

# Site-specific Intensive Monitoring of Wetlands of the Delaware River Estuary and Barnegat Bay



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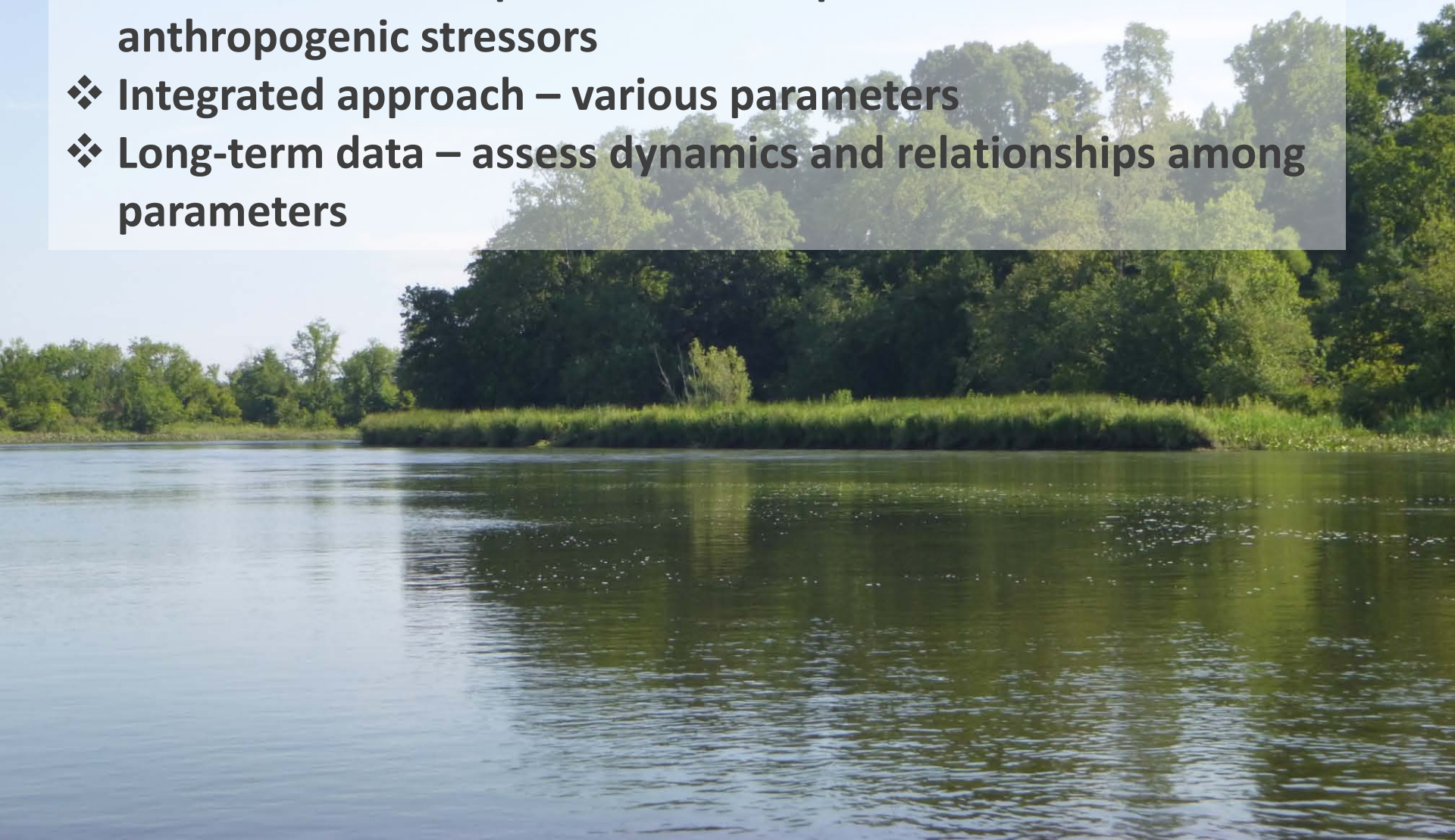


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# Importance of Monitoring

- ❖ **Baseline information about a system**
- ❖ **Understand consequences of multiple environmental and anthropogenic stressors**
- ❖ **Integrated approach – various parameters**
- ❖ **Long-term data – assess dynamics and relationships among parameters**



**Habitat**

**High productivity**

**Nutrient cycling**

**Carbon burial**

**Opportunity**

**Ecological processes – tides, salinity, sedimentation, and nutrients**



# Causes for concern

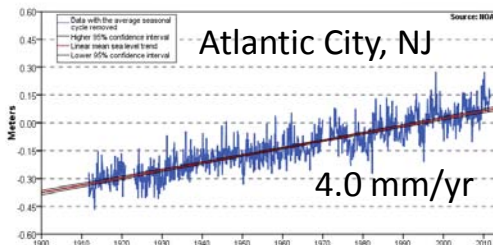
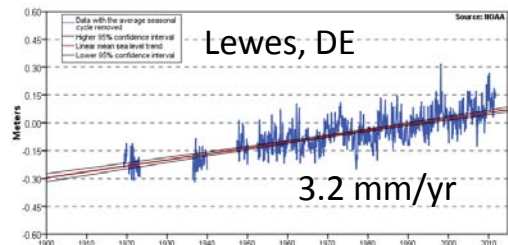
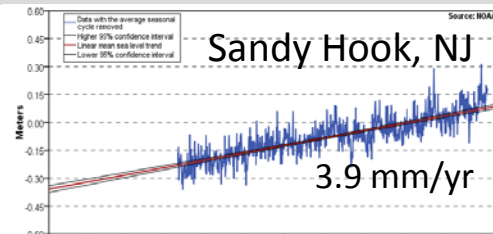
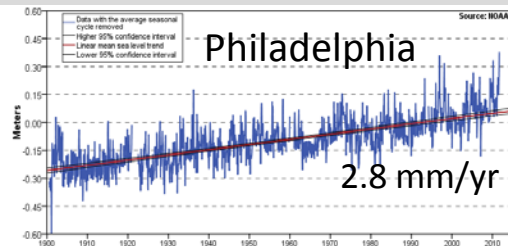
## 1. ALTERED LANDSCAPE

- Coastal development
- Altered sediment load
- Increased nutrient load
- Direct human alterations



