Floating Bog Interceptors (FBIs):

An innovative ecological tool for wetland protection

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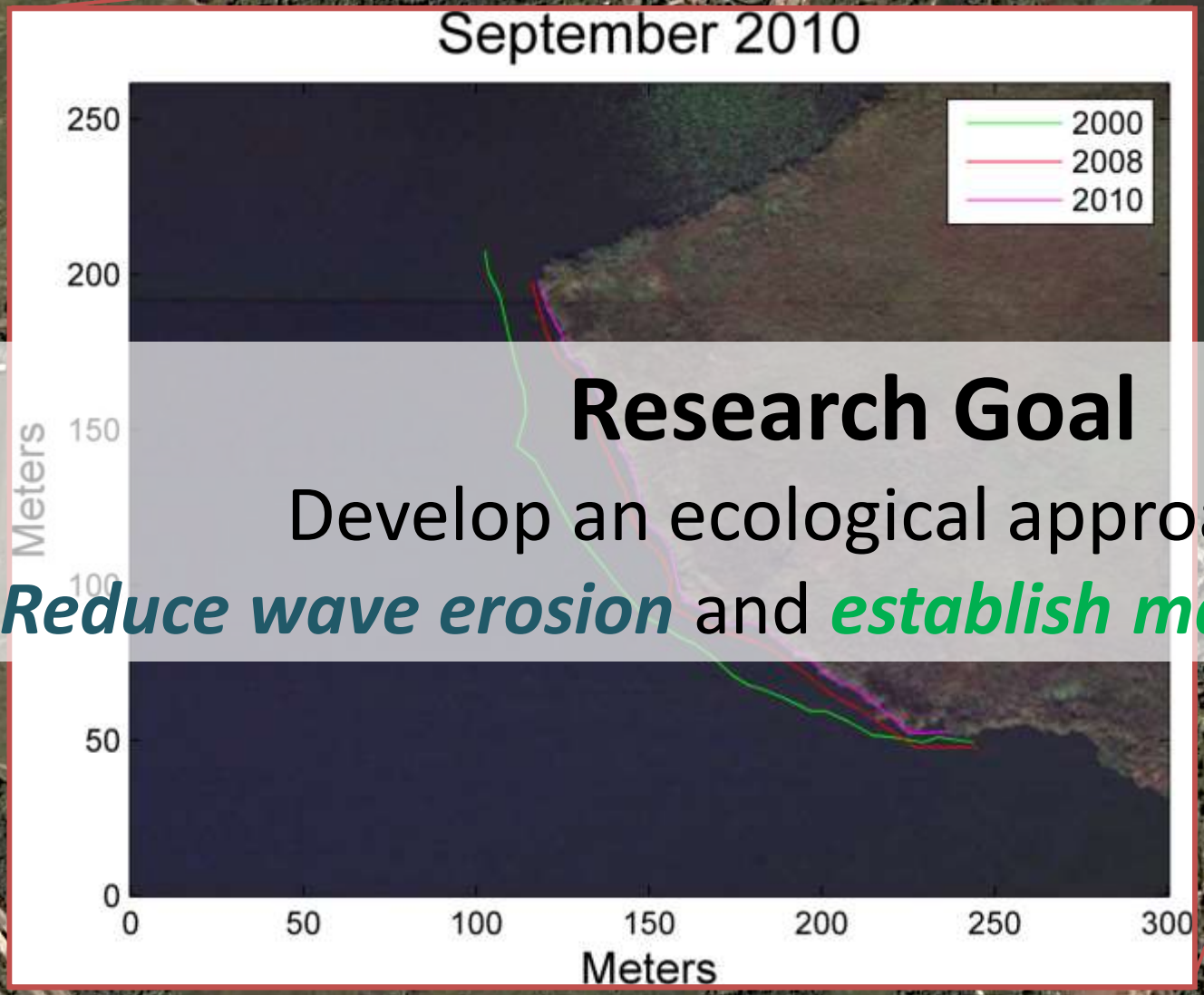
Yahara River
Cherokee Marsh
Downtown Madison

Cherokee Marsh is *disappearing!*

640 acres lost **~ 1 square mile**

Where to focus efforts?

