

Maine Climate & Storm Overview

Maine Infrastructure Rebuilding and
Resilience Commission

June 26th, 2024

Dr. Sean Birkel

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Climate Change Institute
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University of Maine



CLIMATE
CHANGE
INSTITUTE

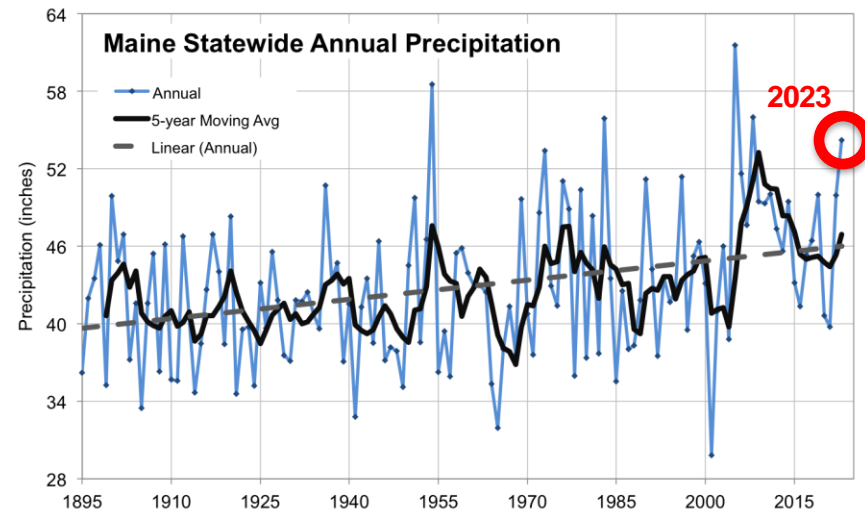
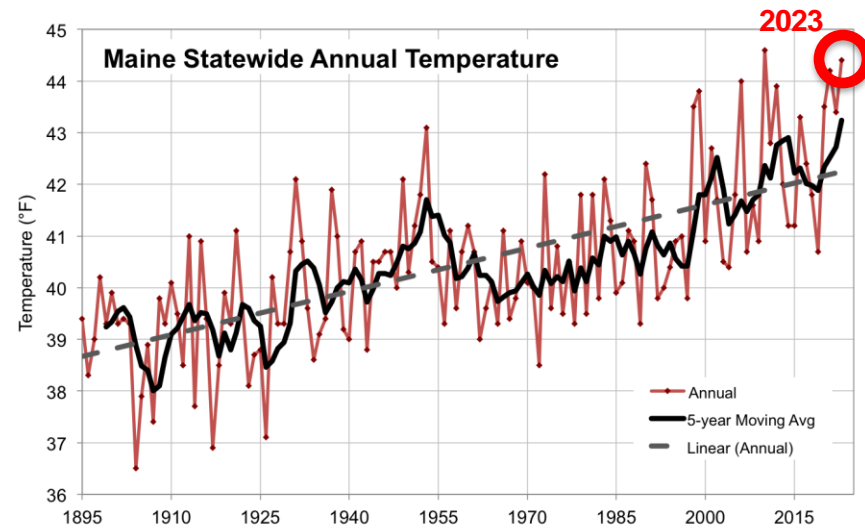
Maine's climate is getting warmer and wetter with more extremes

Temperature

- Annual increase of about 3.5 °F since 1895
- The 10 warmest years have occurred since 1998
- Projected 2–10 °F warming by 2100 depending on emissions scenario

Precipitation

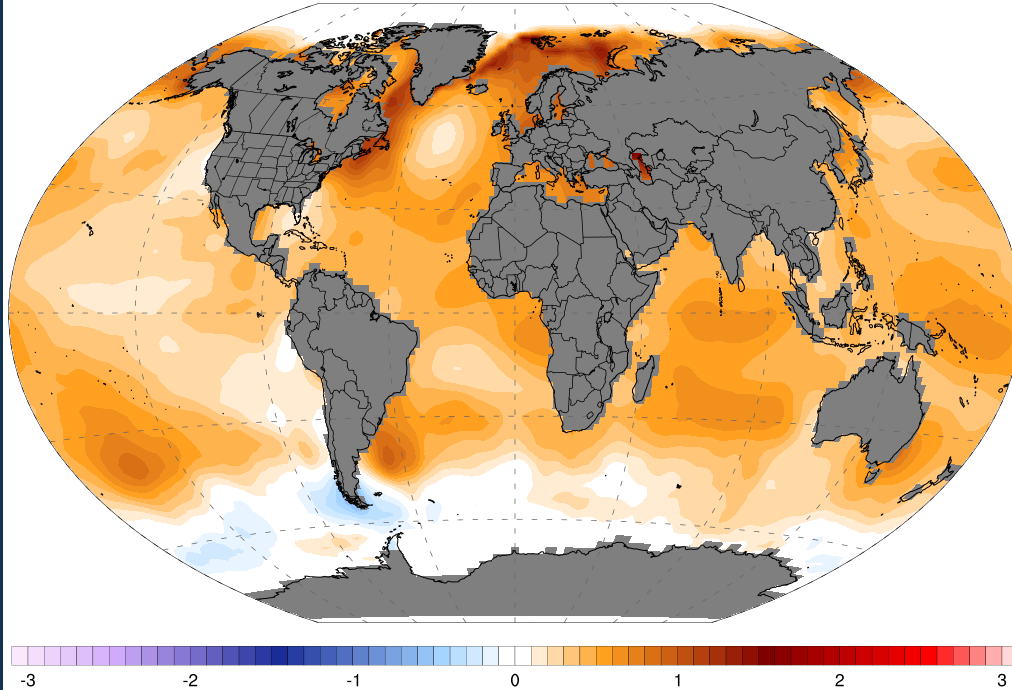
- Annual increase of about 6" since 1895
- Heavy precipitation > 2" per day becoming more common
- Projected 5-14% annual rainfall increase by 2100 and more frequent extremes