## 2. RELATIVE SEA LEVEL RISE

- Salinity, tide range increase



# Wetlands designated as a long-term monitoring sites

## Mid-Atlantic Coastal Wetlands Assessment (MACWA)

### MACWA Partners

Partnership for Delaware Estuary

Barnegat Bay Partnership

Academy of Natural Sciences

NJDEP

US Fish and Wildlife Refuges

Villanova University

Rutgers University

### Monitoring activities

Surface elevation changes

Plant production

Soil chemistry

Water quality



## EPA 3-Tiered Framework for Wetland Monitoring and Assessment

Level 1	Landscape assessment	GIS data (e.g., % forest cover, land use)
Level 2	Rapid assessment	Simple metrics of wetland condition
Level 3	Intensive site assessment	Direct and detailed measurement of biological taxa and hydrogeomorphic function
Level 4	Site-specific intensive monitoring	Repeated measurements of physical, chemical and biological metrics

## Central questions:

**Are wetlands keeping up with sea level rise?**

**Is there spatial and temporal variation in wetland structure and function over time?**

1. Are elevations and topography changing over time?
2. Are plant zones and morphology changing over time?
3. Is plant biomass above- and belowground changing and how does it contribute to elevation change?
4. How does water and soil quality relate to elevation change and change over time?

## Elevation and Accretion



# Methods

## Plant Biomass



## Algal Biomass



## Plant community

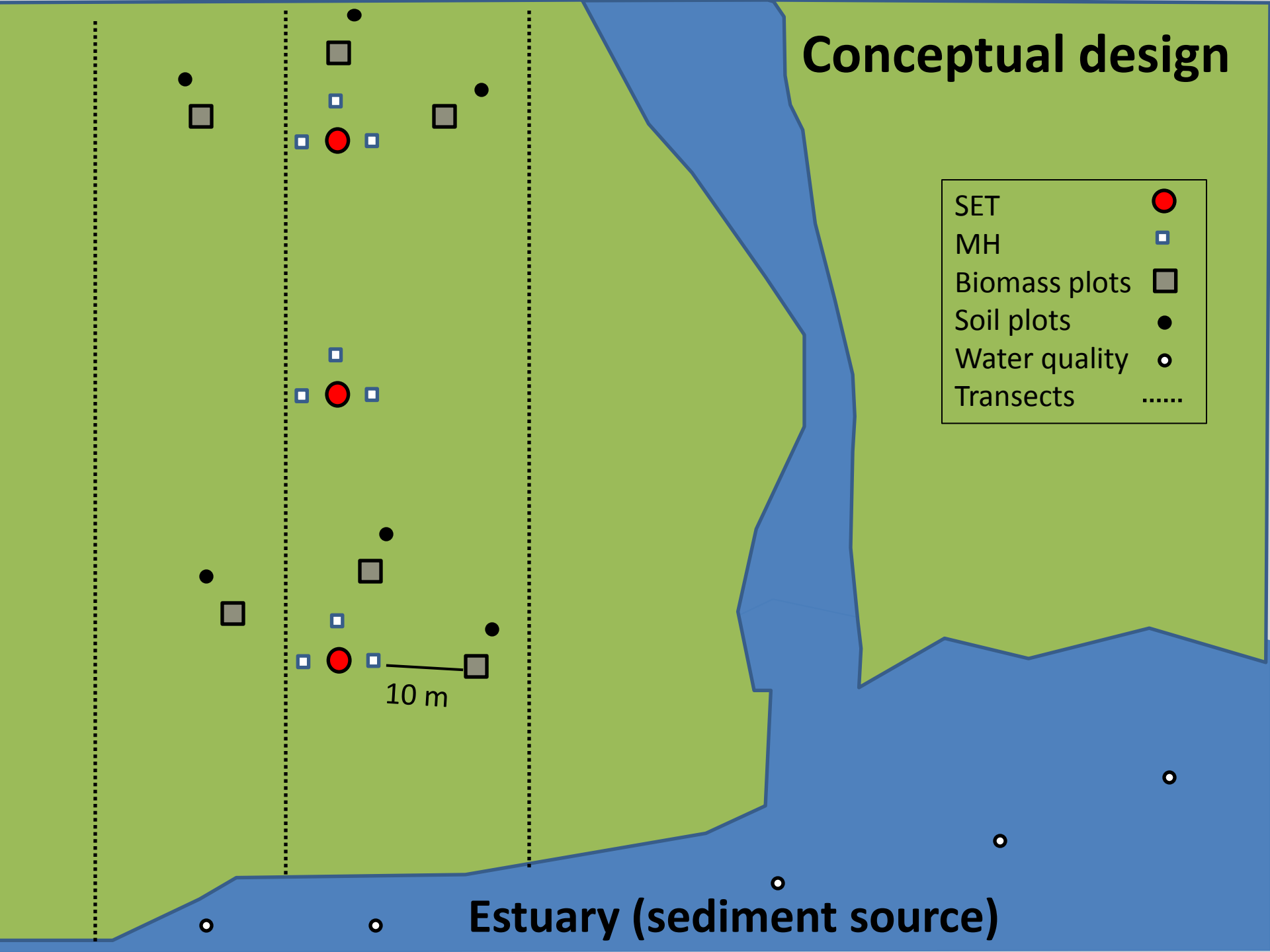
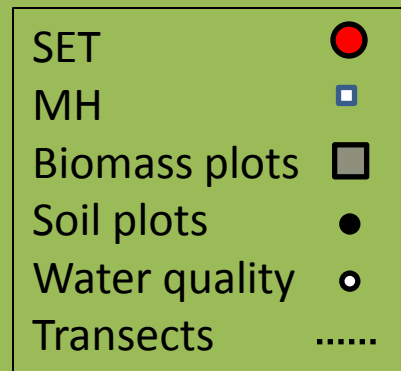