- Difficulty growing vegetation
- Continued marsh erosion



Research Goal

Develop an ecological approach to:

Reduce wave erosion and ***establish marsh vegetation***

Approach

1. **Design** environmentally-friendly
   Floating Bog Interceptors (**FBIs**) **Gardens**

2. **Implement** and **monitor** performance
   - Wave energy attenuation
   - Sediment accumulation
   - Vegetation growth

3. **Assess** ecological functions
   - Vegetation diversity
   - Wildlife habitat
   - Community values

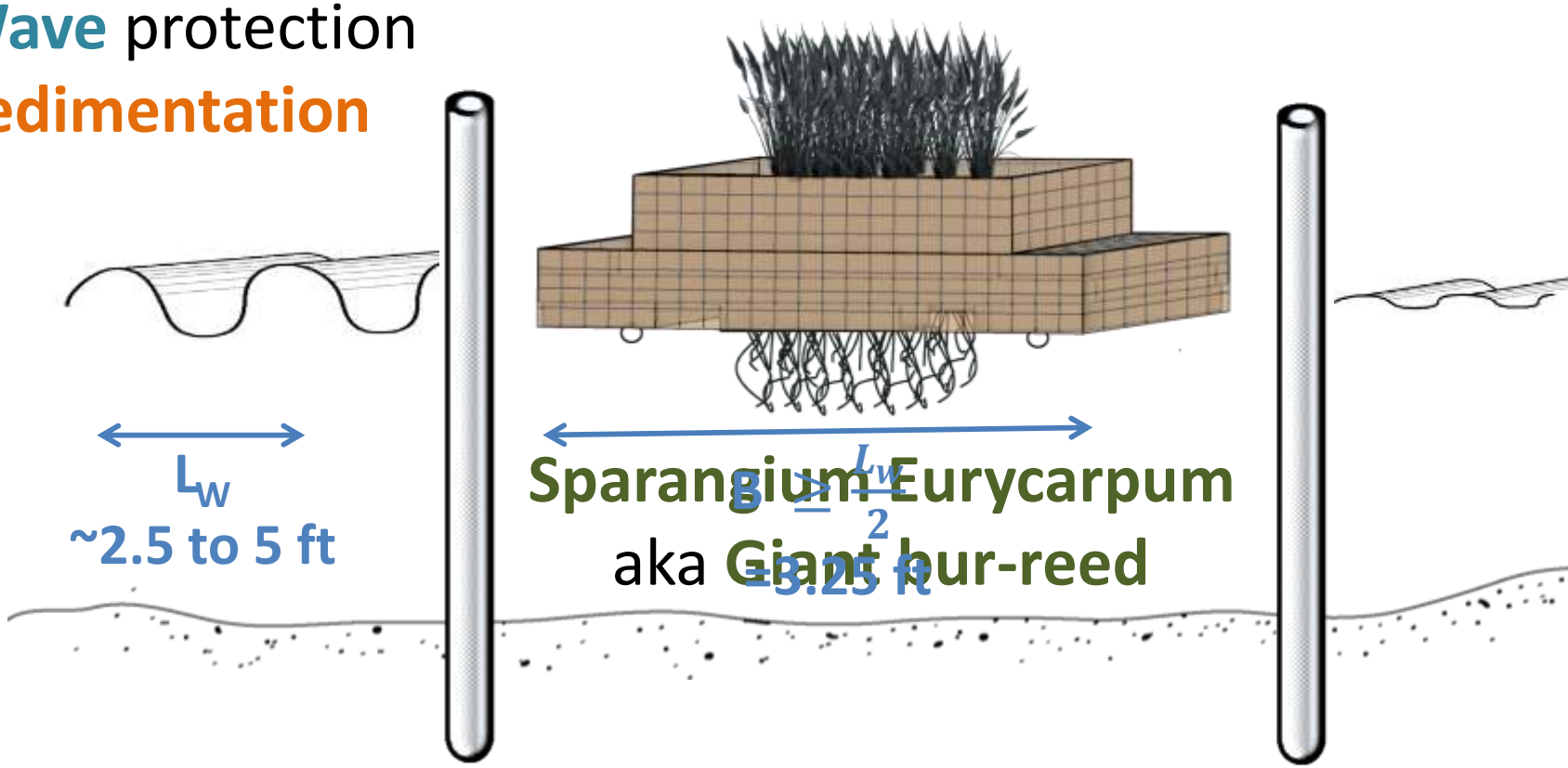
1. **Design** FBI Gardens

Ecological perspective:

