Sustainability in the Created Marshes at the Poplar Island Restoration Project in Mid-Chesapeake Bay

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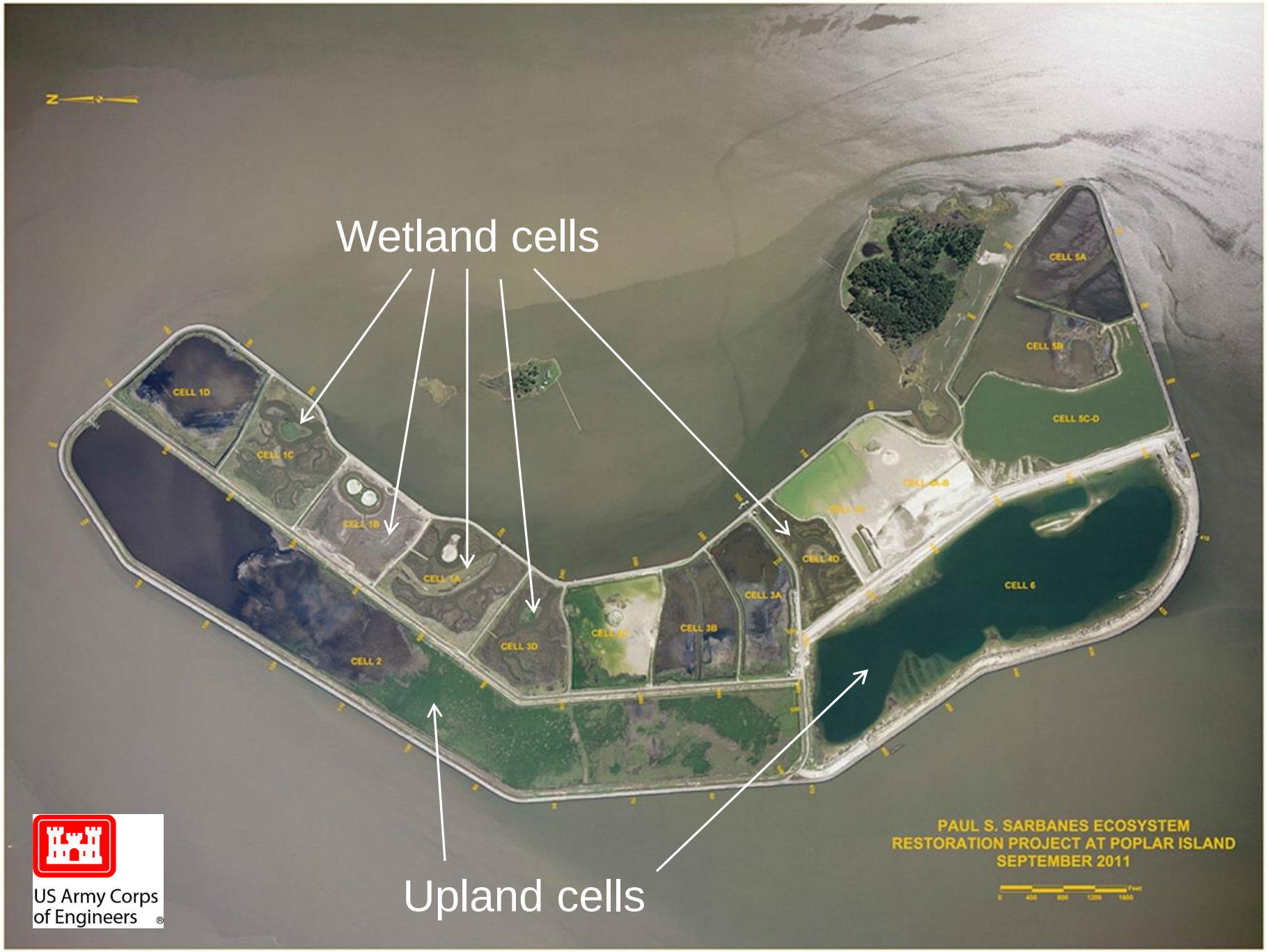
*** NOAA National Geodetic Survey, Silver Spring, MD**

