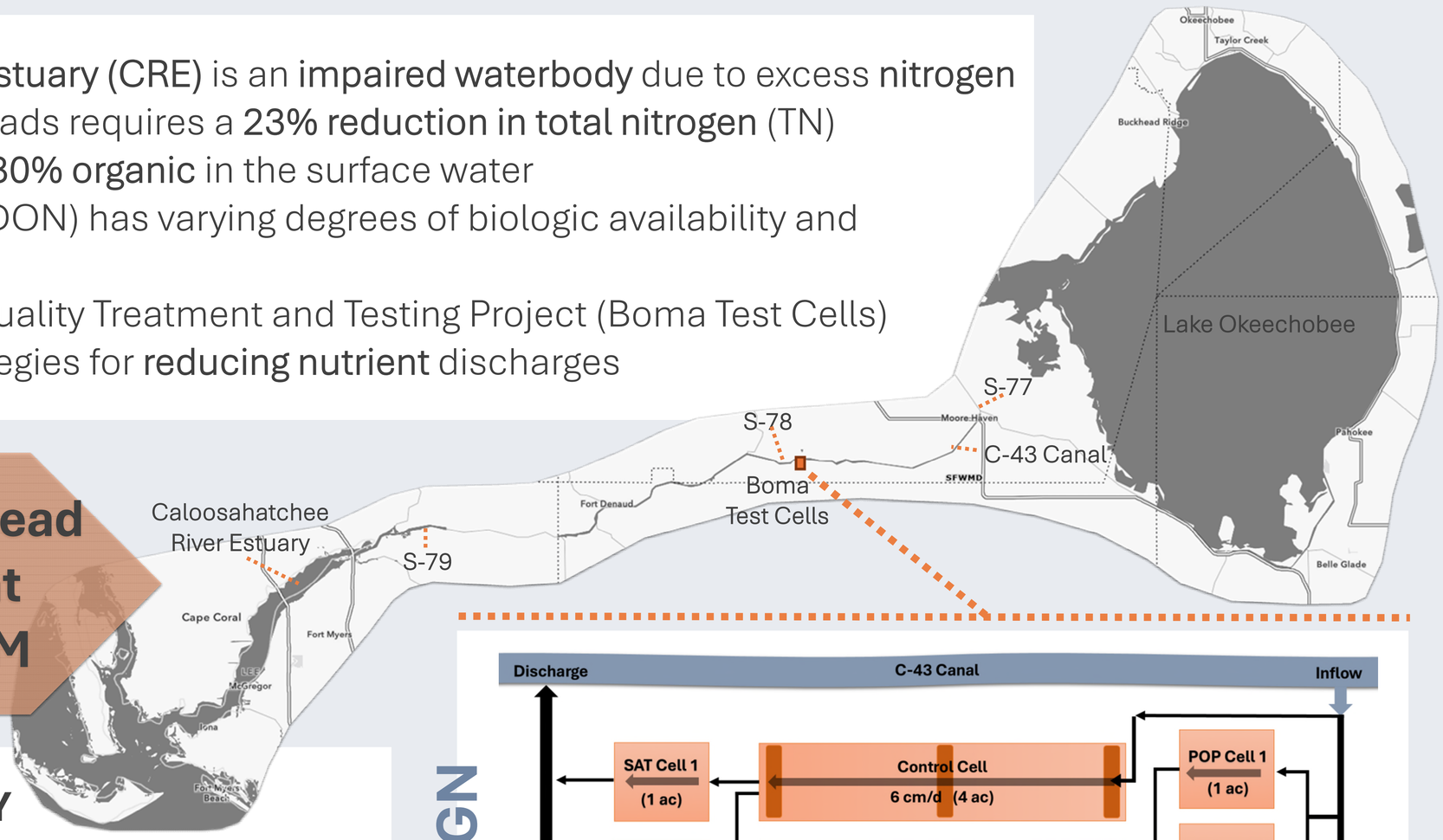
WETLAND-BASED STRATEGIES FOR REDUCING NITROGEN: THE C-43 WATER QUALITY TREATMENT AND TESTING PROJECT - PHASE II

SARAH BORNHOEFT, CASSONDRA ARMSTRONG AND NATHAN GAVIN

INTRODUCTION

- Caloosahatchee River and Estuary (CRE) is an **impaired waterbody** due to excess **nitrogen**
- CRE Total Maximum Daily Loads requires a **23% reduction in total nitrogen** (TN)
- Total dissolved nitrogen is **≈ 80% organic** in the surface water
- **Dissolved organic nitrogen** (DON) has varying degrees of biologic availability and is **difficult to remove**
- Phase II of the C-43 Water Quality Treatment and Testing Project (Boma Test Cells) will **test wetland-based** strategies for **reducing nutrient** discharges

EXCESS NITROGEN can lead to ALGAL BLOOMS that HARM THE ECOSYSTEM



LESSONS LEARNED

PHASE I MESOCOSM STUDY

What wetland vegetation community provided the best treatment performance for TN and DON?

