

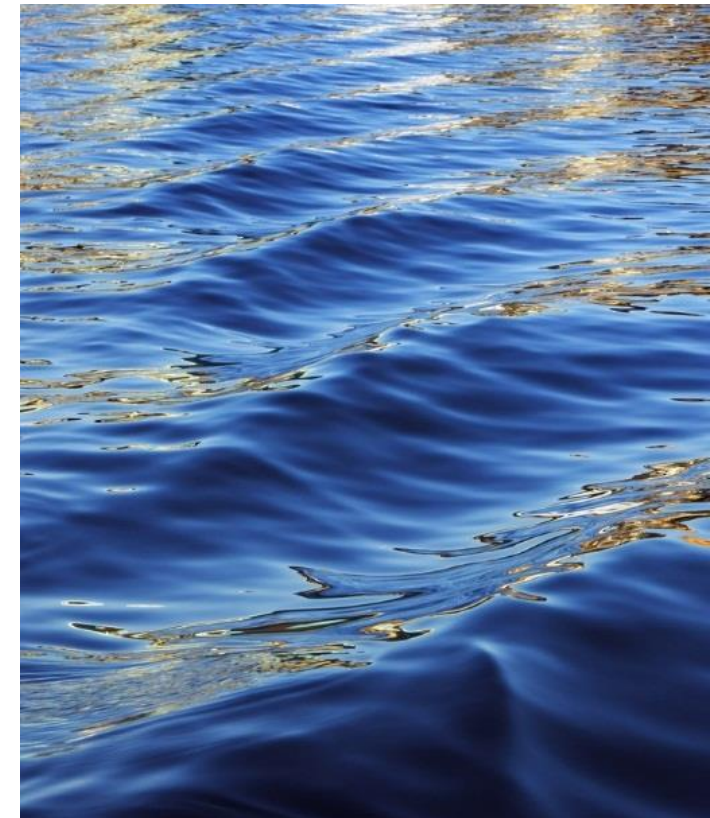
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# Floating treatment wetlands:

**A pilot-study and large-scale field trial of the stormwater treatment potential in urban catchments in a subtropical environment**

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# Stormwater Runoff – “Pollutant Soup”





### Stormwater ponds

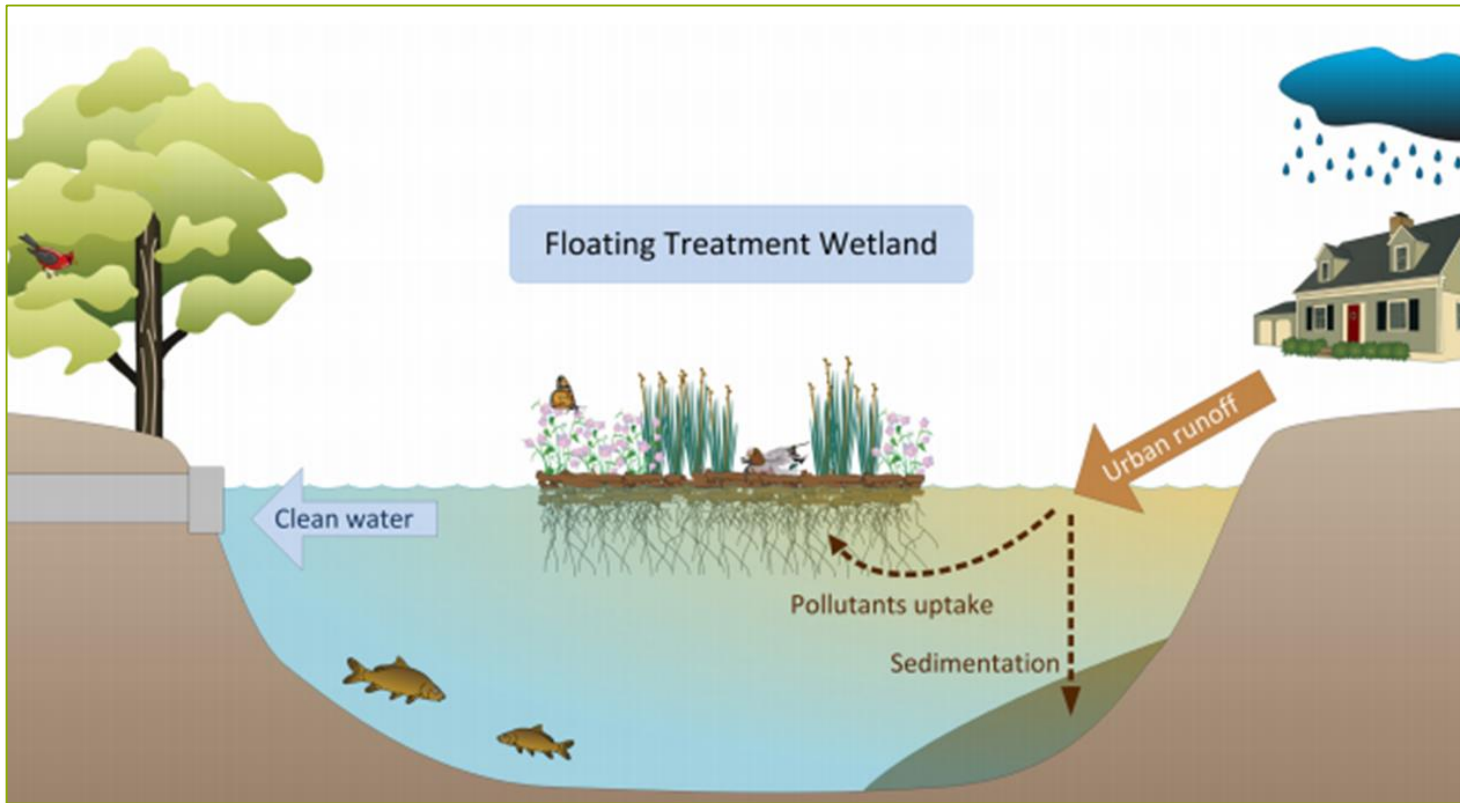
- Extreme water level fluctuations
- Nutrients such as N & P can accumulate without proper maintenance

