

STORM RESPONSE IN ACTION



ISLAND
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**A Webinar Series on Coastal Resilience
for Working Waterfront Communities**



**We boldly navigate climate and economic change
with island and coastal communities to expand
opportunities and deliver solutions.**



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Presenters



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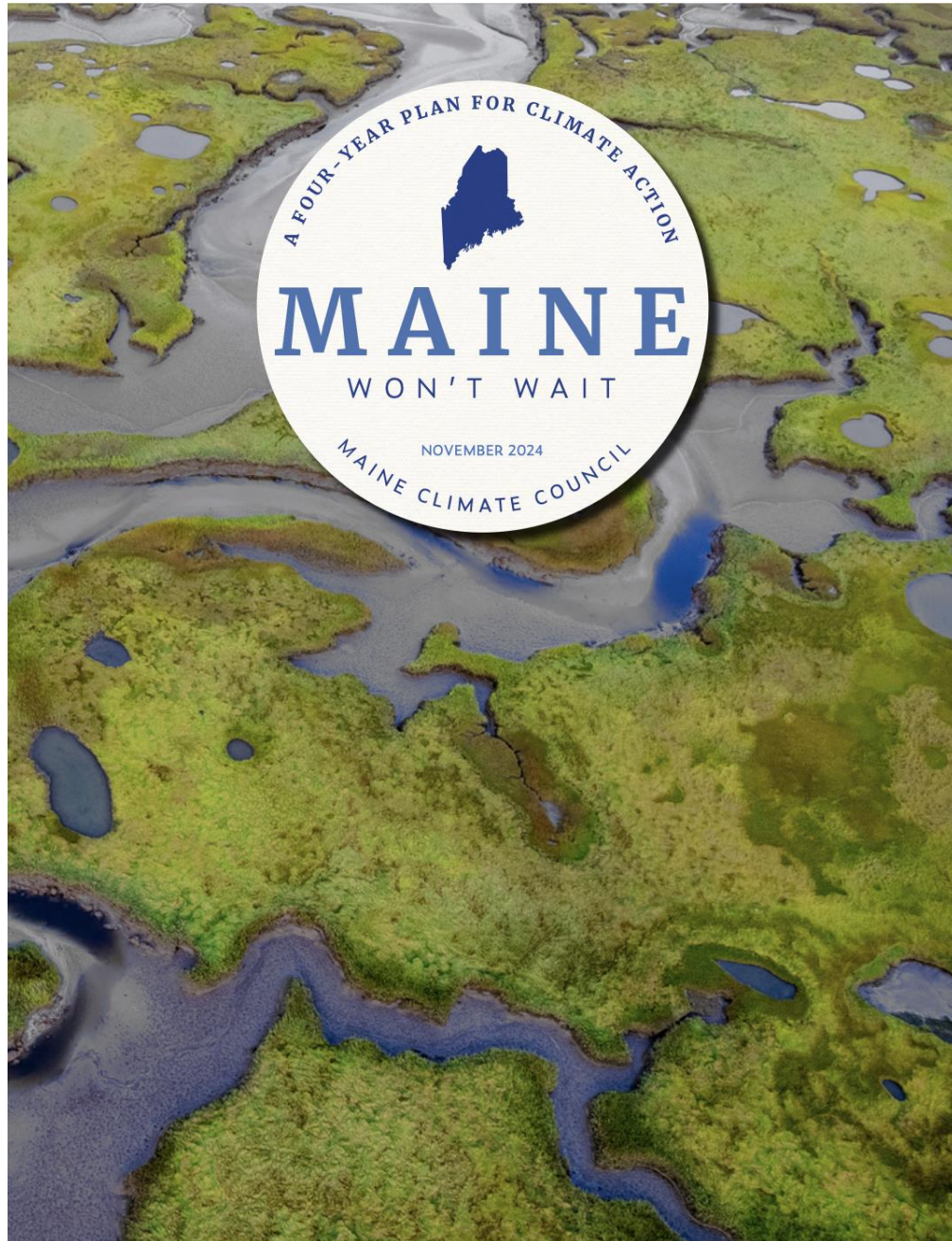
Judith C. East

Bureau Director, Bureau of
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State of Maine



Curt Brown

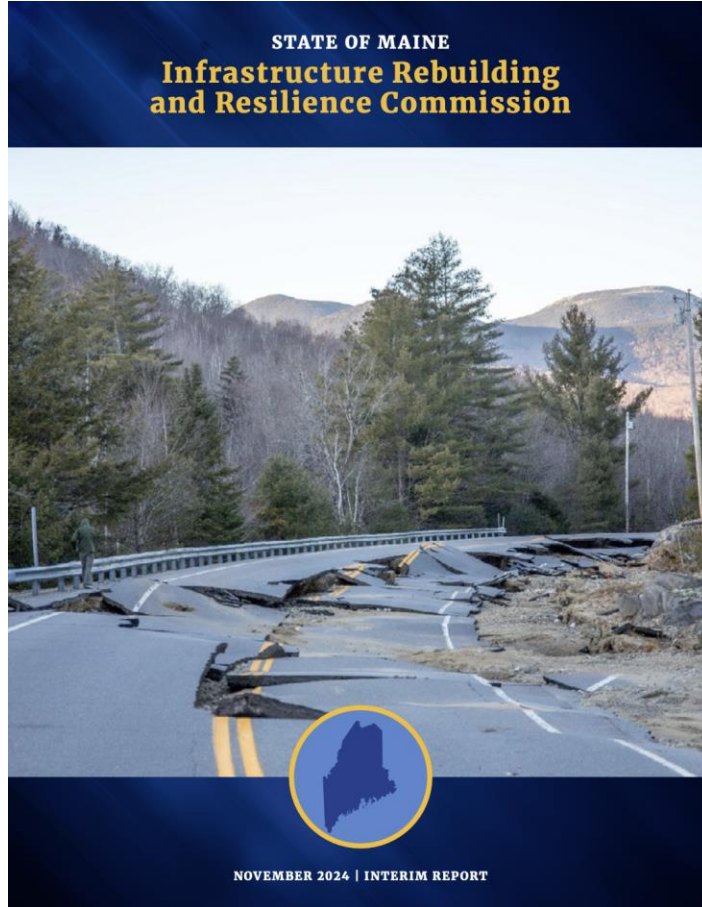
Lobsterman and Marine Biologist
Ready Seafood



