva

Peninsula (map right). Equal chances of below-,

near-, or above-normal **precipitation** were forecast for the rest of the region. Normal January–March precipitation ranges from less than 6 inches in western/central New York to more than 13 inches in several locations including Rhode Island, southeastern Massachusetts, and higher elevations of West Virginia.

CPC's <u>seasonal drought outlook</u> from mid-December indicates **dryness** could **improve but linger** in northern New England.

However, **drought** could **develop** in the southeastern corner of the Northeast, which has a tilt toward drier-than-normal conditions for January–March.



40% 50% 60% 70% Probability of Above

Northeast Partners

National Oceanic and Atmospheric Administration offices including:

NESDIS/National Centers for Environmental Information

NWS, Eastern Region

NWS, Climate Prediction Center

<u>NWS, National Operational Hydrologic Remote</u> <u>Sensing Center</u>

<u>NMFS, Fisheries Science Centers and</u> <u>Regional Office, Atlantic</u>

NOS, Office for Coastal Management

NOS, National Centers for Coastal Ocean Science

OAR, Climate Program Office and Geophysical Fluid Dynamics Lab

OAR, National Sea Grant Office

North Atlantic and Great Lakes Regional Collaboration Teams

And the following other offices:

Northeast Regional Climate Center

National Integrated Drought Information System

Consortium of Climate Risk in the Urban Northeast

Cooperative Institute for the North Atlantic Research

Northeast Region State Climatologists Mid-Atlantic RISA



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