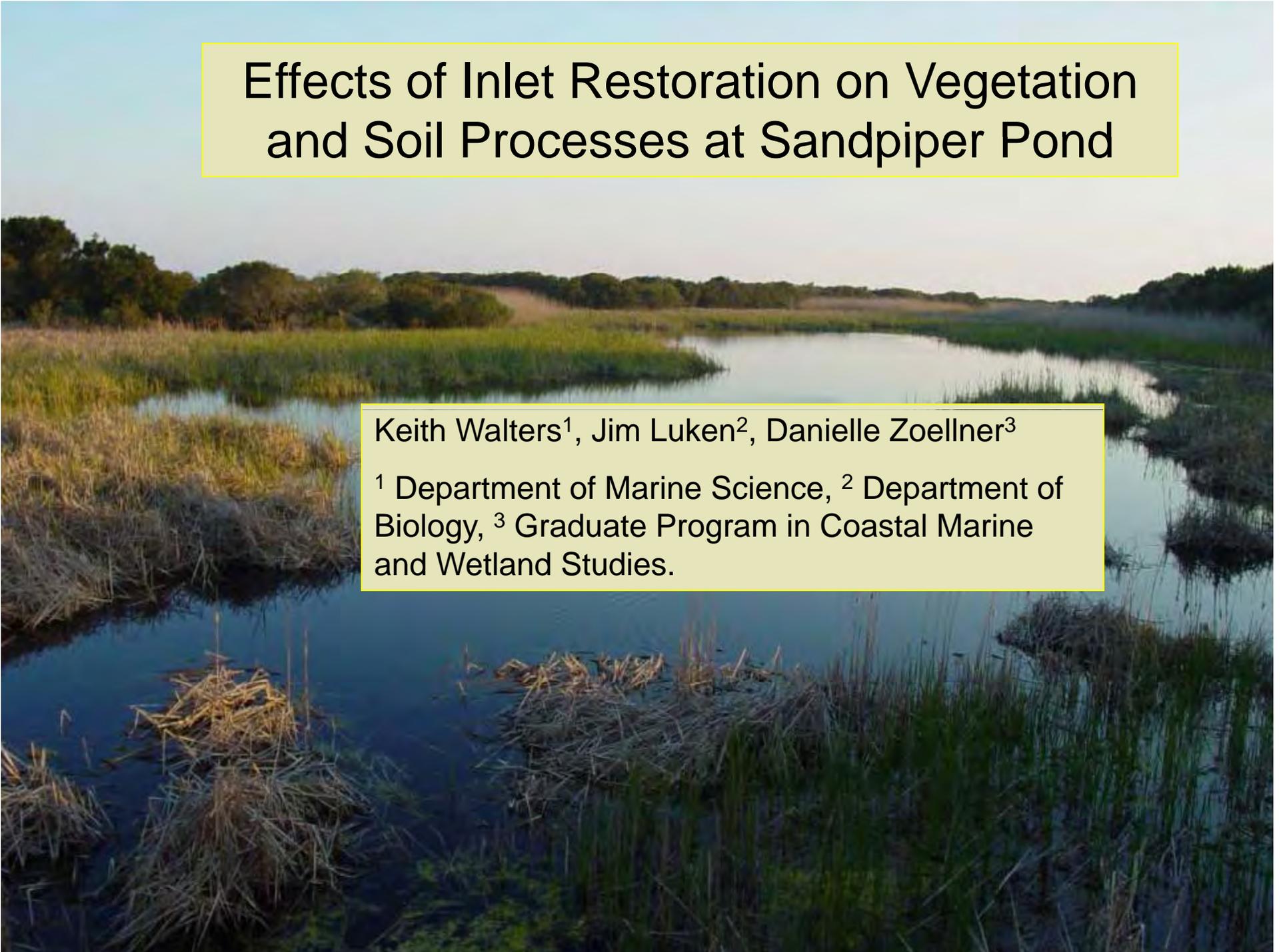


# Effects of Inlet Restoration on Vegetation and Soil Processes at Sandpiper Pond

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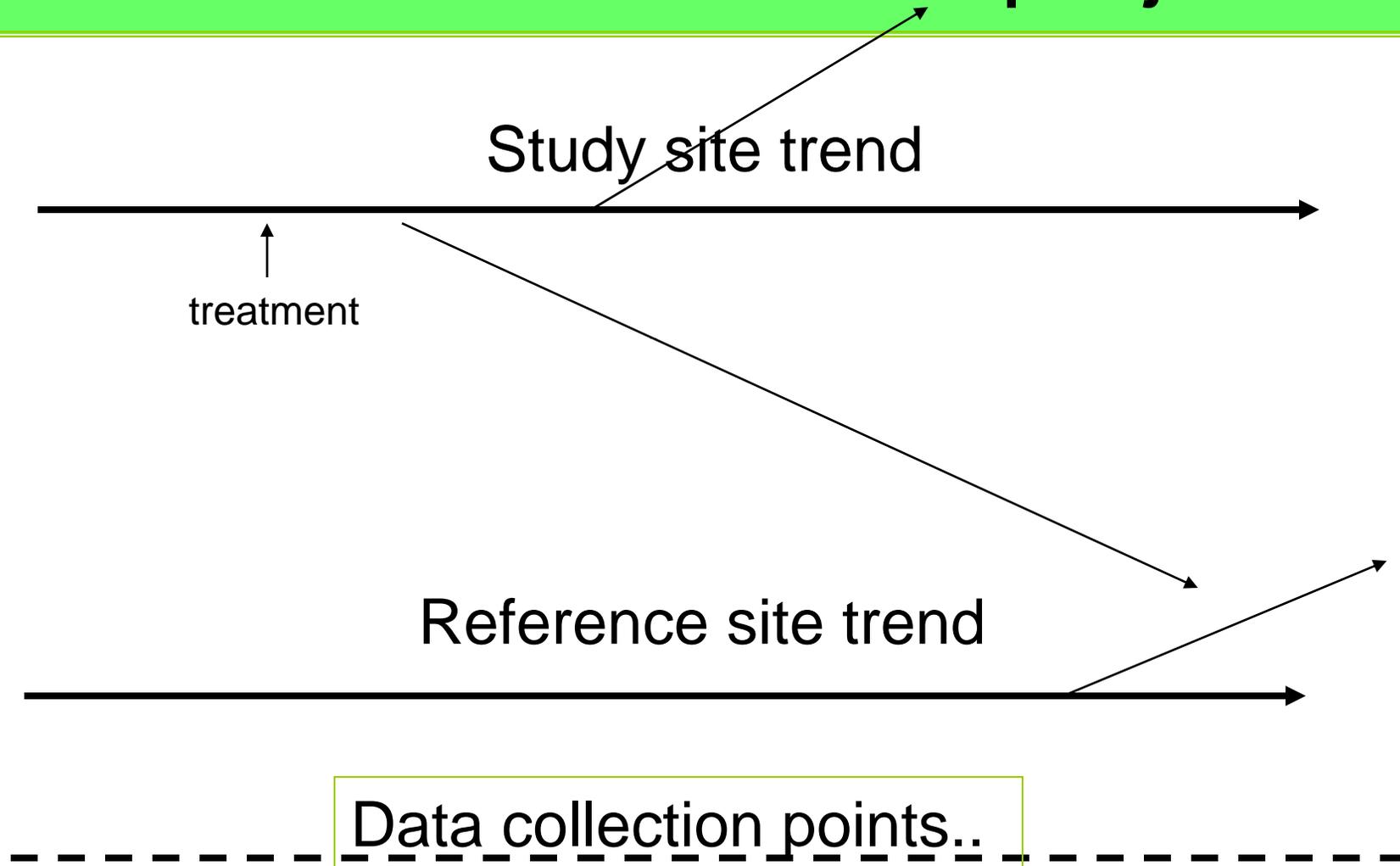
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# Research Objectives

- Characterize changes in marsh vegetation associated with inlet opening.
- Characterize changes in soil properties associated with inlet opening.
- Characterize rates of system change associated with inlet opening and compare these rates with reference systems.

# The ideal restoration project:



Invasions, natural disturbances, pathogens, human impacts, funds dry up

Which kid is having more fun??????



# Some problems with previous restoration efforts.....

- Lack of pre-treatment data.
- Poorly chosen reference sites.
- Lack of clearly stated management goals.
- Short-term data or no data.
- Management goals focused on “system states” vs. “system trends”

We attempted to address some of these problems by....

- Collecting pretreatment data.
- Utilizing two reference sites.
- Collecting data through time over the long-term.
- Including environmental gradients in our sampling scheme.

# Salt Marsh Reference Site



# Jetty Pond Reference Site



Jetty Pond



# Sandpiper Pond Study Site





Phragmites

Typha

# Basic monitoring involved...

- Establishment of stations at all sites: n=6, Jetty pond; n=4, salt marsh, n=12, Sandpiper pond.
- Sampling three topographic positions on the shoreline.
- Plant coverage, biomass, soil salinity and organic content.