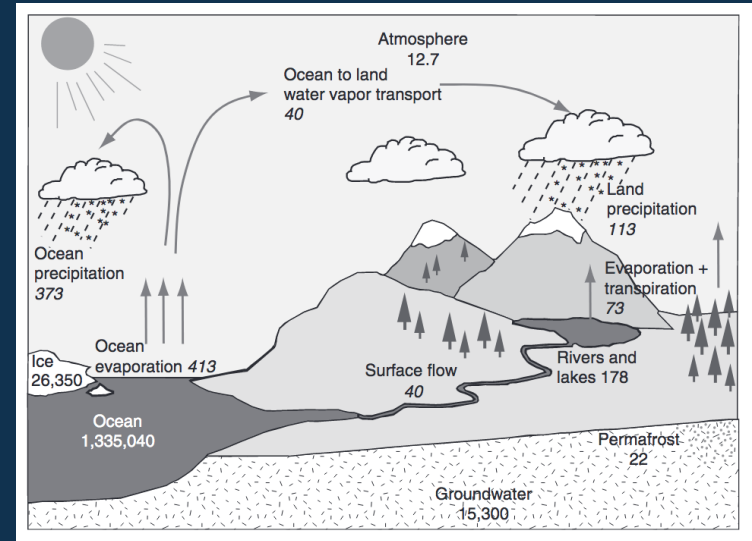
Warming Oceans and an Intensifying Hydrologic Cycle

Sea Surface Temperature Anomaly (°C)
Annual 2001-2019 - 1951-2000

NOAA ERSST V5



ClimateReanalyzer.org | Climate Change Institute | University of Maine

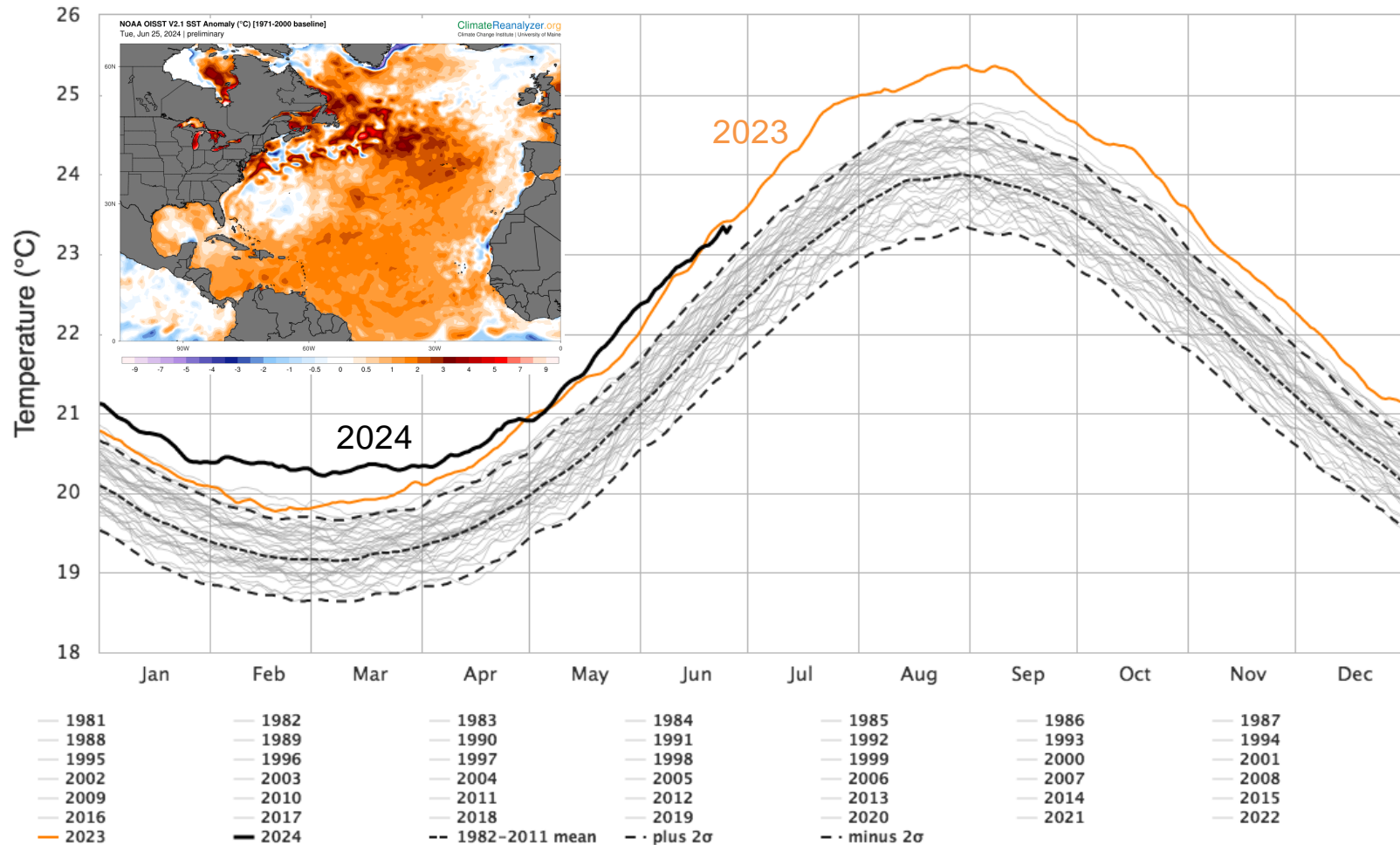


Trenberth et al. (2007), Huntington (2010)

