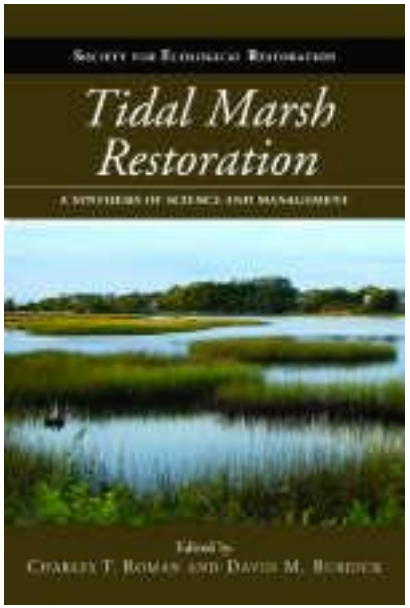
Salt Marshes are Responding to Sea Level Rise, Can *We*?
Or
Choices for Coastal Management Critical for Salt Marsh Health



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NOAA
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U.S. DEPARTMENT OF COMMERCE

NEW HAMPSHIRE
COASTAL PROGRAM

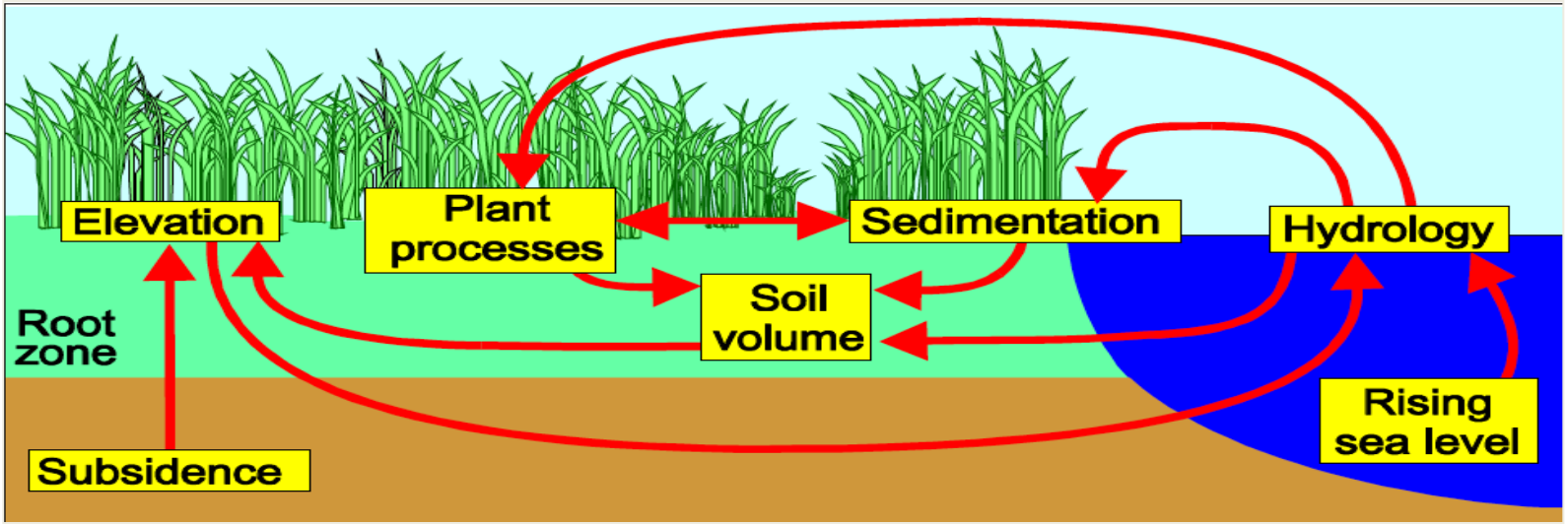
GREAT BAY
NATIONAL
ESTUARINE
RESEARCH
RESERVE

NH

Most of our Tidal Marshes have been Building with Sea Level Rise over the past 3,000 years

Salt Marshes are Poised Systems

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



- . . . and eroding processes
  - Compaction (Floods and Ice)
  - Decomposition of roots and peat (Temperature, Nitrogen)
  - Physical exposure to waves and ice

Global Sea Level Rise Measurements (Church & White 2011)