Goals for Maine's Climate Action Plan

- Reduce Maine's Greenhouse Gas Emissions
- Make Maine More Resilient to the Impacts of Climate Change
- Foster Economic Opportunity and Prosperity
- Advance Equity through Maine's Response

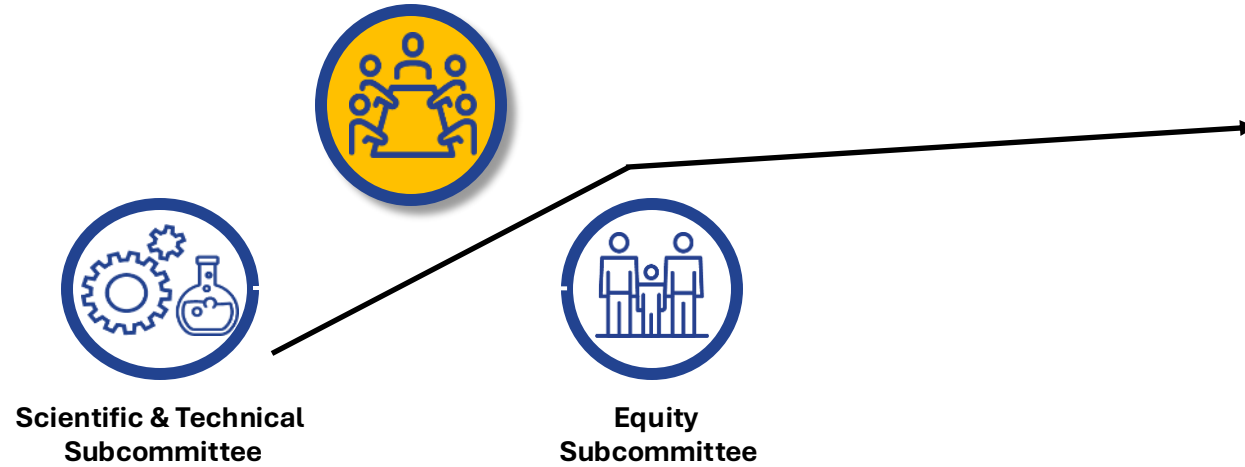
Building a More Resilient Maine



- Immediate Actions to Improve Storm Response
- Cementing the Foundation for Resilience
- Integrating Resilience for the Long-term



Maine Climate Council



Transportation



Buildings,
Infrastructure
& Housing



Energy



Community Resilience



Coastal & Marine



Natural &
Working Lands

Added in 2024: Materials Management Task Force
Land Use Task Force

Scientific Assessment of Climate Change and Its Effects in Maine 2024 Update

A REPORT BY
THE SCIENTIFIC AND TECHNICAL SUBCOMMITTEE
OF THE MAINE CLIMATE COUNCIL

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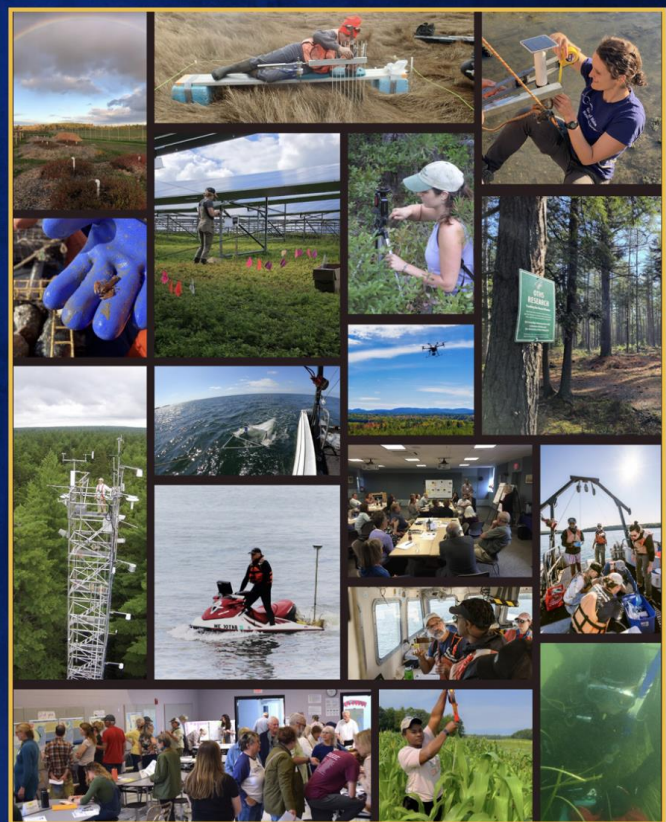
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Report lays out Maine's latest climate projections. Here's what you need to know.

Scientists and working groups weigh in on all aspects of climate change, from heat waves to soaring pollen counts to sea level rise, to help the Maine Climate Council set new goals for the second installment of Maine Won't Wait, the state's climate action plan.

2024 Maine Climate Council Science Update

Scientific Assessment of Climate Change and Its Effects in Maine



MAINE CLIMATE COUNCIL
SCIENTIFIC AND TECHNICAL SUBCOMMITTEE

Climate

CLIMATE

CLIMATE INSIGHTS SINCE 2020

Maine's climate is getting warmer and wetter and experiencing more extremes. In the four years since the 2020 STS report, researchers have seen further indications of these primary trends in Maine's changing climate. As a statewide mean, each of the calendar years 2020–2023 rank among the top 10 warmest for records beginning in 1895 (Figure 1). Calendar year 2023 ranks 2nd warmest and 5th wettest for Maine, with the precipitation surplus being a distinct departure from recent years.

