

## ANALYSIS OF LACUSTRINE SEDIMENTS AND THEIR EFFECT ON SUBMERGED AQUATIC VEGETATION IN LAKE OKEECHOBEE

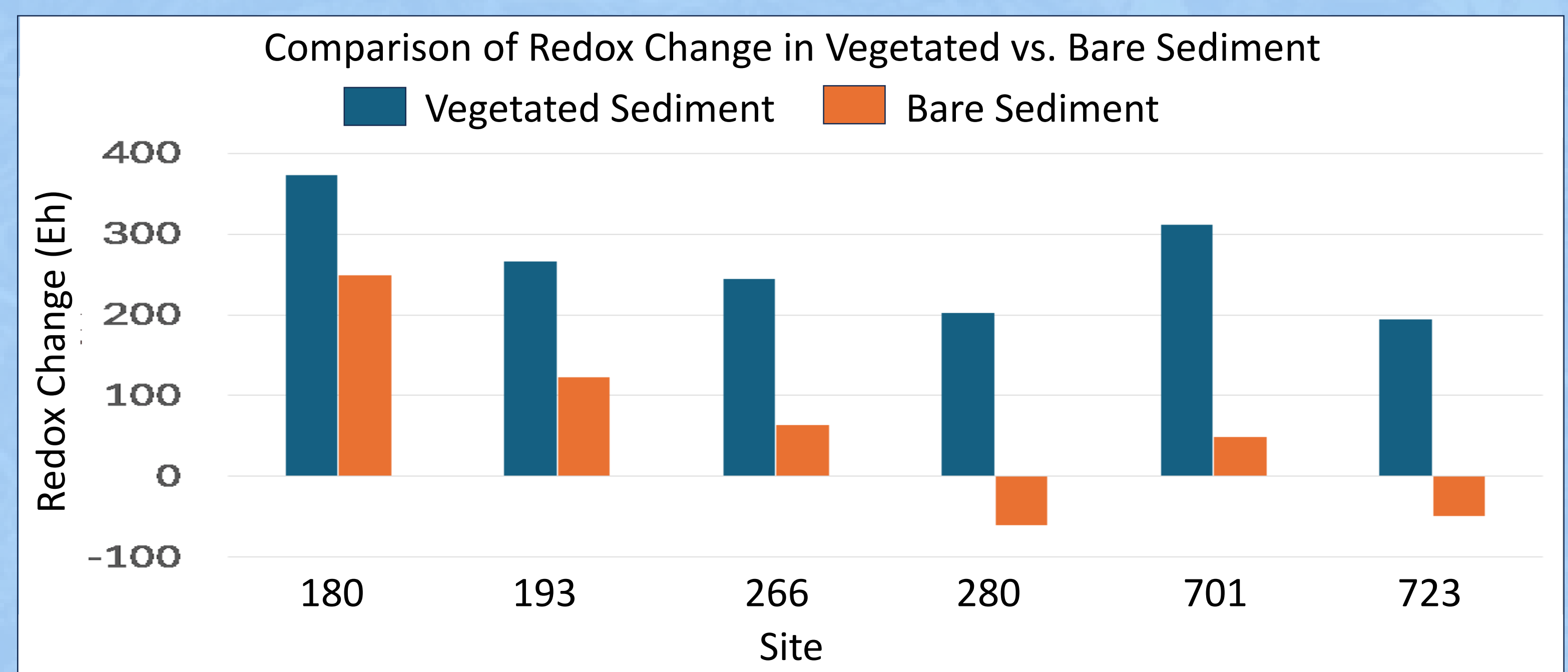
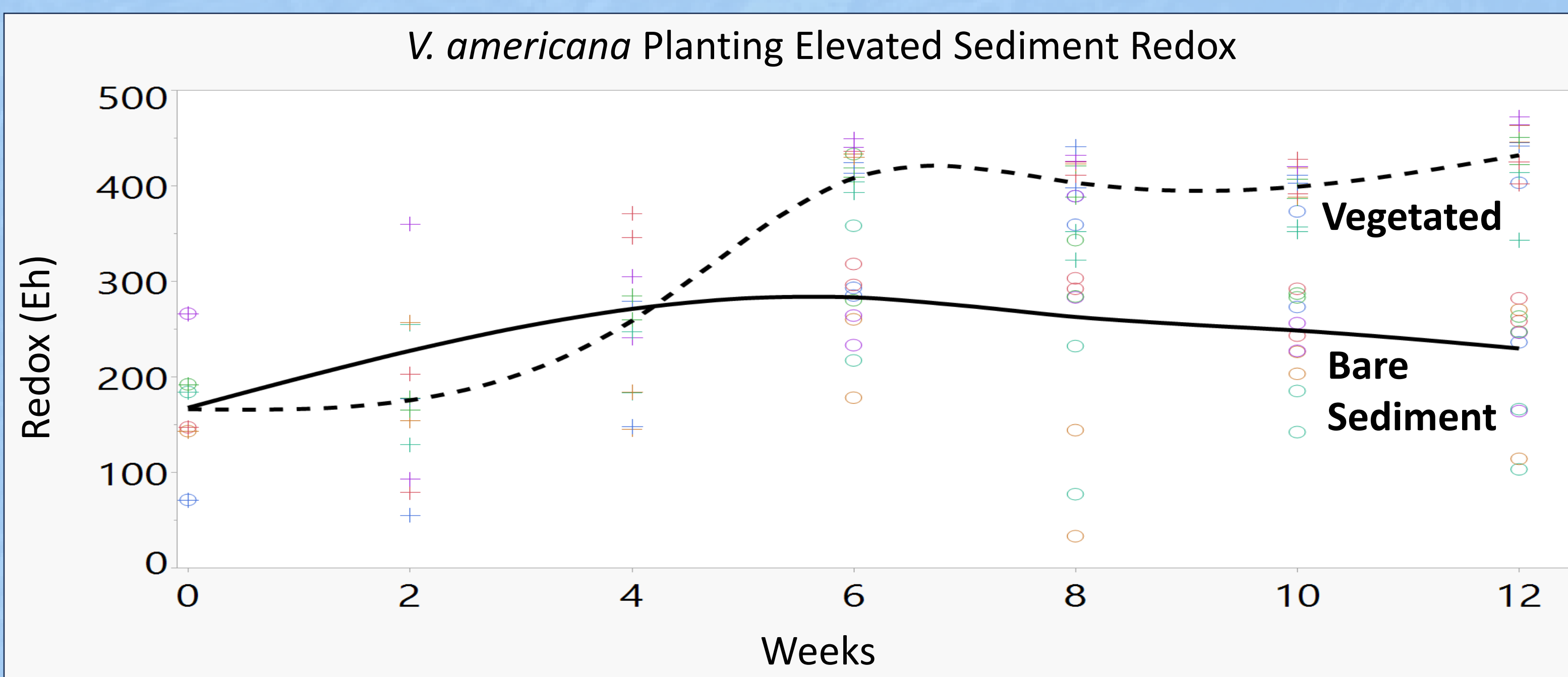
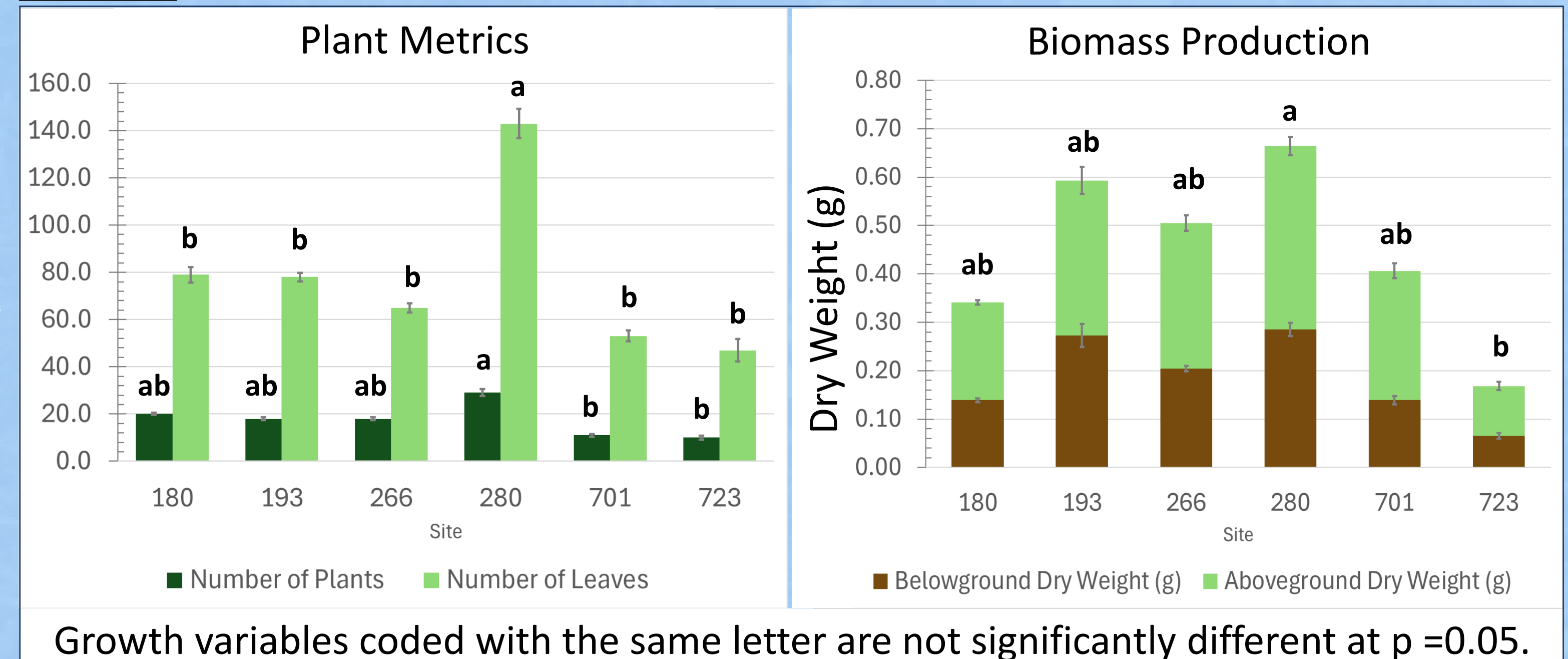
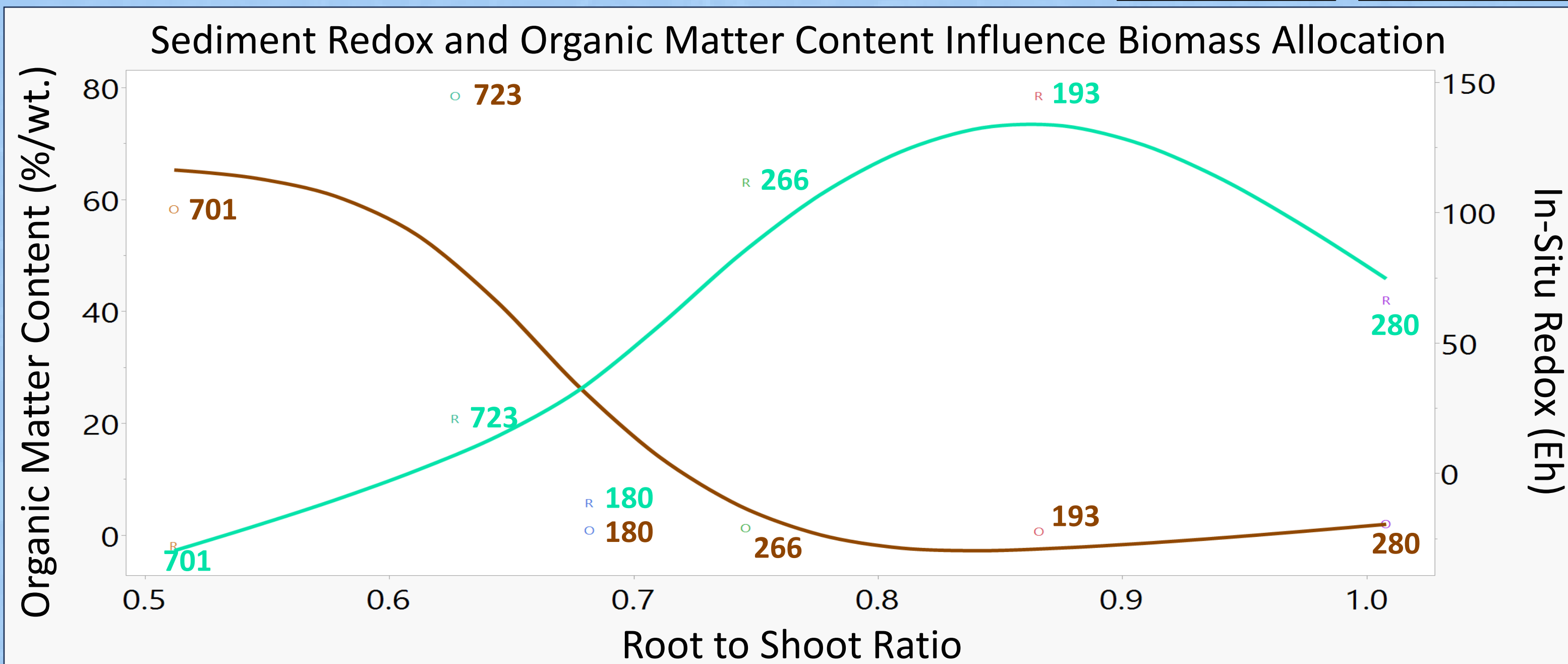
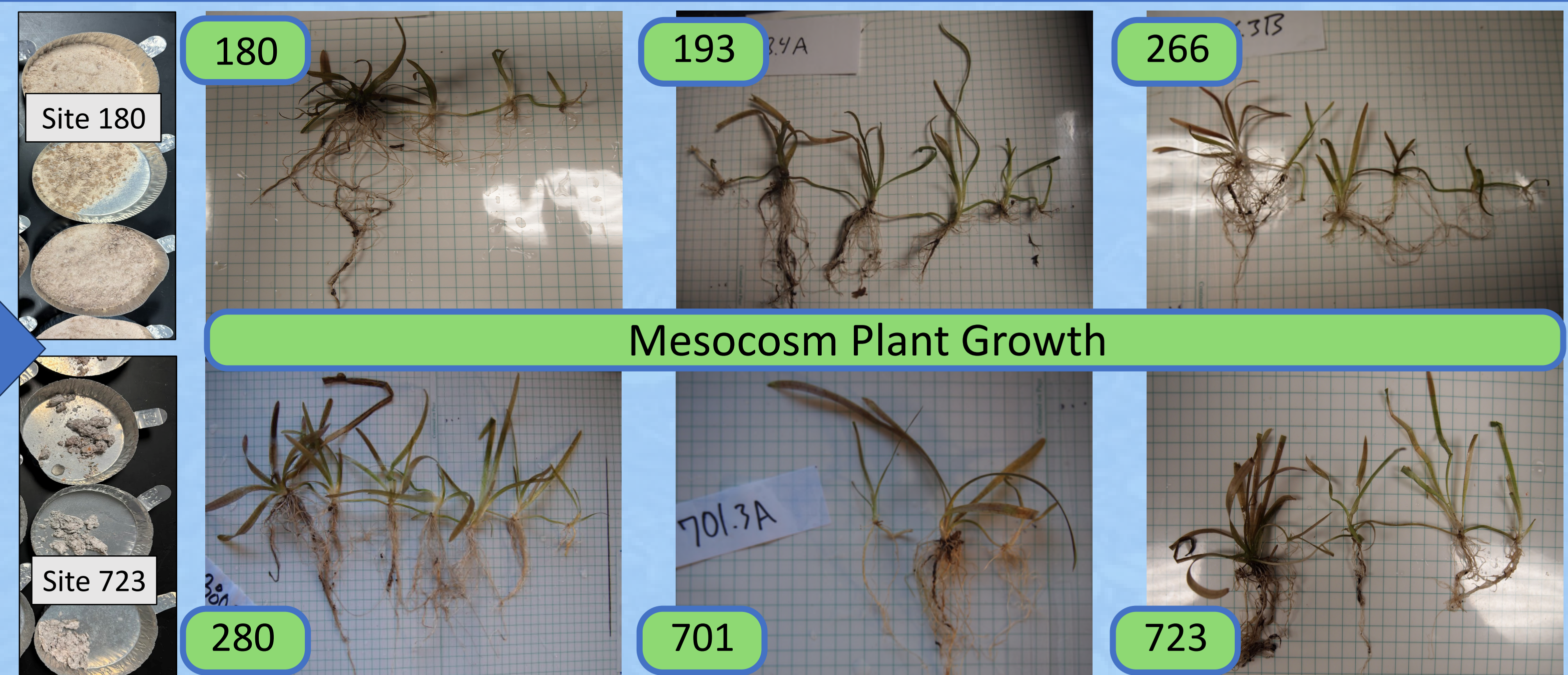
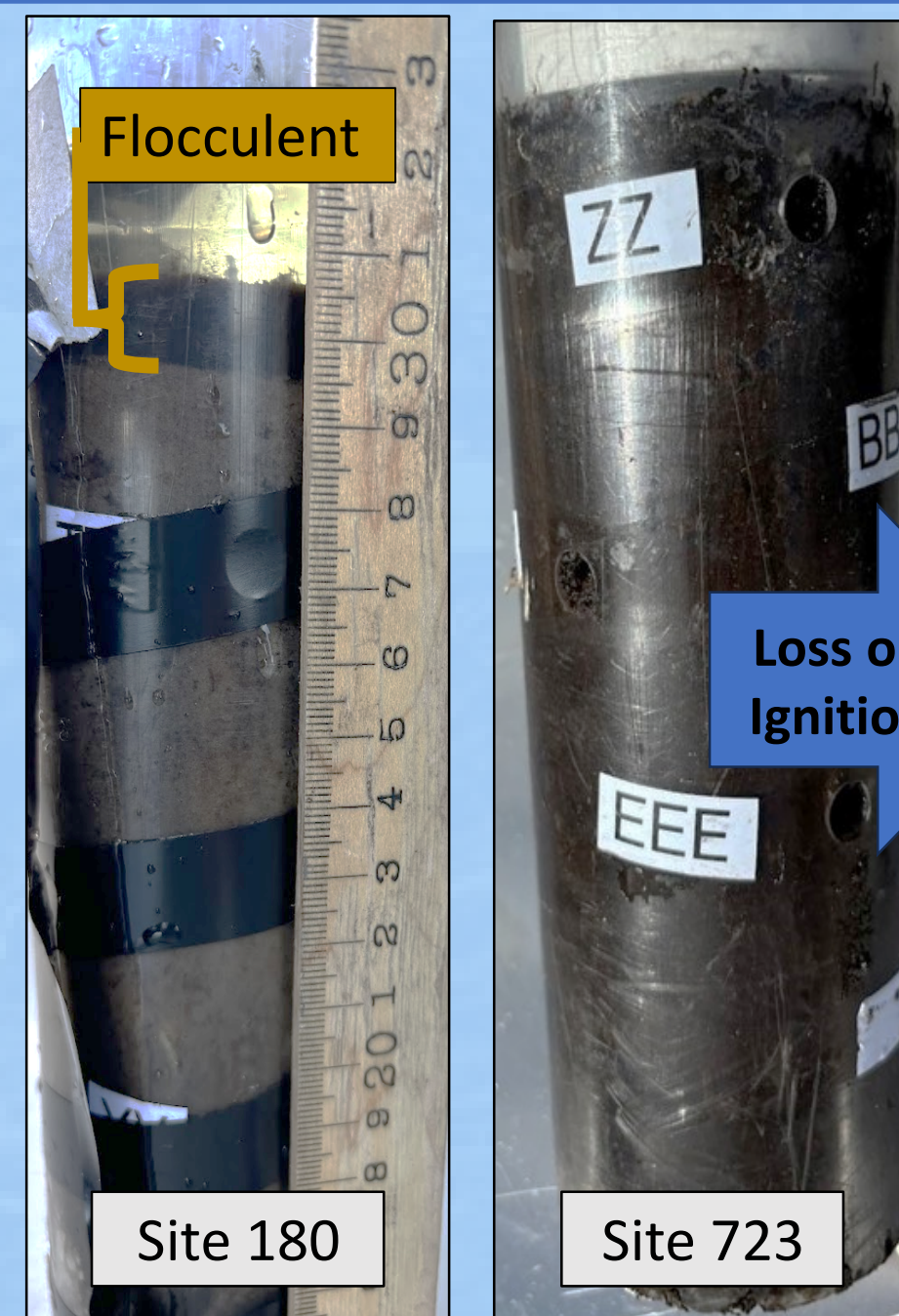
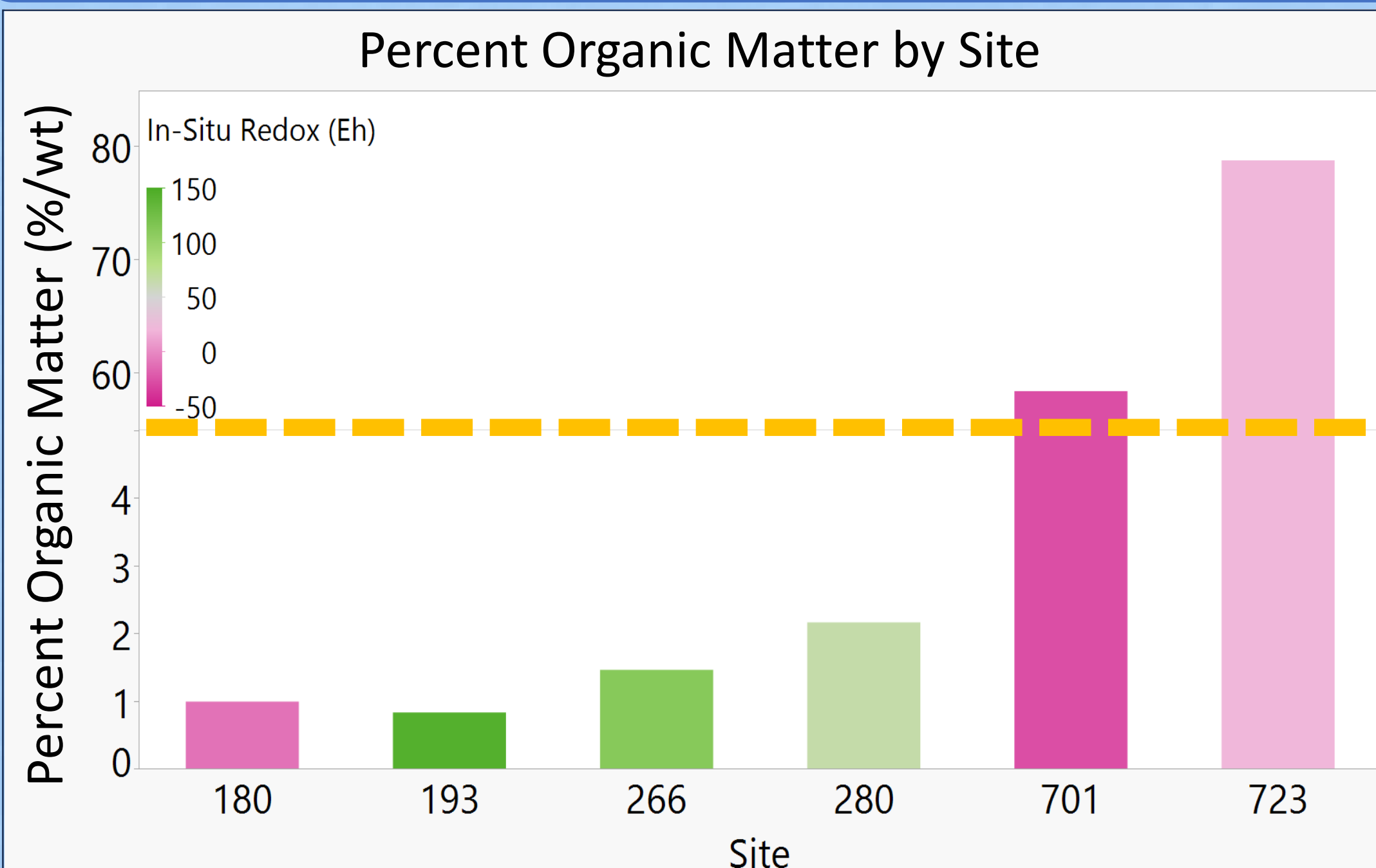
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## Key Findings