## Soil and Water Chemistry





# Conceptual design

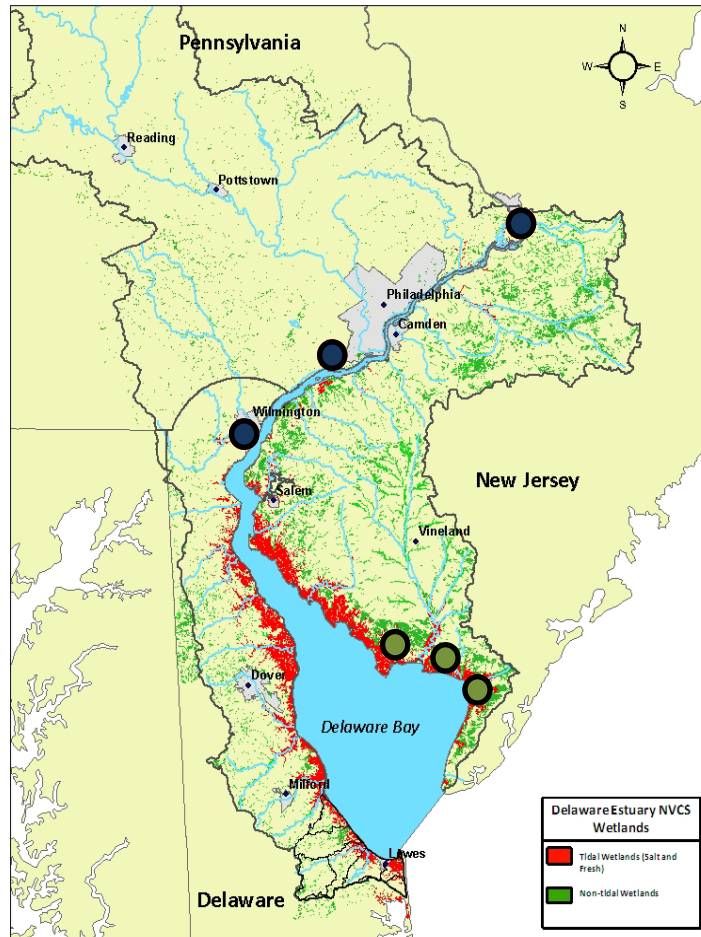


Estuary (sediment source)