Increasing Extremes

In addition to more days per year with over an inch of precipitation, more events with one-hour intensities have prompted adaptive actions. Heavy precipitation events continue to impact Maine and the broader Northeast region as warming drives more intense hydrologic cycles (Whitland et al., 2023). Based on an analysis of daily surface observations since the 1950s, Maine now receives on average 1–2 more days per year with 2 inches or greater precipitation, and 2–3 days more per year with 1 inch of precipitation (Figure 2). Short-duration (minutes to hours), high-intensity precipitation events with several inches of accumulation can occur over limited areas during thunderstorms, tropical or strong extratropical cyclones, and in association with meteorological factors such as topographic enhancement. A previous examination of data across New England and New York found that extreme precipitation days (up 1% of wet days) tended to have 50% of the total accumulation occurring in 3 hours or less (Agui et al., 2015). Historical and future trends for the frequency of these intense sub-daily events are not yet established for the region, but recent storms with record one-hour intensities have spurred adaptive measures nonetheless (Whitland et al., 2023).

What is “the climate”?

Climate can be defined as the average weather over a period of time. It includes temperature, precipitation, and wind (Joy et al., 2023). More technically, the climate is a statistical description of the average and variability of weather, including meteorological trends from days to millions of years. A statistical, natural definition of “climate” refers to the complete system in which the sun, land, oceans, ice, and living organisms interact with and influence each other and the atmosphere (Joy et al., 2023).

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Marine Ecosystems

MARINE

OCEAN TEMPERATURE

The Gulf of Maine is warming faster than 97% of the world's ocean surface. Recent sea surface temperatures (SST) in the Gulf of Maine maintain the region's distinction as being one of the fastest warming ocean regions on the planet. In 2021 and 2022, SSTs were the warmest and second warmest, respectively, recorded since the satellite SST data record began in 1982 (Figure 3; GBRRL 2022, 2023). Over the 1982–2023 period, the Gulf of Maine has warmed approximately three times faster (0.48°C / decade) than the global average SST warming rate of 0.16°C / decade (GBRRL 2024). SST in the region shifted into a warm regime during the 2010s (Mills et al., 2024), with temperatures for 2010–2023 averaging 1.38°C above the average for 1982–2009 (Figure 4).

Ocean heatwaves continue to increase. Marine heatwaves, a period when the daily average SST is greater than the 90th percentile of the long-term (1991–2020) average for five or more consecutive days, have increased in frequency, duration, and intensity in the Gulf of Maine over the past decade (Figure 2). In 2022, SSTs met the heat wave criteria for 355 days, or 97% of the year (GBRRL 2023).

Gulf of Maine SST Changes

Figure 1. A time series of annual average sea surface temperatures (SST) recorded by satellite from the long-term average for the Gulf of Maine (black line) and from 1982 through 2023, showing that 2023 was the warmest year on record and 2022 the second warmest. The warming trend in the Gulf of Maine (green line) is about three times faster than the global SST warming trend. Between 1982 and 2019, SST averaged 0.91°C (blue line), and the 2010–2023 average compares to 1.38°C, averaging 0.48°C (GBRRL 2024).

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Sea Level Rise and Coastal Hazards

SEA LEVEL RISE AND COASTAL HAZARDS

Figure 6. Upper image: Location of sea level gauges in Portland, Bar Harbor, and Eastport. Lower image: Graph showing total water level (meters) for the January 10 and 13, 2024 storm events in reference to the historic high water level at each gauge. The combined tide, storm surge, and wave height (blue line) is shown in blue. The dark red represents storm surge, and light red represents the difference between January 2024 mean sea level and 1982–2019 mean sea level. Asterisks denote when the January 10 or January 13, 2024 storm surge was level reached or greater. For example, although the January 10, 2024 storm led to the 4th highest total water level in Portland, that has been 10 similar storm size. This indicates that extremely rare combination of tide and surge led to extreme flooding because sea level was high.

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The Science of Hope

HOPE

Hope Theory Construct

HOPE = Goal Setting + Agency Thinking + Pathways Thinking

Goals
HOPE
Agency Pathways

- **Goal Setting:** Do you have a meaningful goal?
- **Agency Thinking:** Do you have the knowledge and determination that gives you confidence you can achieve your goal?
- **Pathways Thinking:** Do you have a plan and the willingness to modify/adjust your plan?

(Modified from Duncan et al., 2021)

Figure 6. Hope theory construct.

These three components can bolster each other along with well-being (Duncan et al., 2022). Research finds that perceptions of higher goal attainment, independent of the kind of goal, were significantly associated with hope; that social support elevated hope and pathway thinking; and that perceived higher social standing raised hope and agency thinking (Duncan et al., 2022).

Hope differs from optimism: while optimism implies confidence in a successful outcome, hope does not; consequently, one can “hoping against hope” even when optimism has been lost (Molina, 2008). Hope, instead of optimism, has often been cited as the driving psychological force behind survival against the odds (Molina, 2008). Dispositional optimism, or the individual personality trait to tend to see things positively, can provide motivation and health benefits, especially cardiovascular health and healthy lifestyle habits; however, it is a risky strategy because it can leave people open to crushing disappointment and losses incurred from overconfidence of success (Molina, 2008). Hope can equally inspire demonstration when placed in a specific person or outcome; however, hope can be learned, engages with individual choice, and provides the instrumental value of increasing the likelihood of the desired outcome (Molina, 2008). Hope is not an essentialist or the outcome of deterministic political life policies that undermine hope as perceived as oppressive, and institutions that enhance hope prove desirable. Hope not only begins hope; it increases the odds of individual success (Molina, 2020).