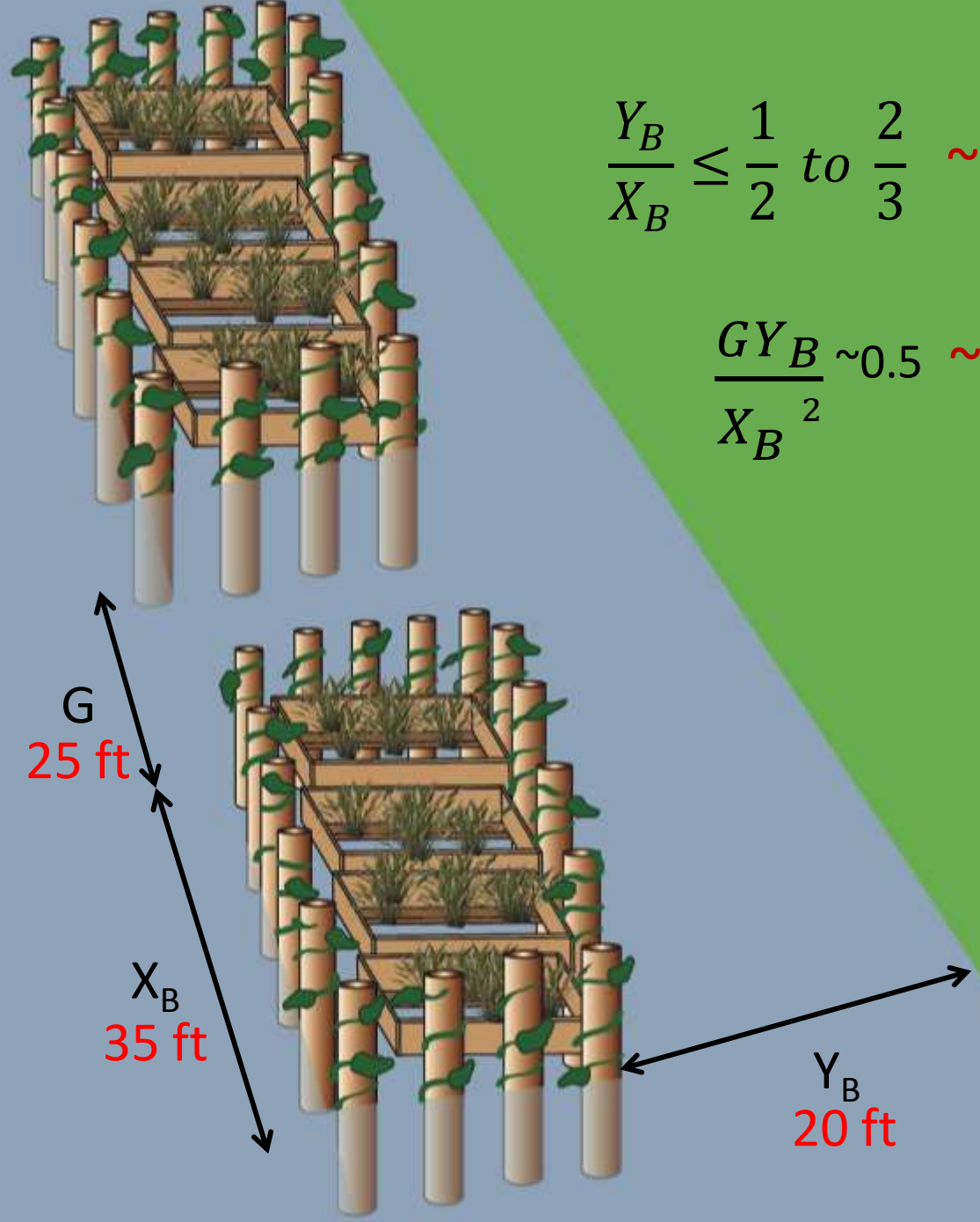
- All natural material
- **Vegetation** introduction

Engineering perspective:

