

Northeast Regional
Climate Center



Climate and Weather Information for New England Water Utilities and Stormwater Managers

Science and Trends

New England is experiencing an increased frequency of heavy precipitation, warming temperatures, and wildly varying seasonal snowfall.¹ A shift in the frequency of heavy rains² is contributing to increased flooding in small basins, especially where there has been significant land use change or urbanization. Drought risk is also projected to increase in summer and fall as higher temperatures lead to greater evaporation and earlier winter and spring snowmelt.

Four elements contribute to flooding: antecedent conditions (e.g., soil moisture); the 'theme' of the pattern (e.g., active pattern versus one large storm); its tropical connections (e.g., moisture content); and 'the givens' (e.g., terrain, impervious surfaces, design of infrastructure). Storms in this region include Nor'easters; tropical cyclones; southern gales; and summertime stalled fronts with thunderstorms.

¹ Dupigny-Giroux, L.A., et al., 2018: Northeast. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., et al. (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 669–742. doi: 10.7930/NCA4.2018.CH18

² Easterling, D.R., et al., 2017: Precipitation change in the United States. In: *Climate Science Special Report: Fourth National Climate Assessment, Volume I* [Wuebbles, D.J., et al. (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 207–230. doi: 10.7930/J0H993CC.

Purpose of the Workshop Series

This workshop series was designed by NOAA and the Water Research Foundation to improve its delivery of information resources for small- and medium- size water systems useful for building their resilience to climate change. Each workshop was organized by NOAA's regional partners and was tailored to address issues identified by and for each region. The workshops sought to exchange ideas in order to:

- Identify gaps and improve NOAA climate and weather-related tools and information resources;
- Raise regional-scale awareness of NOAA water tools and resources;
- Build regional connections that support small-scale utility decision making;
- Develop improved communication materials to make NOAA's information and tools more accessible.

The New England Workshop

NOAA and its partners at the Northeast Regional Climate Center hosted four virtual workshops in July 2020 for small- to medium-sized water utilities and stormwater managers serving up to 100,000 customers. The New England region is experiencing the impacts of climate change including extreme precipitation, flooding, and drought, that continue to create challenges for water managers. Participants gained an understanding of precipitation variability, heard from cities and water managers who shared their experience, and learned how to access tools that will help build their communities' resilience to extreme weather events.

Summary

Flooding was the primary concern, by far, of the participants in this workshop series –whether extreme rainfall, sea level and storm surge, river flooding, or the inability of the built system to manage the flow of water effectively. Protecting the quality and quantity of drinking water supplies was another theme – including managing both supply and demand and managing reservoirs. A pre-workshop survey indicated that about half knew about (but didn't necessarily use) some of the tools demonstrated. When asked what they found most useful from the workshop, the most frequent reply was learning about the many tools and data sources that are available. However, participants voiced the overwhelming need for local scale projections of precipitation, updated flood maps, and dynamic models to visualize the implications of future changes with their built systems and community.

Workshop Date :: July 2020

Case Studies

Preparing for Storms: A Utility's Perspective - Portland, Maine Water District (Paul Thomas Hunt, Environmental Manager). A tabletop exercise led to a change of mindset – a District-wide unified protocol now includes a game plan for how to prepare for different levels of storms and how to maintain effective communication throughout.

Managing Multiple Risks of Flooding - Boston, Massachusetts Water and Sewer District (Charlie Jewell, Director of Planning and Sustainability). The District developed a risk mapping tool to inform a multi-pronged approach to manage stormwater and protect against the risk of flooding, including during concurrent incidents of intense rain, storms, and storm surge.

Preparing Cambridge for Climate Change: The Cambridge Flood Viewer - Cambridge, Massachusetts Community Development Department - (John Bolduc, Environmental Planner). Planners in this dense urban coastal town realized they couldn't build their way out of future flooding, so they adopted a multi-objective approach, including planning all future development with the goal of upgrading design codes to withstand the future 10-year storm while being able to recover from a 100-year storm.

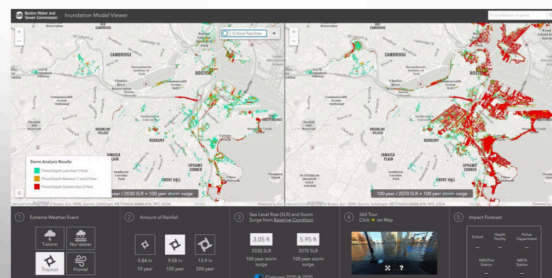
Drought Response & Recovery - Castine, Maine Water Department - (Annaliese Hafford, Engineer, Oliver Associations Inc.). To address long-standing water supply issues and to protect against drought, an engineering firm was hired to design and reconstruct a groundwater well system that would recharge the aquifer with filtered pond overflow.

Building Resilience: A Survey of Connecticut Utilities: (Dr. Christine Kirchoff, Assistant Professor, Department of Civil and Environmental Engineering, University of Connecticut). While 70% of wastewater systems have been impacted by storms, their 'resiliency' plans tend to be based on past weather and climate. Drinking water utilities have been mainly affected by drought. Planning for climate change is primarily driven by State Revolving Fund requirements.



