Great Marsh
Adaptation Planning to Implementation

North Shore Regional Workshop:
Innovative Approaches to
Reducing Community Vulnerability

May 18, 2016

Presentation Outline

Great Marsh Regional Coastal Adaptation Plan

- Phase 1: Vulnerability Assessment
  - Work conducted to date
- Phase 2: Adaptation Planning
  - Process outline
  - Work conducted to date
- Phase 3: Implementation
  - Assessing the implementation landscape

Project Overview

Project Area: Salisbury, Newbury, Newburyport, Essex, Ipswich, & Rowley.

Project Objectives:

1) Assess overall community vulnerability, providing focused assessments of vulnerable community assets through a comprehensive and integrated approach.

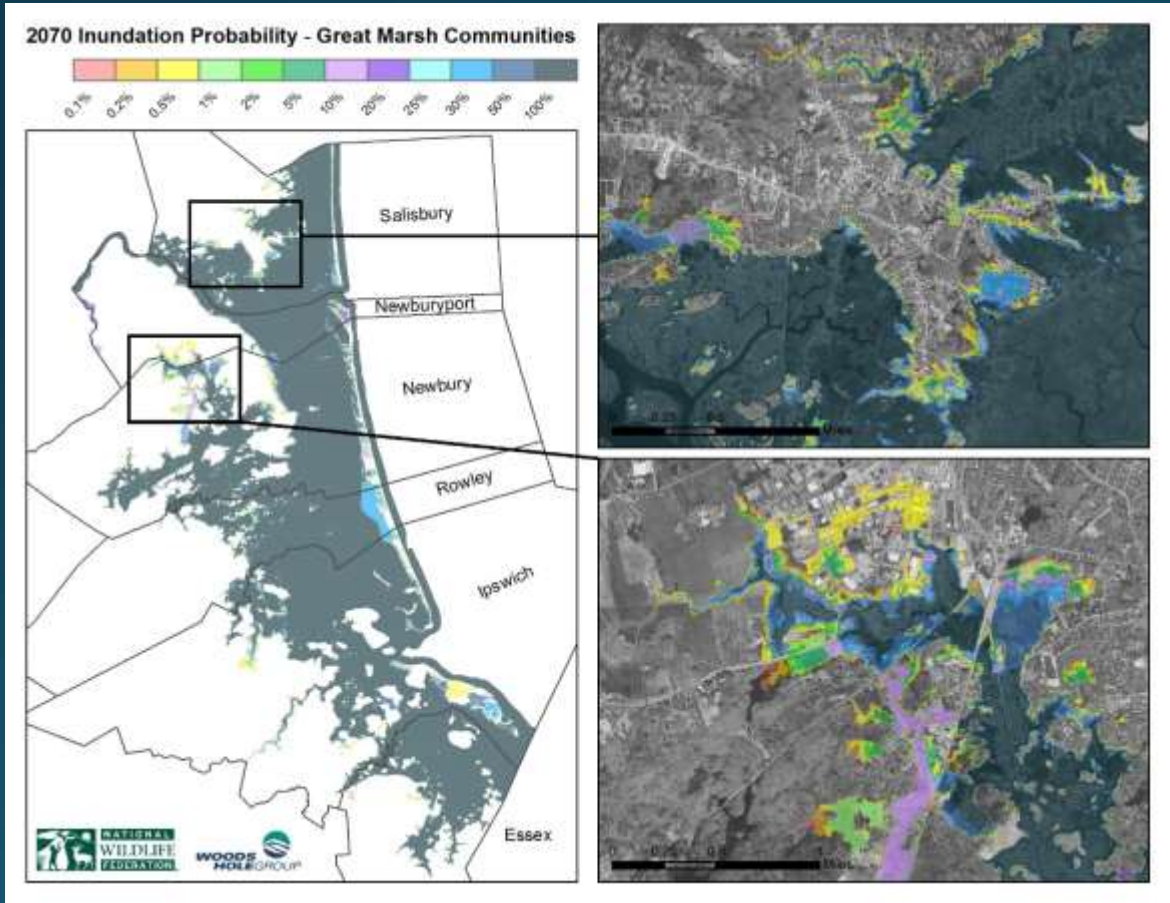
2) Identify (ecosystem-oriented) adaptation strategies that serve to reduce risk.

