Above- and Belowground Biomass Densities at Salt Marsh Sites in Delaware and Barnegat Bays, New Jersey

THE ACADEMY OF NATURAL SCIENCES of DREXEL UNIVERSITY

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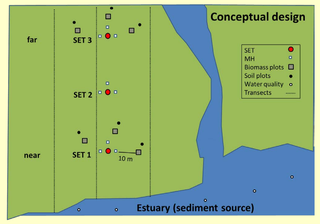
Introduction

As part of the Mid-Atlantic Coastal Wetland Assessment we are measuring mid-summer above- and belowground biomass in salt marshes of the Delaware Estuary and Barnegat Bay in New Jersey. Variation in salt marsh plant species biomass may be dependent on differences in elevation, tidal height, nutrient availability, and sediment load. Inter-annual differences in plant biomass can be due to differences in temperature, precipitation, and mean sea level. As a proxy for productivity, peak standing biomass measurements will allow us to examine differences among marshes, as well as the relationships between plant production and nutrient availability, soil carbon, accretion and elevation change. Long-term monitoring of biomass will allow us to forecast trends in salt marsh migration and other geomorphologic changes.

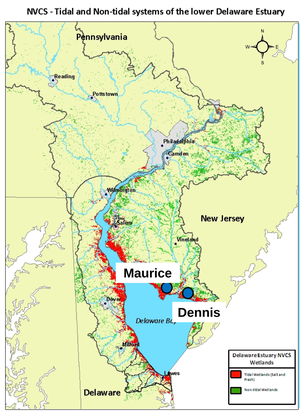
Methods

Above- and belowground biomass

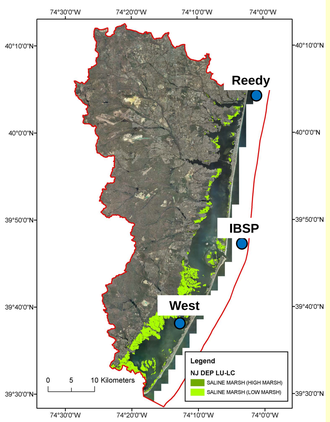
- annually in mid-summer (2011 and 2012)
- 3 salt marshes in each: Delaware Estuary and Barnegat Bay
- 6 plots per marsh at 2 different distances from estuary (3 *near*, 3 *far*)
- standing aboveground biomass was clipped within each 0.25 m^2 plot
- litter on the marsh surface was collected
- belowground biomass was collected using 15-cm diameter x 30-cm core barrel, washed over a 5-mm mesh sieve, and separated into live and dead material
- all biomass was washed and dried at 60°C to a constant weight