- Warming drives increased ocean evaporation, atmospheric water vapor content, and changes in circulation leading to greater potential for wet and dry extremes.
- The water holding capacity of air increases 7% for 1°C (1.8°F) warming

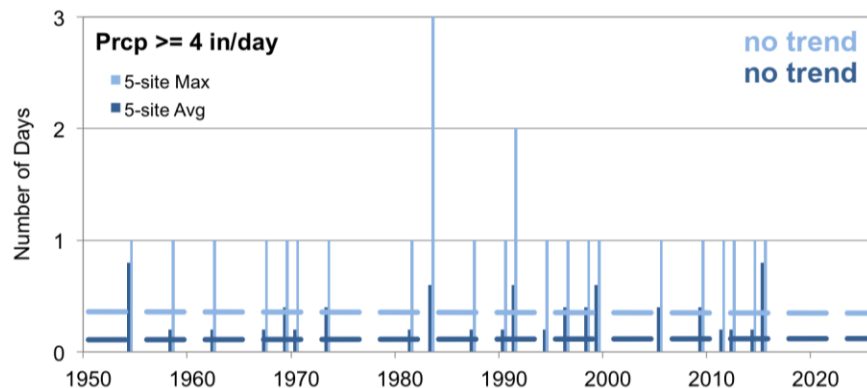
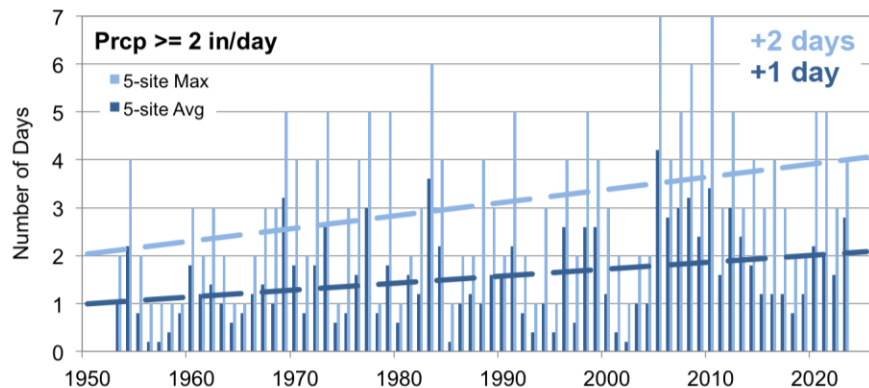
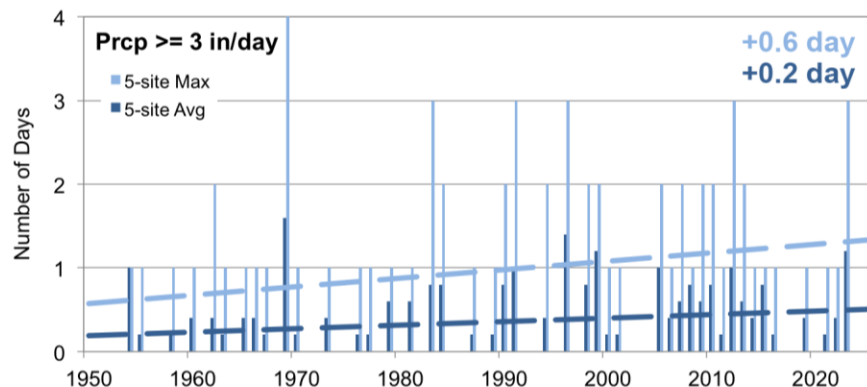
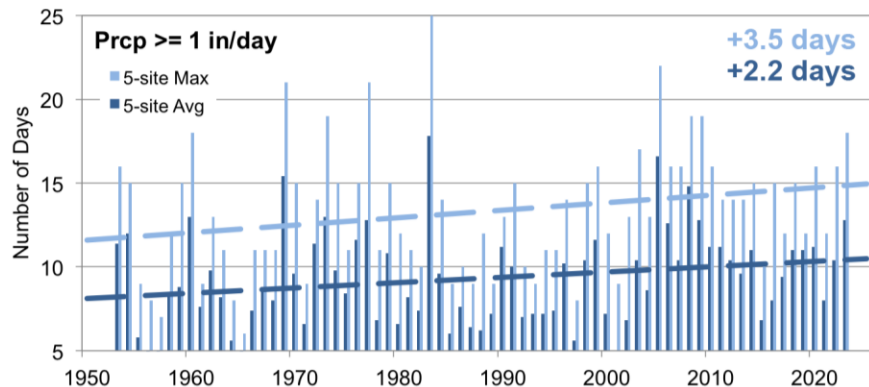
Daily Sea Surface Temperature, North Atlantic (0–60°N, 0–80°W)

Dataset: NOAA OISST V2.1 | Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine



Annual Number of Precipitation Events, 1953-2023

Based on observations from Augusta, Bangor, Caribou, Farmington, and Portland



Beyond the power outages, Friday's storm dumped record rainfall

Portland Press Herald

Rainfall in Portland and August broke longtime records for the day, according to the National Weather Service in Gray. Most outages were likely to be repaired by Saturday night, according to Central Maine Power.