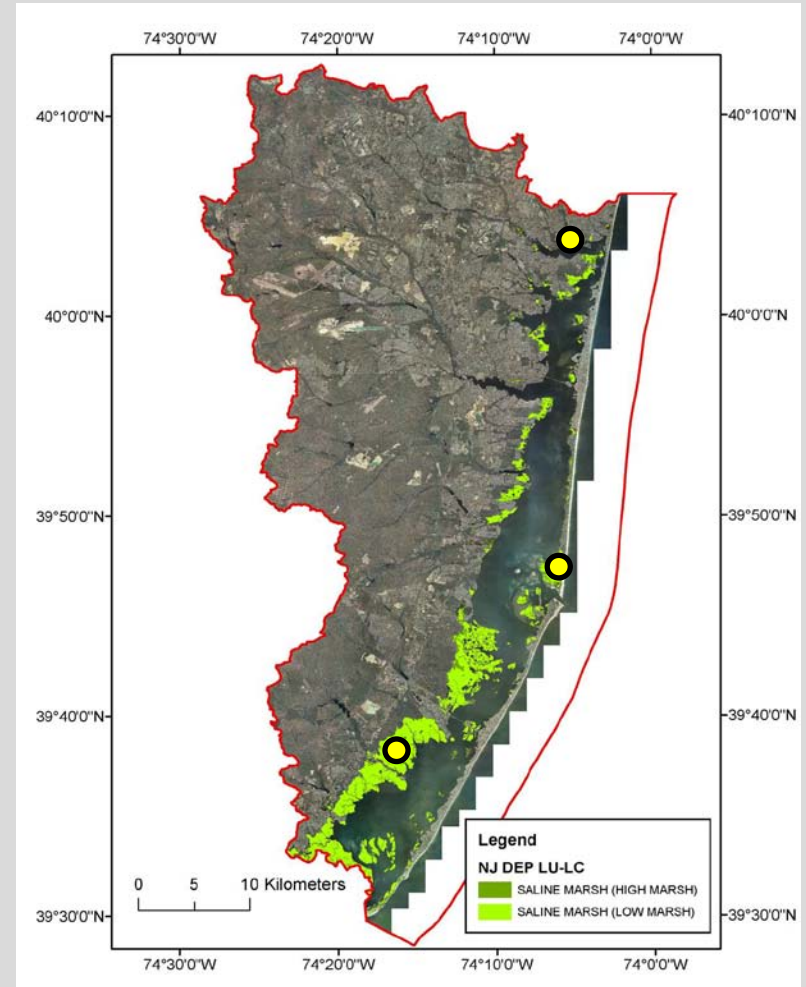
# Wetland Monitoring Locations

## Delaware Bay

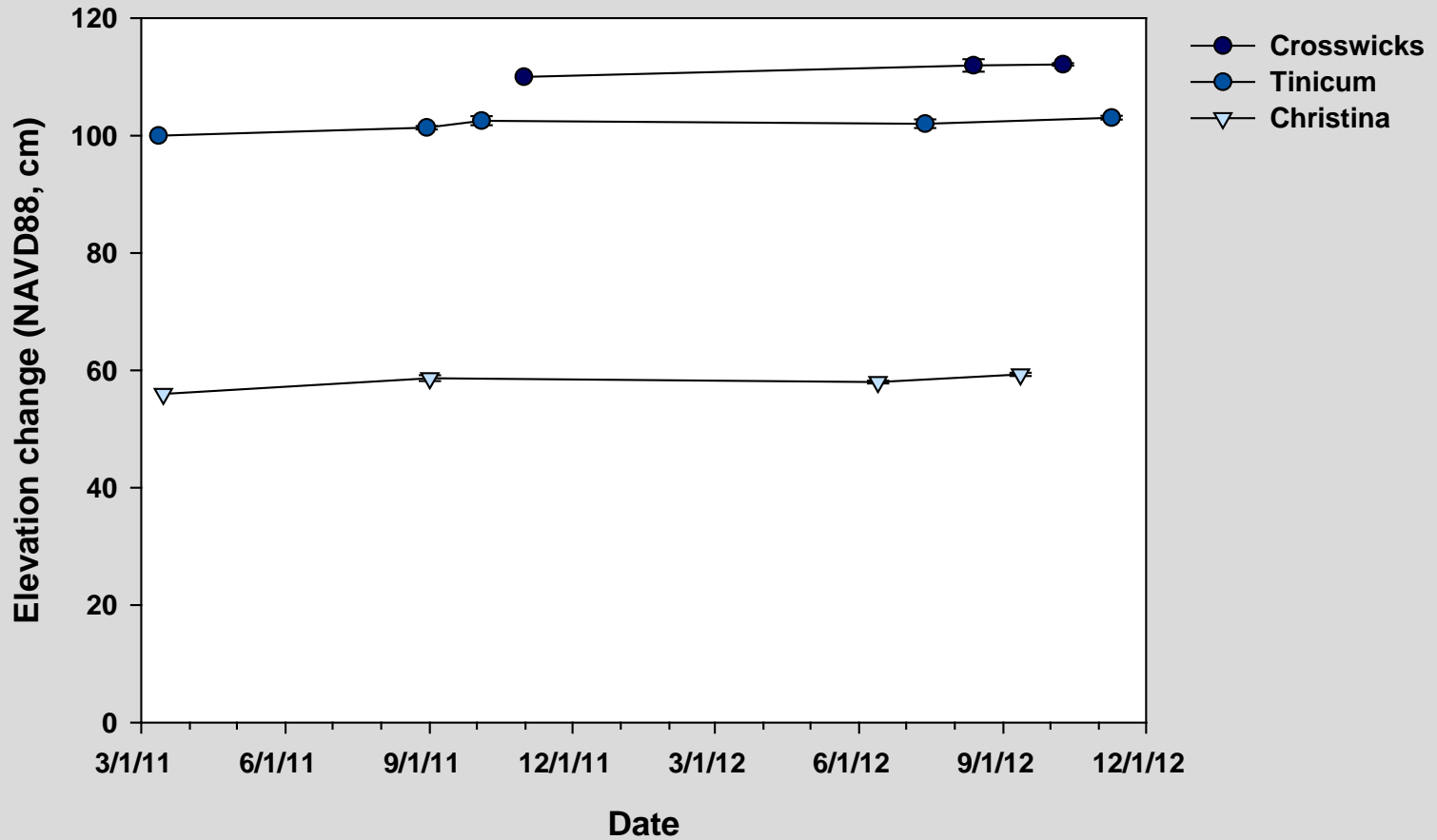
NVCS - Tidal and Non-tidal systems of the lower Delaware Estuary



