



Maine's Climate Has Been Changing for Decades

Winters Have Become Warmer, and Rainfall More Intense, as Sea Level Has Risen and High Tide Flooding Increased

WHY IT MATTERS

As our climate changes, it will continue to shape the Bay, its people, communities, and natural landscape. Climate change will also exacerbate other ongoing issues such as water quality and habitat degradation. As storms become more severe, river towns and coastal communities are at greater risk of flooding. Increased rainfall delivers not only more fresh water but also more pollutants to the Bay, and warmer waters mean our lakes and the Bay are more vulnerable to those pollutants. Warming climate on land brings health risks, while a warming ocean shifts the range and abundance of marine organisms, changing fisheries and altering coastal economies. Gradually rising seas mean that monthly extreme high tides inundate waterfront infrastructure such as piers and coastal roads more frequently. Rising seas also threaten salt marshes, eelgrass beds, tidal flats, and other coastal habitats.

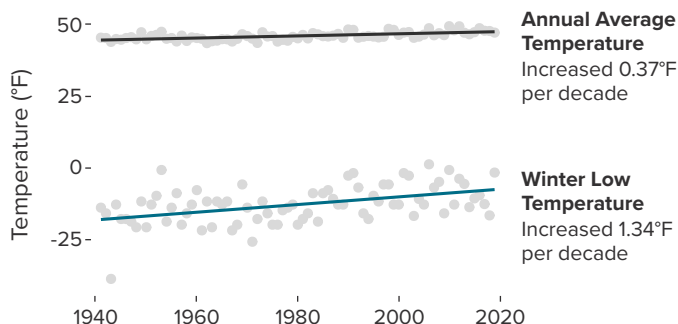
STATUS & TRENDS

A NOAA weather monitoring station set up eighty years ago at what is today the Portland International Jetport is still in operation, providing a decades-long record. While the record shows substantial year-to-year variability, long-term trends are clear. Overall, conditions are warmer, especially in the winter, and wetter than in the past. Ocean data collected over the past century at Portland Harbor show a rising sea level.



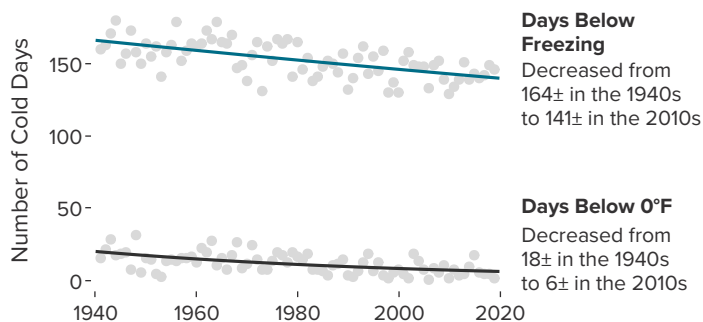
Sea level rise is making tidal flooding of coastal infrastructure much more frequent. Flooding is about three times more likely today than in the recent past. With only one more foot of sea level rise, it may become ten to fifteen times more common.

Warmer Years and Winters



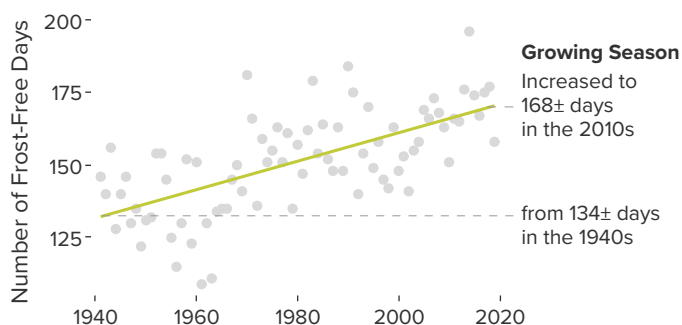
Annual average temperatures and coldest winter temperatures have become warmer over the last eighty years. Data on summer high temperatures indicated no change (not shown on graph).

Fewer Cold Days



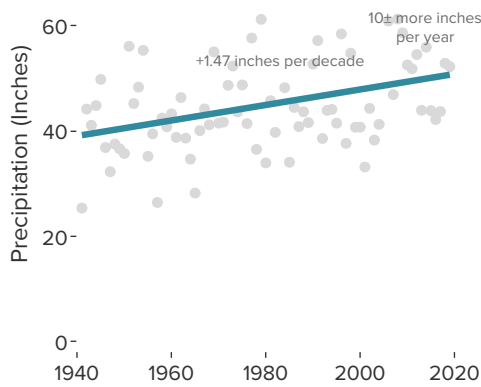
Days with cold temperatures are less common than in the past. Data on hot days (above 90°F) indicated no change (not shown on graph).

Longer Growing Season



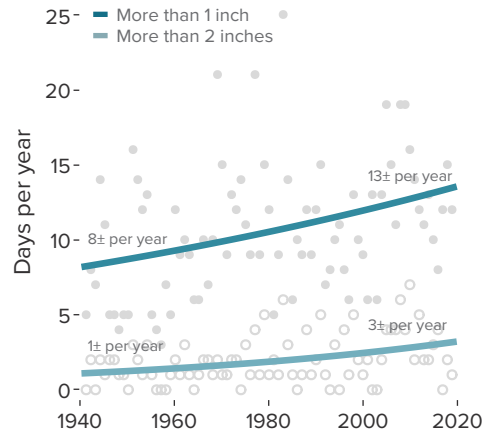
Our growing season (contiguous days that stay above freezing) has lengthened by about a month in eighty years.