- **Wave** protection
- **Sedimentation**



Sedimentation design



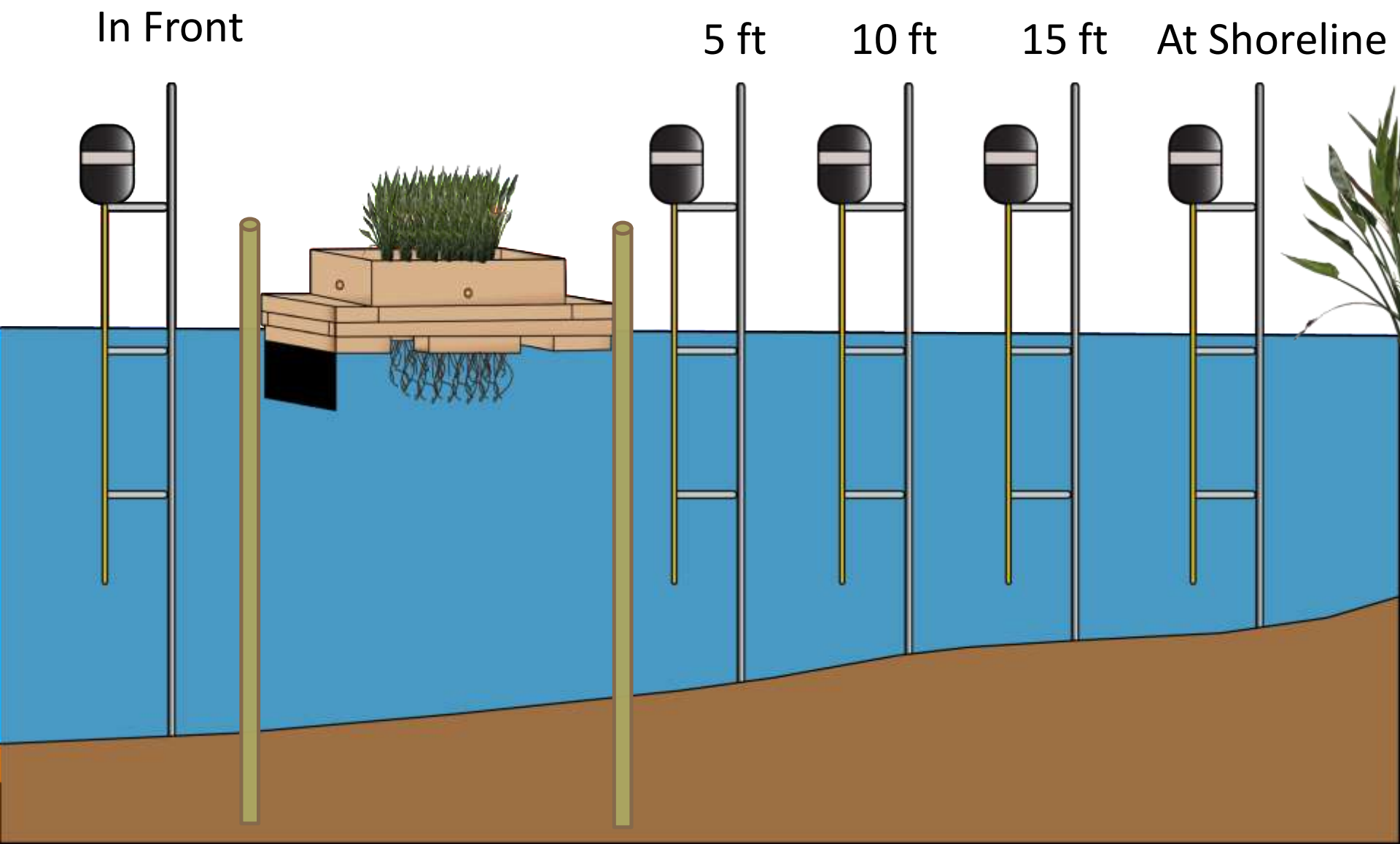
$$\frac{Y_B}{X_B} \leq \frac{1}{2} \; to \; \frac{2}{3} \quad \sim 0.6$$

