

TOWN OF NEWBURY MASSACHUSETTS

Modeling Future Effects of Coastal Storms & Sea Level Rise

Newbury



Plum Island beach and the surrounding residences have seen severe impacts from storm events. photo credit: The Massachusetts Coastal Storm Damage Assessment Team

Like many communities along the North Shore of Massachusetts, the Town of Newbury 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 Newbury'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.

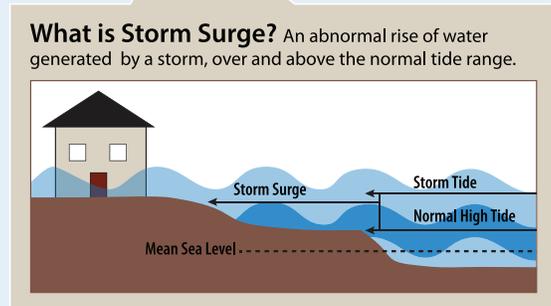
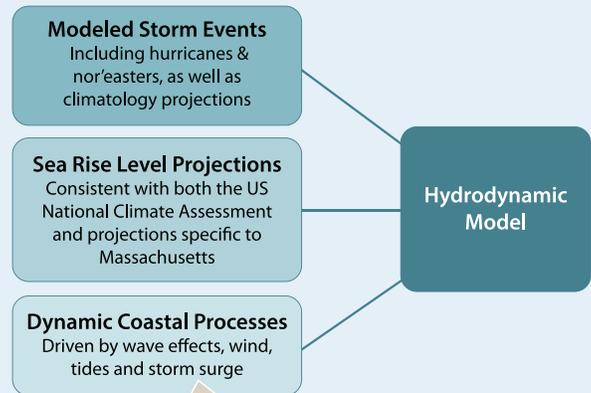
The Town of Newbury has high exposure to coastal flooding, riverine flooding, and erosion due to its topography, hydrology, and geographic location. Plum Island, with dense residential development, faces the open ocean and is highly exposed to wind, wave action, and sea level rise – with no buffering landmass to diminish these hazards. Interior portions of Newbury rely on Plum Island and its salt marshes to buffer the worst storm effects. However, the extensive number of tidal rivers and creeks, including the Parker and Little Rivers, can lead to widespread inland flooding during storms.

As seen in the maps on the reverse side, much of the town's infrastructure is located in low-lying areas that are susceptible to flooding and erosion. The Plum Island Turnpike, the only access point to residences and public recreational areas on Plum Island, is frequently flooded. Overall, approximately 48% of Newbury lies within the FEMA 1% flood zone, often referred to as the "100-year" flood zone.

Current activities in Newbury and throughout the Great Marsh are seeking to manage flood waters and restore 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.

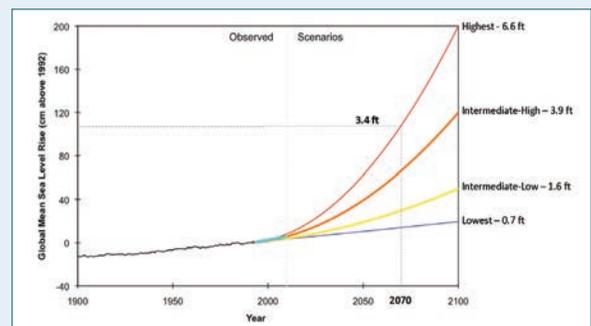
The goal of the Great Marsh Resiliency Planning Project is to work together on identifying and prioritizing strategies which will help our communities adapt to future climate changes. We aim to reduce the vulnerability of our communities through the enhancement of natural systems, such as the salt marsh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

As part of the Great Marsh Resiliency Planning Project, the Town of Newbury 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.



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).

