Preparing New Hampshire for Projected Storm Surge, Sea-Level Rise, and Extreme Precipitation

July 14, 2017
The Beaches Conference
Wells High School | Wells, ME
Listening to Local Needs to Drive Policy

Our Mission:
To assist communities in NH’s coastal watershed in becoming resourceful, ready, and resilient to extreme weather and long term climate change.
If you give a mouse a cookie...

He’s going to ask for some milk.
The Dillon Rule Dilemma
Coastal Risk and Hazards Commission (CRHC)

Senate Bill 163 | 2013 | Chapter Law 188 (RSA 483-E)

Clear & Focused Mission

Broad-based Membership

Sunset Date: December 1, 2016

Photo credit: Maren Bhagat
CRHC Final Report & Recommendations

Our Risks & Vulnerabilities
Potential impacts to our economy, our built landscape, our natural resources, and our heritage.

What We Need To Do
General guidance and planning principles for responding to coastal flood risk in New Hampshire.

Our Goals & Recommendations
Key science, assessment, implementation, & legislation (SAIL) recommendations for a resilient coast.

NEW HAMPSHIRE COASTAL RISK AND HAZARDS COMMISSION

Preparing New Hampshire for Projected Storm Surge, Sea-Level Rise, and Extreme Precipitation

Final Report and Recommendations
November 2016
Understanding What We’re Facing

2014 Science and Technical Advisory Panel (STAP) Report

<table>
<thead>
<tr>
<th>SEA-LEVEL RISE</th>
<th>STORM SURGE</th>
<th>EXTREME PRECIPITATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6 – 2.0 ft. by 2050</td>
<td>Flood Hazard Area</td>
<td>Frequency</td>
</tr>
<tr>
<td>1.6 – 6.6 ft. by 2100</td>
<td>Flood duration</td>
<td>Amount</td>
</tr>
</tbody>
</table>

**SEA-LEVEL RISE SCENARIOS AT 2050 AND 2100**

- **HIGHEST** +6.6 feet sea level
- **INTERMEDIATE HIGH** +3.9 feet sea level
- **INTERMEDIATE LOW** +1.6 feet sea level

Figure modified from NH Coastal Risks and Hazards Commission, Science and Technical Advisory Panel Report (2014)
Understanding our Risks and Vulnerabilities

Economy  Built Landscape  Natural Resources  Heritage

Economic Indicators & Existing Regional Vulnerability Assessments

**Atlantic Coast:** Tides to Storms (RPC, 2015)
**Great Bay:** C-RiSE (NHDES et. al, 2017)

Summary of flood impacts from sea-level rise and storm surge scenarios* for the seven Atlantic Coast municipalities**


<table>
<thead>
<tr>
<th>Sea-Level Rise (SLR) Scenarios</th>
<th>1.7 feet SLR</th>
<th>4.0 feet SLR</th>
<th>6.3 feet SLR</th>
<th>1.7 feet SLR + Storm Surge</th>
<th>4.0 feet SLR + Storm Surge</th>
<th>6.3 feet SLR + Storm Surge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland*** (acres)</td>
<td>1,485</td>
<td>2,602</td>
<td>3,615</td>
<td>3,474</td>
<td>4,439</td>
<td>5,298</td>
</tr>
<tr>
<td>BUILT LANDSCAPE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrastructure (# of sites)</td>
<td>37</td>
<td>90</td>
<td>135</td>
<td>137</td>
<td>162</td>
<td>190</td>
</tr>
<tr>
<td>Critical Facilities (# of sites)</td>
<td>13</td>
<td>33</td>
<td>48</td>
<td>44</td>
<td>64</td>
<td>98</td>
</tr>
<tr>
<td>Roadways – Local (miles)</td>
<td>4</td>
<td>17</td>
<td>29</td>
<td>33</td>
<td>39</td>
<td>51</td>
</tr>
<tr>
<td>Roadways – State (miles)</td>
<td>2</td>
<td>7</td>
<td>14</td>
<td>19</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>Transportation Assets (# of sites)</td>
<td>35</td>
<td>50</td>
<td>68</td>
<td>65</td>
<td>78</td>
<td>90</td>
</tr>
<tr>
<td>100-year floodplain (acres)</td>
<td>8,180</td>
<td>9,361</td>
<td>9,593</td>
<td>9,639</td>
<td>9,766</td>
<td>9,818</td>
</tr>
<tr>
<td>NATURAL RESOURCES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshwater Wetlands (acres)</td>
<td>184</td>
<td>396</td>
<td>519</td>
<td>489</td>
<td>593</td>
<td>661</td>
</tr>
<tr>
<td>Tidal Wetlands (acres)</td>
<td>235</td>
<td>257</td>
<td>264</td>
<td>267</td>
<td>268</td>
<td>269</td>
</tr>
<tr>
<td>Conserved Lands (acres)</td>
<td>493</td>
<td>717</td>
<td>873</td>
<td>883</td>
<td>1,007</td>
<td>1,131</td>
</tr>
<tr>
<td>Land Protection Priorities (acres)</td>
<td>4,022</td>
<td>4,851</td>
<td>5,469</td>
<td>5,385</td>
<td>5,948</td>
<td>6,458</td>
</tr>
<tr>
<td>Critical Wildlife Habitat (acres)</td>
<td>1,081</td>
<td>1,600</td>
<td>1,915</td>
<td>1,865</td>
<td>2,112</td>
<td>2,310</td>
</tr>
</tbody>
</table>