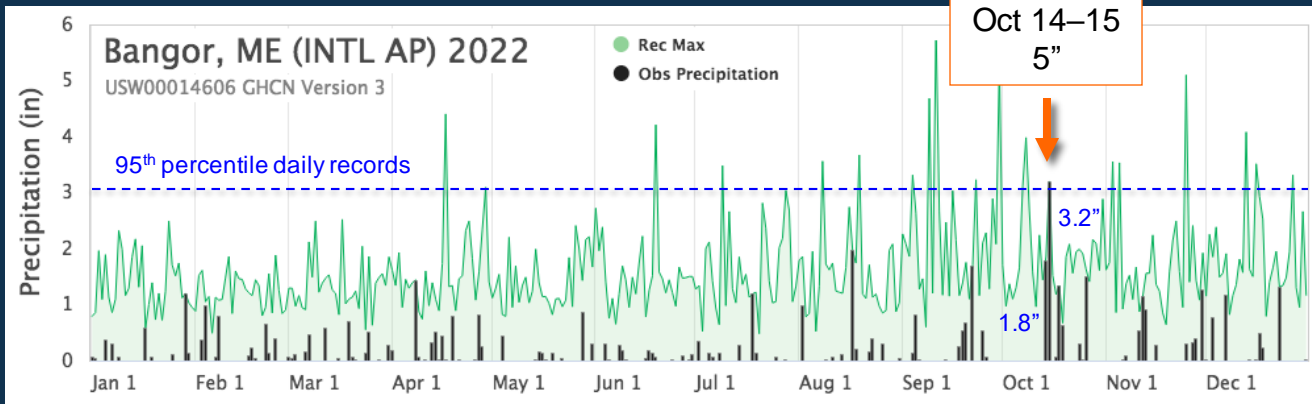
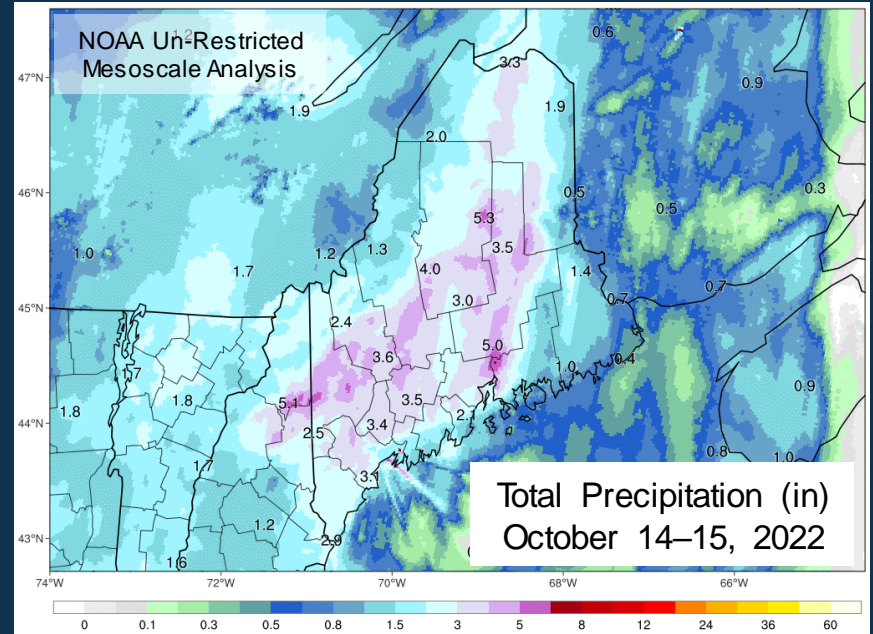


WATCH THE EXACT MOMENT A MAINE ROAD WASHES AWAY IN FRIDAY'S CRAZY STORM



Matt James | Updated: October 15, 2022

Andy Ryder, Facebook Video





Flood damage on Woodman Hill Road
in Jay, Maine, after heavy rainfall in
summer 2023.

Photo credit:
Murray Carpenter,
Maine Public Broadcasting Network

Storm that wrecked boats along Maine coast called ‘worse than Sandy’



Nick McCrea | BDN
Waves and wind smash the Nomad into the rocks at Balfest harbor on Monday, Oct. 30, 2017. The boat was dashed against the rocks during a severe wind storm after breaking free from its mooring. At least six boats were destroyed or ran aground in the storm.

By Nick McCrea, BDN Staff • October 30, 2017 3:41 pm
Updated: October 31, 2017 2:29 pm

As Monday morning's wind storm subsided, the scope of the damage left in its wake in Balfest became more clear. Debris and bits of unidentified boats floated in the harbor or washed up on shore as the tide receded.

A deep pile of seaweed, flotsam and broken pilings lingered on the road that leads to the town landing, marking the place where the waves finally stopped.

RELATED STORIES

70-mph wind gust knocks Maine truck off bridge, into river

500K Mainers without power as outages surpass Ice Storm of '98

POLL

(Bomb Cyclone)
Oct. 30th, 2017
Gusts BGR 66, PWM 69 mph
500k power outages

(Bomb Cyclone)
Oct. 17th, 2019
Gusts BGR 43, PWM 62 mph
219k power outages

LOCAL & STATE • Posted October 17 | Updated October 18

CMP says storm damage could leave some coastal customers without power for days

The nor'easter that pummeled the area with winds topping 60 mph leaves a trail of downed power lines and damaged cars and homes.

