What can our salt marshes tell us about climate change and sea level rise?

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WHAT DO SALT MARSHES DO FOR US?
Salt marshes are among our most productive and valuable ecosystems.
HOW DO SALT MARSHES WORK?
Salt Marshes are Poised Systems

- Reflect a dynamic balance of building processes;
  - Sediment trapping and binding
  - Root production and limited decomposition - peat
  - Sea Level Rise (up to 5 mm /yr)

- ... and eroding processes
  - Compaction (by floods and ice)
  - Decomposition of roots and peat (Oxygen, Temperature, Nitrogen)
  - Physical exposure to waves and ice
WHAT ARE THE MOST IMPORTANT COMPONENTS OF CLIMATE CHANGE FOR TIDAL MARSHES?
Climate Change Impacts to Wetlands

– Increased sea level and storm activity
  • Seaward edges will retreat
  • Lower elevations will drown

– Temperature increases
  • Range expansions
  • Loss of forb pannes
  • Increased decomposition rates
HOW DO SALT MARSHES RESPOND TO CLIMATE CHANGE?
Marsh Responses to three SLR rates under three Tidal Ranges

Matt Kirwan and Glen Guntenspergen, 2009
SETs in New Hampshire
Great Bay marsh elevation change:
1.7 mm/yr 1995-97
4.3 mm/yr 2000-11
2.0 mm/yr 2011-14

Portsmouth tide gauge: 1.76 mm/yr 1927-2001

1990-2013
Monthly MSL vs. Time at Portland, Maine

Year

Meters


1.7 4.3 2.0

What have we learned from our tidal marshes?

• Build from 1-5 mm/year as sea level rises
• Respond to changes in sea level over years to decades
• As seaward edges of marshes drown, landward edges can expand over uplands (Marsh Migration)
WHAT CAN WE DO TO PROTECT OURSELVES FROM COASTAL EROSION, STORM SURGES, SLR AND . . . MAINTAIN HEALTHY MARSHES, COASTAL PRODUCTION, FISHERIES, ETC.?
Actions to Maintain Healthy Marshes and Coastal Communities

• Federal level
  – Advise/guidance and funds $

• State Level
  – Guidance - new or modify federal for region
  – Develop programs for marsh health:
    • restoring full tides to restricted marshes
    • marsh migration
    • justify all existing /planned coastal structures via sea level rise permit
Actions to Maintain Healthy Marshes and Coastal Communities

• Local Towns
  – New sea level rise zoning ordinances
  – Wider buffers
  – DPW culvert and bridge replacement plan

• Homeowners
  – Re-evaluate any shoreline structures (removal? can marsh be used to control erosion?)
  – Do not mow or fill the marsh, lawn clippings, etc.
  – Support local and state plans to adapt to SLR
With contributions and help from many students of marsh ecology, and:
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Thank You!
2011-2014 Rates of Accretion and Elevation Change in NH from SETs

**NH SETs - Average by Location**

- **Elevation Change**
- **Accretion**

**Measurement record:**
- Awcomin Down 2012-14
- Awcomin Up 2012-14
- Great Bay GBF 2011-14
- Great Bay SP & SF 2011-14
- HSE 2013-14

**Average**