Water Storage, Portland Water District

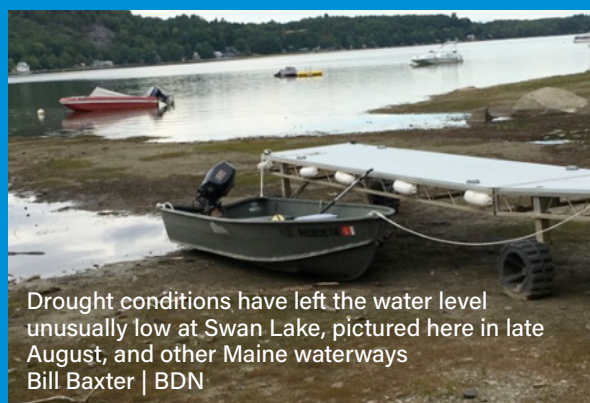
INUNDATION MODEL VIEWER – 2030 VS. 2070 COMPARISON



Boston, Massachusetts Water and Sewer District
Credit: Hazen



Record flooding along the Shawsheen River during the Mother's Day Floods, Lawrence, MA May 16th, 2006 | Source: Eagle Tribune



Drought conditions have left the water level unusually low at Swan Lake, pictured here in late August, and other Maine waterways
Bill Baxter | BDN



Wastewater treatment | Photo Credit: Kristian Bjornard/WikiCommons

Lessons Learned

Access to Projected Rainfall Data, Flood Maps, and Hydrologic Models is Needed For Long Range Planning.

Access to estimations of future design storms that go beyond historic precipitation levels is needed for designing green and gray infrastructure to convey and manage stormwater. Similarly, updated maps that estimate floodplains in light of future precipitation changes are need for land use planning. Some larger communities have begun conducting these types of analyses and using them to upgrade local codes and plans. Expanding this capability is a priority.

Dynamic Modeling and Visualization Helps Decision Makers.

Some communities are developing dynamic models of their stormwater systems and overlaying the results with visualization tools to show what ‘design storm’ or ‘inches of rain’ means for communities. Dynamic modeling also helps to identify unrealized vulnerabilities, such as where coordination is needed to ensure storm surge barriers and tide gates work in conjunction with each other to both prevent overtopping and to prevent turning stormwater outfalls into conduits for surge to enter the city.

Climate Change Awareness and Education Would Improve Buy-In for Using Updated Tools and Projections for Resilience Planning.

Many communities, including smaller ones, face many barriers to adaptation, such as lack of community awareness or buy-in, limited or untrained staff, competing priorities for limited funds, uncertain cost-benefit analyses, an overwhelming array of tools, etc. Showing community planners how to communicate risk using user-friendly tools can help overcome some of the barriers – for example, the NOAA Climate Explorer can show how future climate compares to today’s; the EPA Stormwater Calculator can help evaluate effectiveness of stormwater management under future scenarios; the U.S. Drought Monitor can help communicate the need for water conservation. Outreach and education tailored for use by smaller communities can help build awareness and buy-in for managing risk.

To Be Resilient, Communities Need to Reevaluate Local Codes Using Extreme Precipitation Data and Projections.

Engineers and environmental planners use precipitation data to design and manage municipal stormwater systems, water treatment systems, roads and culverts, dams and levees, and more; in other words, to manage the flow of water in the urban and natural environment. Updated precipitation and flood information needs to be incorporated into state and local code and national standards to facilitate their use by engineers and planners.

SCAN ME



› [NOAA Workshop Series Website](#)



› [NRCC Workshop Website](#)

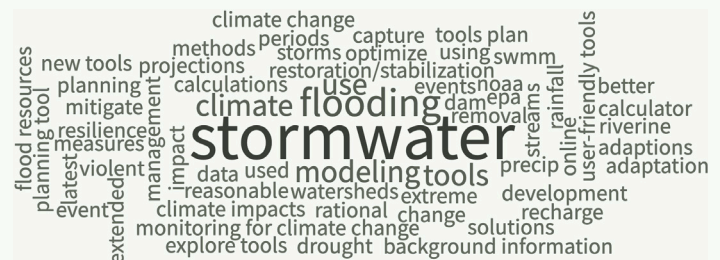
Tools Demonstrated:

- › [Water Resources Dashboard](#)
- › [Esri Story Map](#)
- › [NOAA Atlas 14](#)
- › [Climate Explorer](#)
- › [U.S. Drought Monitor](#)
- › [EPA National Stormwater Calculator \(SWC\)](#)
- › [Northeast River Forecast Center](#)
- › [Extreme Precipitation In New York and New England - historical](#)
- › [IDF Curves for New York State - projected](#)
- › [EPA Drought Response & Recovery Guide](#)
- › [Climate Resilience Toolkit](#)

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› What do you most want to get out of today's session?



- › Which tools in these workshops have you found the most useful?



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<https://cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/Water-Resources>