TOWN OF ROWLEY, MASSACHUSETTS

Modeling Future Effects of Coastal Storms & Sea Level Rise

Rowley

Businesses along Route 133 in Rowley are impacted by floodwaters from nearby Batchelder Brook. photo credit: B. Baeslack

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

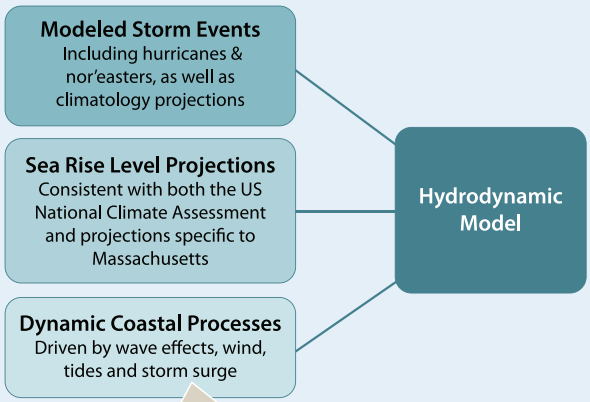
Rowley has high exposure to coastal flooding, riverine flooding, and erosion due to its topography, hydrology, and geographic location. Interior portions of Rowley rely on Plum Island to buffer the worst storm effects. However, the abundance of fresh and tidal rivers that crisscross the landscape can bring flood waters to many parts of the town.

As seen in the maps on the reverse side, Rowley infrastructure appears to have a moderate level of exposure and sensitivity to climate-driven threats. Residential infrastructure and travel corridors located in low-lying areas are susceptible to flooding. Route 1A, as it travels north into Newbury, may be consistently flooded in the future.

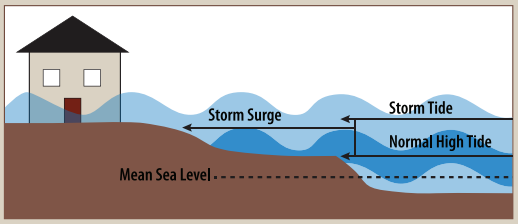
Current activities in Rowley and throughout the Great Marsh are seeking to manage flood waters and restore beach and marsh systems. However, these activities may not be sufficient to protect our communities in the future. We need to expand on our efforts to restore natural systems, while simultaneously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

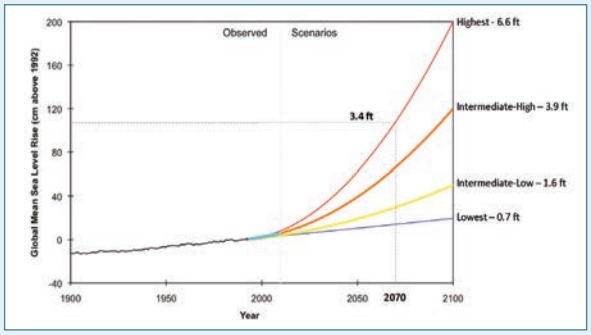


What is Storm Surge? An abnormal rise of water generated by a storm, over and above the normal tide range.



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).

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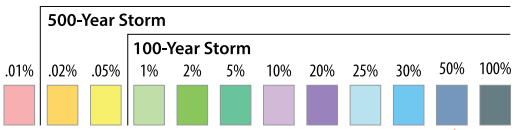
A Closer Look at Coastal Inundation

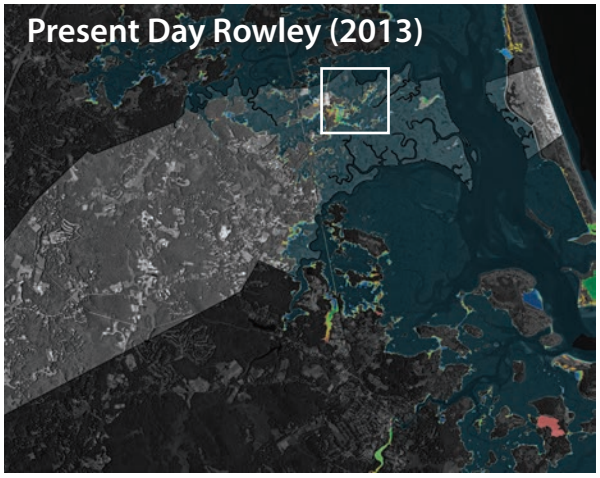
These maps illustrate current (2013) and future (2070) probability of coastal inundation in Rowley, Massachusetts. Results are based on a hydrodynamic model developed for the Massachusetts Department of Transportation (Famely et al. 2016). Note: This data does not take into account inland freshwater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

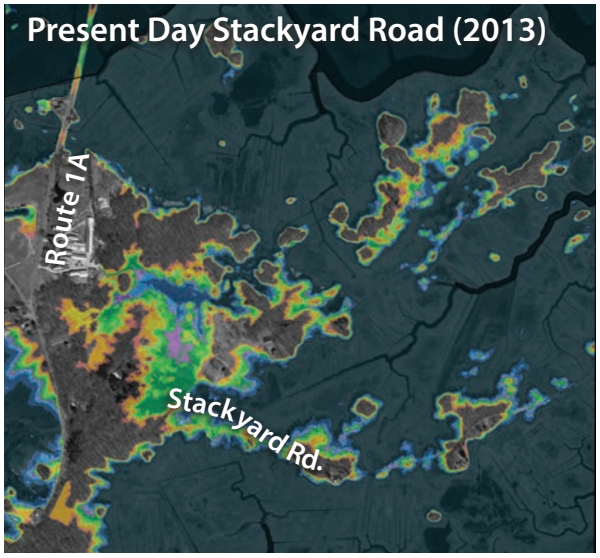
Percent risk of coastal flooding, also called probability of inundation, is defined as the likelihood that at least two inches of flood water will encroach on the land at a particular location at least once in a calendar year.

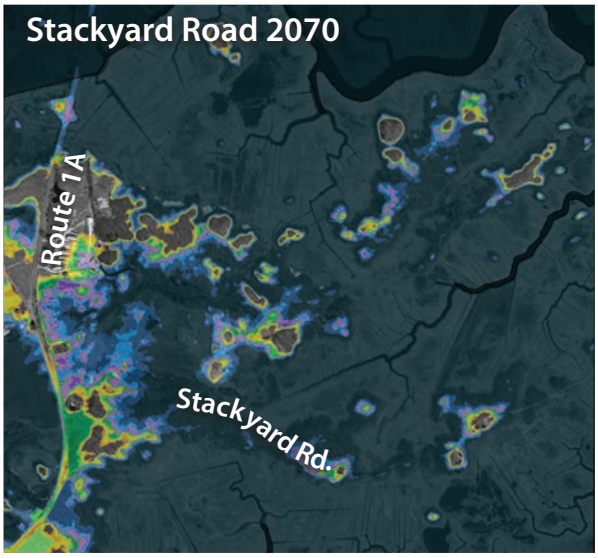
Percent Risk of Coastal Flooding



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, there is a 100% chance that much of Stackyard Road and portions of Route 1A in the northern section of Rowley will be flooded at least once per year.

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

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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.