* Storm surge = 100-year (one-percent annual-chance) flood event.
** The seven Atlantic Coast communities include Hampton, Hampton Falls, New Castle, North Hampton, Portsmouth, Rye, and Seabrook.
*** Upland refers to land above mean higher high water (highest tidal extent). The seven coastal region municipalities have approximately 49,266 acres of upland.
Vulnerability Highlights:

*Dollar values do not reflect projected cost from flood scenarios, but rather the assessed value of properties exposed to any amount of flooding. Source: Tides to Storms 2015 (maps for each community available on the Rockingham Planning Commission website)
Vulnerability Highlights:

Current Tidal Wetlands in Hampton-Seabrook Estuary
Source: NHFG, 2014.

Understanding What We Need to Do

Our Guiding Principles

• Act Early
• Respond Incrementally
• Revisit and Revise
• Collaborate and Coordinate
• Incorporate ‘Risk Tolerance’ in Design
• Make ‘No Regrets’ Decisions
Our Goals, Recommendations, and Actions

35 Recommendations and Actions to Set SAIL

Science

Research, understand, establish, and use the best available science

Assessment

Identify vulnerable assets and resources within our economy, built landscape, natural resources, and heritage

Implementation

Evaluate existing statutes, regulations, policies, plans, programs for deficiencies

Legislation

Identify and implement strategies to protect, adapt, and sustain our economy, built landscape, natural resources, and heritage

Recommend timely legislation that leads to actions to minimize risk and enhance resilience
Recommendation Highlights

S1. Legislatively authorize a state agency to review and periodically update storm surge, sea-level rise, extreme precipitation, and other relevant climate projections at least once every 5 years.

SB 374 (2016) – requiring the department of environmental services to update a report on coastal flooding trends every 5 years

Approved: May 20, 2016
Effective Date: July 19, 2016
CC2. Identify vulnerable state and municipal assets at regional, municipal, and site-specific scales as appropriate.
Recommendation Highlights

CC3. Review whether existing state statutes and rules adequately permit state agencies and municipalities to prepare for and adapt to best available science and impacts.

SB 452 (2016) – requiring certain state agencies to conduct an audit of laws governing coastal regions to enable authorities to take appropriate actions

Approved: June 6, 2016
Effective Date: June 6, 2016
Recommendation Highlights

BL2. Adopt regulatory standards requiring that best available climate science and flood risk information be considered in new construction, rehabilitation, or retrofit of public and private structures and facilities.

Example: Apply Federal Flood Risk Management Standard (Federal Executive Order 13690) at state and local level.

Require state agencies and encourage municipalities to select one of three approaches to determine flood hazard elevation & area used in siting, design, and construction:

- Utilizing best-available, actionable data and methods that integrate current and future changes in flooding based on science
- Two or three feet of elevation above the 100-year (1%-annual-chance) flood elevation, depending on the criticality of the building
- 500-year (0.2%-annual-chance) flood elevation
NR4. Consider ecosystem services in state and local planning and asset management decisions.

**Example:**
- Develop BMPs for shoreline buffers and stabilization
- Explore options to minimize shoreline hardening and promote nature based shoreline stabilization techniques.

**Living Shoreline Examples for Coastal Communities**

- **Marsh Planting**
  - Materials: Native marsh plants or tolerant plants, soil, mulch, irrigation
  - Suitable Locations: Low energy wave environments
  - Pros: Natural approach, least impact to adjacent properties, provides habitat
  - Cons: Low cost, but can be high energy environments

- **Fibrous Sill**
  - Materials: Fibrous materials, rocks, or large woody debris
  - Suitable Locations: Moderate energy wave environments
  - Pros: Natural approach, reduces erosion, promotes habitat
  - Cons: High cost, but can be high energy wave environments

- **Rock Sill**
  - Materials: Large rocks, boulders, or large woody debris
  - Suitable Locations: High energy wave environments
  - Pros: Natural approach, reduces erosion, promotes habitat
  - Cons: High cost, but can be high energy wave environments

- **Live Crib Wall**
  - Materials: Large rocks, boulders, or large woody debris
  - Suitable Locations: High energy wave environments
  - Pros: Natural approach, reduces erosion, promotes habitat
  - Cons: High cost, but can be high energy wave environments
Where We Go From Here

Actions Already Underway

New Hampshire Setting SAIL
*Acting on the Coastal Risk and Hazards Commission*

*Science, Assessment, Implementation, and Legislation Recommendations*

**Outreach**
- State Agencies / State Environmental Resilience Group
- Regional Workshops
- Great Bay Engagement Meetings

**Technical Assistance**
- Great Bay Technical Assistance Grants
- Dover Climate Adaptation Master Plan Chapter
- Coordinated State Agency Implementation of SB 452
- Spatial Inventory of NHDES, NHFG Assets
Questions?

For more information, visit: http://nhcrhc.org/

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