Background

- 694 hectares (1715 acres)
- 50/50 upland/wetland
- ~73 hectares (180 acres) completed
- Capacity 68 mcy
- Cost $1.4 billion
- Completion 2029


Wetland cells
CELL 1D
CELL 1C
CELL 1B
CELL 1A
CELL 2
CELL 3D
CELL 3C
CELL 3B
CELL 3A
CELL 4D
CELL 6
CELL 5A
CELL 5B
CELL 5C-D
Upland cells
US Army Corps of Engineers
PAUL S. SARBANES ECOSYSTEM RESTORATION PROJECT AT POPLAR ISLAND
SEPTEMBER 2011

Construction

Crust management

Tidal opening

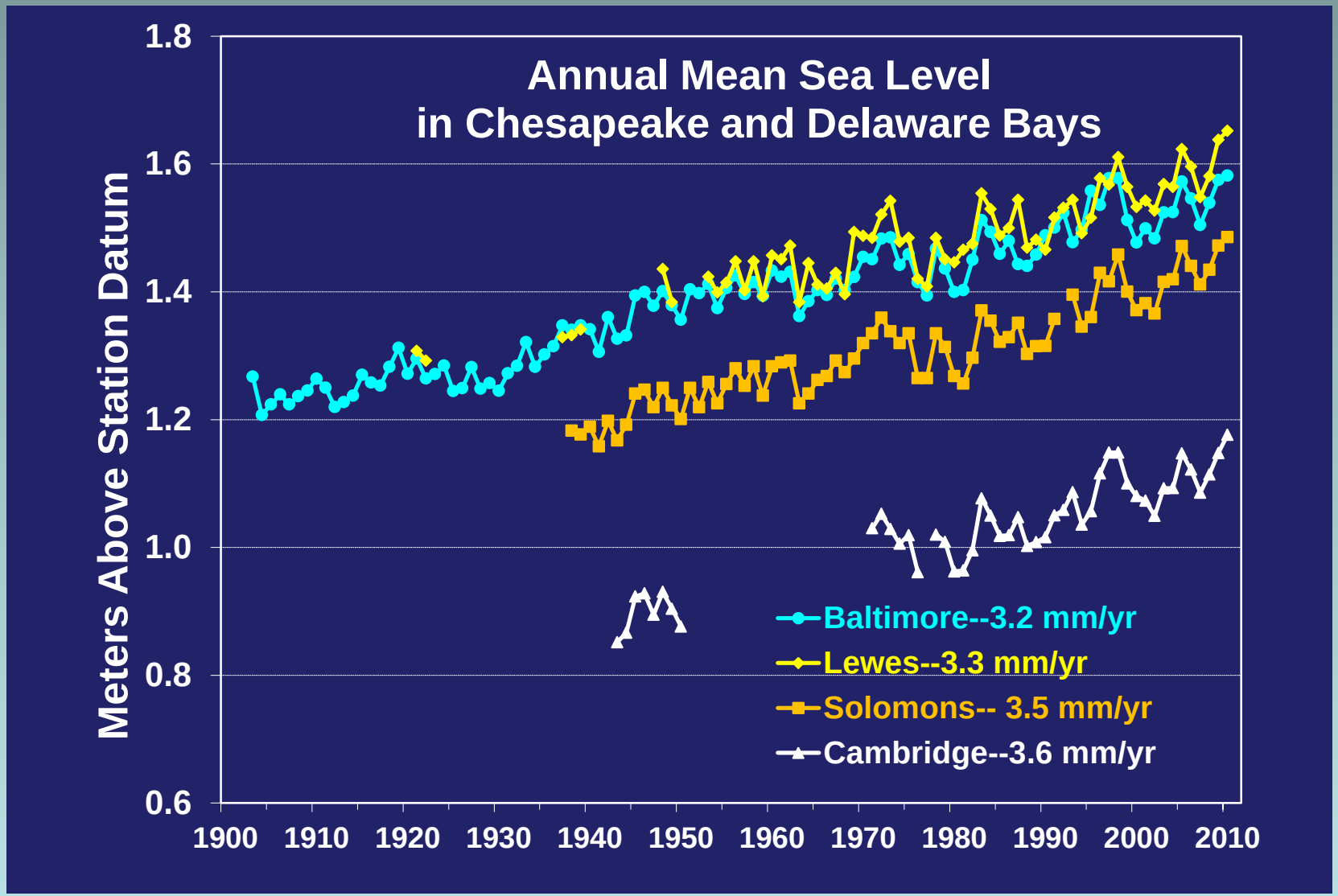
Source

- Fine-grained
- Nutrient rich
- Mesohaline
- Pyrite rich

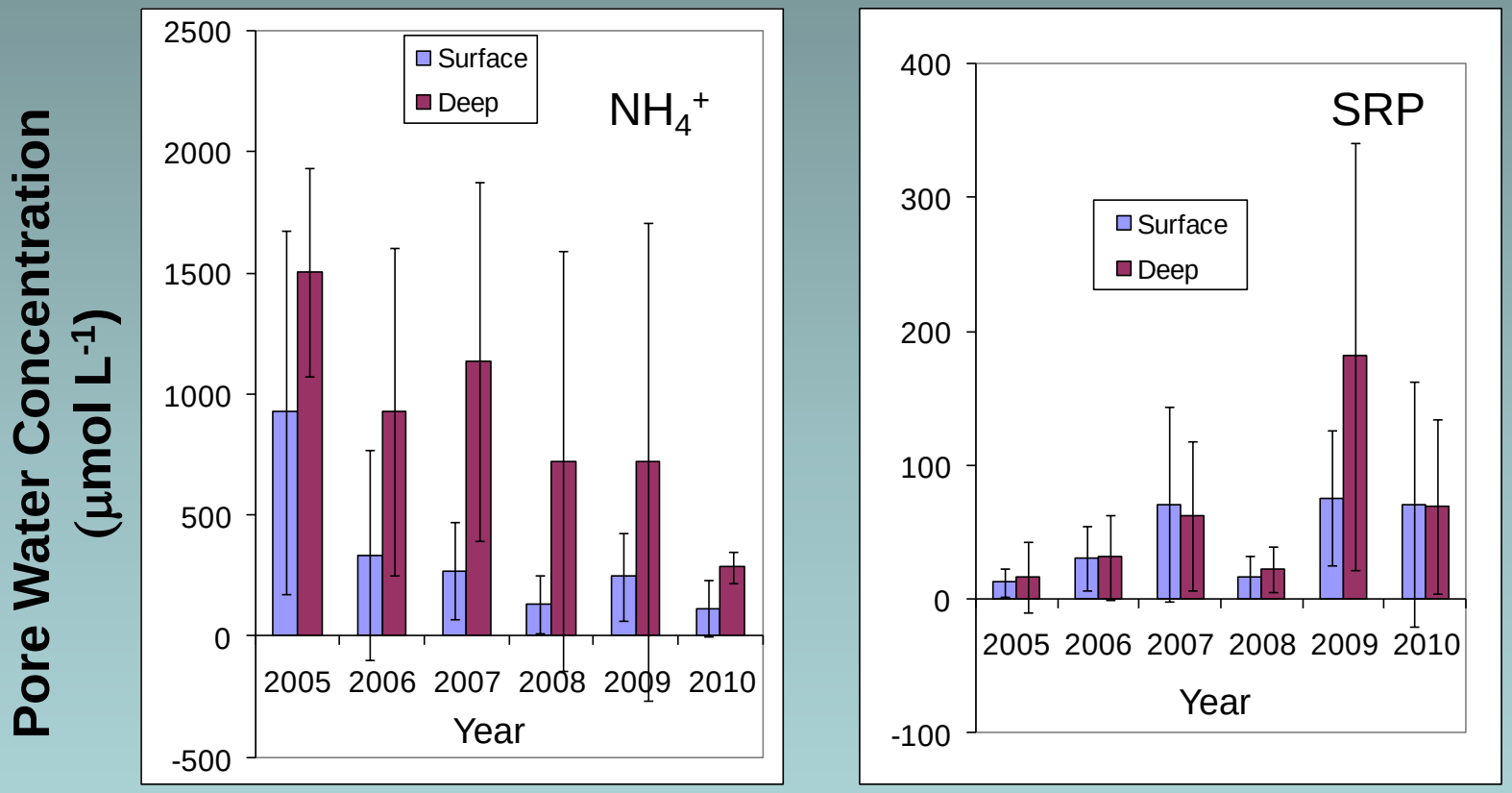
Planting

- 80% Low marsh: *Spartina alterniflora*
- 20% High marsh: *Spartina patens*
- Flood dominated design to maximize deposition