Marsh



Shoreline



Shrub zone



# The unexpected; the sideline

- In 2004 we found remnant (relic) populations of salt marsh vegetation around the edge of Sandpiper pond. *Juncus roemerianus*; *Spartina patens*
- In an effort to understand how one of these species responds to dramatic changes in soil salinity, we transplanted clumps of *Juncus* from the Salt Marsh Reference Site into both Jetty and Sandpiper Pond Sites.
- Stem demography of these transplants is being measured.

# Other unexpected results...



# The fundamental question:

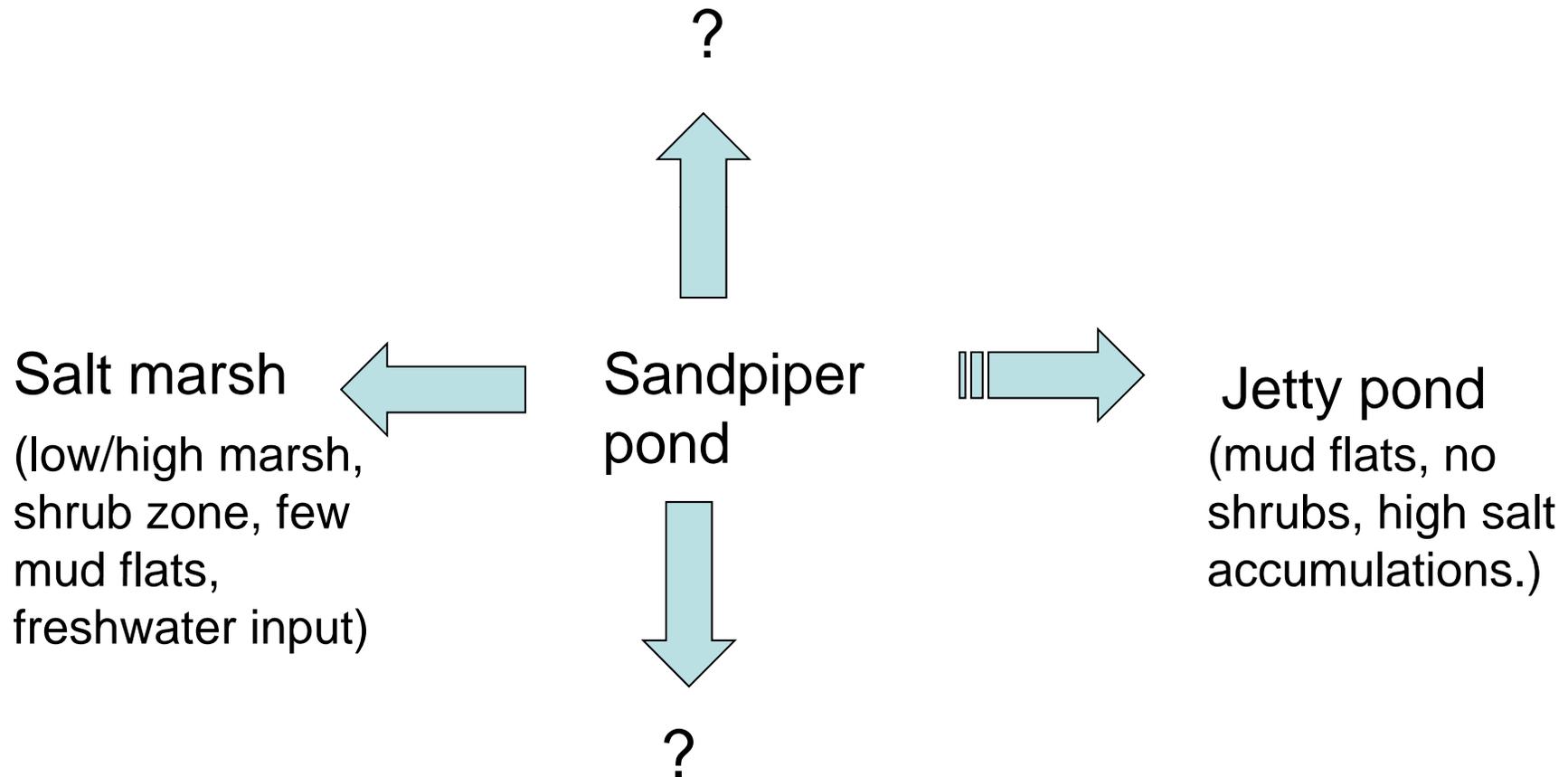
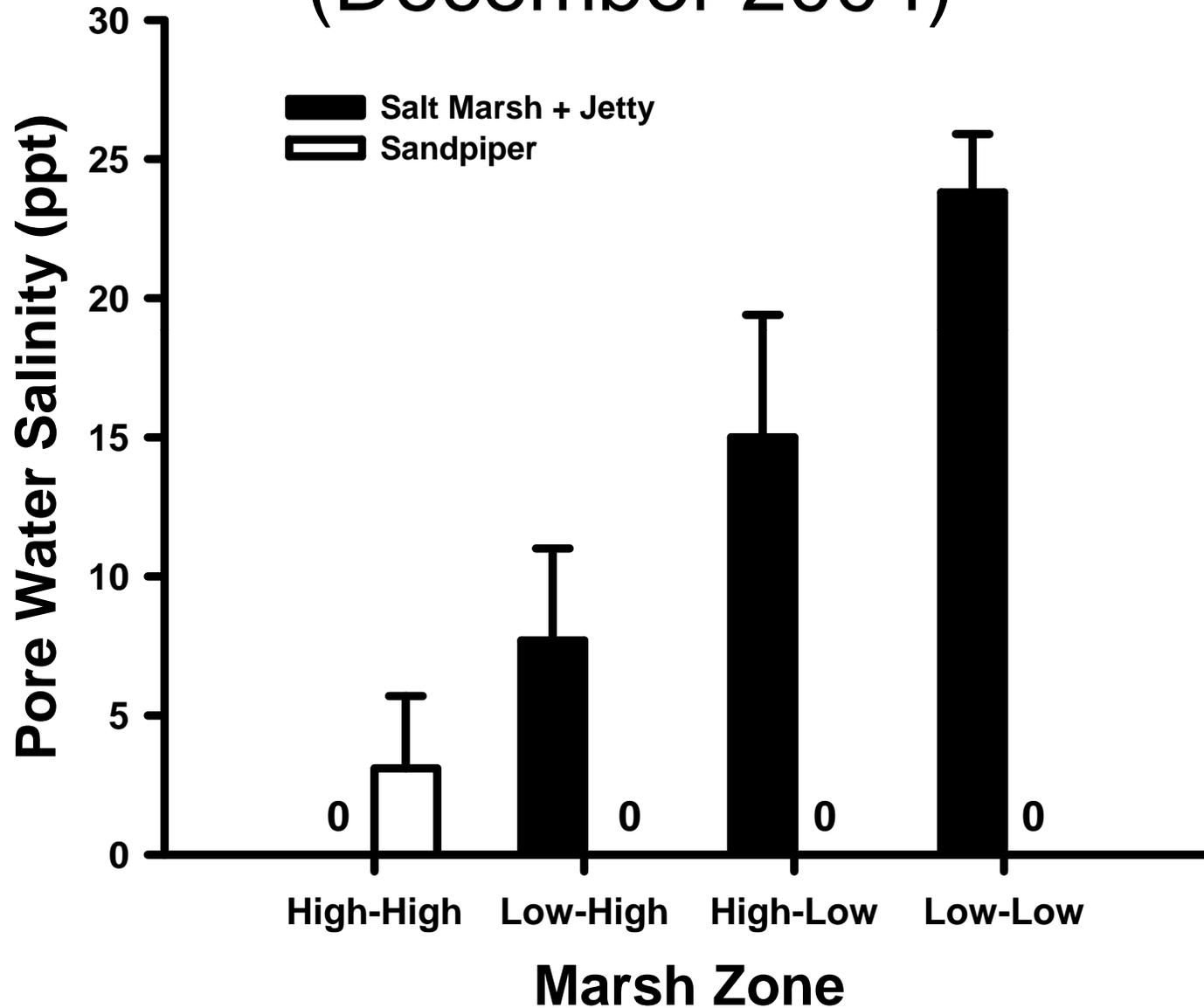


