Town of Salisbury, Massachusetts

Modeling Future Effects of Coastal Storms and Sea Level Rise

Introduction

Like many communities along the North Shore of Massachusetts, the Town of Salisbury is vulnerable to climate-driven hazards, including sea level rise and storm surge. Predicted sea level rise and increased storm surge have the potential to significantly impact the town's coastal economy and the natural systems that the community depends upon. Understanding where and how these hazards are likely to impact the community is a necessary first step in addressing vulnerability.

Given its exposure to climate-driven hazards, the Town of Salisbury took part in a mapping effort to identify areas that are particularly vulnerable to coastal inundation. This poster highlights the results of this effort and is intended to help support the Town of Salisbury as it works to identify adaptation strategies that reduce its vulnerability to sea level rise and storm surge.

Mapping Coastal Flooding

These maps illustrate current (2013) and future (2070) probability of coastal inundation in Salisbury, Massachusetts. Results are based on a hydrodynamic model developed for the Massachusetts Department of Transportation (Famely et al. 2016). Note: This data does not take into account inland freshwater flooding.

This advanced hydrodynamic model incorporates:

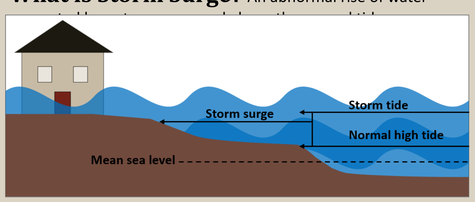
Modeled Storm Events
Including hurricanes and nor'easters, as well as climatology projections

Sea Level Rise Projections
Consistent with both the US National Climate Assessment and projections specific to Massachusetts

Dynamic Coastal Processes
Driven by wave effects, wind, tides, and storm surge

Hydrodynamic Model

What is Storm Surge? An abnormal rise of water



Adapted from NOAA

Coastal Inundation Probability

Probability of inundation is defined as the likelihood that at least 2 inches of flood water will encroach on the land at a particular location at least once in a calendar year. Note that the 1% probability of inundation shown on the present day maps (2013) roughly corresponds to the Federal Emergency Management Agency's (FEMA) 100-year storm.

How much sea level rise?

- Present day (considered 2013) results incorporate existing sea level conditions
- 2070 results incorporate 3.4 feet of sea level rise, which is also approximately the "Intermediate-High" scenario for 2090 (Figure 1)

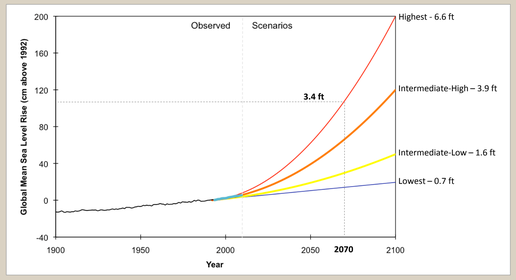
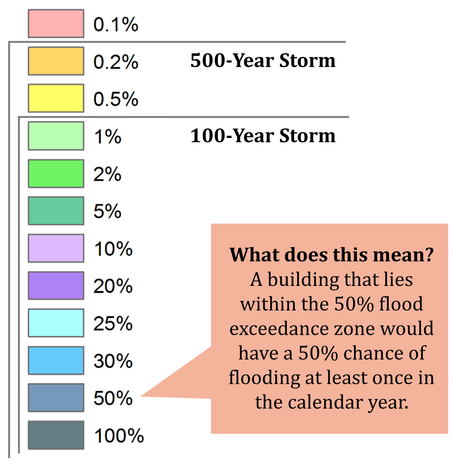
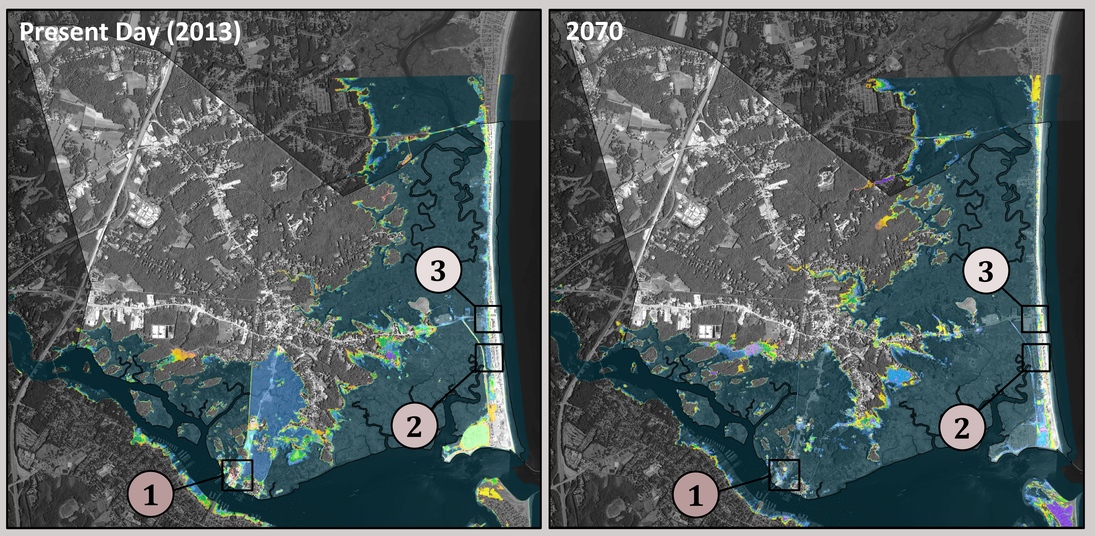


Figure 1. Global Mean Sea Level Rise Scenarios. The highest, or worst case, scenario is based on estimated rise in ocean temperatures leading to thermal expansion combined with maximum melting of the glaciers and ice sheets. The lowest scenario assumes a historical rate of sea level rise with no increase due to climate change. Adapted from the US National Climate Assessment (Melillo et al. 2014) and NOAA (Parris et al. 2012).