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Warmer temperatures

The past four years have ranked among the ten warmest on record



More precipitation

1-2 additional days per year with 2+ inches of precipitation



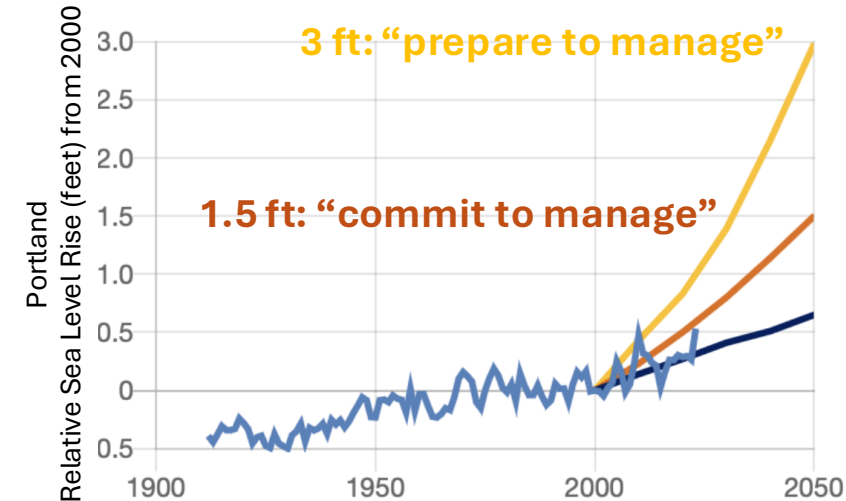
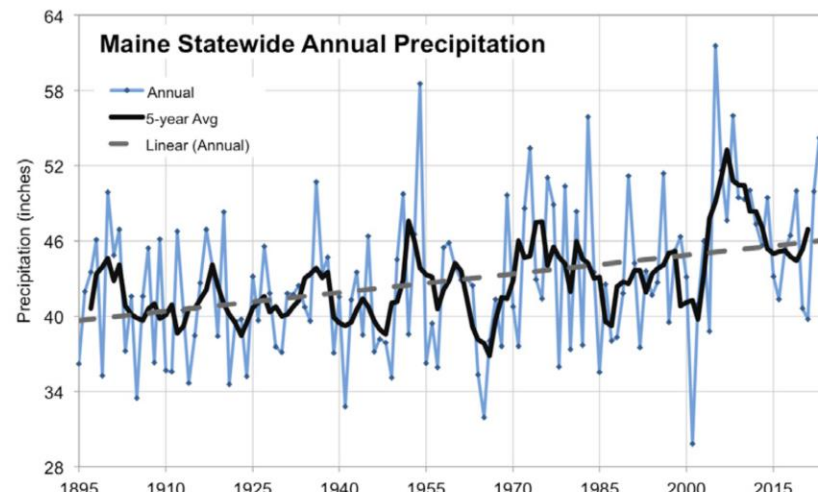
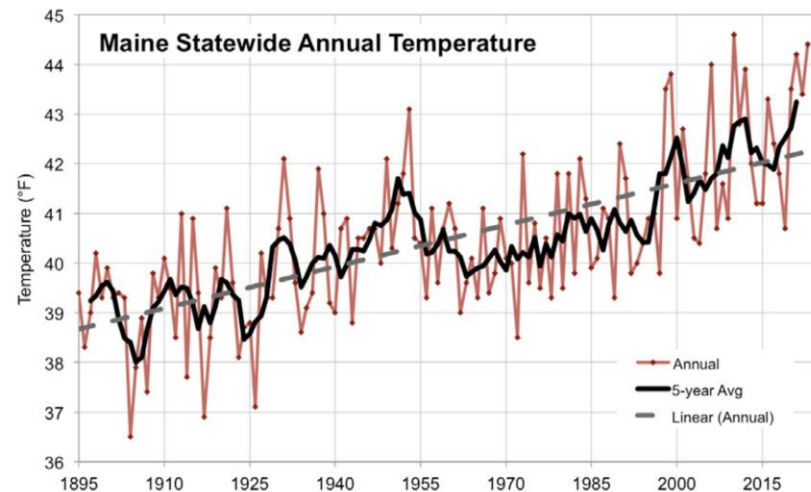
Shorter winters