- ❑ Sites found in the southern portion of the lake (Ritta Island) contain approximately 30-40 times more organic matter (58-80%) than sites within Fisheating Bay (1.4-2.2%) or Indian Prairie (< 1%) sites. Similarly, sediments with high organic matter content generally exhibited more reducing conditions (-27 to +21 Eh) compared to sites with more mineral composition (-11 to +145 Eh).
- ❑ High organic matter in the sediment was the strongest predictor of poor plant performance ( $R^2 = 0.55$ ), accounting for over half of the variability in overall *Vallisneria americana* growth. Sites with >20% organic matter significantly inhibited plant growth, particularly root development ( $R^2 = 0.60$ ).
- ❑ *V. americana* total biomass growth exhibit positive relationships with redox potential, confirming that more oxidized sediments support better overall plant growth.
- ❑ The growth of *V. americana* substantially increased sediment redox potential across all Lake Okeechobee sediment types sampled, creating approximately 150-250 Eh higher redox values compared to bare sediments.
- ❑ Sediment from Fisheating Bay, site 280, represented the “sweet spot” for *V. americana* growth, the combination of moderate redox potential (~67 Eh) and modest organic content (~2.2%) supported optimal root to shoot ratios and produced significantly higher biomass production and plant establishment.
- ❑ The most significant finding is the reciprocal relationship between sediment conditions