$$\frac{G Y_B}{X_B{}^2} \sim 0.5 \quad \sim 0.4$$

2. Implement

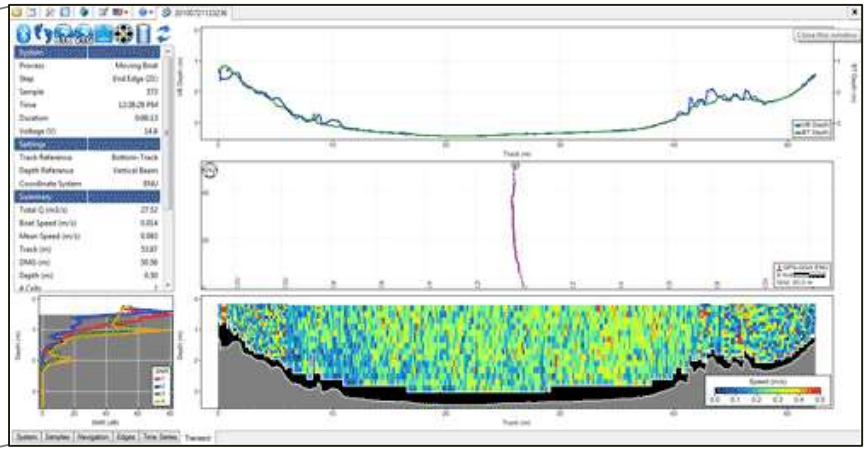
Fall 2013

2. **Monitor** Wave attenuation

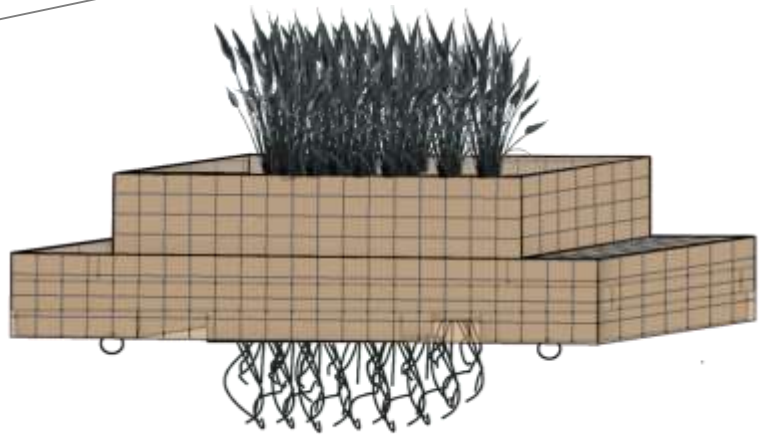


Bathymetry measurements

Submeter DGPS



Sontek RiverSurveyor

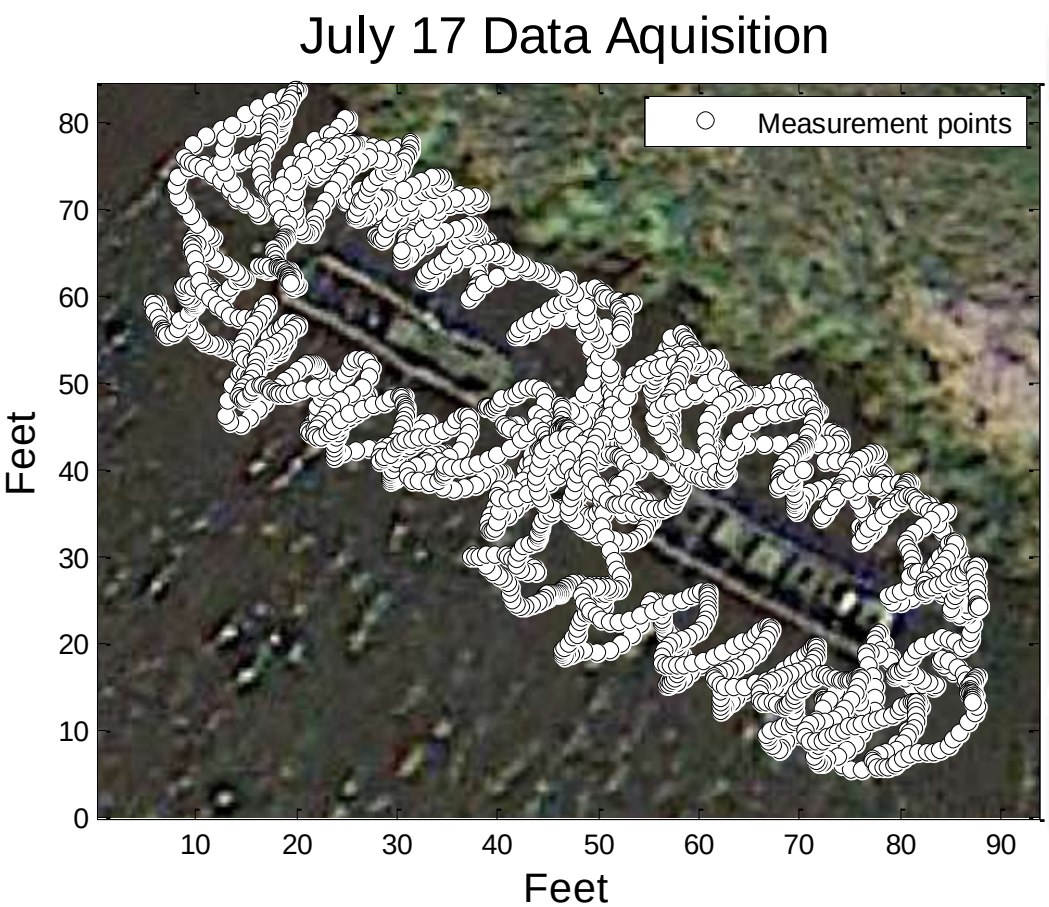


Acoustic signal