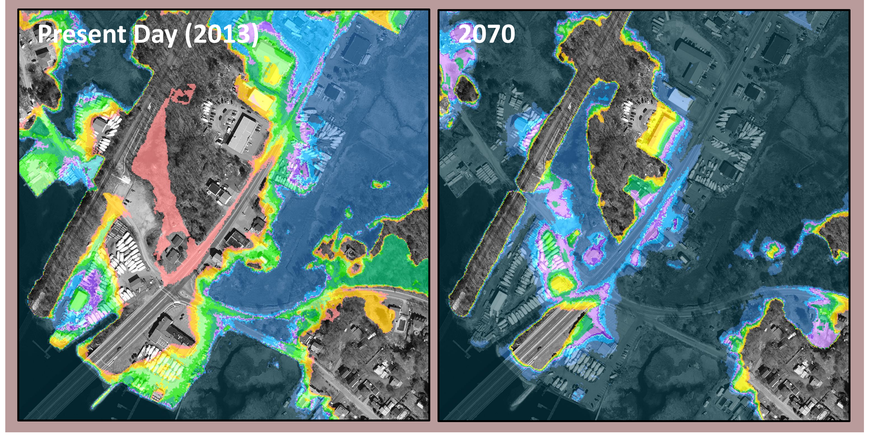
Percent Risk of Coastal Flooding



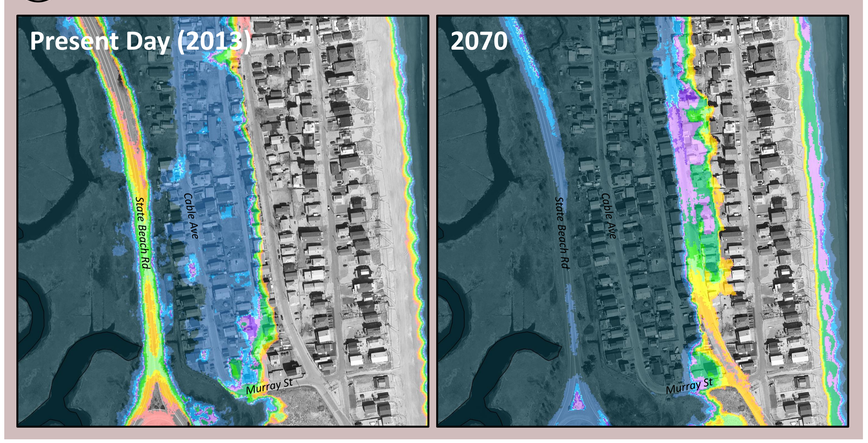
What does this mean? A building that lies within the 50% flood exceedance zone would have a 50% chance of flooding at least once in the calendar year.



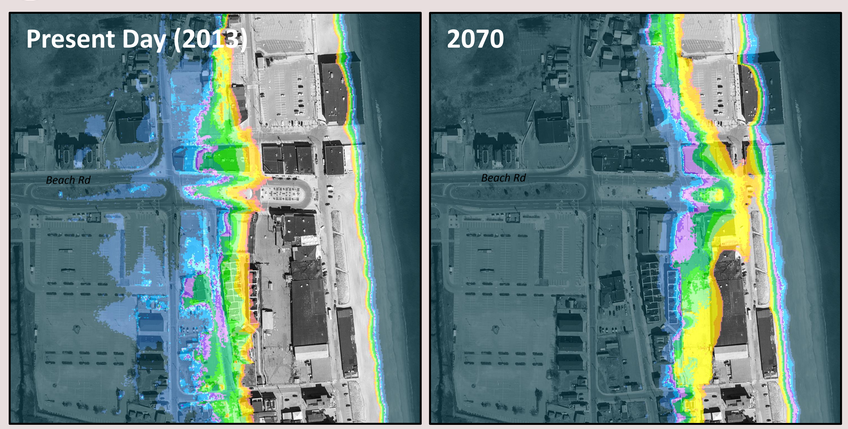
1 Route 1 at Merrimack Bridge



2 Southern end of Cable Avenue



3 Salisbury Beach Center



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Literature Cited

Famely, J., K. Bosma and B. Hoffnagle. 2016. *Sea Level Rise and Storm Surge Inundation Mapping – Great Marsh Communities (Essex County, MA)*. Prepared by Woods Hole Group for National Wildlife Federation and U.S. Geological Survey.

Melillo, J.M., T.C. Richmond, and G.W. Yohe, Eds. 2014. *Climate Change Impacts in the United States: The Third National Climate Assessment*. Washington, DC: U.S. Global Change Research Program, 841.

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Data Source: Bosma, K., E. Douglas, P. Kirshen, K. McArthur, S. Miller and C. Watson. 2016. MassDOT-FHWA Pilot Project Report: Climate Change and Extreme Weather Vulnerability Assessments and Adaptation Options for the Central Artery. Photo Science, Inc. (2012). State of Massachusetts (Raster DEM): LIDAR for the North East – ARRA and LiDAR for the North East Part II. (USGS Contract: G10PC00026, ARRA LIDAR Task Order Numbers) USGS Contract: G10PC00026 Task Order Number: G10PD02143 Task Order Numbers: G10PD01027 (ARRA) and G10PD02143 (non-ARRA). Aerial Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001. Maps created by the National Wildlife Federation using: ArcGIS 10.3 for Desktop (v10.30.1332)