and plant growth. *V. americana* growing in oxidizing, moderately enriched sediments actively maintain oxidized conditions and exhibited the best growth and strongest sediment oxidizing effect.

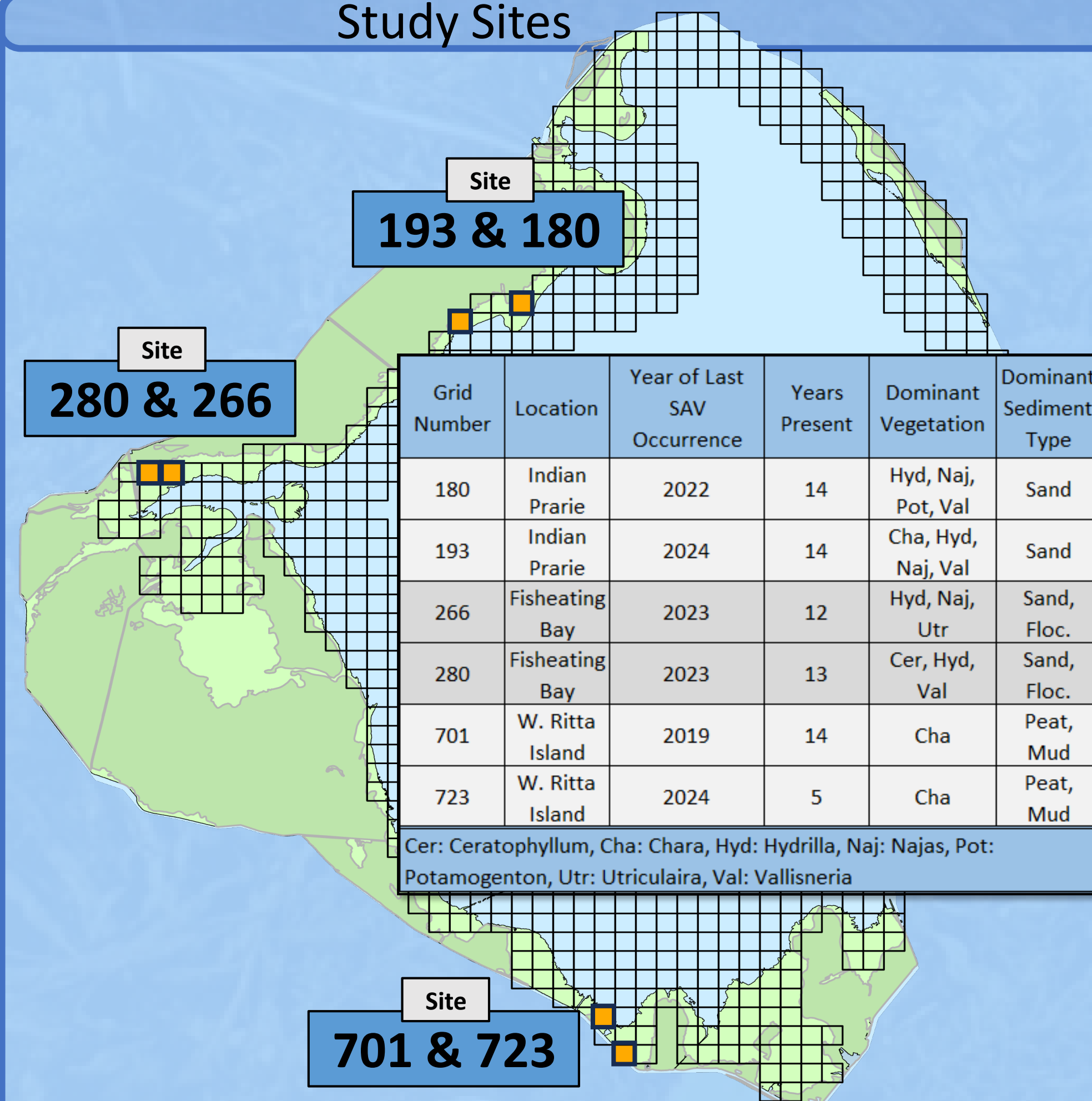
## Results



## Introduction

- Cultural eutrophication has accelerated nutrient accumulation in Lake Okeechobee.
- Physical conditions—wide fetch, high water levels, and resuspendable P-rich mud—promote nutrient buildup nearshore, especially at high water levels.
