Casco Bay's Vulnerability to Climate Change

Casco Bay Estuary Partnership

FACT SHEET

From day to day, the weather is always changing—sometimes cooler, sometimes warmer, sometimes wetter, sometimes drier. However, long-term data on conditions over the past century reveal clear trends in Casco Bay's climate, and these trends are expected to continue far into the future. With climate change increasingly affecting the Casco Bay ecosystem and people who live and work around the Bay, Casco Bay Estuary Partnership (CBEP) carried out a vulnerability assessment to identify the most important climate-related risks. The assessment also determined the most effective ways for CBEP and local communities to respond to the changes in order to ensure the long-term health and vitality of the Bay.

CBEP's climate change work is a reflection of a priority goal in the *Casco Bay Plan 2016-2021* to "Foster resilient communities and their connections to Casco Bay." To that end, CBEP has produced a number of documents (see p. 4) to help communities prepare for climate change impacts and the resulting economic, cultural and ecological disruptions.

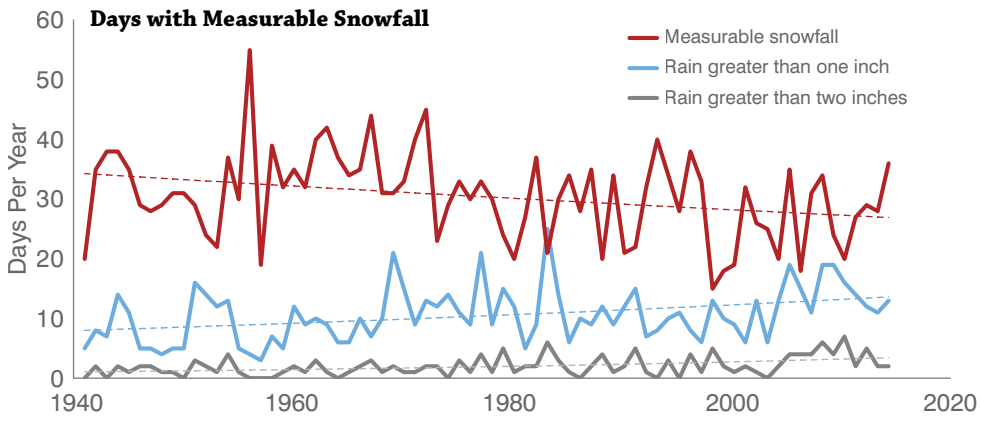
How Is Casco Bay's Climate Changing?

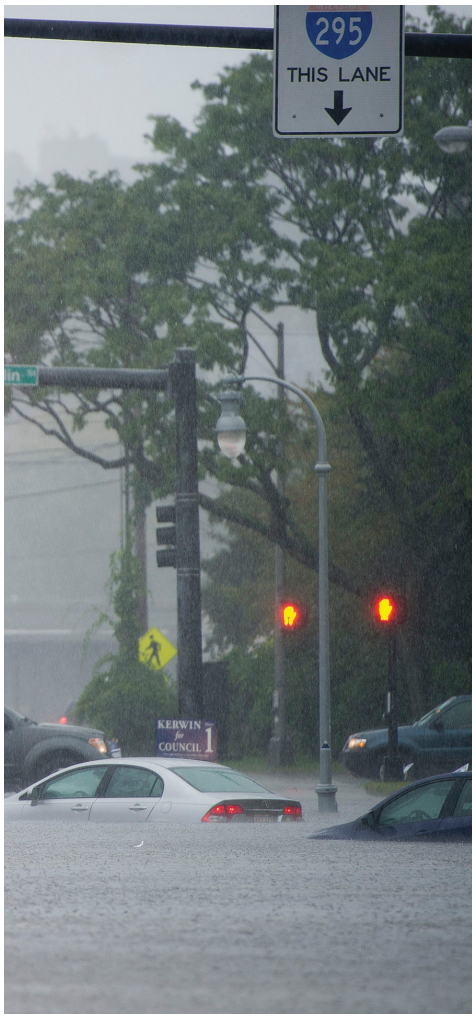
Warmer Summers

From 1895 to 2014, average annual temperature in Portland warmed by 4°F. Climate models for the Casco Bay watershed show further increases of 2 to 6°F by mid-century and 3 to 10°F by 2100. As many as 60 days per year could have temperatures exceeding 90°F.

