Maine’s Tidal Marshes: Present and Future

Coastal Resiliency Master Class
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Outline

- Marshes Present
- Marshes Future
- Marshes in planning...
Outline

• Marshes Present

• Marshes Future

• Marshes in planning...
Maine's Tidal Marshes
22,408 acres statewide

- Spartina Saltmarsh: 80%
- Mixed Graminoid-Forb Saltmarsh: +/-
- Brackish Tidal Marsh: +/-
- Freshwater Tidal Marsh: 19.6%

Data from Maine Natural Areas Program, 2014
Moody Beach, Wells
Sea Level, Portland, Maine
1912-2014 (through December 31, 2014)

1.89 ± 0.10 mm per yr or 0.63 ft (7.5”) per century

\[ y = 1.8867x - 3743.3 \]
\[ R^2 = 0.7651 \]

Data courtesy of NOAA CO-OPS, www.tidesandcurrents.noaa.gov

Peter Slovinsky, Maine Geological Survey, January 12, 2015
2017 NOAA Sea Level Projections for Portland Maine

Source: www.corpsclimate.us/ccaceslcurves.cfm
Outline

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LiDAR Data

MGS SLR simulation using tidal gauge data up and down the coast to generate local highest annual tide (HAT) data (simulations for 1, 2, 3.3, 6 feet)
Little River Estuary, Wells & Kennebunk
Little River Estuary, Wells & Kennebunk
Little River Estuary, Wells & Kennebunk
MIGRATION TO HIGHER GROUND

Past sea level

Current sea level

Future sea level

Graphic: Make Way for Marshes, Northeast Regional Ocean Council
Marsh Transformation

Low Marsh

Bare ground
Water
Dead vegetation

Spartina alterniflora

Draft data, NERR 2019
Maine SLR and Landcover (Avg.)

- 86%
- 4%
- 10%

Legend:
- Agriculture
- Developed
- Natural

Cameron and Slovinsky, 2014

% of each SLR Simulation by Ecoregion

- South Coast
- Mid-Coast & Pen Bay
- Downeast-Coast

SLR Simulation:
- 1ft
- 2ft
- 3ft
- 6ft
<table>
<thead>
<tr>
<th>Maine SLR Simulation</th>
<th>% Saltmarsh* Replacement on Natural and Agricultural Lands</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ft</td>
<td>17%</td>
</tr>
<tr>
<td>2 ft</td>
<td>30%</td>
</tr>
<tr>
<td>3.3 ft (1 m)</td>
<td>46%</td>
</tr>
<tr>
<td>6 ft</td>
<td>77%</td>
</tr>
</tbody>
</table>

*Calculations do not include Merrymeeting bay (Cameron and Slovinsky, 2014)*

<table>
<thead>
<tr>
<th>Maine SLR Simulation</th>
<th>% Simulation on Conserved Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ft</td>
<td>33%</td>
</tr>
<tr>
<td>2 ft</td>
<td>31%</td>
</tr>
<tr>
<td>3.3 ft (1 m)</td>
<td>29%</td>
</tr>
<tr>
<td>6 ft</td>
<td>27%</td>
</tr>
</tbody>
</table>

=16,000 acres NOT conserved (includes MMB area)

MNAP 2019
Conservation Status of Potential MM Area
1 m SLR / Southern Coastal Maine

- **Gap1-3 Conserved**: 29%
- **Farmland easements**: 6%
- **Municipal land**: 0%
- **Not conserved**: 65%

Current marsh

Future sea level
Conservation Status of Marsh Migration Area, by Region

Conservation Status of Potential MM Area
1 m SLR / Midcoast* Maine

- Gap 1-3 Conserved: 29%
- Farmland Easements: 1%
- Municipal Land: 1%
- Not Conserved: 70%