Main Concern: Sea Level Rise



Unanticipated - Extreme Fertility



- NH_4^+ decreasing over time in both surface (<12 cm) and deep (>20 cm)
- SRP increasing over time in both surface and deep
- Result of coastal eutrophication

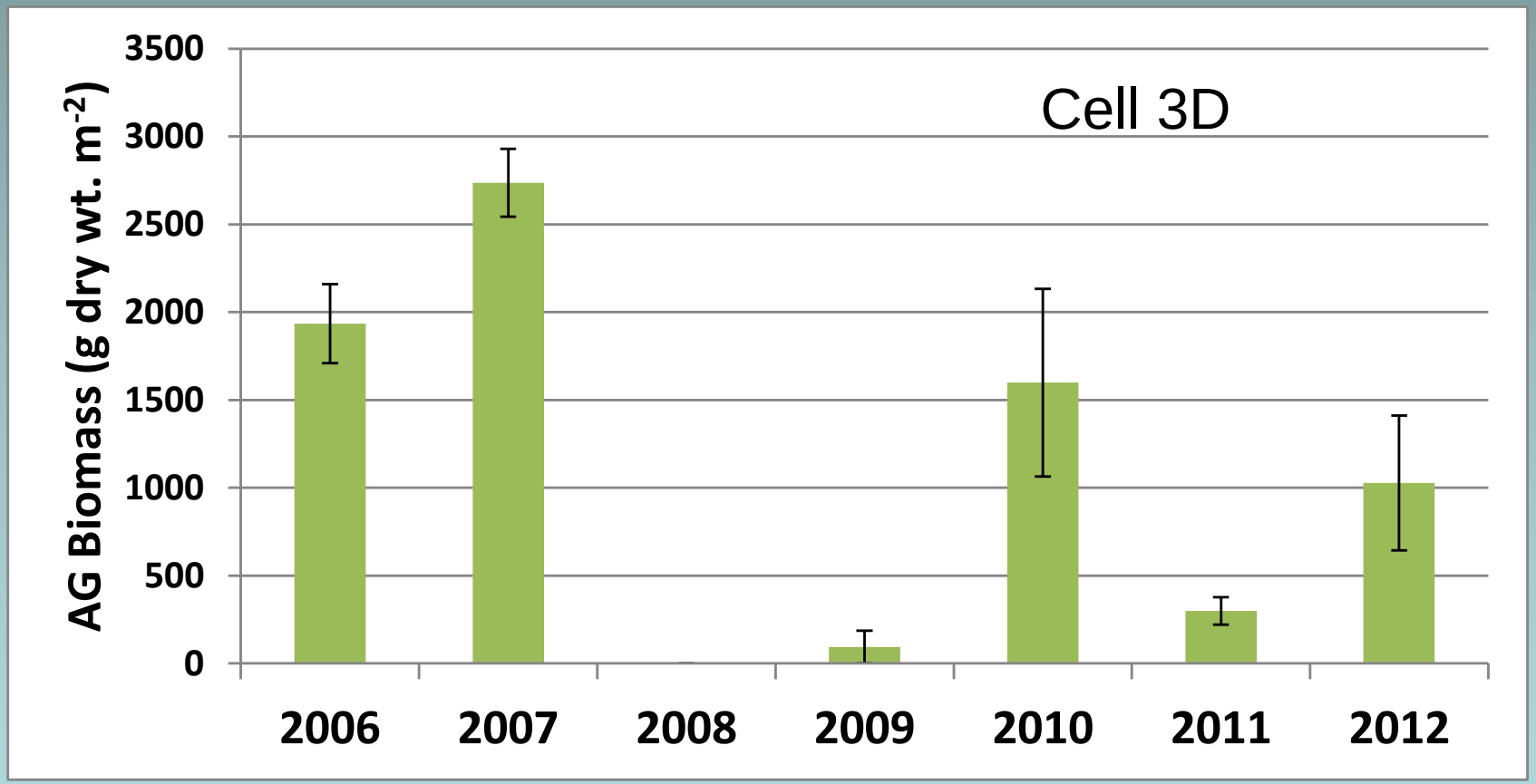
Planting

Lush growth

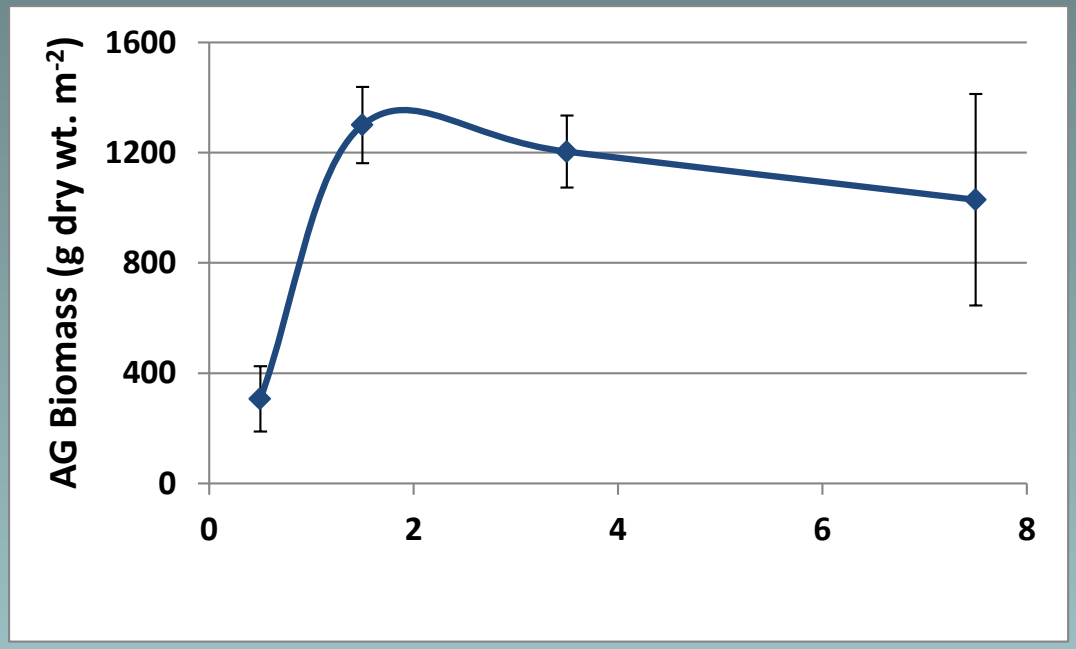
Die-back

Re-colonization

Inter-annual variability in aboveground biomass production



2012 Biomass vs. Wetland Age



- Declining AG following early maximum
- Increasing BG

2012 Culm Height

Marsh characteristics associated with high fertility sediments:

- Lodging
- Low root:shoot ratio
- Fungal infection
- Leaf speckling
- Grazing pressure