BY GILLIAN GRAHAM AND DENNIS HOEY STAFF WRITER

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Margaret Ann Metcalf inspects the damage in her driveway on Vannah Avenue in Portland where a tree came down, taking down the power lines, on Thursday. Shawn Patrick Ouellette/Staff Photographer

[Buy this Photo](#)

Central Maine Power warned customers Thursday night that it could be several days before electricity is restored in some coastal areas in the wake of a powerful storm that pummeled Maine Thursday morning, knocking out power to more than 219,000 homes and businesses at its height.

Nov. 1st, 2019
Gusts 53 BGR, PWM 49 mph
230k power outages

Thousands Still Without Power After Last Week's Windstorm

By CHARLES EICHACKER - BANGOR DAILY NEWS • NOV 3, 2019

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High winds brought down a tree in a neighborhood on 18th Street in Bangor on Friday morning. Winds gusting up to 52 mph in Greater Bangor caused widespread outages overnight into Friday morning

LINDA COAN O'KRESIK / BDN

About 16,000 homes and businesses in Maine still lacked power on Sunday morning after a heavy windstorm blew across the state late Thursday night into Friday.

About 11,100 Central Maine Power customers and 4,900 Emera Maine customers still had outages as of 9:45 a.m. Sunday, the companies reported. Both utilities projected that they would restore power to nearly all of their customers by the end of Sunday.

More than 230,000 — 180,000 for CMP and 58,000 for Emera Maine — lost power at the height of the storm, the utilities said Sunday.

Connecting Extremes via the Jetstream

Late October /
Early November
2019

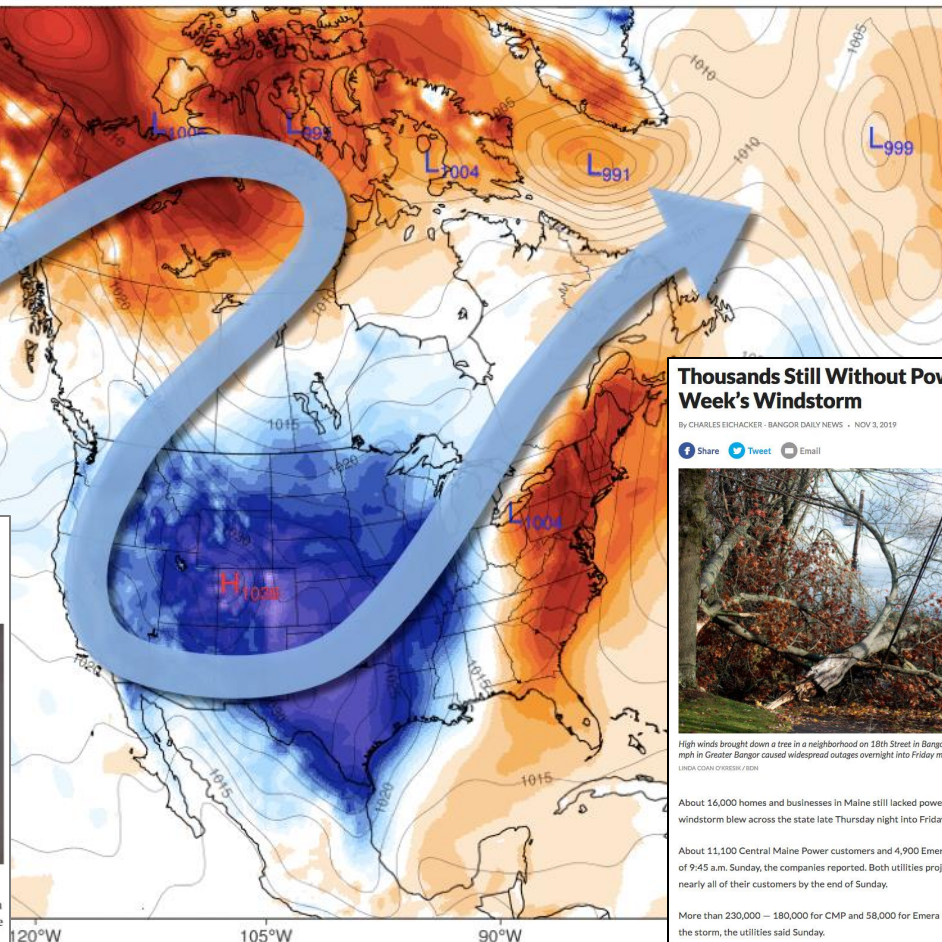
'Potentially historic': dangerous winds expected as fires burn across California

Fresh evacuations in Sonoma county as Kincadee fire spreads and
wave of power blackouts begin across the state



© A firefighter works to extinguish the Tick fire in a factory near Santa Clara, California, 24 October 2019. Photograph: Elvane Laurent/EPA

Californians braced for power cuts and a "potentially historic" wind event on Saturday as a growing wildfire prompted fresh evacuations for 50,000 people in the northern Bay Area.