Warmer Winters with Fewer Snowy Days

Data collected at Portland International Jetport since 1950 show that winters are warmer than they were a generation ago, and winters have been warming at a faster rate than summers. Sebago Lake's ice-out in the spring occurs 23 days earlier than it did in 1807. Days with measurable snowfall have declined about 20 percent in the past 65 years as more winter precipitation arrives as rain. By the end of this century, climate scientists expect that Portland will have 15 to 30 fewer days with temperatures below 32°F.





A September 2015 storm brought 5.6 inches of rain to Portland, causing extensive flooding and damage. Data show that intense storms are increasingly frequent, as climate changes. Photo by Gabe Souza/Portland Press Herald

Warmer Waters

Between 2004 and 2013, the Gulf of Maine warmed at a rate of 0.41°F per year—faster than 99 percent of the world's ocean. Since the mid-1990s, water temperatures in Casco Bay have increased approximately 3°F. As fish and other marine species shift in response to warmer water, many traditional fisheries, including lobster, may be disrupted.

Increased Drought

From 1996 through September 2015, the coast of Maine had only two droughts recorded by the Northeast Regional Climate Center—one of 2 months duration in 1999 and one of 9 months duration in 2001–2002. If greenhouse gas emission levels remain high, the Portland area could go from a current average of 4 months of drought in a 30-year period to more than 12 months.

More Precipitation, Greater Storm Intensity and Frequency

From 1895 to 2014, annual average precipitation in Portland increased by 0.75 inches per decade. Since about 1960, the rate has been much more rapid at 1.92 inches per decade. Intense rain events typically occurred about once a year in the early 1940s but are now occurring in Portland about three times a year. The number of extreme precipitation events—categorized as coastal floods, flash floods, floods, heavy rain and tropical storms—in Cumberland County has increased dramatically. From 2005 to 2014, 55 days had extreme precipitation events, 35 of which involved property damage.

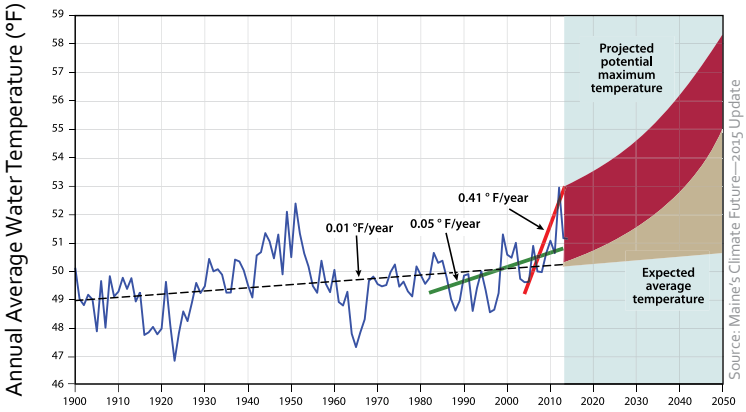
Rising Sea Level

Sea level at Portland rose 7.5 inches during the past century, according to tide gauge data. In the past two decades, sea level rise increased 130 percent faster than the average rate in the last 100 years. Studies indicate that sea level could rise another 2 to 10 feet by 2100.