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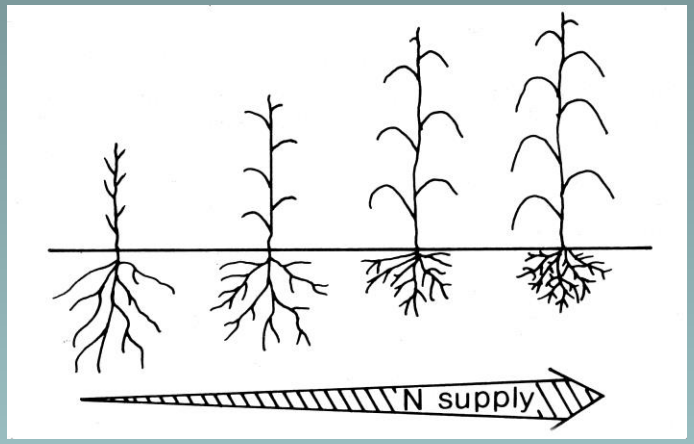
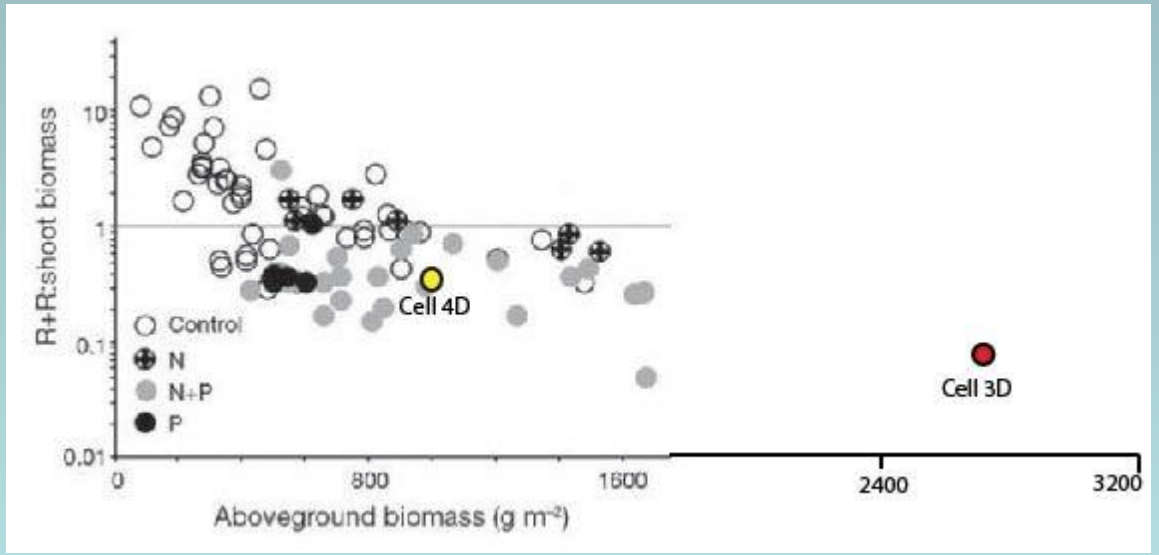


Marschner 1995



Adapted from Darby and Turner 2008

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Fusarium infections on *S. alterniflora* stems (left), Poplar Island.

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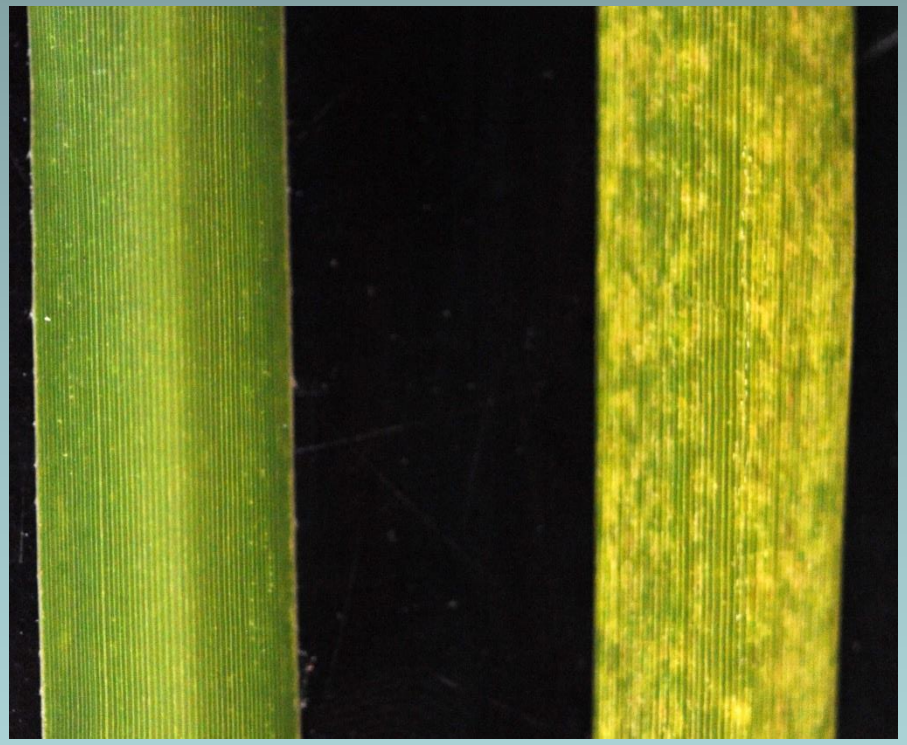