3) Engage communities as we work together to lay a framework for future implementation of on-the-ground adaptation strategies.

Vulnerability Assessment

Assessed vulnerability by:

- ✓Collecting existing data
- ✓Conducting new analyses



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Town of Essex, Massachusetts
Modeling Future Effects of Coastal Storms and Sea Level Rise

Introduction

Like many low-lying communities along the North Shore of Massachusetts, the Town of Essex is both exposed and vulnerable to climate-driven threats. Predicted sea level rise and increased storm surge have the potential to drastically 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 critical first step in reducing vulnerability. With this important information, the Town of Essex can begin identifying adaptation strategies to help mitigate the near and long-term effects of sea level rise and storm surge.

Given its exposure to climate-driven hazards, the Town of Essex took part in a mapping effort to identify areas that are vulnerable to coastal inundation. This poster highlights the results of that work.

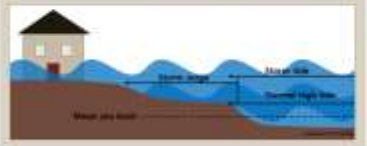
Mapping Coastal Flooding

These maps illustrate current (2013) and future (2070) probability of coastal inundation in Essex, Massachusetts. Results are based on a hydrodynamic model developed for the Massachusetts Department of Transportation (Famely et al. 2016). 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 generated by a storm, over and above the normal tide range.



Literature Cited

Famely, J. S., Sharma, and E. Hallhagen. 2016. Sea Level Rise and Storm Surge Inundation Mapping – Great Marsh Communities (Essex County, MA). Prepared for Woods Hole Group, the National Wildlife Federation and the U.S. Geological Survey.

Hamlet, John, T.C. Hirschfeld, and Erik Rikki Pike. 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. Washington: U.S. Global Change Research Program, 841.

Parris, A., P. Bromirski, V. Burkett, D. Cayan, M. Culver, J. Hall, E. Horton, R. 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.

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

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)

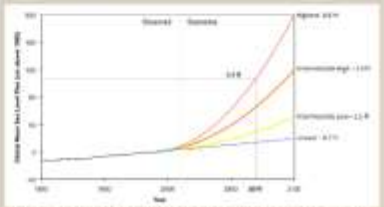
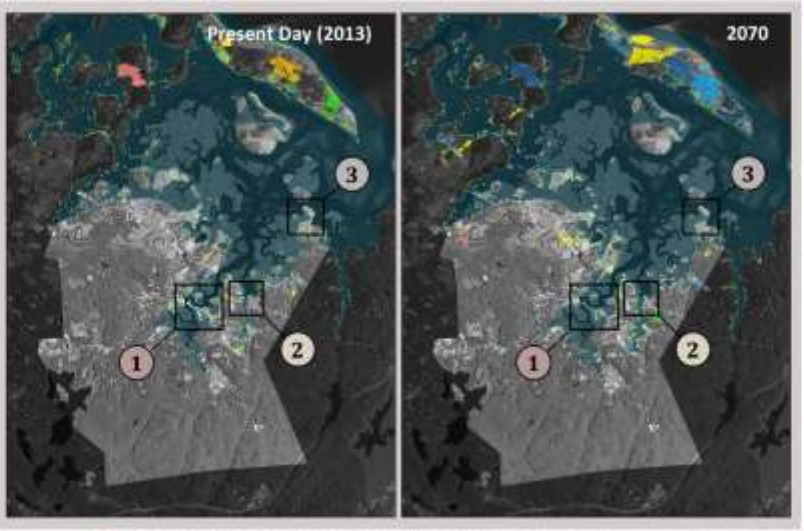


Figure 1. Global Mean Sea Level Rise Scenarios. The highest, or worst case, scenario is based on extended rise in ocean temperatures leading to thermal expansion combined with maximum melting of the glaciers and ice sheets. The lowest scenario assumes a historical rate of sea level rise with no increase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