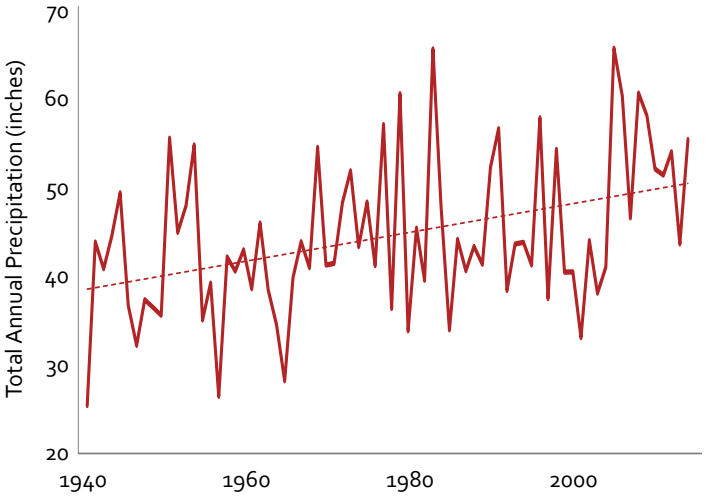
Ocean Acidification

Approximately one quarter of human emissions of CO_2 is being absorbed by the ocean, causing seawater to become more acidic. The ocean is acidifying at a rate at least 100 times faster than at any other time in the past 200,000 years. The acidity of Gulf of Maine waters is expected to grow markedly in coming decades, increasing faster than the average for global seas.

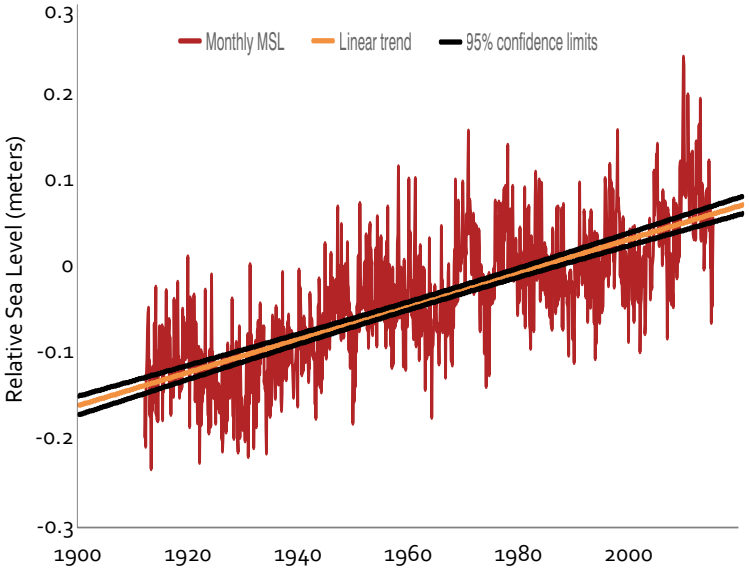
Rising Ocean Temperature in the Gulf of Maine



Increase in Precipitation

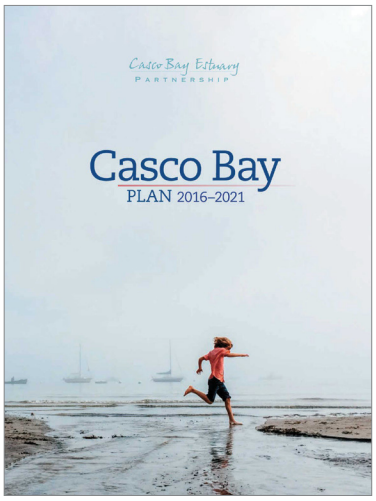


Sea Level Rise at Portland



Climate Change and the *Casco Bay Plan 2016-2021*

In 2015, CBEP released the *Casco Bay Plan 2016-2021*, which details the goals, strategies, and actions that guide CBEP's efforts to sustain a healthy Bay.



Goal 1: Protect, restore and enhance key habitats that sustain ecological health
Goal 2: Reduce nutrient pollution and its impacts, including coastal acidification
Goal 3: Foster resilient communities and their connections to Casco Bay
Goal 4: Mobilize collective knowledge and resources to support Casco Bay

Based on the climate change vulnerability assessment, CBEP identified the following risks and actions as among the most important for the future of Casco Bay. The complete list is available in the *Casco Bay Climate Change Vulnerability Assessment Report* at www.cascobayestuary.org.