Reference Marsh Dredged Material

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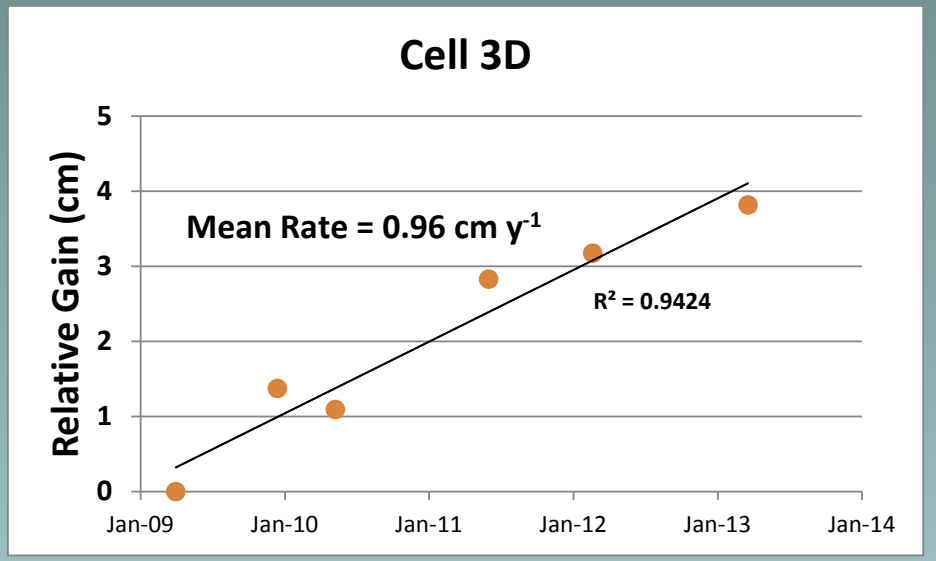
Common factor:
Reduced potential for sediment oxygenation