Winters now are 2 weeks shorter than the period between 1901-2000

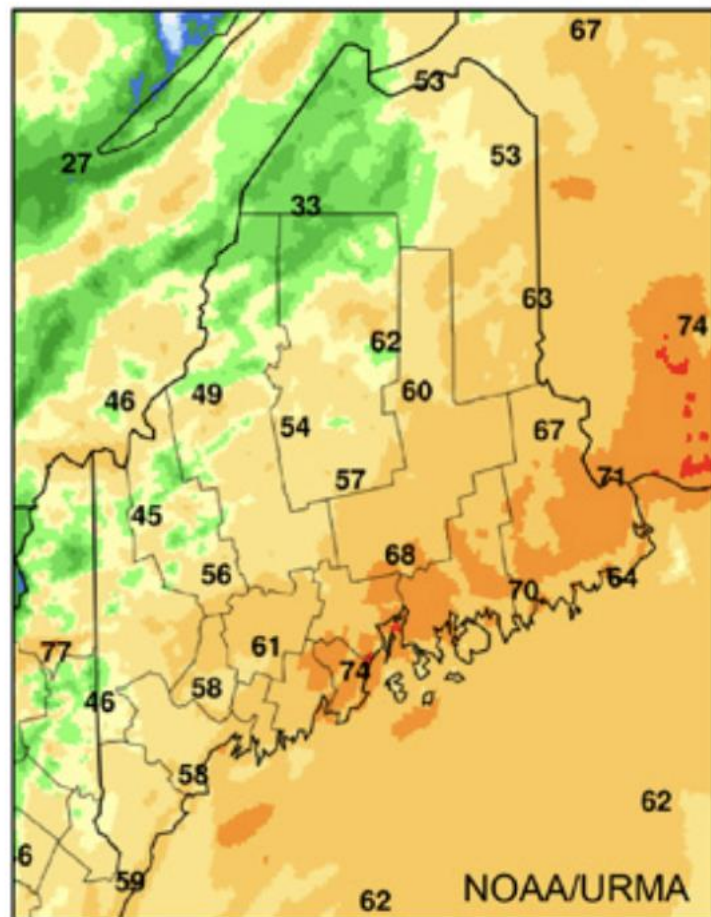


Rising sea levels

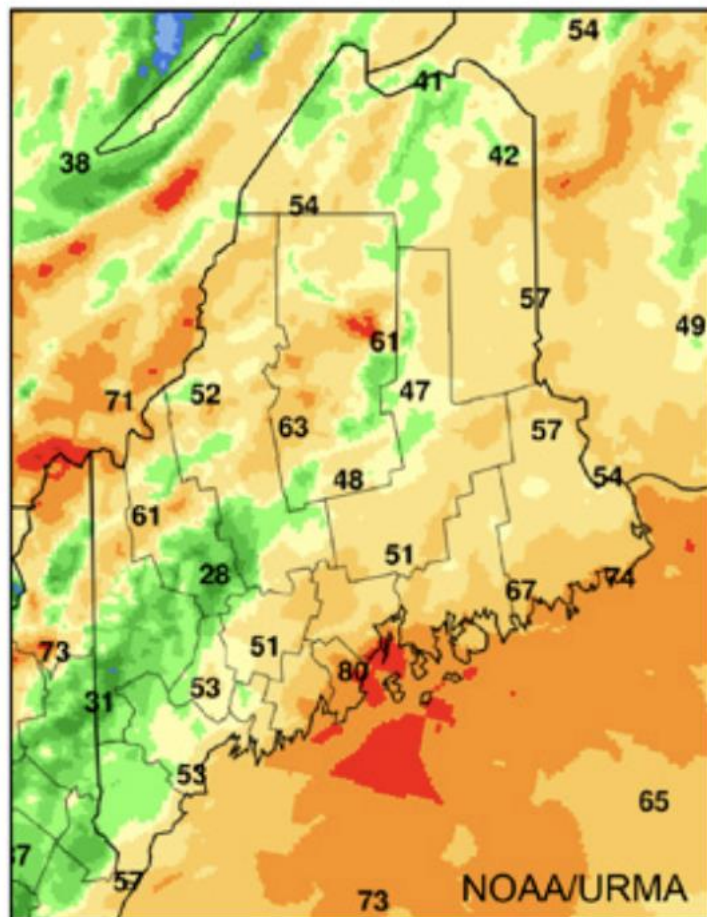
Sea levels are 8 inches higher than a century ago



December 18th



January 10th



January 13th

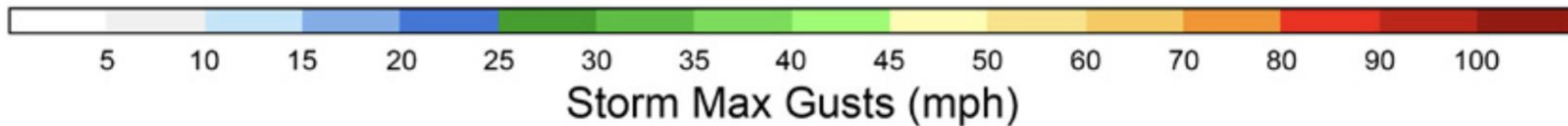
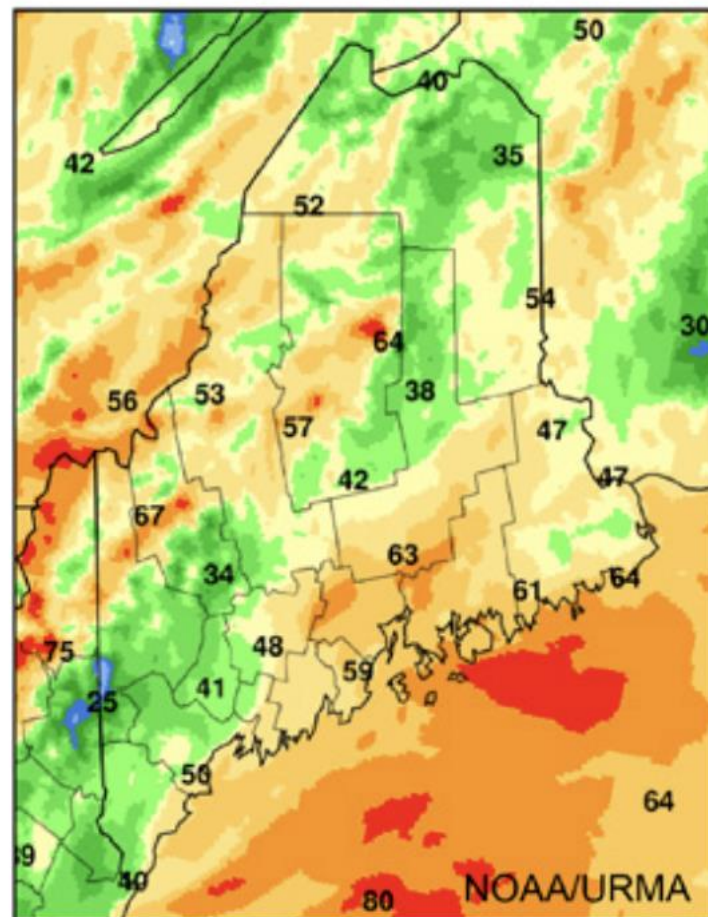
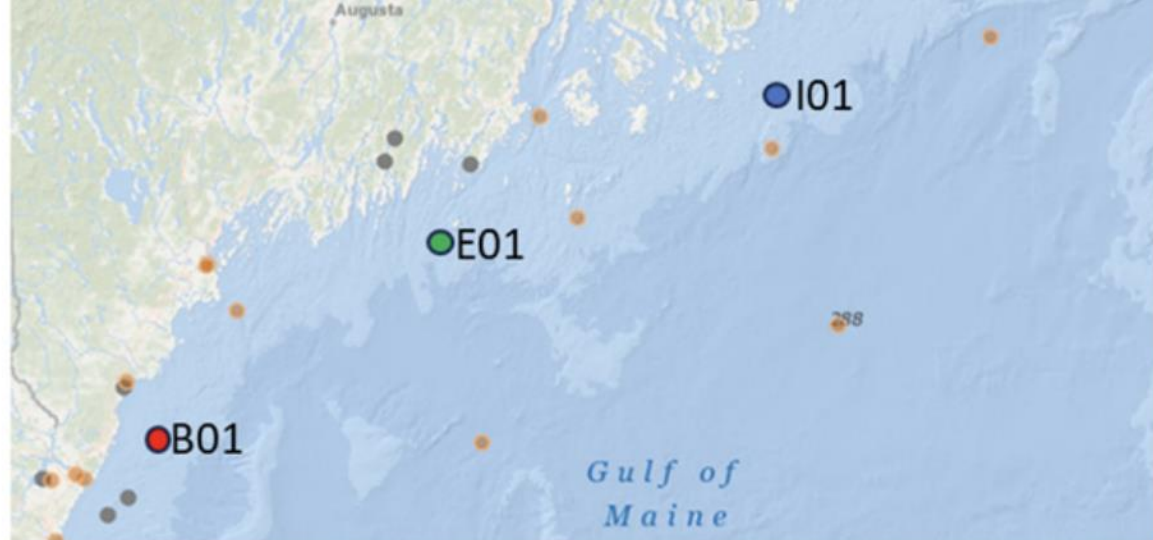