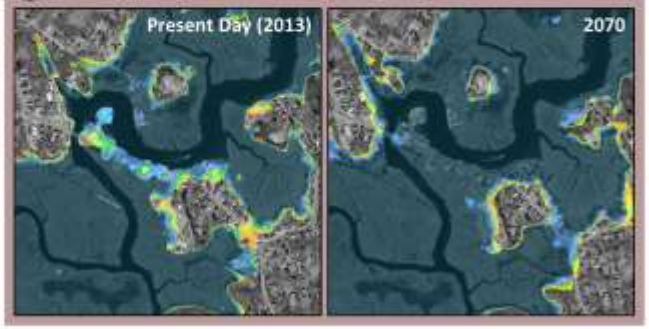
Percent Risk of Coastal Flooding

0.1%	
0.2%	500-Year Storm
0.5%	
1%	100-Year Storm
2%	
5%	
10%	
20%	
25%	
30%	
50%	
100%	

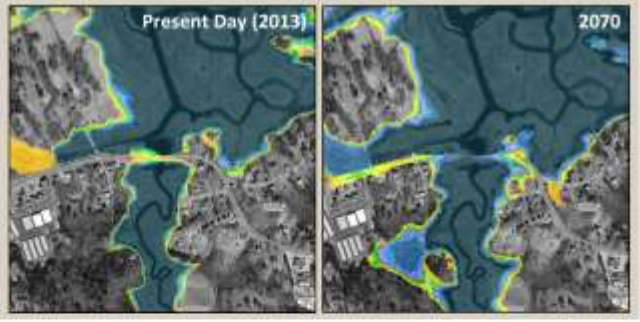
What does this mean? A building that lies within the 50% flood exceedance zone would have a 50% chance of flooding at least once in the calendar year.



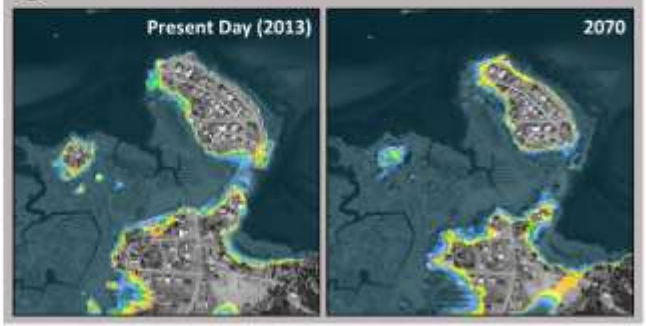
1 Downtown Essex



2 Eastern Avenue by Ebben Creek



3 Conomo Point & Robbins Island



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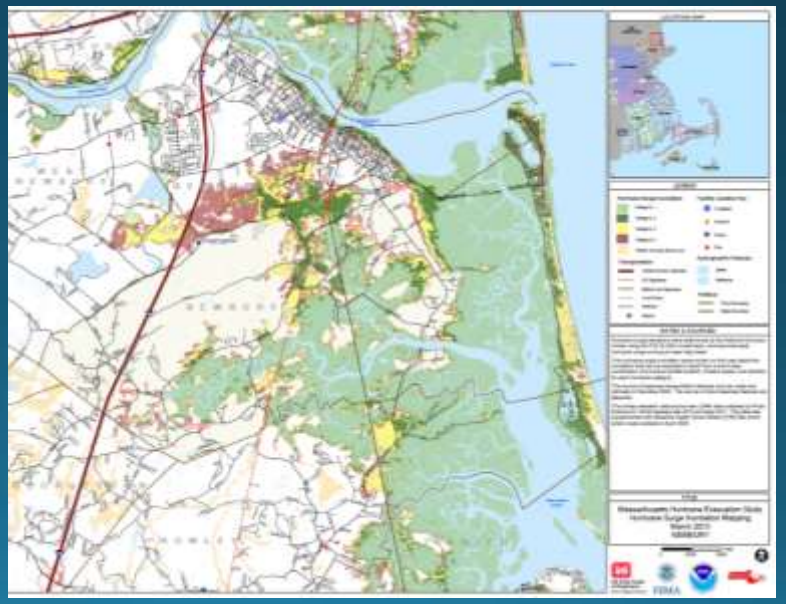
Community Input