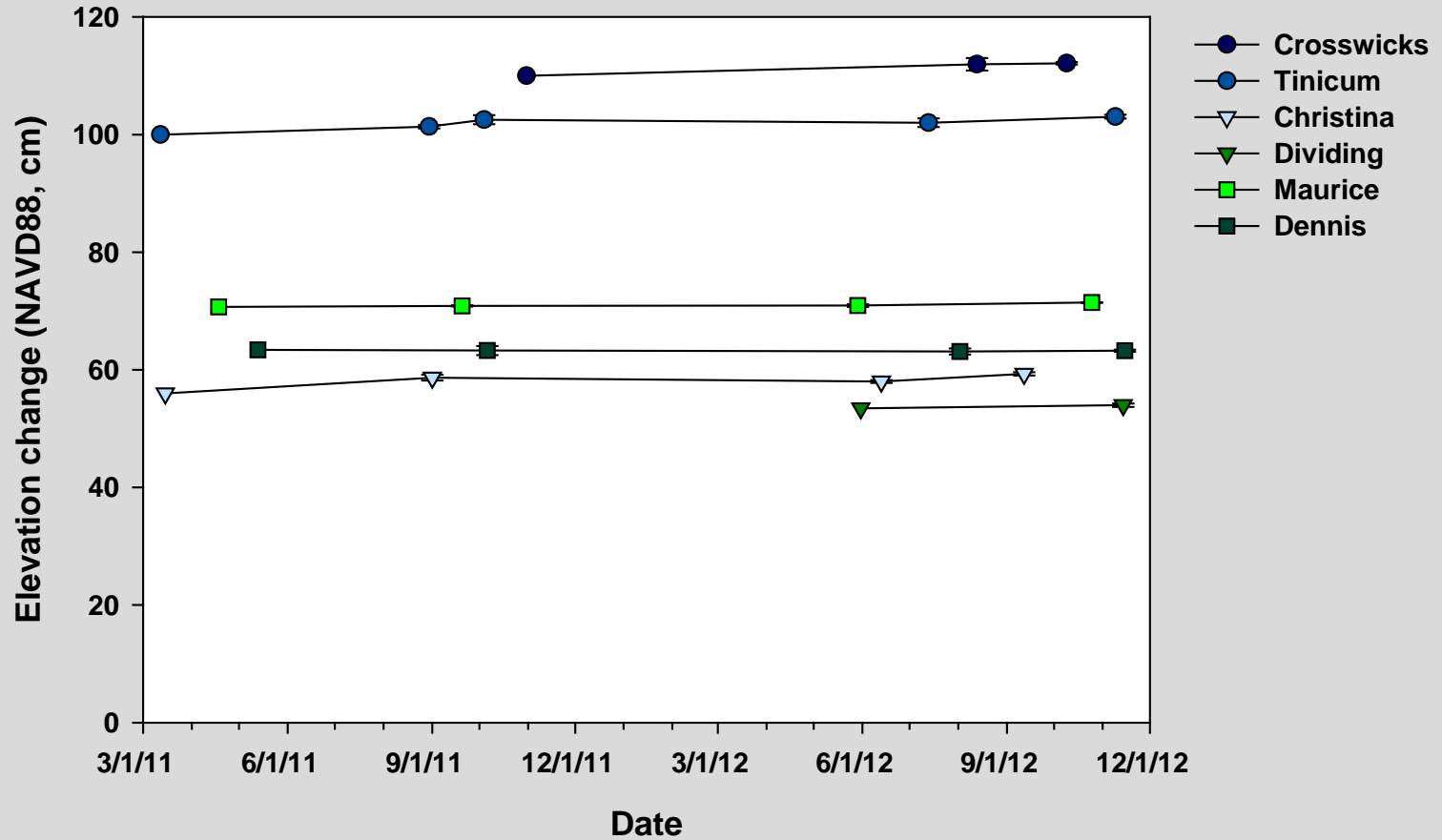
## Barnegat Bay, New Jersey



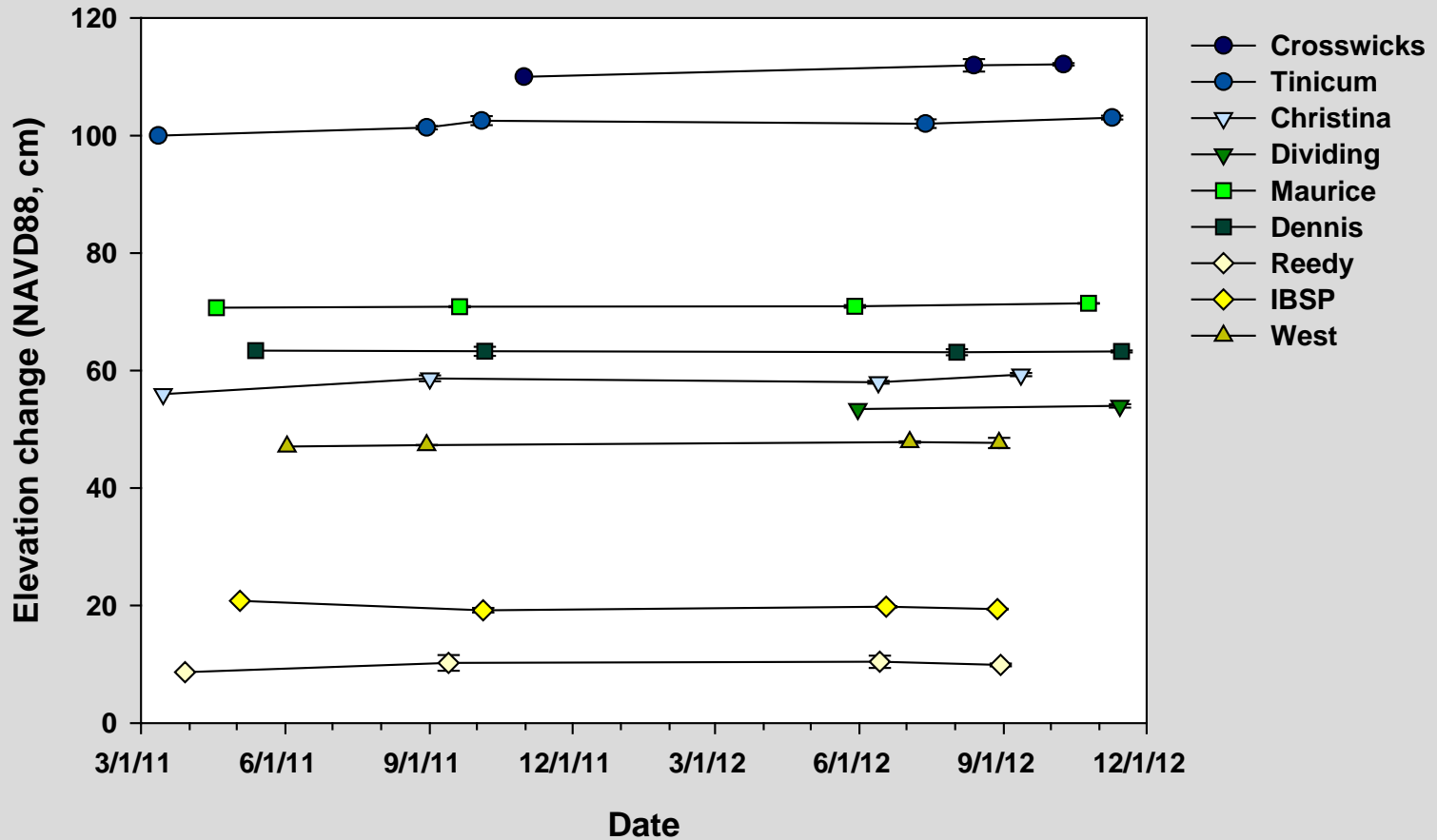
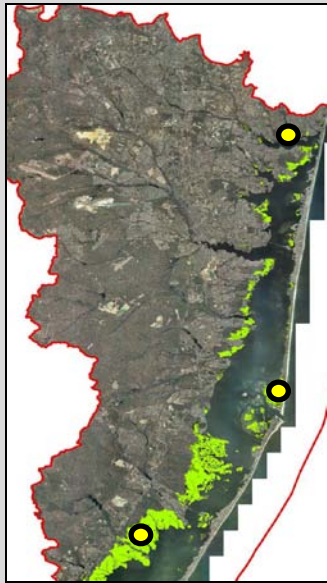
# Elevation