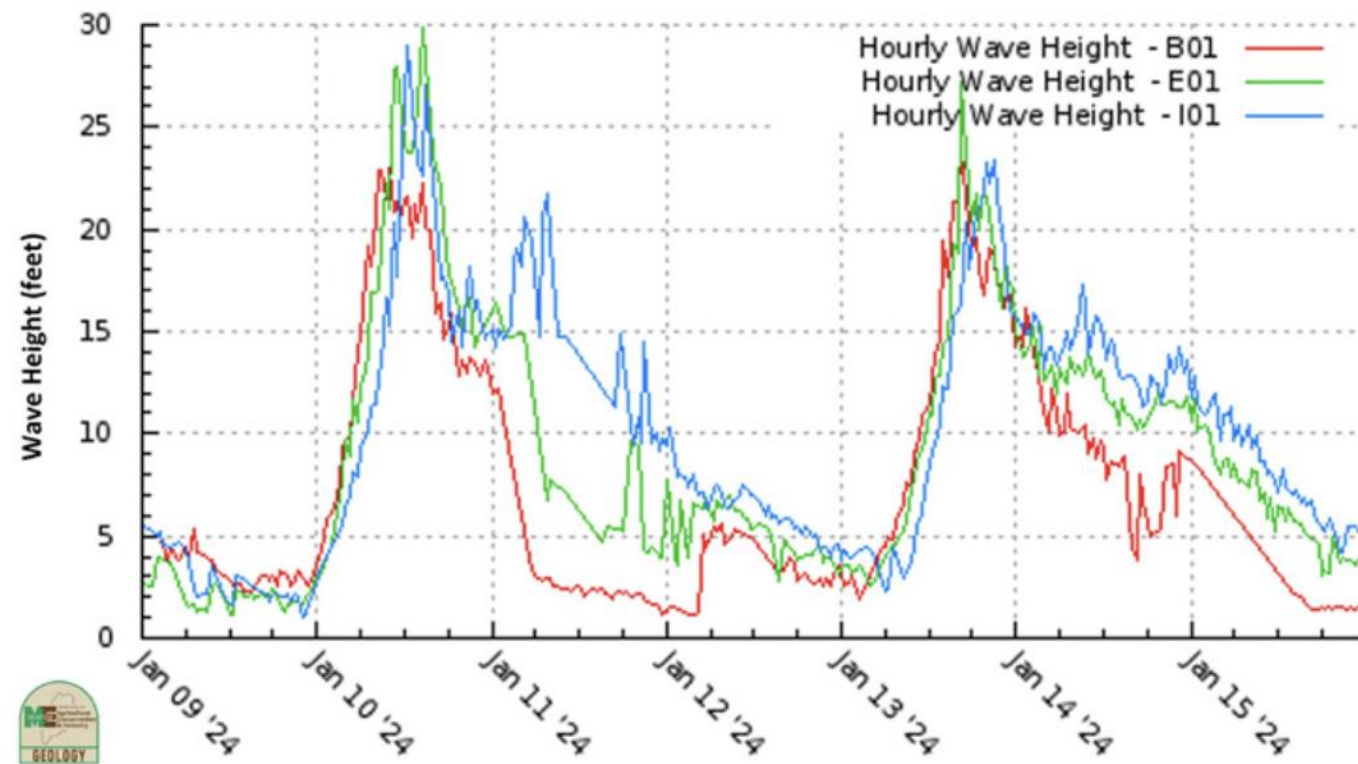
Figure from STS 2024 Scientific Assessment

Map image from Climate Reanalyzer (2024)