- These factors could impair SAV growth and favor a shift to a turbid, phytoplankton-dominated system.
- SAV coverage is now near-record lows (<3,300 acres), far below the 50,000-acre target of CERP.
- Sediment changes (e.g., more organic matter) may fuel microbial respiration, leading to hypoxia, metabolic stress, and increased phytotoxins.
- SAV and oxygenated sediments form a feedback loop—SAV oxygenates sediments but also depends on them.
- Our research investigates whether sediment hypoxia limits SAV recruitment and persistence, guiding restoration strategies.

## Study Sites



## Methods

- Sediment cores were collected from three ecological zones: Persistent SAV presence, recently lost SAV, & SAV absence for 3–5 years.
- Cores were analyzed for: Redox potential at 2-cm intervals using Mettler Toledo Redox Micro sensors, organic matter content via loss-on-ignition at 550°C, bulk density, & suitability for *Vallisneria americana* growth in a controlled mesocosm assay.
- Mesocosm experiment design: Four replicate cores per site (two treatment, two control), Upper 10 cm of sediment transferred to nursery pots.
  - Redox measured biweekly
- Maintained in 150-gallon mesocosms under artificial LED light (~100  $\mu\text{mol/s/m}^2$ , LI-COR 193SA).
  - Ambient temperature, 85-day duration
- Plant response variables measured post-experiment:
  - Above- and belowground biomass
  - Maximum leaf, root length & total leaf count