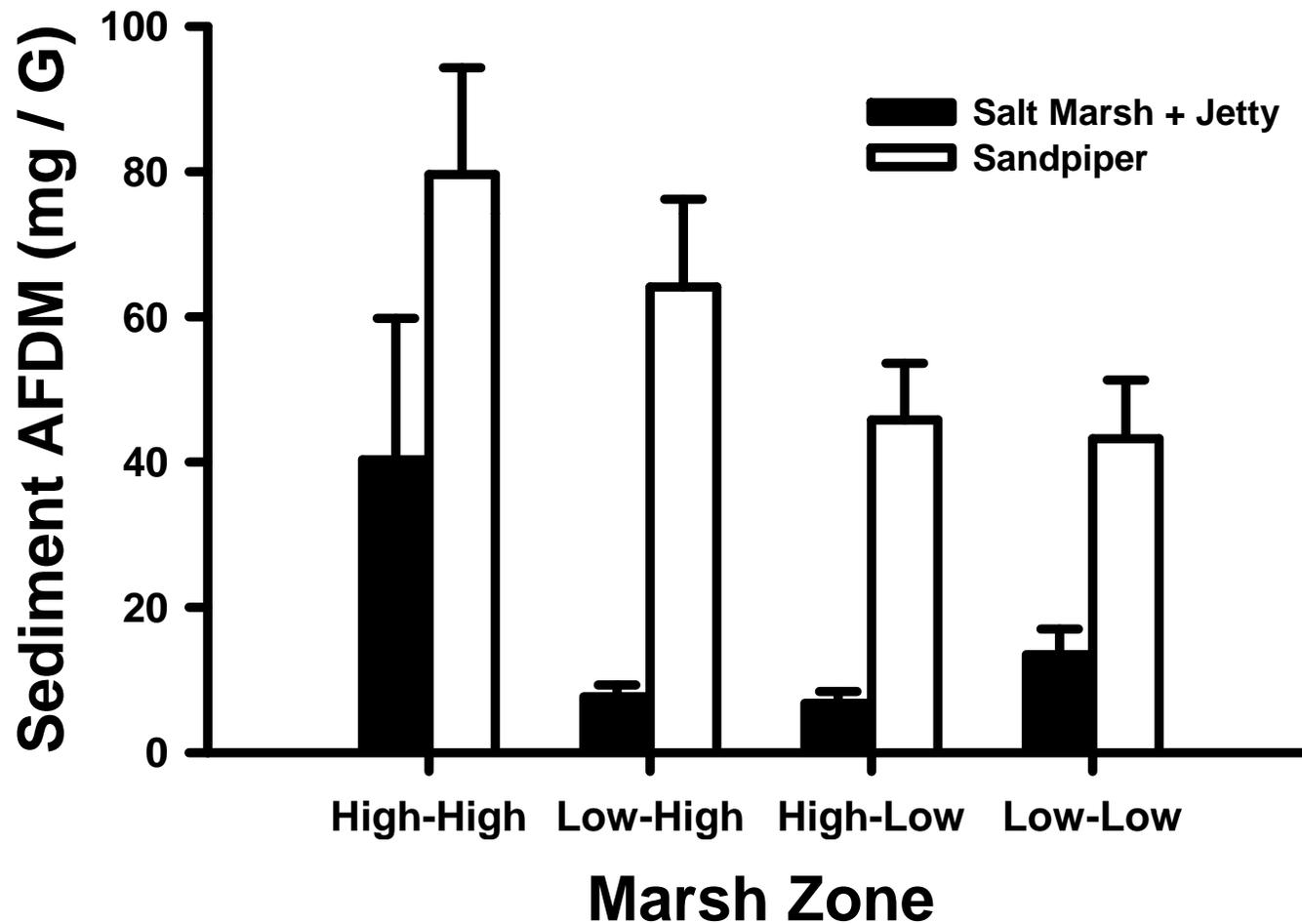
Table 1. Mean cover of dominant plant species at the edges of three marshes at Huntington Beach State Park, SC. Sandpiper pond (SP), Reference Pond (RP), and Saltmarsh (SM).

Species	Marsh Site		
	SP	RP	SM
<i>Borrichia frutescens</i>	-	-	8
<i>Distichlis spicata</i>	-	-	8
<i>Juncus roemerianus</i>	-	-	55
<i>Phragmites australis</i>	31	-	-
<i>Salicornia virginica</i>	-	23	-
<i>Spartina alternifolia</i>	-	13	-
<i>Spartina patens</i>	-	12	-
<i>Typha spp.</i>	37	-	-