Risks Associated with RISING SEAS and INCREASED STORM INTENSITIES

- **Damage and loss of piers** and other waterfront infrastructure.
  - Actions:
    - Assist landowners and towns in planning for sea level rise.
- **Changes in sizes and locations of salt marshes** and their susceptibility to invasive species.
  - Actions:
    - Monitor changes in salt marshes and identify methods to enhance their resilience.
    - Conduct salt marsh restoration using strategies that account for climate change risks.
- **Greater potential for shoreline erosion** and need for ecofriendly ways to protect properties.
  - Actions:
    - Develop "living shorelines" techniques using plants and other natural elements to stabilize shorelines.
    - Collaborate to solve regulatory barriers that impede ecofriendly shoreline protection.
    - Pursue policy and legal means to prevent non-ecofriendly shoreline protection.
- **Declines in water quality** due to undersized and aging stormwater control devices, larger stormwater volumes that reduce wastewater treatment effectiveness, increased runoff, and more discharges from Combined Sewer Overflow systems.
  - Actions:
    - Encourage stormwater control designs suited for future conditions.
    - Facilitate use of "green infrastructure" and low impact development, an approach to stormwater management that mimics a site's natural landscape.
    - Continue to reduce volume and nutrient levels of water entering treatment plants, and combined sewer overflow events.
- **Greater erosion of land**, causing more turbidity (cloudiness) and nutrient pollution of water.
  - Actions:
    - Support efforts to reduce soil erosion.
    - Protect forested lands and other vegetated areas.

Risks Associated with OCEAN ACIDIFICATION

- **Reduced growth and survival of some species**, potentially including shellfish because of impaired shell growth.
  - Actions:
    - Reduce nutrients entering the Bay from fertilizers, faulty septic systems, and other sources that contribute to greater acidification.
    - Experiment with methods to reduce impacts on shellfish and other resources.
    - Work with communities on strategies to diversify local economies.

Risks Associated with WARMER TEMPERATURES

- **Declines in some native freshwater fish** like brook trout.
  - Actions:
    - Improve fish passage to streams and rivers, such as by fixing culverts blocking fish movement.
    - Protect riparian and floodplain forests to shade streams.
- **Major changes in the ecosystem and fisheries** as species from the south move northward, including invasive species and diseases.
  - Actions:
    - Support emerging fisheries and environmentally sound aquaculture.
    - Monitor the presence and abundance of invasive species.
    - Provide education for boaters, marina owners, and others about how to fight invasive species.
- **Reduced growth and productivity of eelgrass**, a seagrass that provides nursery habitat for fish and shellfish.
  - Actions:
    - Protect eelgrass beds by improving water quality.
    - Enhance eelgrass beds through restoration and integration into living shorelines projects.
- **Increased susceptibility of the Bay to excess nutrients**, leading to harmful algae blooms, decreased water clarity, lower dissolved oxygen, and fish kills.
  - Actions:
    - Reduce nutrients entering the Bay from fertilizers, faulty septic systems, and other sources.

Risks Associated with MULTIPLE CLIMATE STRESSORS

- **Increasing difficulty for local and state government decision makers** to understand and respond effectively to changing coastal conditions.
  - Actions:
    - Work with policy officials, managers, and regulators to identify and ameliorate risks.

What You Can Do

- Avoid or minimize use of fertilizers on lawns and gardens.
- Plant or retain vegetation along the shoreline.
- Make sure septic systems function properly.
- Support your community doing climate vulnerability assessments and adaptation planning.
- Take steps to reduce greenhouse gas emissions in your home, such as by using ENERGY STAR lighting products, replacing old heating and cooling equipment, and sealing and insulating your home.
- Purchase a fuel-efficient, low-greenhouse gas vehicle, drive more efficiently, do regular maintenance, and use public transportation, carpool or walk and bike more often.
- Support businesses that invest in renewable energy and that take other actions to protect the climate.
- Consider how climate change may affect your own life and stay informed.

While climate change will increasingly affect the ecosystem and economy, efforts by CBEP and local communities can facilitate adaptation.

Learn More

Publications available at www.cascobayestuary.org:

- *Casco Bay Climate Change Vulnerability Assessment Report*
  More information about climate change trends, the full list of risks of primary concern, and approaches to address the risks
- *Sea Level Rise and Casco Bay's Wetlands: A Look at Potential Impacts*
- *Climate Adaptation Resource Guide for Casco Bay Communities*

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