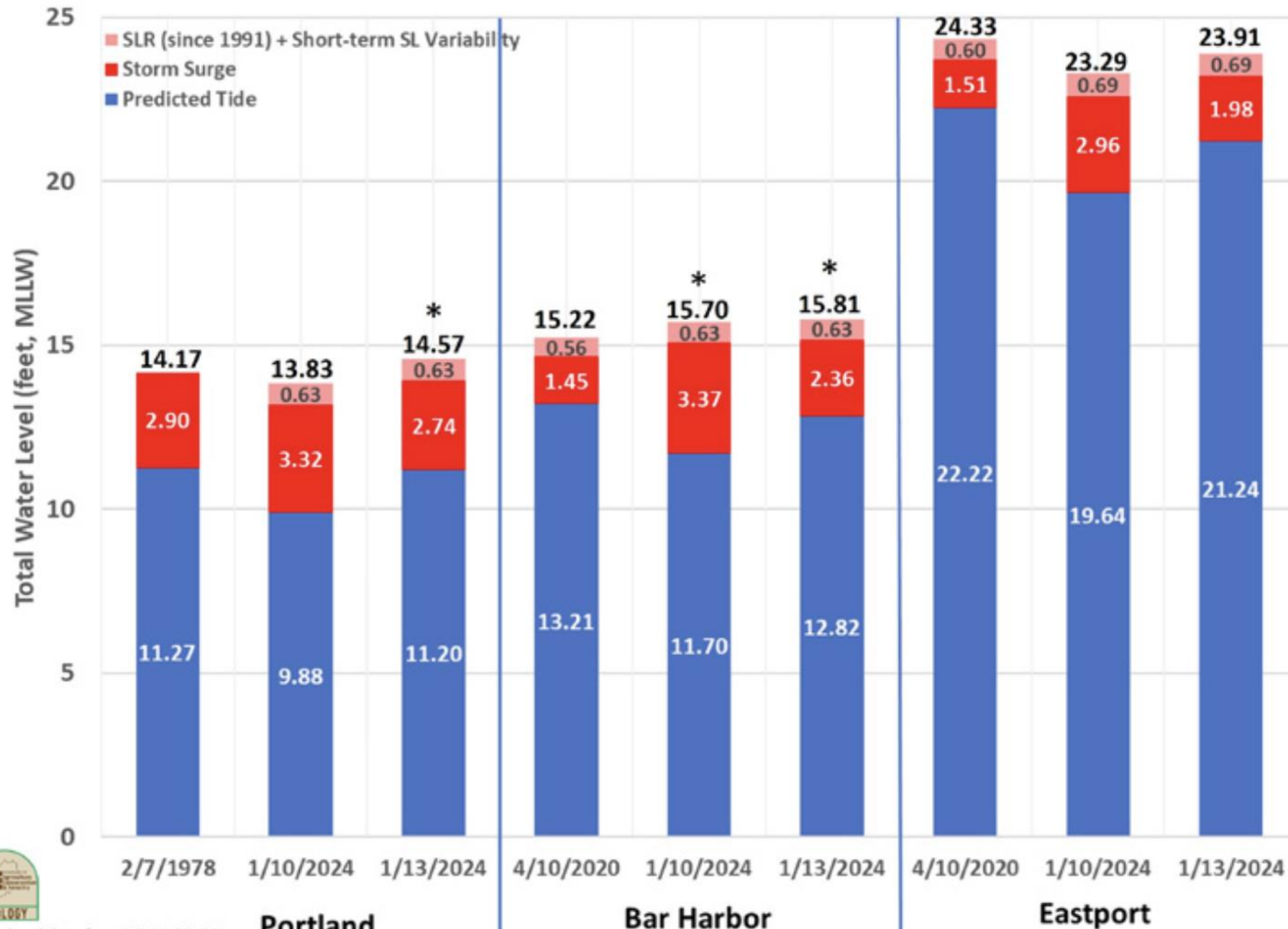
Data source: NOAA Un-Restricted Mesoscale Analysis (URMA)