*does not include Merrymeeting Bay

Merrymeeting Bay only

- Gap 1-3 Conserved: 23%
- Farmland Easements: 1%
- Municipal Land: 75%
- Not Conserved: 1%
Conservation Status of Marsh Migration Area, by Region

Conservation Status of Potential MM Area
1 m SLR / Downeast Maine

- Gap 1-3 Conserved: 24%
- Farmland Easements: 1%
- Municipal Land: 75%
- Not Conserved: 1%

Future sea level
Current marsh
Conservation Status of 1 m Marsh Migration Area, by Region

- **Southern Coastal**
  - Not Conserved: 6,937 acres (salty)
  - Total: 8,645 Acres (all tidal)

- **Downeast**
  - Not Conserved: 75%

- **Midcoast**
  - Not Conserved: 70%

- **Statewide (no MMB)**
  - Not Conserved: 69%

- **Not Conserved:**
  - 6,937 acres (salty)
  - 8,645 Acres (all tidal)
Outline

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Coastal Undeveloped Blocks: 1m SLR

Current marsh

Future marsh

Buffer

Non-tidal buffer
HAT 3.3 Tidal wetland

300 meters
Potential Hat3.3 Habitats

- Freshwater Tidal Marsh
- Man-made land
- Non-tidal buffer
- Rocky Shoreline
- Salt Marsh
- Sand or Gravel Beach and Dunes
- Unknown, not within tidal estuary
- Unknown, within tidal estuary
250’ impervious buffer
Marshes in Planning

The Marsh Migration and Undeveloped Coastal Block models show:

- Marsh Migration space
- Restoration opportunities (or C/R nexus)
- Large, connected areas of future marsh and buffer (preventing stressors, providing habitat, ecosystem services)
- Regional, local applications
- Prioritization
Where are coastal landscapes that:

- Have large existing marshes, +
- *Will* have relatively large future marshes, +
- Contain undeveloped, complex shorelines +
- Have intact coastal buffers?
# Marshes in Planning – Maine Data

## Applications and Data Access:

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Access</th>
<th>Application</th>
</tr>
</thead>
</table>
| Maine Sea Level Rise & Marsh Migration Scenarios (1’-6’)                 | MNAP, MGS Web Viewers, Maine-TNC Web Viewer     | -Scale: *Parcel to Local*  
-Conservation, Mgmt. & Restoration Planning                                  |
| Maine Coastal Undeveloped Blocks                                        | MNAP Web Viewer (& download)                     | -Scale: *Parcel to Regional*  
-Cons, Mgmt, & Rest. Planning  
-Strategic planning, buffers                                                 |
| Maine Highly Resilient Coastal Areas                                    | MNAP, MCHT                                       | -Scale: *Regional to Statewide*  
-Strategic planning, connectivity                                             |
| TNC Northeast Coastal Resilient Sites                                   | Nature.org/resilientcoasts                       | -Scale: *Regional to Statewide*  
-Strategic & Restoration planning, connectivity                                |
Thank you!

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http://www.maine.gov/dacf/mnap/
Resilient Coastal Area Scoring

**Complexity**
- Current tidal marsh/coastline
- Future tidal marsh/coastline

**Condition**
- Undeveloped shoreline length
- Undeveloped block size
Cross-shore integration: Each portion of the shoreline, from the upland to riparian to wetland to aquatic zone, affects all other portions of the shoreline. Riparian trees slow overland runoff, reducing sediment inputs to the aquatic system. Seagrasses and marsh vegetation reduce wave energy, protecting the upland from erosion. Birds, such as seagulls, may nest in riparian forests but hunt in the aquatic environment. Crabs and juvenile fish move in and out of the marsh with each tidal cycle, using it for protection and foraging for food. Any action taken on one portion of the shoreline will have impacts that resonate throughout the entire cross-shore area. Symbols courtesy of the Integration and Application Network (iain.umd.edu/symbols/). University of Maryland Center for Environmental Science.

Figure 2. Cross-shore Ecosystem Services