- Resolution: 0.001 m
- Accuracy: ±1%

Sediment accumulation

- Bathymetry collected monthly
- ~2000 ft^2 area
- ~2500 measurement data



Vegetation growth

- 4 time-lapse cameras
  - 8.0 MP resolution
- Hourly from 8 AM to 6 PM

Monitor

Sediment

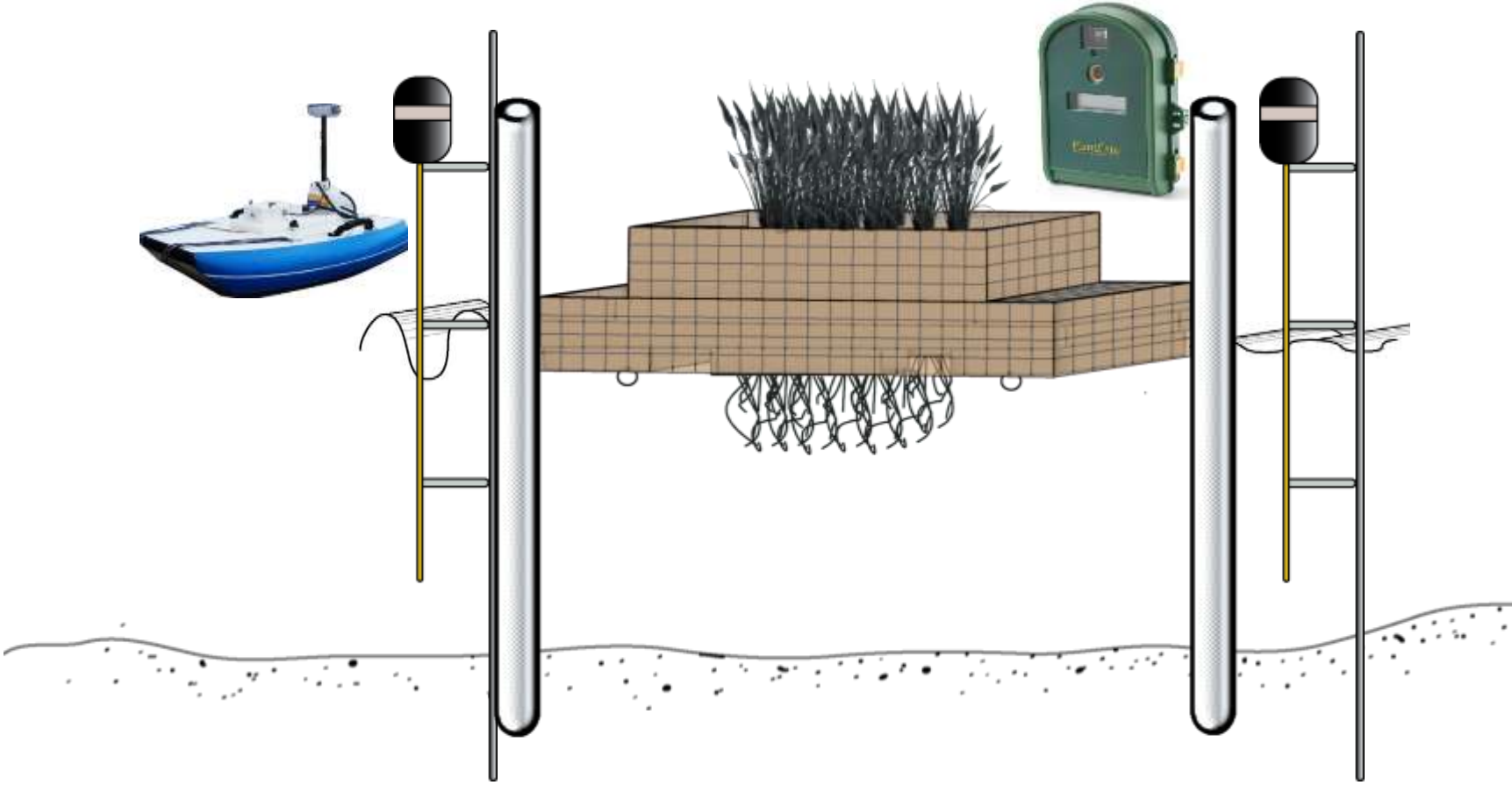
- RiverSurveyor

Wave

- Wave gauges