More Annual Precipitation



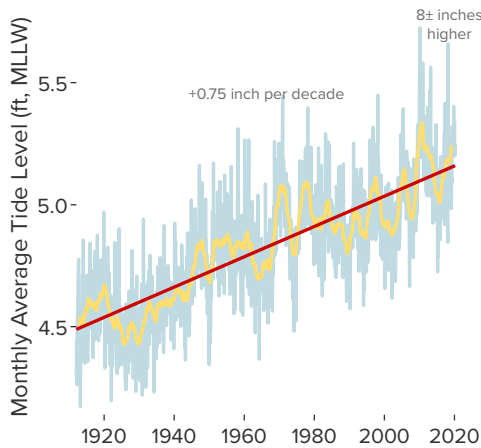
Total annual precipitation has increased gradually. A typical year gets about ten inches more rainfall now than in the middle of the twentieth century.

More Days of Heavy Precipitation



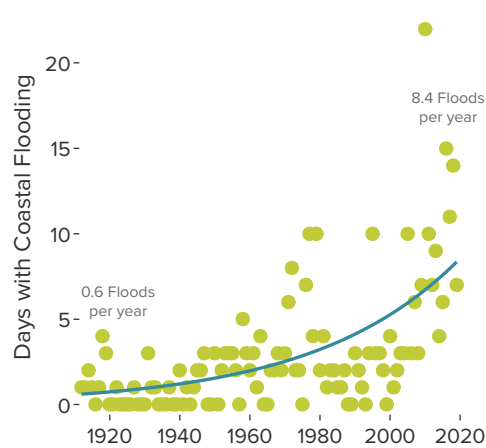
Big storms are more common now. Days with more than 1 inch (solid circles) or 2 inches (open circles) of precipitation happen more often. Extreme storms can occur even in years of average total rainfall.

Rising Sea Level



At Portland, sea level has risen about eight inches over a century, in line with global averages. Sea level rise has not been steady, with periods of increase interrupted by declines lasting several years. Scientists predict the rate of sea level rise will increase in coming decades.

More Days with Coastal Flooding



A century of moderate sea level rise has greatly increased the frequency of coastal flooding. Analysis suggests coastal flooding could be eight times more frequent still under an additional foot of sea level rise—meaning some sixty days of coastal flooding each year.

EFFECTS OF SEA LEVEL RISE ON COASTAL HABITATS

Coastal habitats occur in a narrow range of elevations. Eelgrass grows only in shallow water. Tidal flats form principally in the lower intertidal zone. Tidal marshes develop in the upper intertidal zone.

Sea level rise, therefore, will shift the location and size of coastal habitats; just how is an area of active research. Impacts of sea level rise depend on many factors, especially intertidal elevations and the rates of sea level rise and sediment accumulation.

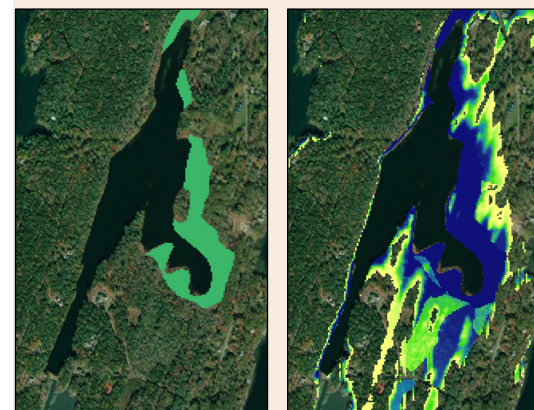
Researchers have looked carefully at the likely impacts of sea level rise on tidal marshes, yet studies of the effects on other coastal habitats lag.

Models suggest that, for most of this century, many of Casco Bay's larger tidal wetlands will "migrate" into adjacent freshwater wetlands and forests. Losses of tidal marsh to submergence and erosion at their seaward margins are likely to be more than balanced by expansion into adjacent low-lying areas. Elsewhere, rising seas will squeeze tidal marshes against steep slopes or developed areas, leading to losses.

The net effect is difficult to predict and may depend on actions and policies that facilitate marsh migration. In particular, by protecting low-lying areas adjacent to tidal wetlands today, we can ensure that tidal wetlands have somewhere to expand into decades from now.

SUCCESSSES & CHALLENGES

- ▶ Changes in Maine's climate will continue for many decades and become more disruptive, particularly if global greenhouse gas emissions do not decrease. Under some scenarios, Maine's climate at the end of the century may resemble the present-day climate of Maryland.
- ▶ The state, through the Maine Climate Council, is developing plans to reduce greenhouse gas emissions and to help Maine communities, businesses, and residents adapt to climate change.
- ▶ The cities of Portland and South Portland are leading local efforts to advance energy efficiency, alternative energy development, and adaptation to climate change through the One Climate Future initiative.
- ▶ Many costs of climate adaptation, such as emergency response, and repairing or upgrading infrastructure, will fall on municipalities, often already strapped for cash.



Existing Tidal Marsh (2015)

Probability of Tidal Marsh in 2100

Tidal marshes around Dan's Ice Pond, in Harpswell, are likely to expand with sea level rise, potentially improving habitat, but putting infrastructure at risk.