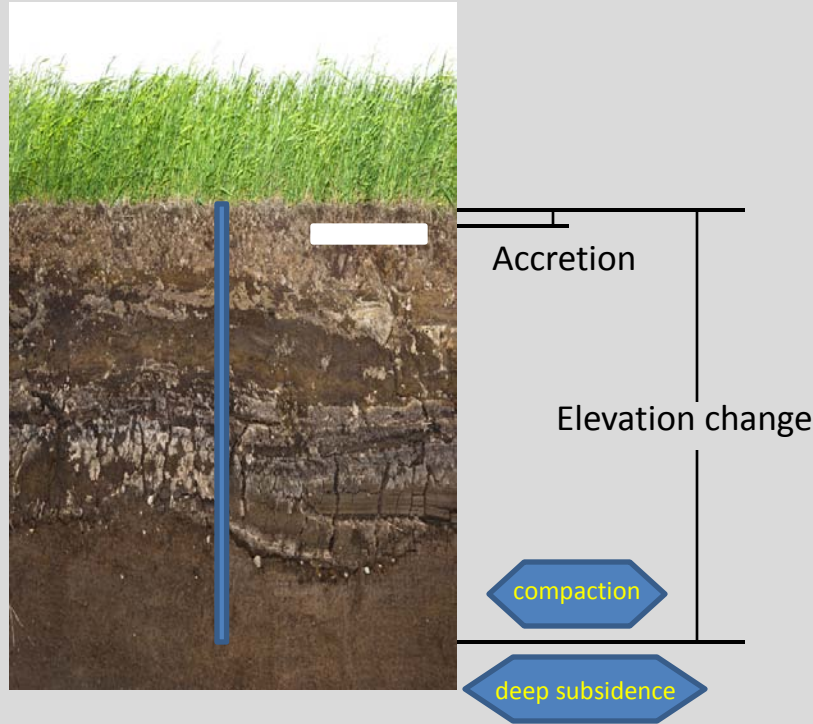
# Elevation



# Elevation



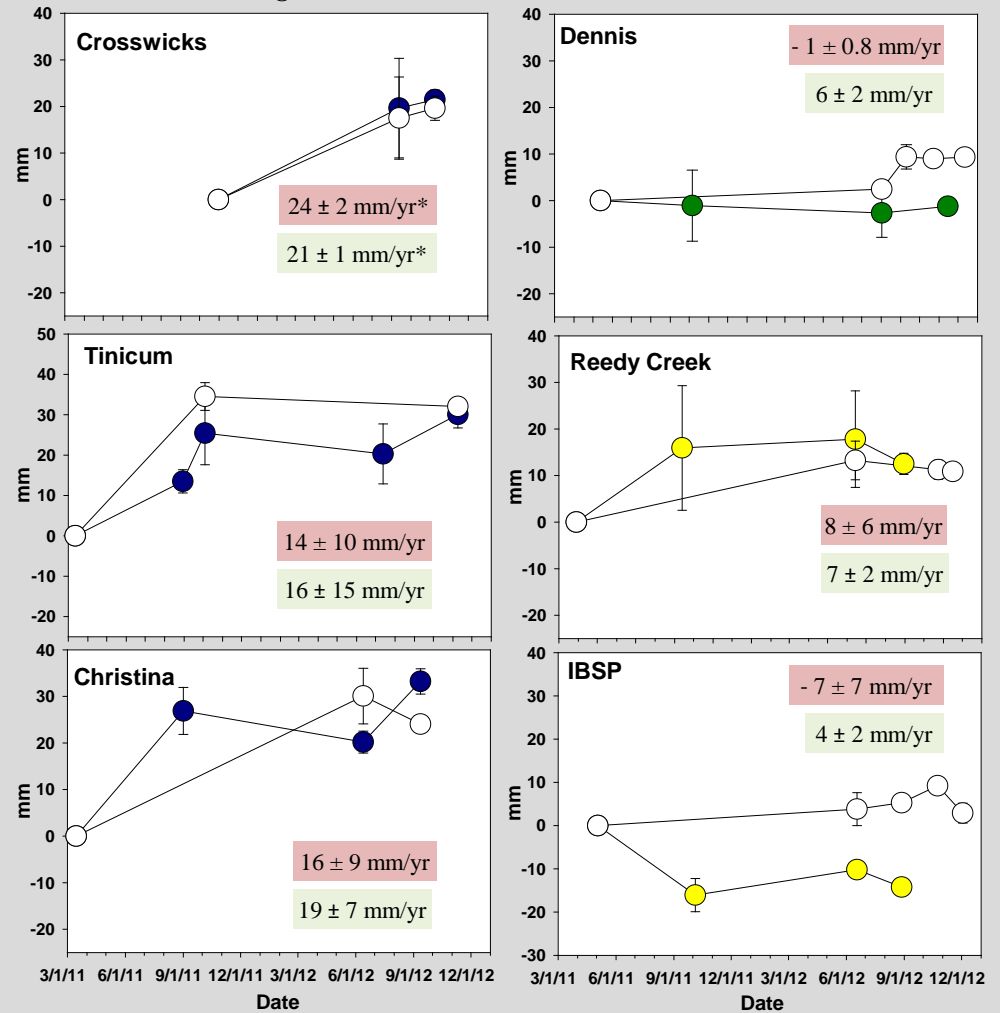
# Elevation change



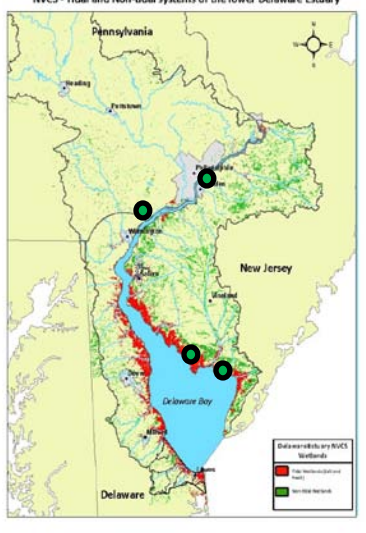
# Accretion



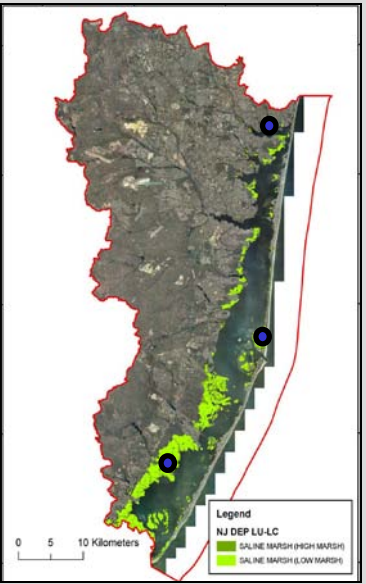
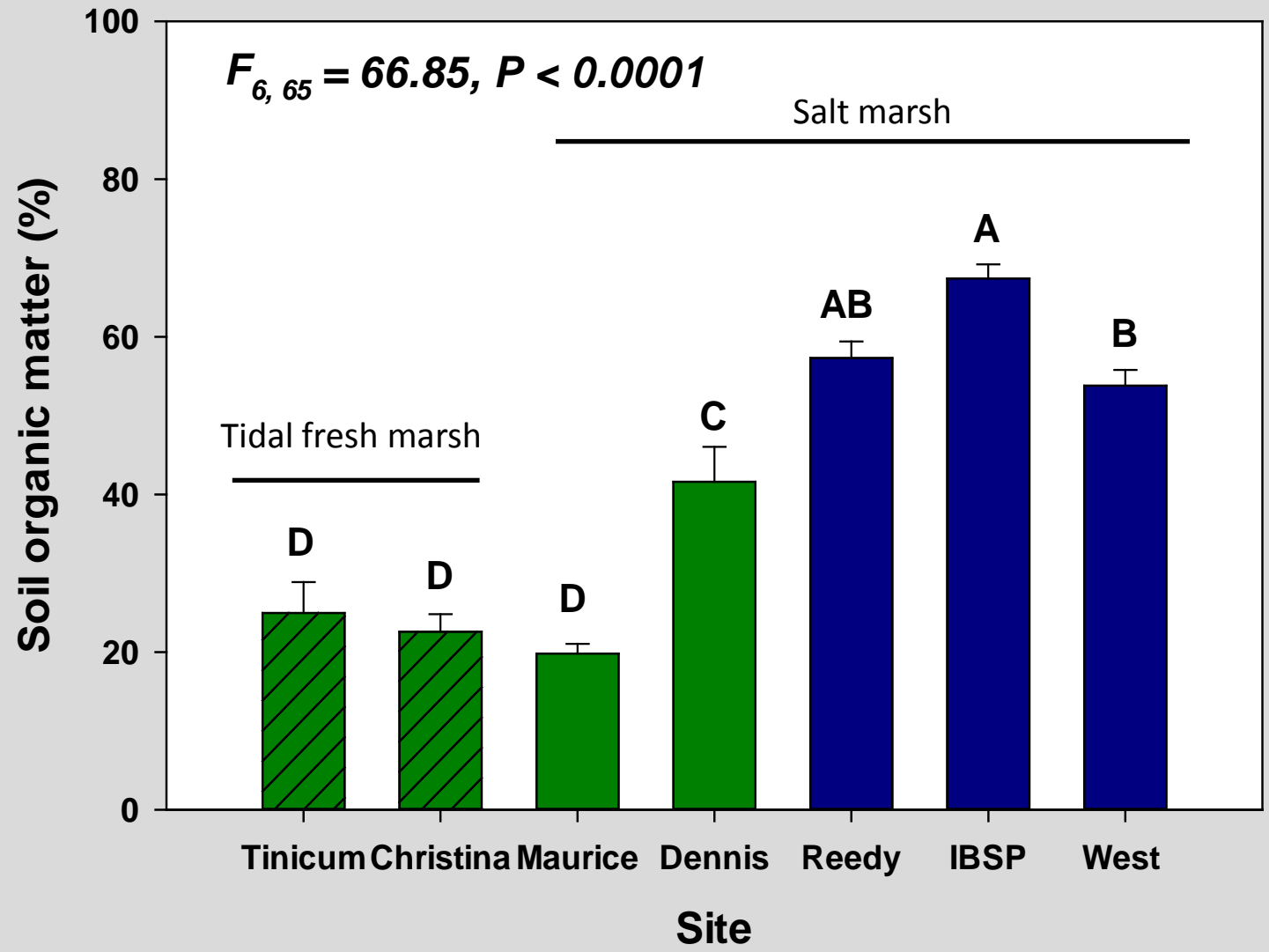
● elevation change  
○ accretion