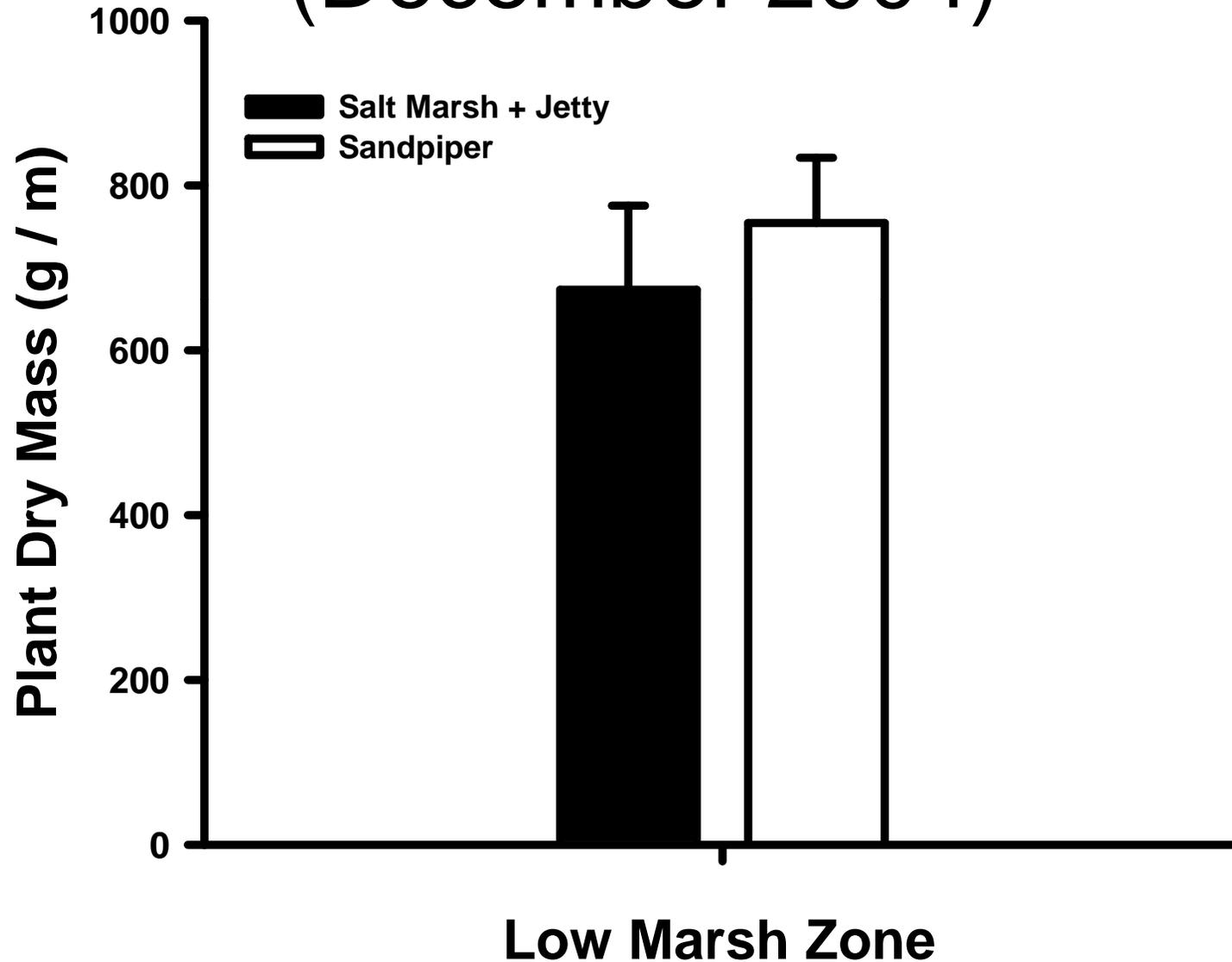
# Mean Soil Salinities (December 2004)



# Mean Soil Organic Content (December 2004)



# Mean Dry Mass of Marsh Plants (December 2004)



# So far we know that...

- Plant communities in Sandpiper are different from our two reference sites.
- In the pond proper (wet positions) the vegetation is dominated by monospecific patches of *Phragmites* and *Typha*.
- Soil pore water salinities generally are greater but organic content is significantly less within our reference sites.
- Relic patches of salt marsh species still persist around the edges of Sandpiper. These should expand as other species are reduced.
- After one year of monitoring, there is little evidence of change in the Sandpiper plant communities. However, in areas near the new inlet plants are showing signs of salt stress.
- *Juncus* can persist in a wide range of soil salinities.
- This is a great system for introducing students to the unpredictable aspects of field research.

# Future system changes will depend on:

- Persistence of saltwater influx from the new inlet.
- Pattern of saltwater efflux from Sandpiper. Freshwater input???
- Responses of the different plant species (residents and new colonizers) *Spartina alterniflora*??
- Long-term changes in the barrier island landscape.