TOWN OF SALISBURY, MASSACHUSETTS

Modeling Future Effects of Coastal Storms & Sea Level Rise

Salisbury

Salisbury Beach suffers from erosion after a winter storm. photo credit: G. Moore

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 Salisbury'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.

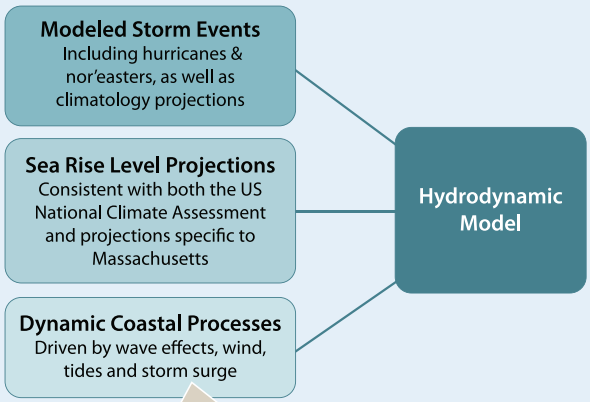
Due to its topography, hydrology, and geographic location, the Town of Salisbury has high exposure to coastal flooding, riverine flooding, and erosion. With almost four miles of sandy beach and dunes facing the open Atlantic Ocean, Salisbury Beach is exposed to wind, wave action, and increasing sea level rise – with no buffering landmass to diminish these hazards. The extensive number of tidal creeks and channels, combined with the overall low topography, can lead to widespread inland flooding during storms.

As seen in the maps on the reverse side, Salisbury infrastructure appears to have a high level of exposure and sensitivity to climate-driven threats. Much of the infrastructure in Salisbury is located in low-lying areas that are susceptible to flooding. Salisbury Beach in particular is an economic hub for the community, and it falls almost entirely within the 1% flood zone (often referred to as the "100-year" flood zone).

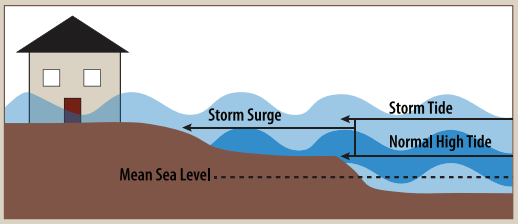
Current activities in Salisbury and throughout the Great Marsh are seeking to manage flood waters and restore Salisbury beach and marsh systems. However, these activities may not be sufficient to protect our communities in the future. We need to expand on our efforts to restore natural systems, while simultaneously providing support for existing infrastructure.

The goal of the Great Marsh Resiliency Planning Project is to work together on identifying and prioritizing strategies which will help our communities adapt to future climate changes. We aim to reduce the vulnerability of our communities through the enhancement of natural systems, such as the salt marsh and coastal dunes, which serve to protect us from coastal storms.

As part of the Great Marsh Resiliency Planning Project, the Town of Salisbury took part in a mapping effort to identify areas that are particularly vulnerable to coastal inundation. The hydrodynamic model used in the maps was comprised of several, highly detailed sets of data.

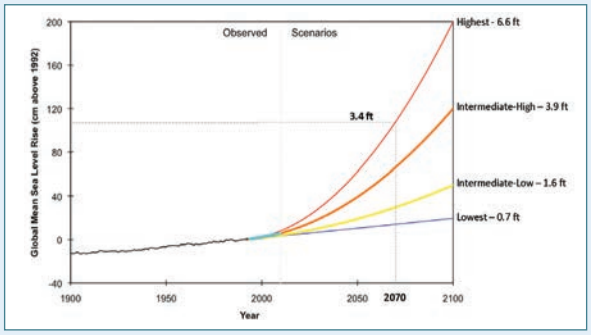


What is Storm Surge? An abnormal rise of water generated by a storm, over and above the normal tide range.



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



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).

CZM Massachusetts Office of Coastal Zone Management
NATIONAL WILDLIFE FEDERATION
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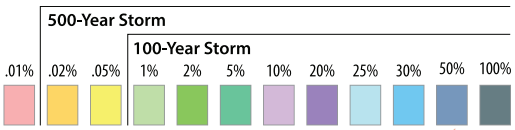
A Closer Look at Coastal Inundation

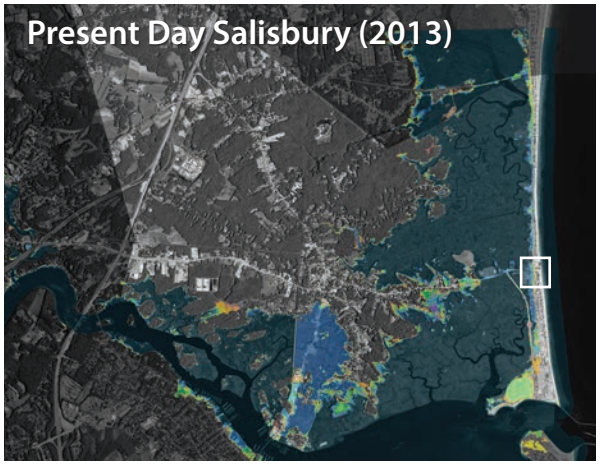
These maps illustrate current (2013) and future (2070) probability of coastal inundation in Salisbury, Massachusetts. Results are based on a hydrodynamic model developed for the Massachusetts Department of Transportation (Famely et al. 2016). Note: This data does not take into account inland freshwater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