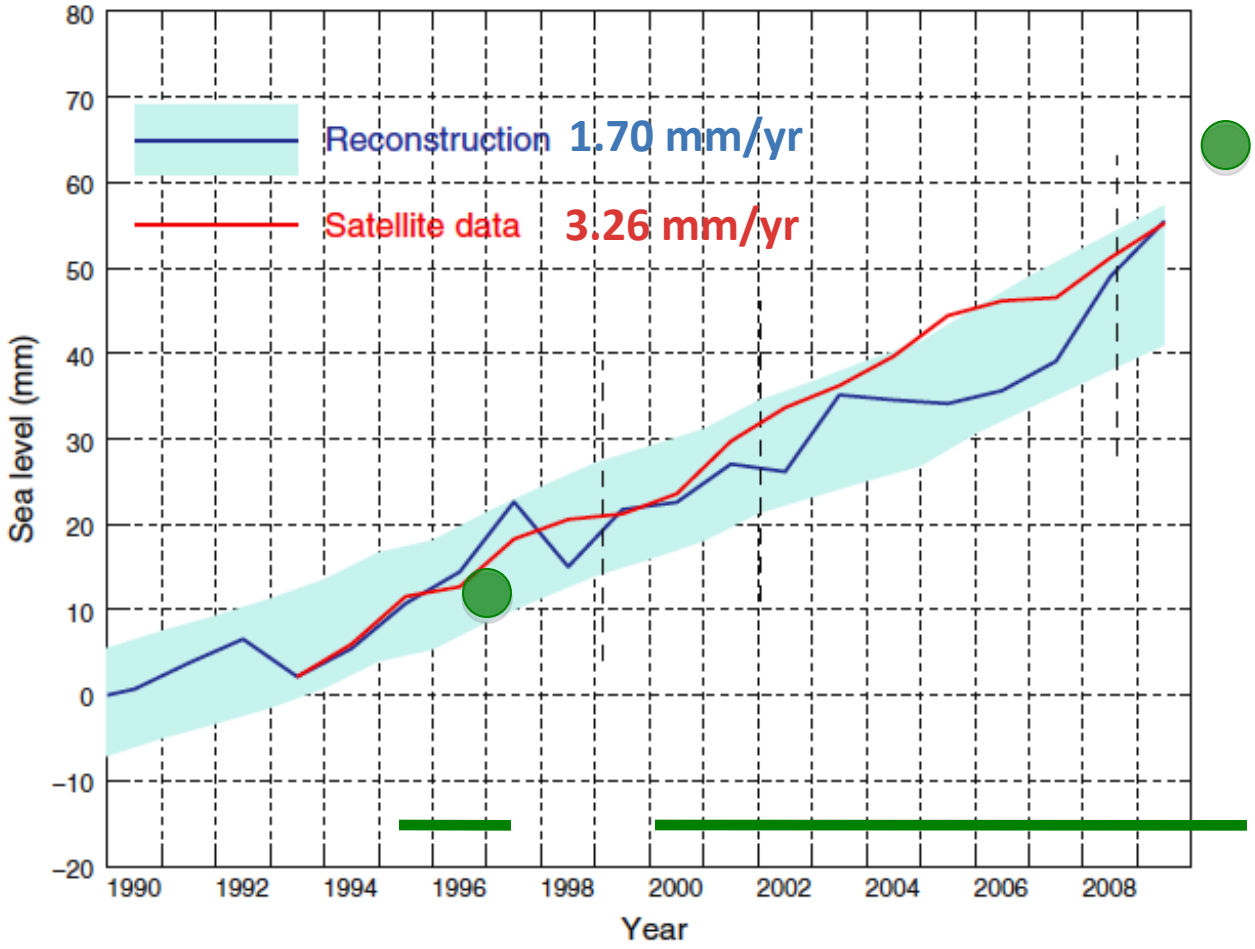
Reflected in Salt Marsh Responses Found in Great Bay