- Emergent and submergent vegetation had similar ability to reduce nutrient discharges
- Both removed between 22-24% TN and 3.1-4.4% DON

What hydraulic loading rate (HLR) had the most efficient nitrogen removal rate?

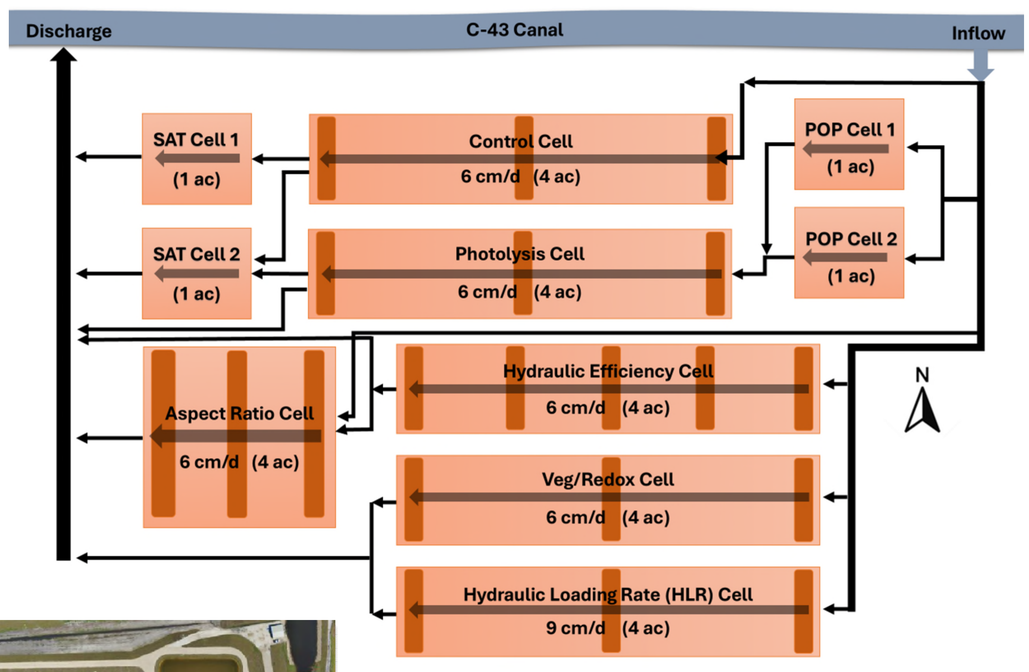
- HLR over the range tested (1.5 to 6 cm/d) did not have statistically significant differences in TN outflow concentrations

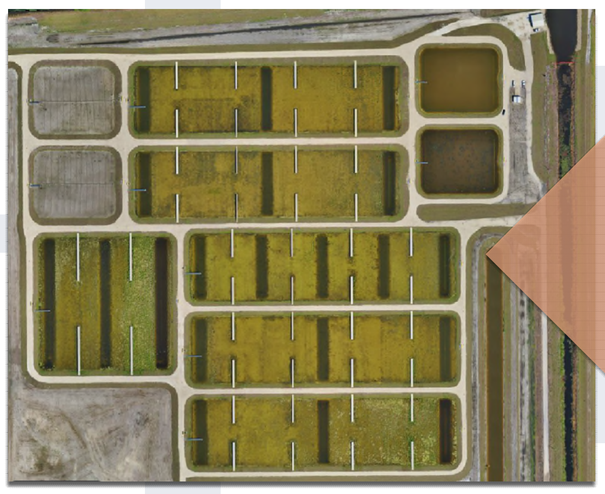
PHASE II TEST CELL STUDY

Can TN and DON be reduced by:

- Using periphyton-enhanced oxidative photodegradation (POP)?
  - Maximize UV exposure to breakdown DON (make it more available for biological use)
- Soil aquifer treatment (SAT)?
  - Filter out particulates and enhance denitrification process
- Alternating emergent and submergent vegetation?
  - Aerobic/anaerobic zones increase microbial diversity to maximize removal of N
- Increasing the hydraulic efficiency?
  - Design variables (aspect ratio and deep zone frequency) may enhance efficiency
- Increasing the nutrient removal total?
  - Higher flow rate may increase nutrient removal

SITE DESIGN





28 ACRES of experimental TREATMENT to OPTIMIZE NITROGEN REMOVAL

PROJECT STATUS

- Test cell construction and planting complete
- Three-year study beginning in May 2025
- Phased sampling design to test each hypothesis
- Non-replicated, repeated-measures format, with each experiment conducted independently