Hourly Wave Heights



January 10 and 13 storm events referenced to historic Total Water Levels

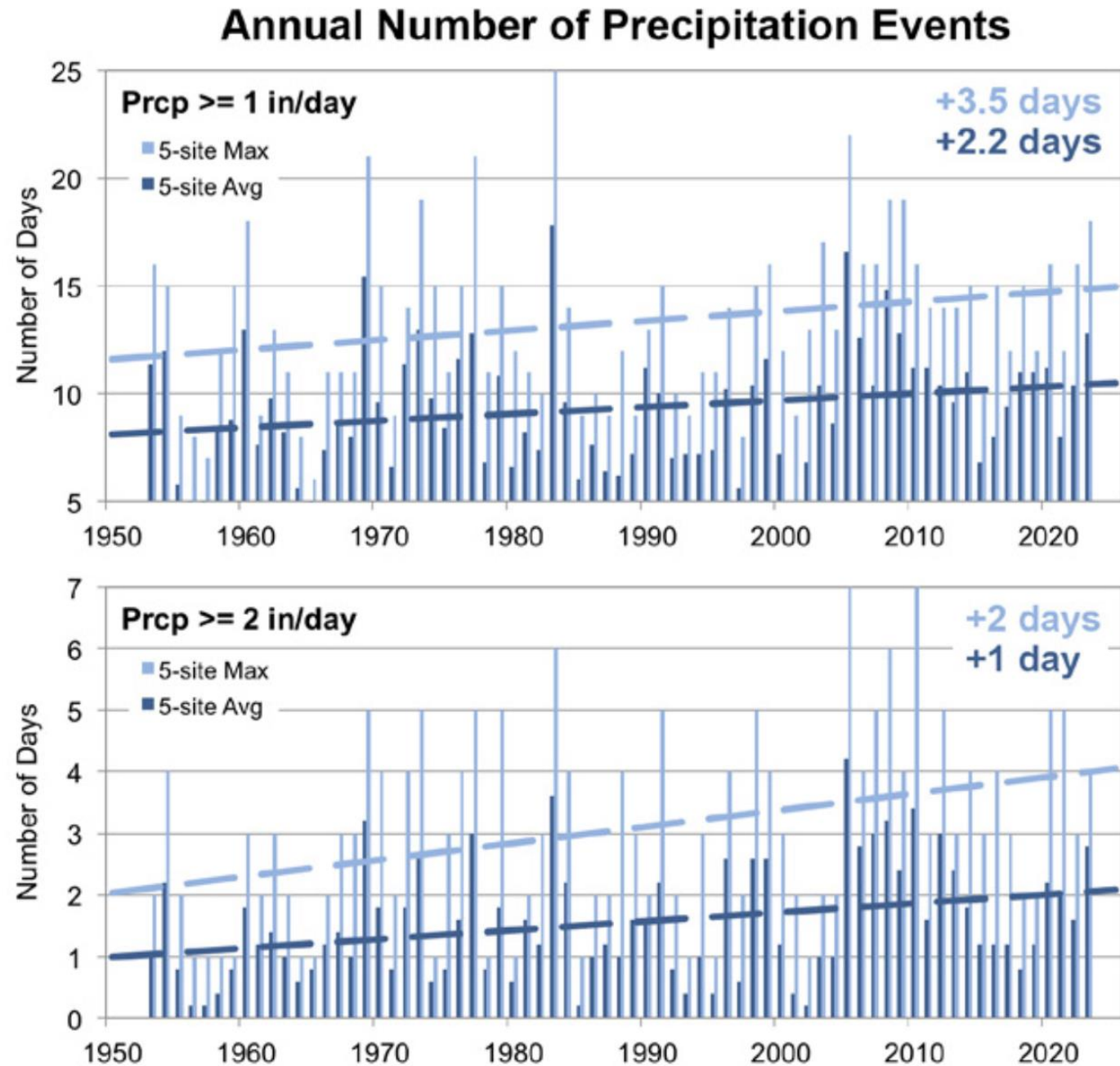


2023 Monthly Mean Sea Level Rankings			
Month	Portland	Bar Harbor	Eastport
	1912-2023	1947-2023	1929-2023
January	2nd	1st	3rd
February	5th	3rd	3rd
March	3rd	1st	1st
April	3rd	3rd	3rd
May	3rd	2nd	2nd
June	1st	1st	1st
July	1st	1st	1st
August	1st	1st	1st
September	1st	2nd	2nd
October	1st	1st	1st
November	1st	1st	1st
December	2nd	2nd	2nd
	2023 monthly water level is in the top 3 for that month		
	2023 monthly water level is the 1st for that month (Chart by P.Slovinsky, MGS)		

Figure from STS 2024 Scientific Assessment

Storm Trends

- Maine's climate is getting wetter, with more high-intensity precipitation in association with warming-driven intensification of the hydrologic cycle
- Winter storms are projected to become more intense (lower central pressure and increased heavy precipitation), but their frequency remains uncertain
- As sea levels rise, the same surges superimposed on higher sea levels will make coastal flooding and inundation more frequent and severe; sea level rise has caused coastal flooding to occur about three times more often since 2010, and the frequency of minor high tide flooding will increase over the next decade





Build Healthy and Resilient Communities





Increase **local capacity** for climate resilience

- **Improve tracking and decision-making** by creating new monitoring programs to fill data gaps, including capturing changes occurring in ecosystems and the effects of extreme weather events on people and natural resources.
- **Increase technical assistance and capacity to provide guidance on climate solutions** to communities and natural resources industries, including through nature-based solutions.



Improve Maine's **preparation for and recovery from natural disasters**

- **Increase capacity for disaster planning** and management at state, county and local levels.
- Support planning and decision-making that reduces **exposure to natural hazards and climate vulnerabilities**.
- **Establish a framework for measuring the effectiveness and equity** of adaptation and resilience actions.





Expand access to **funding and financing** for climate adaptation

- **Expand finance options** to ensure sustainable funding and financing **for climate-ready infrastructure and adaption projects**.
- Study the feasibility of a “**Resilience Bank**” and other finance tools by 2026.
- **Simplify and coordinate state grant application processes**, including a **common access portal** for information about state grant programs, by 2026.





Help Maine people **prepare** their homes, schools, and businesses **for** **climate change**

- Leverage building codes and standards, energy efficiency, education, and outreach to **help people prepare their homes for climate change, especially low-income families and those with health risks.**
- **Increase funding, financing, and outreach for small-scale clean energy and storage options** (including electric vehicle batteries that are used as energy storage) that can **provide electricity during power outages.**
- Identify funding the expand programs that **help prevent spills from residential oil tanks.**





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- Identify funding the expand programs that **help prevent spills from residential oil tanks.**





Increase awareness and action on the mental health impacts of climate change

- **Strengthen connections between disaster planning and mental health services** with a focus on youth, first responders, and other affected groups.
- **Provide training, assessments, educational materials, and funding** across healthcare services to address mental health impacts related to climate change
- **Establish programming and education for schools and communities to build resilience, agency, and hope** regarding climate change.



Protect critical working waterfront infrastructure

- **Preserve and expand working waterfront access**, including intertidal access.
- **Develop a statewide working waterfront strategy** by the end of 2025 to address funding and data gaps and increase protection options as well as publicly accessible infrastructure.
- **Fund improvements that protect against climate impacts**, including clean energy installations that make businesses more resilient during power outages, and address workforce and contractor capacity gaps.
- Support communities to protect working waterfront by using **planning and zoning strategies**, investing in working waterfront **infrastructure that meets community needs**, and **increasing public understanding** about the economic and cultural importance of Maine's working waterfronts.





Increase the amount of food consumed in Maine from state food producers to 30 percent by 2030

- **Strengthen the viability** of Maine farms, fisheries, aquaculture, and other food producers **through expanded, equitable, and ongoing access** to **funding, technical assistance, and processing and distribution** infrastructure.





Support farming, forestry, and fisheries industries in Maine in **adapting to climate change**

- **Promote stewardship of ecosystems that support innovative markets** that are resilient to climate change, and **grow opportunities in fisheries, aquaculture,** forest products, and agriculture.
- Maintain and expand **equitable access** to **cultural, traditional, emerging,** and **heritage industries.**
- Focus **resilience efforts** on communities **most economically dependent on natural resource industries.**





Better **monitor** inland and coastal and marine ecosystems **to** **increase resilience**

- Improve tracking and decision-making by creating **new monitoring programs** to fill data gaps, including capturing changes occurring in ecosystems and the effects of extreme weather events on people and natural resources.
- Increase **technical assistance** and capacity to provide guidance on climate solutions to communities and natural resources industries, including through **nature-based solutions**.





THANK YOU for your support as we boldly navigate climate and economic change with island and coastal communities to expand opportunities and deliver solutions.

- Webinar attendees will be sent an email with the webinar recording and a post-webinar survey.
- The next webinar, **Storm Response in Action: New State Efforts to Help Rebuild Webinar** will be held on **December 10th at 3:00pm**



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