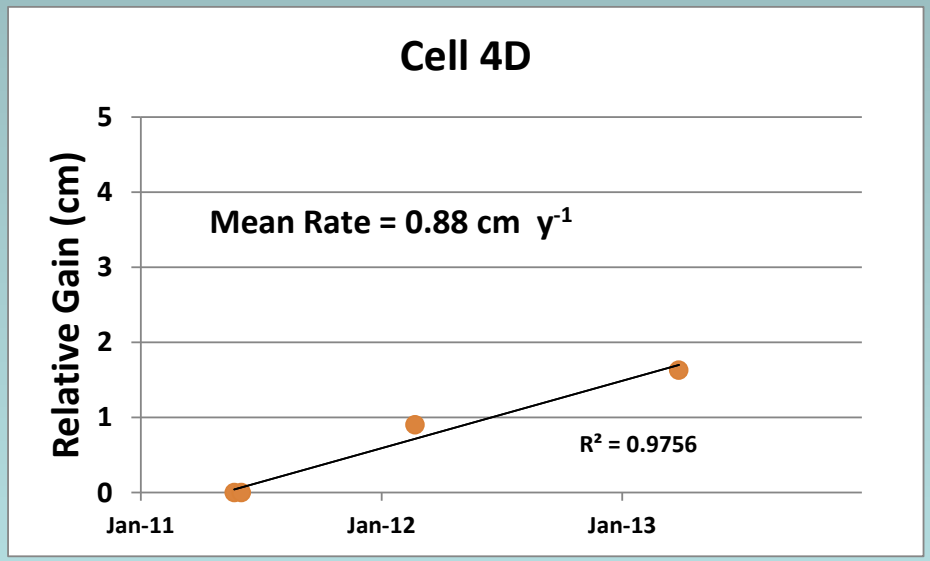
Muskrat grazing in Cell 3D

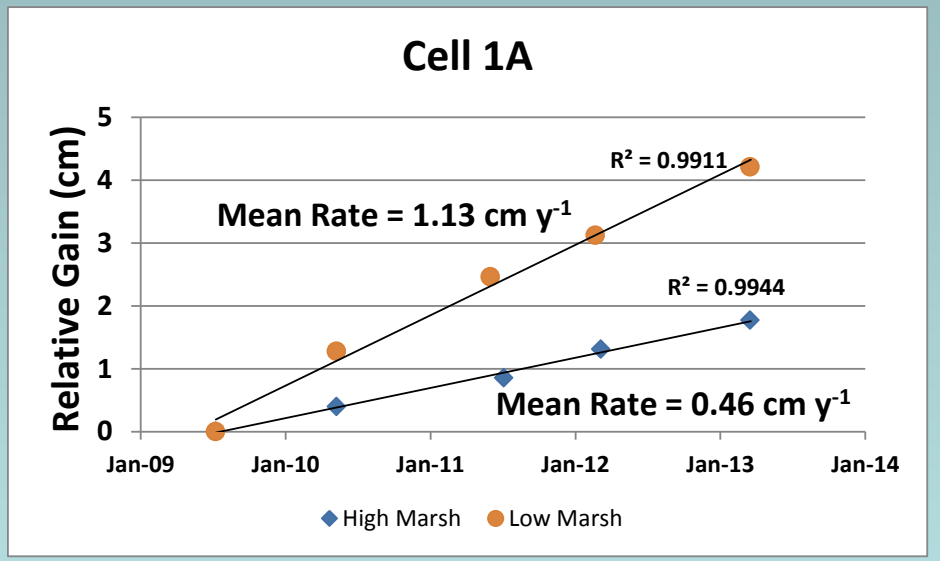
Silicon Amendment

Elevation Change 2009-2013

Upper Chesapeake Bay sea level rise = 3-4 mm y^{-1}

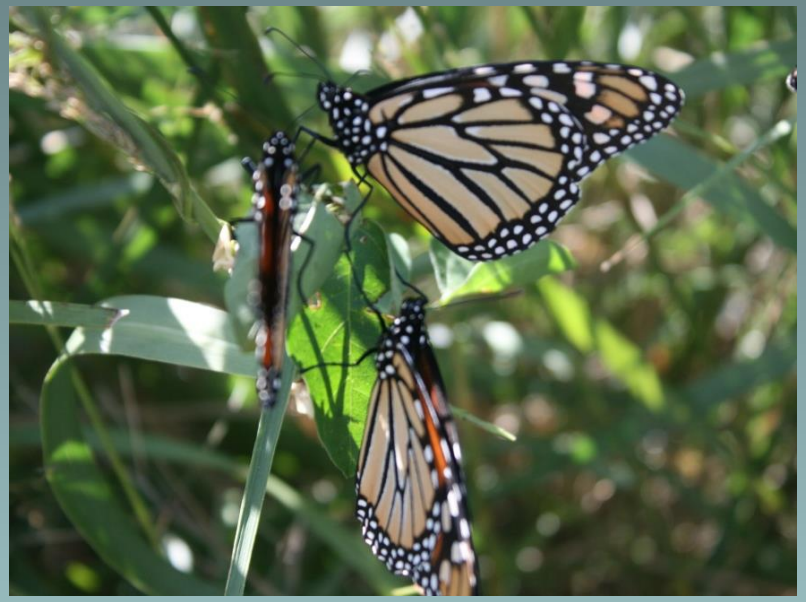






Conclusions

- High fertility substrate leads to pulsed macrophyte production
- Oscillations decline over time as the N supply declines
- Silicon amendments may help prevent die-back
- Sustainability – sea-level rise and eutrophication are both important factors



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