Thousands Still Without Power After Last Week's Windstorm

By CHARLES EICHACKER - BANGOR DAILY NEWS - NOV 3, 2019

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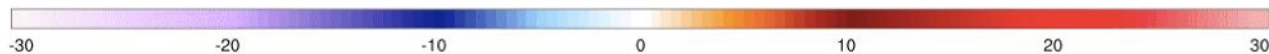
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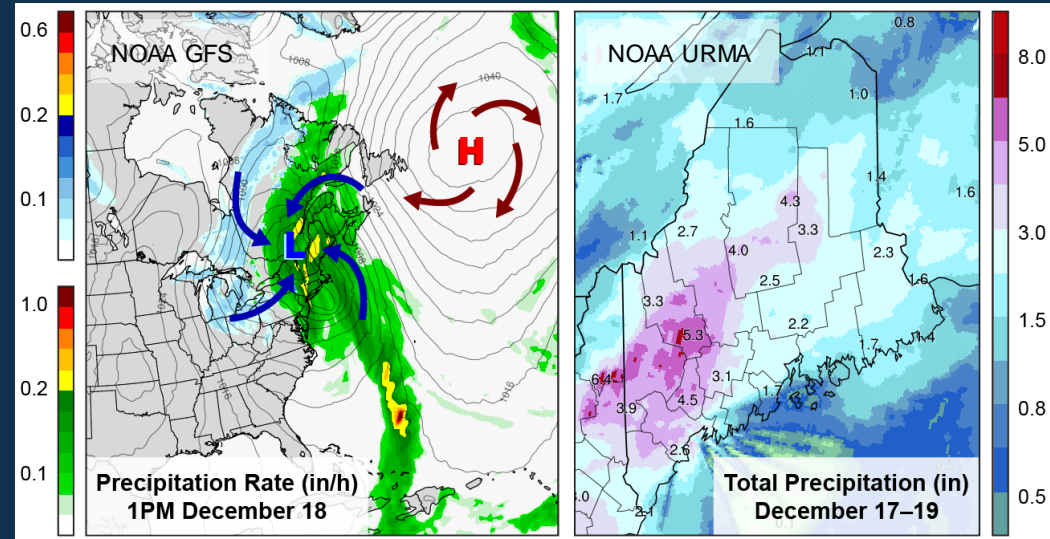
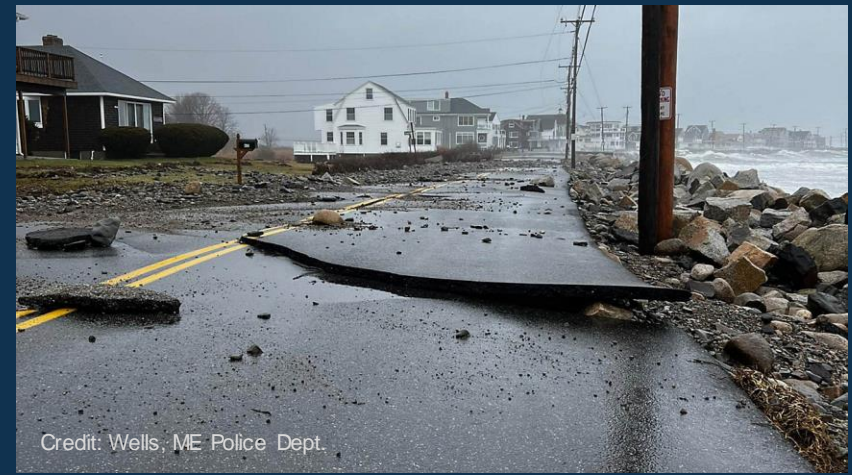
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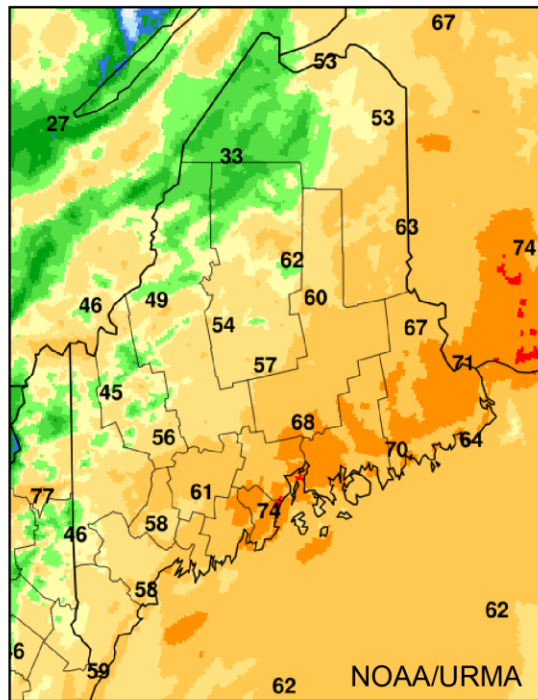
Recent Southeaster Storms