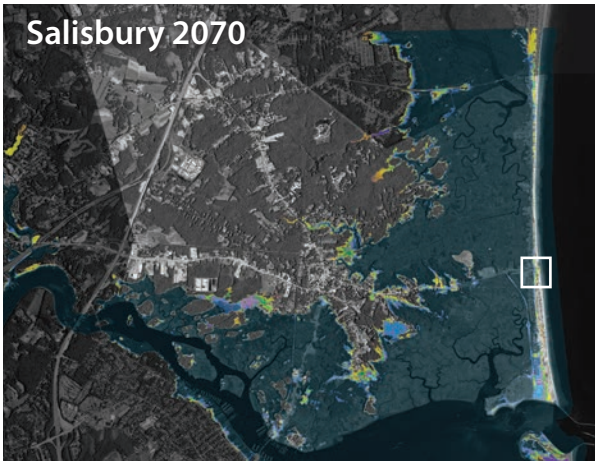
Percent risk of coastal flooding, also called probability of inundation, is defined as the likelihood that at least two inches of flood water will encroach on the land at a particular location at least once in a calendar year.

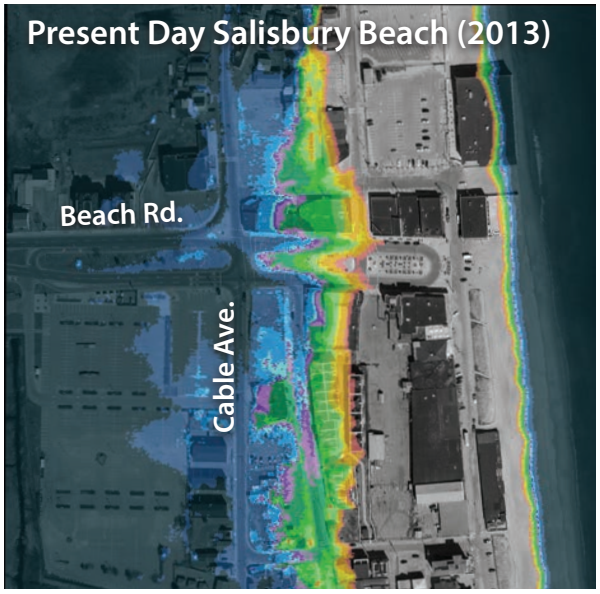
Percent Risk of Coastal Flooding

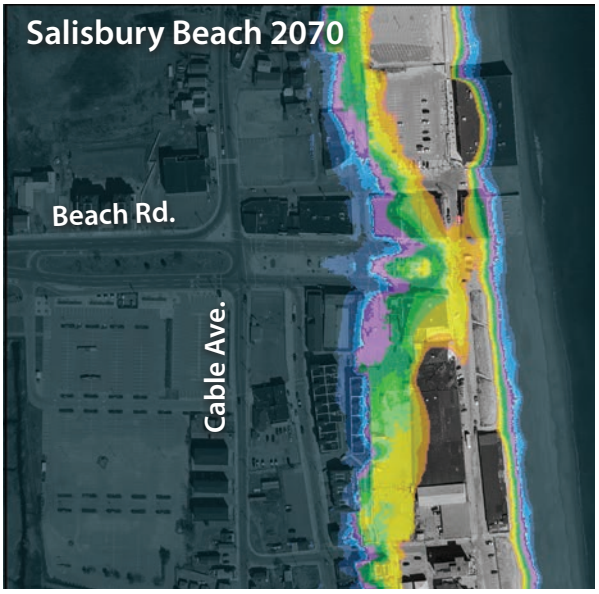


What does this mean? A building that lies within the 50% flood exceedance zone would have a 50% chance of flooding at least once in the calendar year.









By 2070, the majority of Salisbury Beach and much more of Beach Road will flood every year, cutting off access to the beach.

For more maps and information, please visit: www.greatmarshresiliency.org

Maps created by the National Wildlife Federation with funding provided by the Massachusetts Office of Coastal Zone Management through their Coastal Community Resilience Grant Program.

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.

Parris, A., P. Bromirski, V. Burkett, D. Cayan, M. Culver, J. Hall, R. Horton, K. Knuuti, R. Moss, J. Obeysekera, A. Sallenger, and J. Weiss. 2012. *Global Sea Level Rise Scenarios for the United States National Climate Assessment.* NOAA Tech Memo OAR CPO-1. Silver Spring, MD: National Oceanic and Atmospheric Administration, 37.

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.