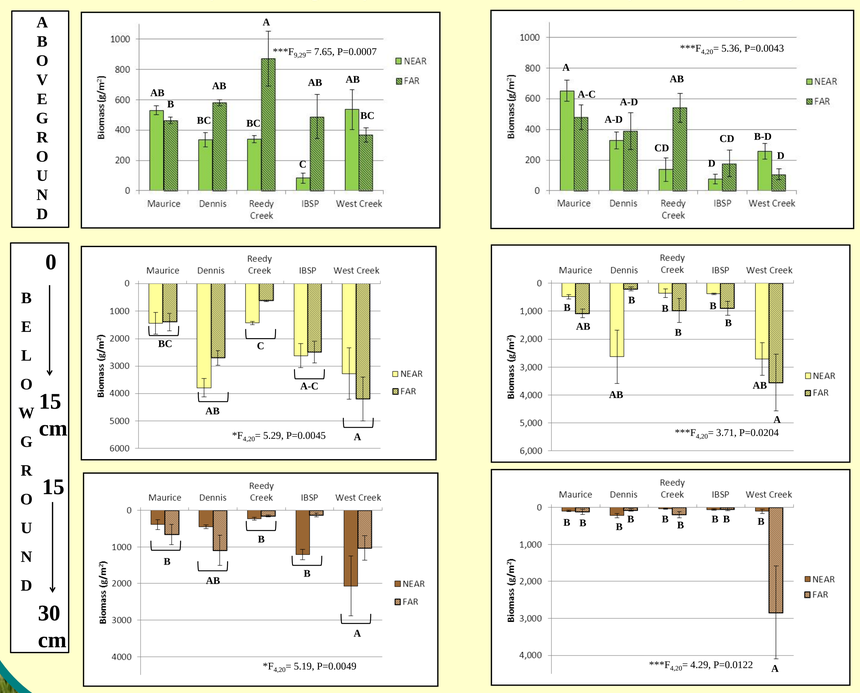
Delaware Estuary



Barnegat Bay

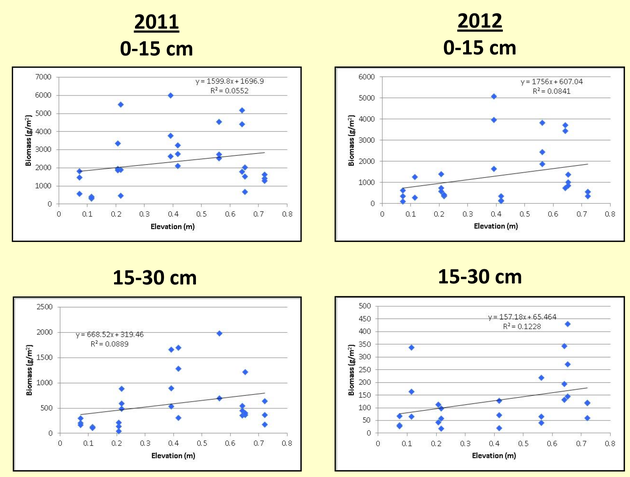


Live Biomass



* Denotes significance among sites *** Denotes significance between both site and SET

Relationships between Live Belowground Biomass and Elevation



*Does not include biomass data from West Creek far SET (3)

Average Elevation at SETs (m) (NAVD88)

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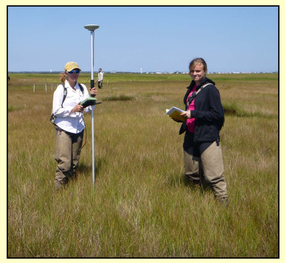
Maurice	0.707±0.028
Dennis	0.634±0.122
Reedy Creek	0.086±0.014
IBSP	0.208±0.005
West Creek	0.471±0.049



Using RTK to collect elevation data at West Creek.

Results

Spartina alterniflora dominated the plant biomass at all sites except the far site at Reedy Creek, which also had *Spartina patens* and *Distichlis spicata*. Live aboveground biomass averaged 305 ± 39 g/m^2 in 2011 and 457 ± 42 g/m^2 in 2012. Live aboveground biomass was similar within sites (near vs far) except for Reedy Creek and IBSP in Barnegat Bay where there was significantly more biomass far from the estuary compared to near in 2011 and for Reedy in 2012. Reedy Creek biomass was greater at the far site due to the high percentage of species with higher stem densities.

Live belowground biomass ranged from 12 – 5986 g/m^2 in 2011 and 18 – 5067 g/m^2 in 2012. Live belowground biomass differed among sites with West Creek having greater biomass than Reedy Creek in 2011 and all sites in 2012 ($p < 0.0001$). There was a general decline in biomass from 2011 to 2012. Marshes in the Delaware Estuary experienced a biomass decline in the upper 15 cm, whereas in the Barnegat Bay marshes biomass declined in both the 0 – 15 and 15 – 30 cm depths. Live belowground biomass was weakly related to elevation (NAVD88).

Conclusions

Salt marshes of the Delaware Estuary and Barnegat Bay were dominated by *Spartina alterniflora*. Tidal ranges experienced by Delaware Estuary marshes are ~1.5 m while marshes in Barnegat Bay are subject to a ~0.3 m tidal range. Elevations in Barnegat Bay marshes were on average 40cm lower than Delaware Bay marshes. Despite distinct differences in elevation, tidal range, and sediment availability, there were relatively small differences in above- and belowground plant biomass among sites in the two estuaries. Inter-annual and within-site differences in plant biomass were often greater than differences among sites.

Future analyses will use mean high water, water column nutrient and suspended solids concentrations data to further examine their impacts on salt marsh accretion and productivity.