Dec 18, Jan 10 & 13

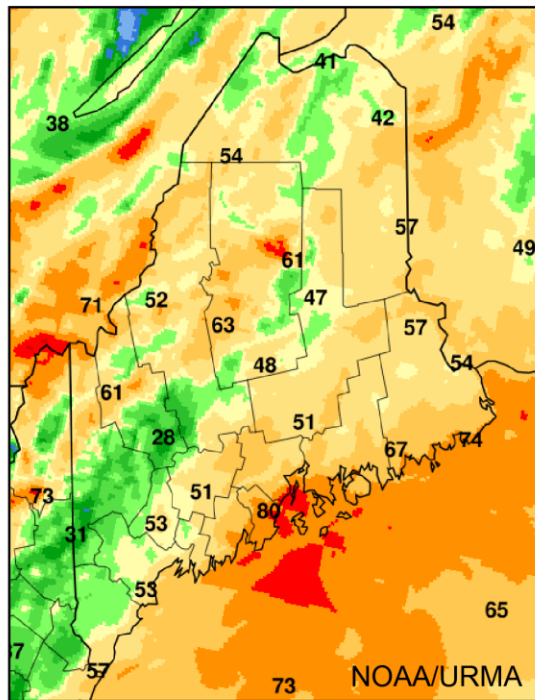
- Similar tracks north across Great Lakes region; produced strong SE winds across Maine
- Dec 18 storm gusts > 70 mph; 5–7" rainfall in parts of western Maine; worst flooding along Kennebec and Androscoggin in almost 40 years
- Power outages comparable to Ice Storm '98
- All three storms had major impact along the coast, with damage increasing as a result of previously weakened infrastructure
- Peak winds on 13th coincided with astronomical high tide resulting in 14.57 ft high tide, breaking 1978 record
- These storms developed against the backdrop of a strong El Niño in the Pacific, record warmth across the North Atlantic and globally.



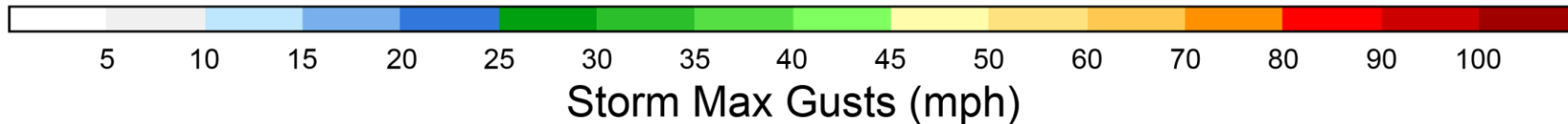
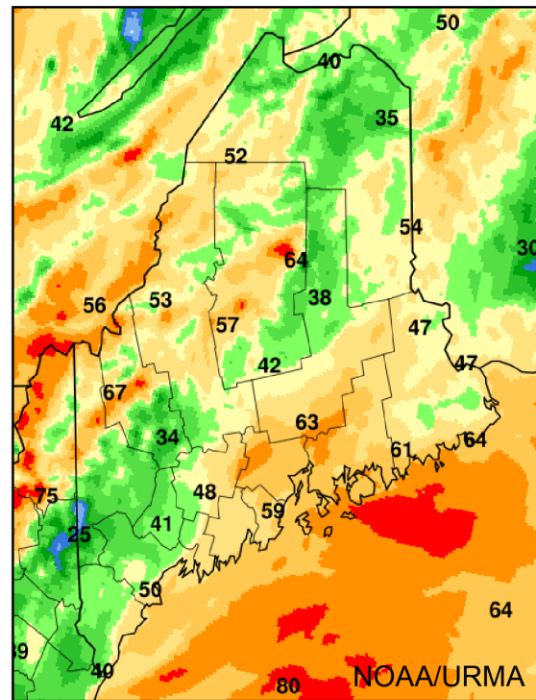
December 18th



January 10th



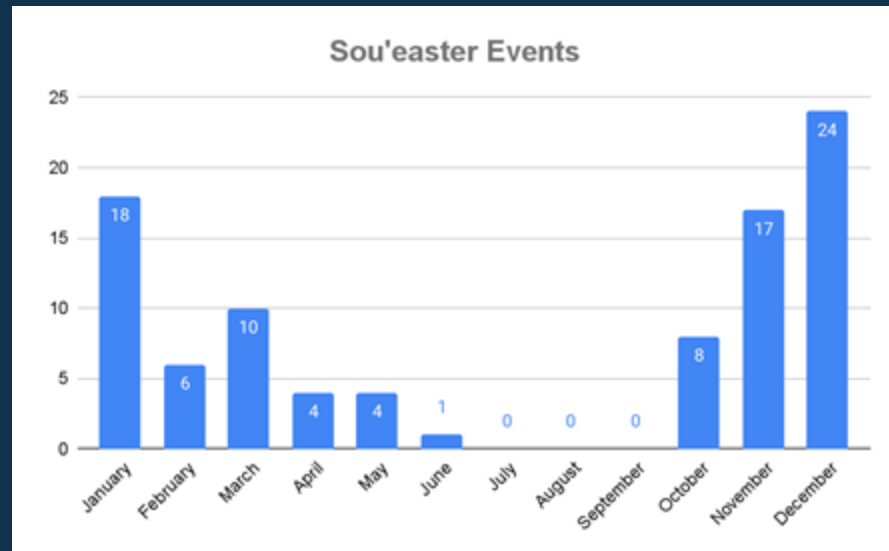
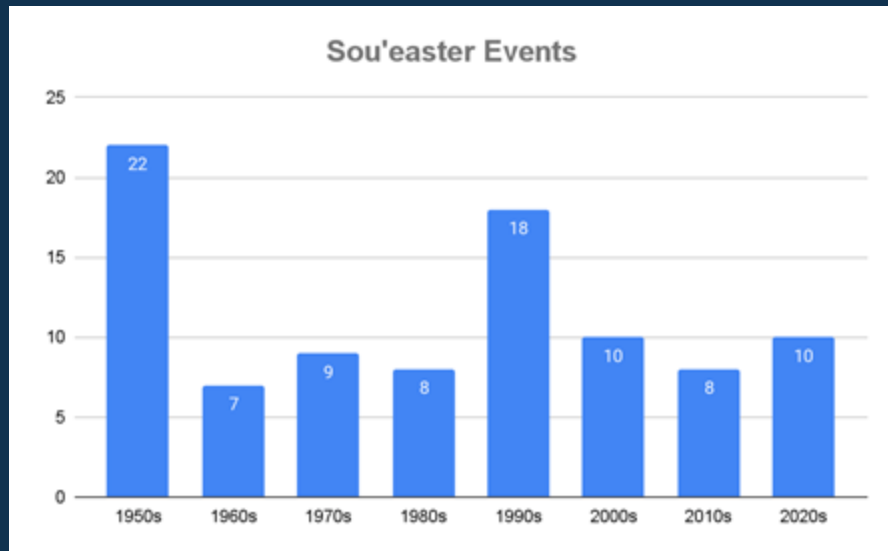
January 13th