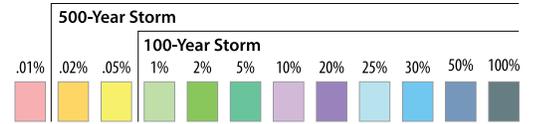


A Closer Look at Coastal Inundation

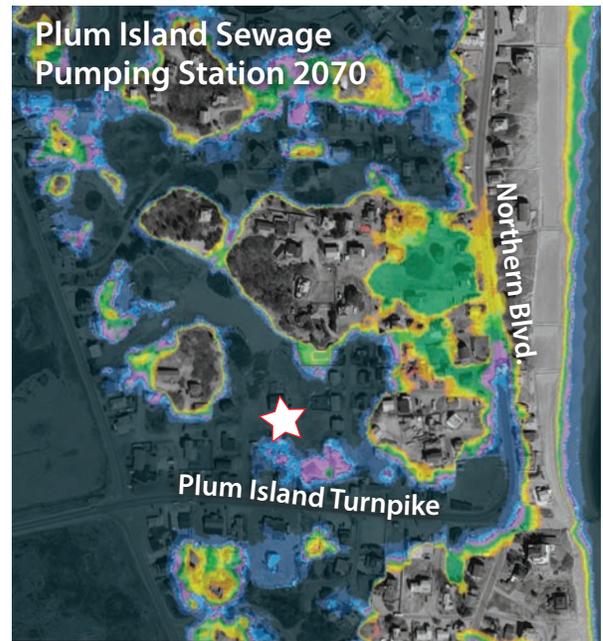
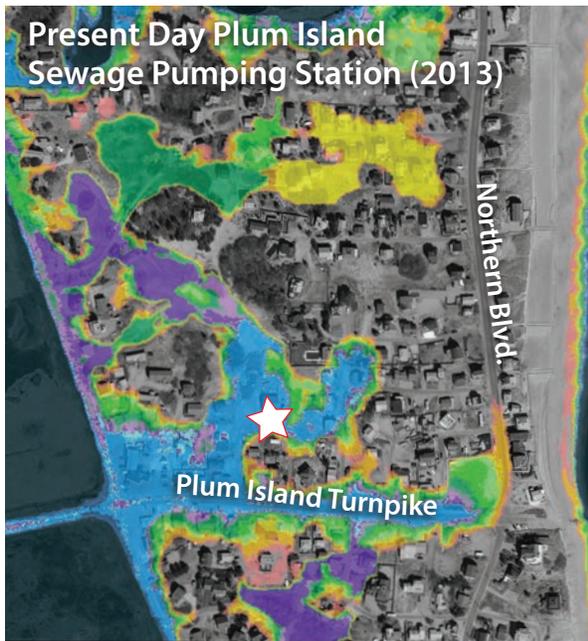
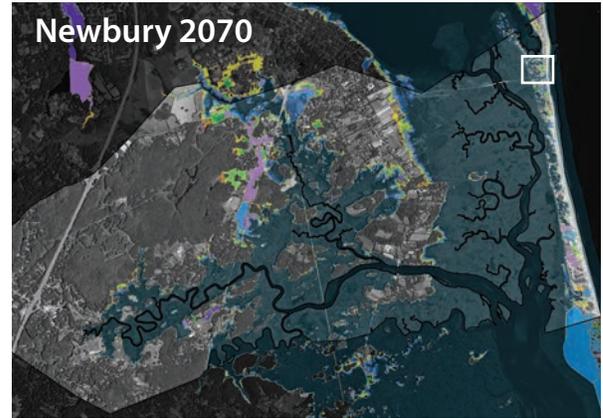
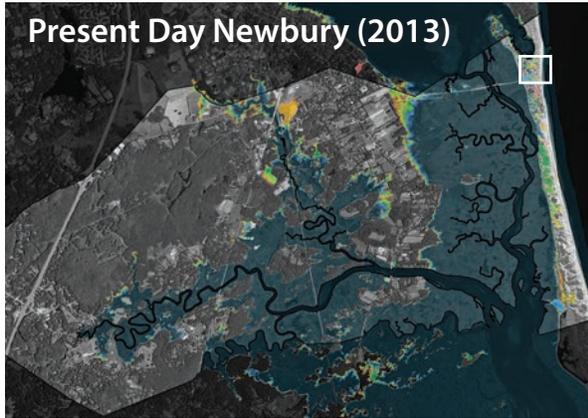
These maps illustrate current (2013) and future (2070) probability of coastal inundation in Newbury, Massachusetts. Results are based on a hydrodynamic model developed for the Massachusetts Department of Transportation (Famely et al. 2016). Note: This data does not take into account inland freshwater 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 Plum Island sewage pumping station, located off of Plum Island Turnpike amidst dense residential development, will be flooded at least once per year.

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.
 Meilillo, 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. Knutti, R. Moss, J. Obeyesekere, 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.