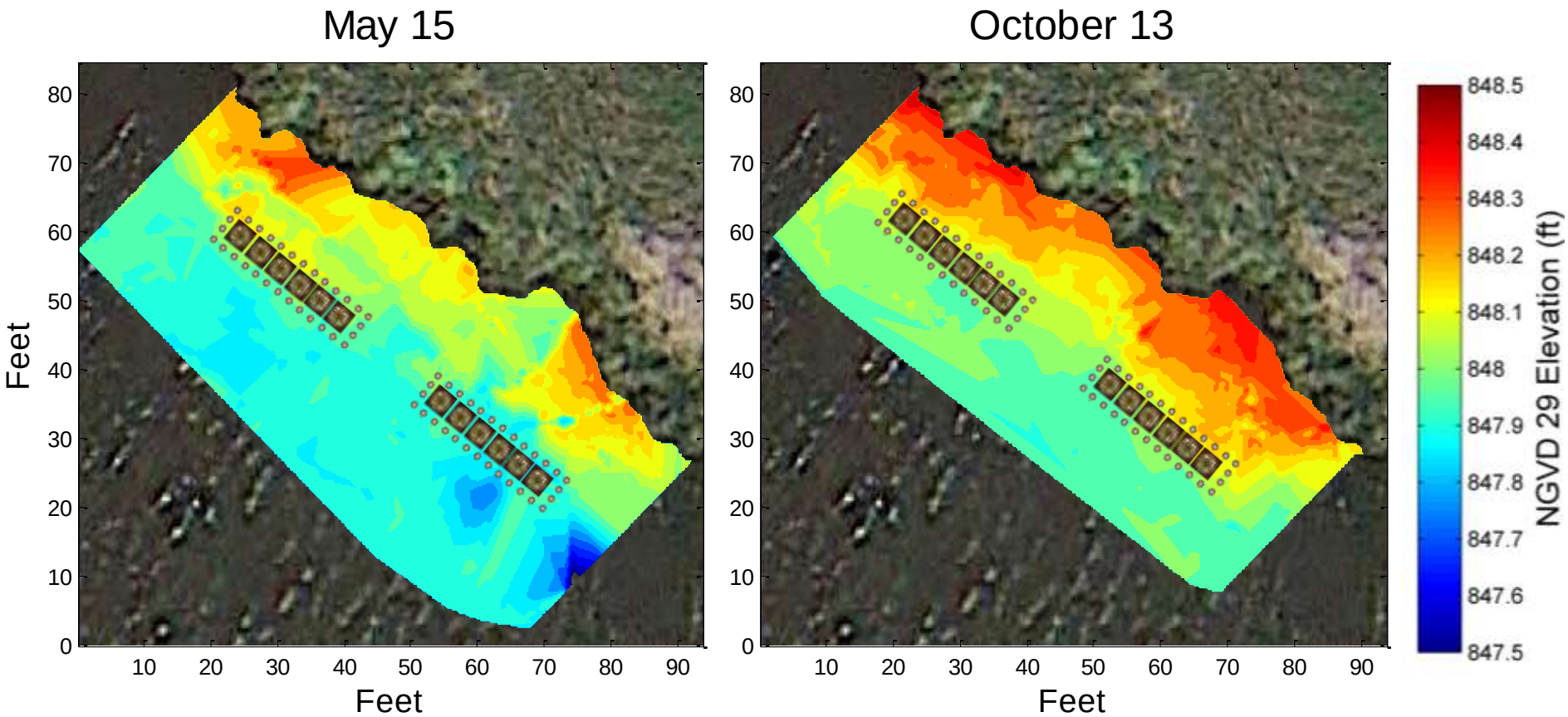
Vegetation

- Time-lapse plant cams



Results: Wave attenuation

Sediment Accumulation



5 month accumulation: **+3”**

Vegetation growth

Vegetation growth → Shoreline Protection

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3. **Assess** Vegetation diversity