Estimated maximum wind gusts attained for recent major storms in December 2023 and January 2024 (Maine Climate Council STS 2024 Update Report).

Portland “Sou’easter” Climatology 1950–2024

Preliminary analysis by Derek Schroeter and Justin Arnott, National Weather Service



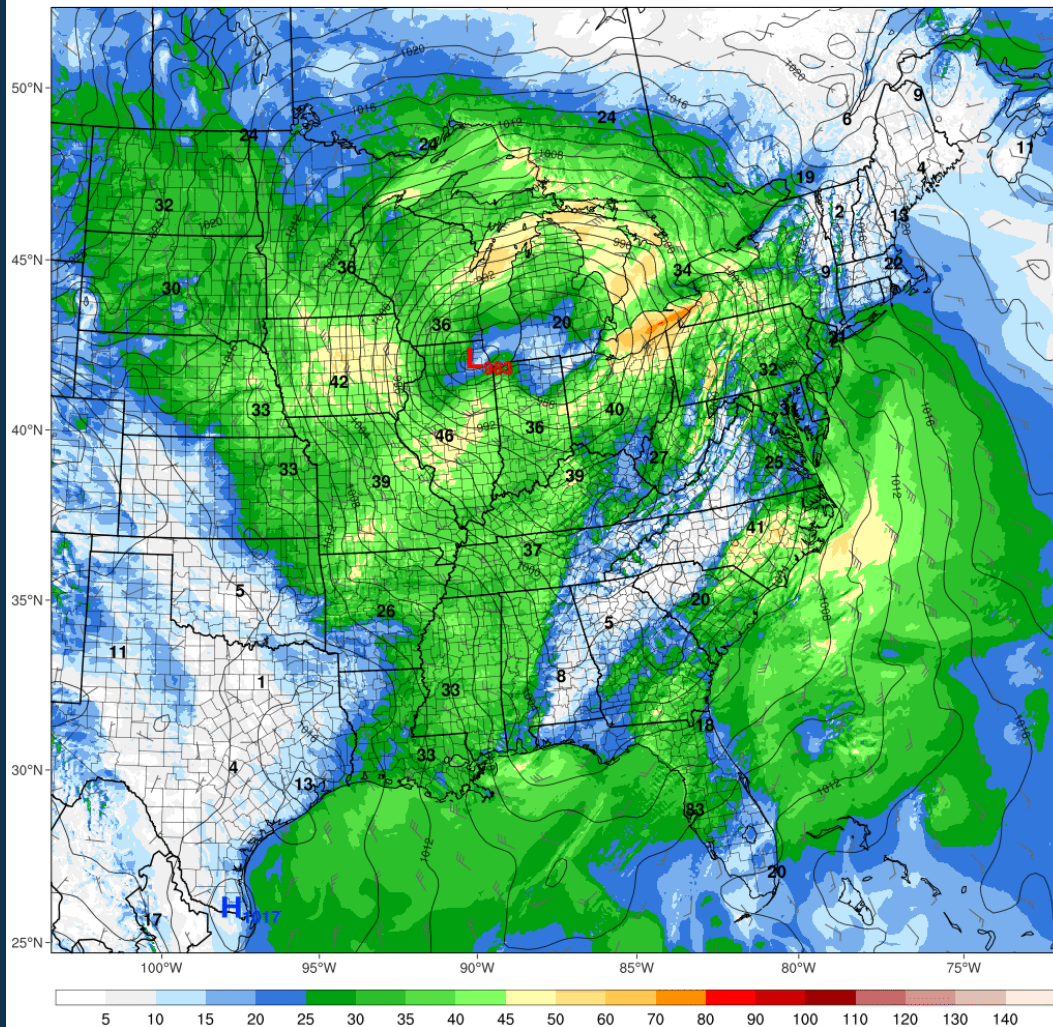
- No clear trend in frequency 1950 to early 2024
- Sou’easters occur primarily during cold season Oct–Mar, especially Nov–Jan

Storm Key Points

- Heavy precipitation events becoming more common due to strengthening hydrologic cycle.
- Available studies do not show clear trends in storm frequency. More analysis is needed.
- Both tropical and extratropical cyclones are projected by climate models to become more intense, but future annual/decadal storm frequencies remain uncertain.
- Sea-level rise is a “threat multiplier” that will exacerbate storm damage along the coast.

HRRR 10m Gust (mi/h), MSLP (hPa)
Init 2024/01/13 00Z | f001 Valid Fri 20EST, Jan 12, 2024

ClimateReanalyzer.org
Climate Change Institute | University of Maine



Thank You

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