# Soil Organic Matter



■ Delaware Bay  
■ Barnegat Bay

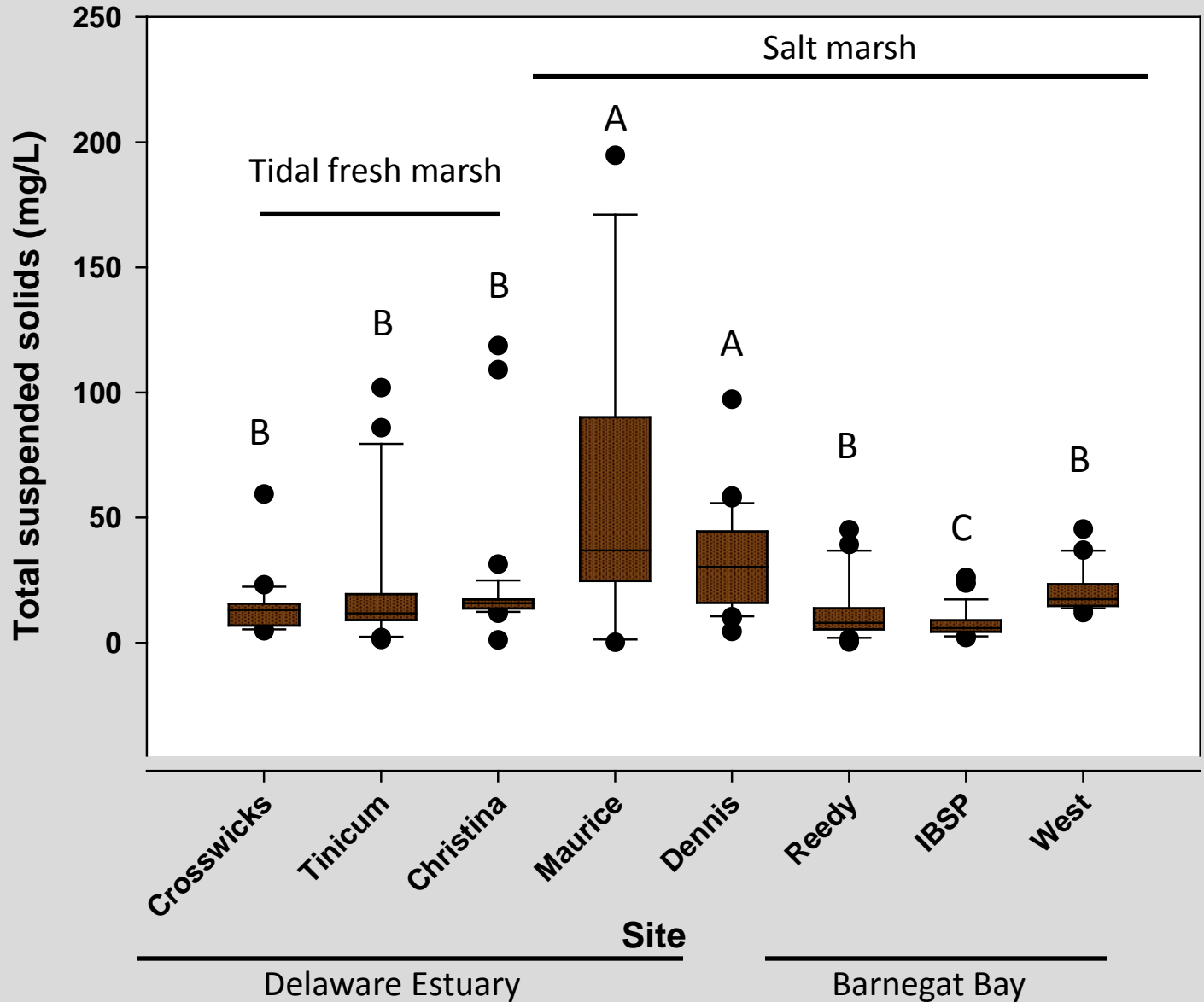
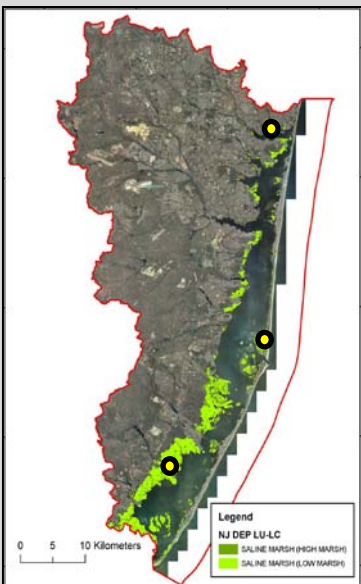
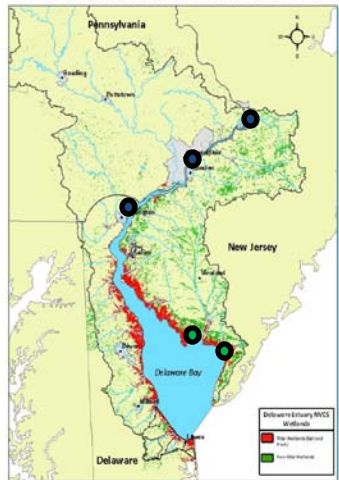