Identifying & Selecting Adaptation Strategies

Natural & Nature-based Solutions

Remove Invasives

Vegetated Dune

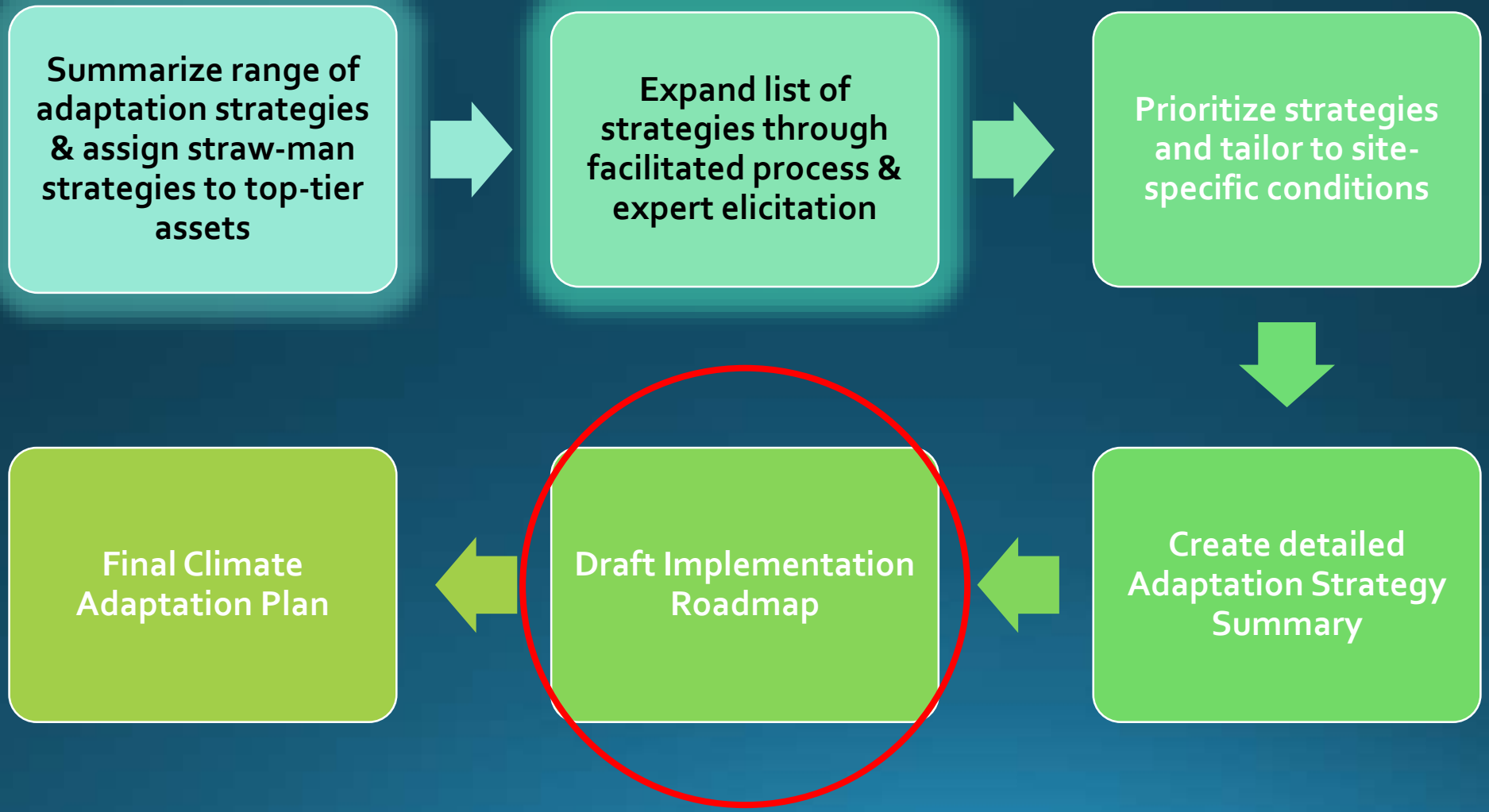
Barrier Island

Oyster Castles

Coir Logs

Rock Sills

Identifying & Selecting Adaptation Strategies



Implementation Landscape

Factors That Support Implementation:

- Regional communication & partnerships
- Examples of successful implementation
- State agency engagement & resources
- Committed state funding sources
- Municipal support for implementation

Implementation Landscape

Potential Challenges To Implementation:

- Limited resources
- Determining relevant data
- Data gaps
- Balancing short term needs and long-term sustainability

Navigating the Landscape

Questions?

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