Great Bay Elevation change
1.7 mm/yr 95-97
4.3 mm/yr 00-11

Portsmouth Tide Gauge:
1.76 mm/yr 1927-2001

Elevation of salt marsh

Measurement period



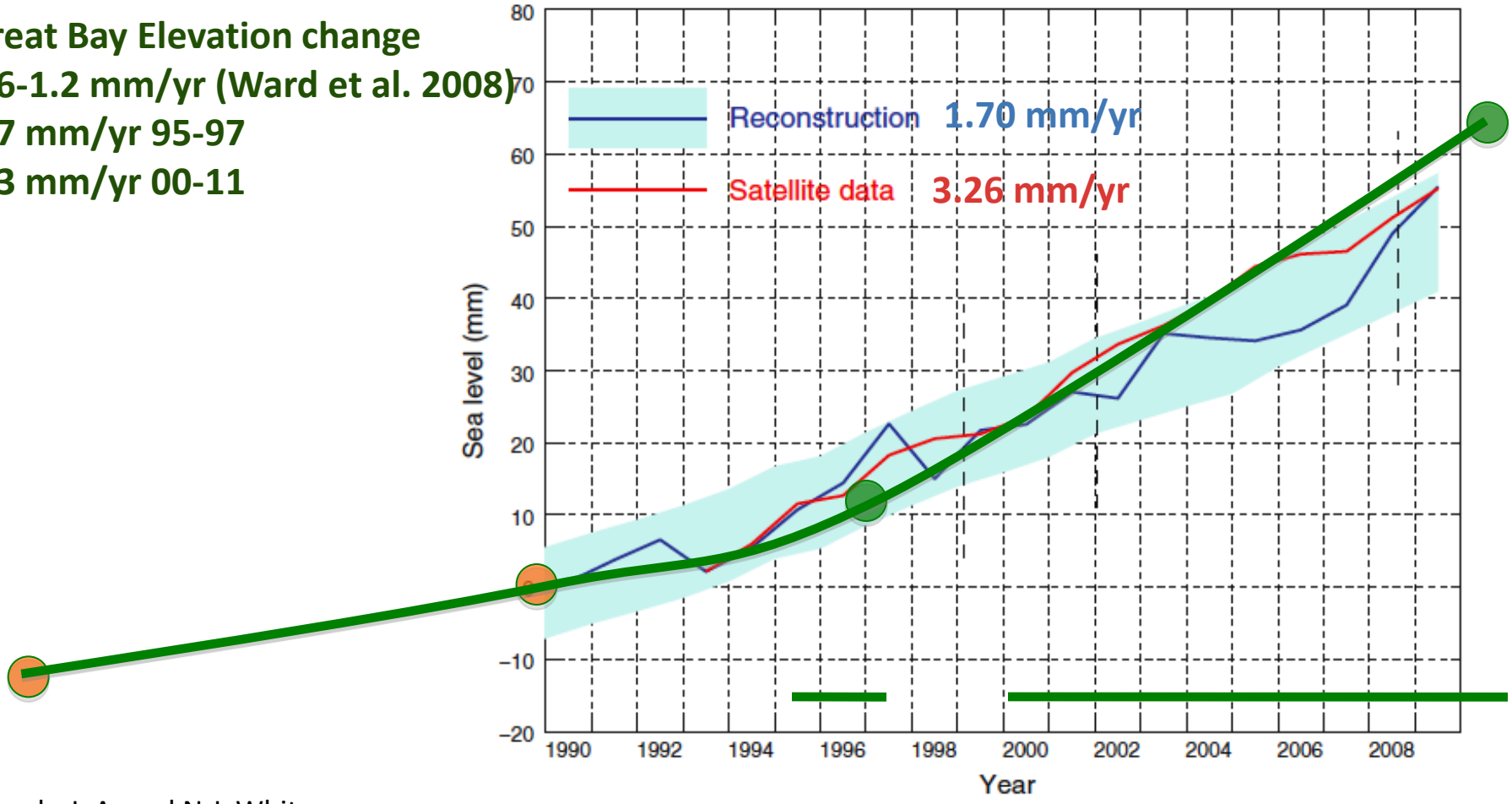
Church, J. A. and N.J. White. 2011. Sea-level Rise from the Late 19th to the early 21st Century. Survey Geophysics 32:585-602

Fig. 4 Global average sea level from 1990 to 2009 as estimated from the coastal and island sea-level data (*blue* with one standard deviation uncertainty estimates) and as estimated from the satellite altimeter data from 1993 (*red*). The satellite and the in situ yearly averaged estimates have the same value in 1993 and the in situ data are zeroed in 1990. The *dashed vertical lines* indicate the transition from TOPEX Side A to TOPEX Side B, and the commencement of the Jason-1 and OSTM/Jason-2 records

Global Sea Level Rise Measurements (Church & White 2011)

Reflected in Salt Marsh Responses Found in Great Bay

Great Bay Elevation change
0.6-1.2 mm/yr (Ward et al. 2008)
1.7 mm/yr 95-97
4.3 mm/yr 00-11



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Adapting to Climate Change Along Coasts

- Increasing SLR threatens tidal wetlands
  - Allow tidal marshes to grow in elevation as Sea Level Rises
    - What is stopping them? Tidal restrictions, dams, dredging, etc.

Adapting to Climate Change Along Coasts

- Increasing SLR threatens tidal wetlands
  - Allow tidal marshes to grow in elevation with SLR
  - Allow marshes to migrate landward (no barriers)

What do marshes need to remain healthy in the 21st century?

a. Tidal flooding

b. Sediment source

c. Zone of retreat into upland buffer

How should we manage and restore marshes in the near future?

a. Remove barriers to hydrology

b. Remove barriers to sediment supply

c. Remove shoreline barriers

d. Provide areas for marsh migration

Next Steps: Develop planning tools

- Balance projected marsh losses with gains
  - If sea level doesn't change very quickly, then neither losses nor gains occur