Orange jewelweed

Purple-leaved willow herb

Blue skullcap

Bulb-bearing water hemlock

Nodding bur-marigold

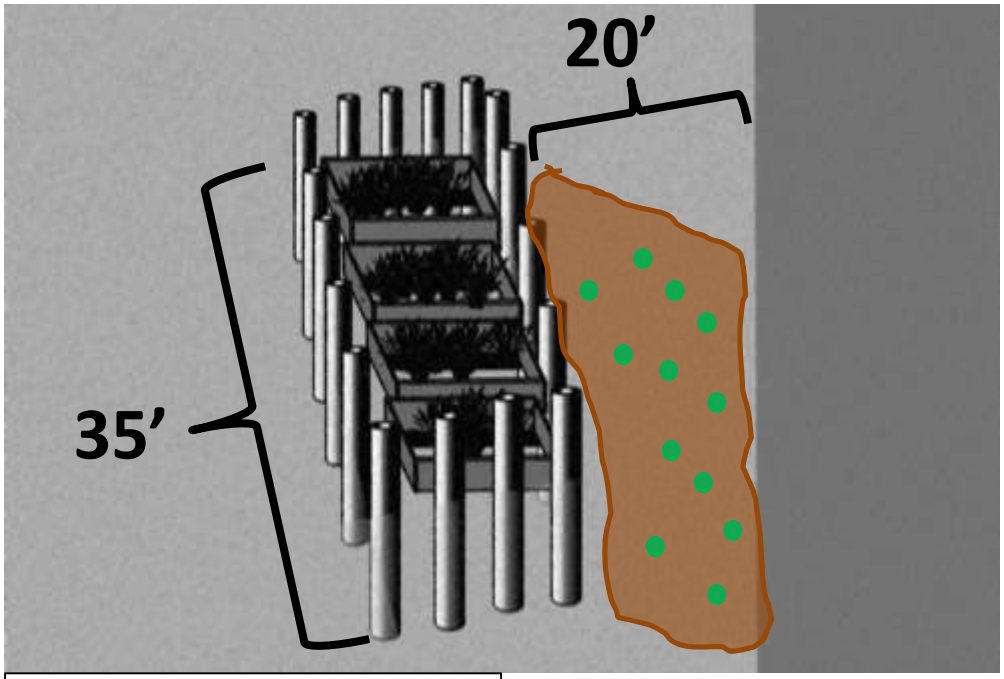
Giant bur-reed

Wildlife habitat

Community values

Friends of Cherokee Marsh

Extended community: Phosphorus retention



Accumulation
+0.25 ft

$$V_{sediment} = \mathbf{250\ ft^3}$$

$$W_{sediment} = \mathbf{3125\ lb}$$

$$\sim \mathbf{1.6\ {}^{tons}/_{FBI\ Garden}}$$

$$Phosphorus\ Level: 0.14\%$$

$$\boxed{W_P = \mathbf{5\ lb/FBI}}$$

Expected Cost and Accumulation per Full Season FBI

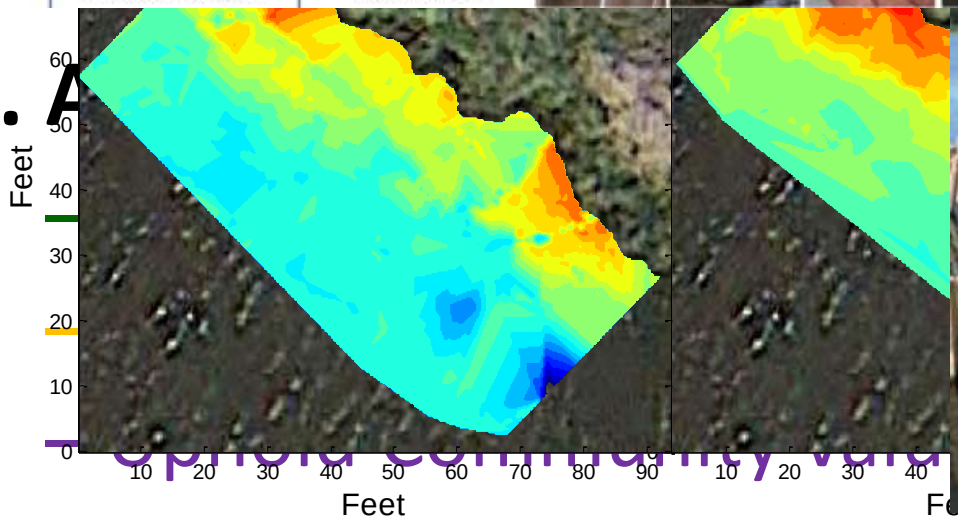
Cost	Sediment (lbs)	Sediment value (per lb)	Phosphorus (lb)	Phosphorus value (per lb)
$1000	3125	$0.30	5	$200.00

Summary

1. **Design** environmentally-friendly

   Floating Bog Interceptors (FBIs) Gardens

3. A



Questions?

Special thanks to:

- UW Water Resource Engineering group
- Dane County: Kevin Connors, Joe Taylor, Scott McDonnell, County Board
- Friends of Cherokee Marsh