# Hypothesis

1. Higher % soil organic material in areas with less sediment available for deposition



# Tidal Creek Water Solids

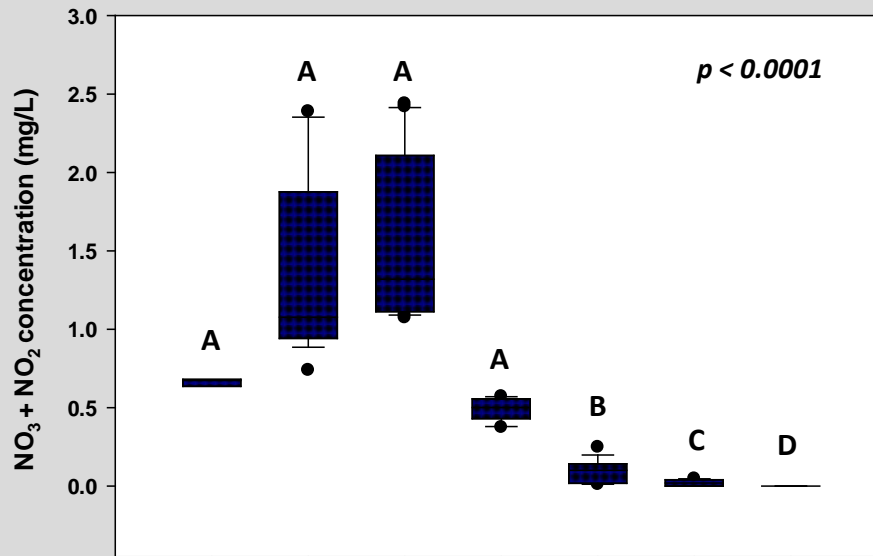


# Hypothesis

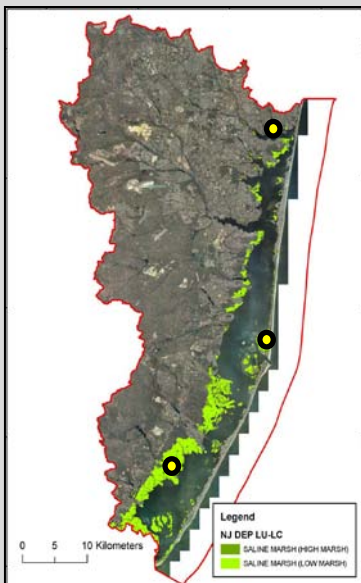
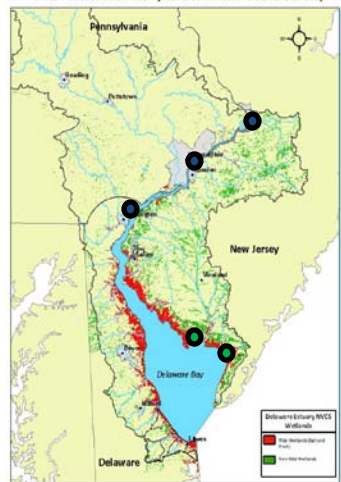
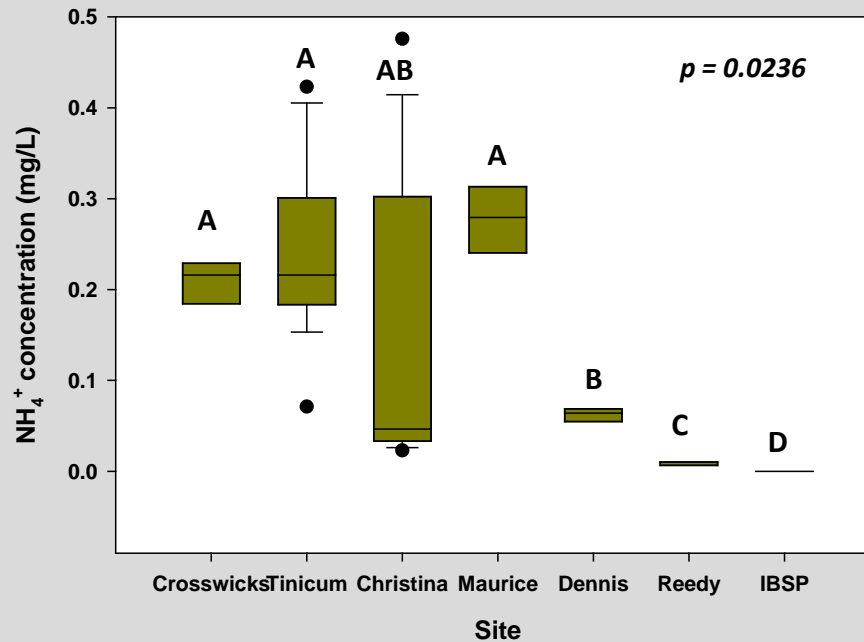
1. Higher % soil organic material in areas with less sediment available for deposition
2. Higher % soil organic material in areas with lower available nutrients

# Tidal Creek Nutrients

## Nitrate + Nitrite



## Ammonium



# Conclusions

## Spatial Variation

- elevation – Barnegat Bay marshes lowest
- elevation change nsd from zero at most sites
- soil organic matter greater in BB marshes
- salt marshes – lower SOM in areas with greater TSS and nutrient concentrations in water

## Temporal Variation and Relationships

- next steps...