### Wetlands and created wetlands

- Provide water filtration and nutrient uptake
- Loss of natural wetlands since 1700s
- Require large amount of land
- Sensitive to temperature and flow fluctuations



# What are floating treatment wetlands (FTWs)?



**Figure 1.** Diagram of a floating treatment wetland receiving urban runoff.

Artificial islands that utilize plants to reduce pollutants in water

Buoyant mats anchored to the bottom or shore

Rise and fall with fluctuating water levels

Native wetland plant species

Roots suspended in water column

## Purpose of study

- Partnered with Harris County Flood Control District (HCFCDD)
  - Phase 1 MS<sub>4</sub> co-permittee
  - Responsible for reducing pollutant loads
- HCFCDD interested in building and evaluating FTWs for use in flood control basins
  - Monitoring & assessing the performance at enhancing targeted pollutant reductions in Harris County

# Methods of Pilot-Study

- Thorough literature review
- Preliminary scoring matrix
  - mat types
  - native Texas wetland plant species
- Selected 4 mat types to compare
  - 3 commercially available and 1 DIY method
  - Selected 7 plant species + a control mat with no plants
- Installed monitoring equipment and released tracer dye to isolate main flow path
- Tracked the construction and planting requirements

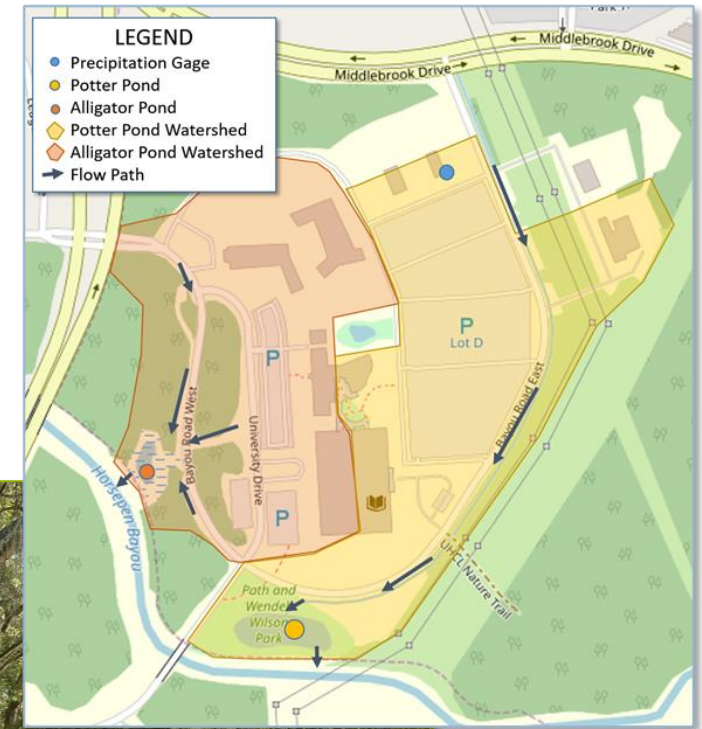
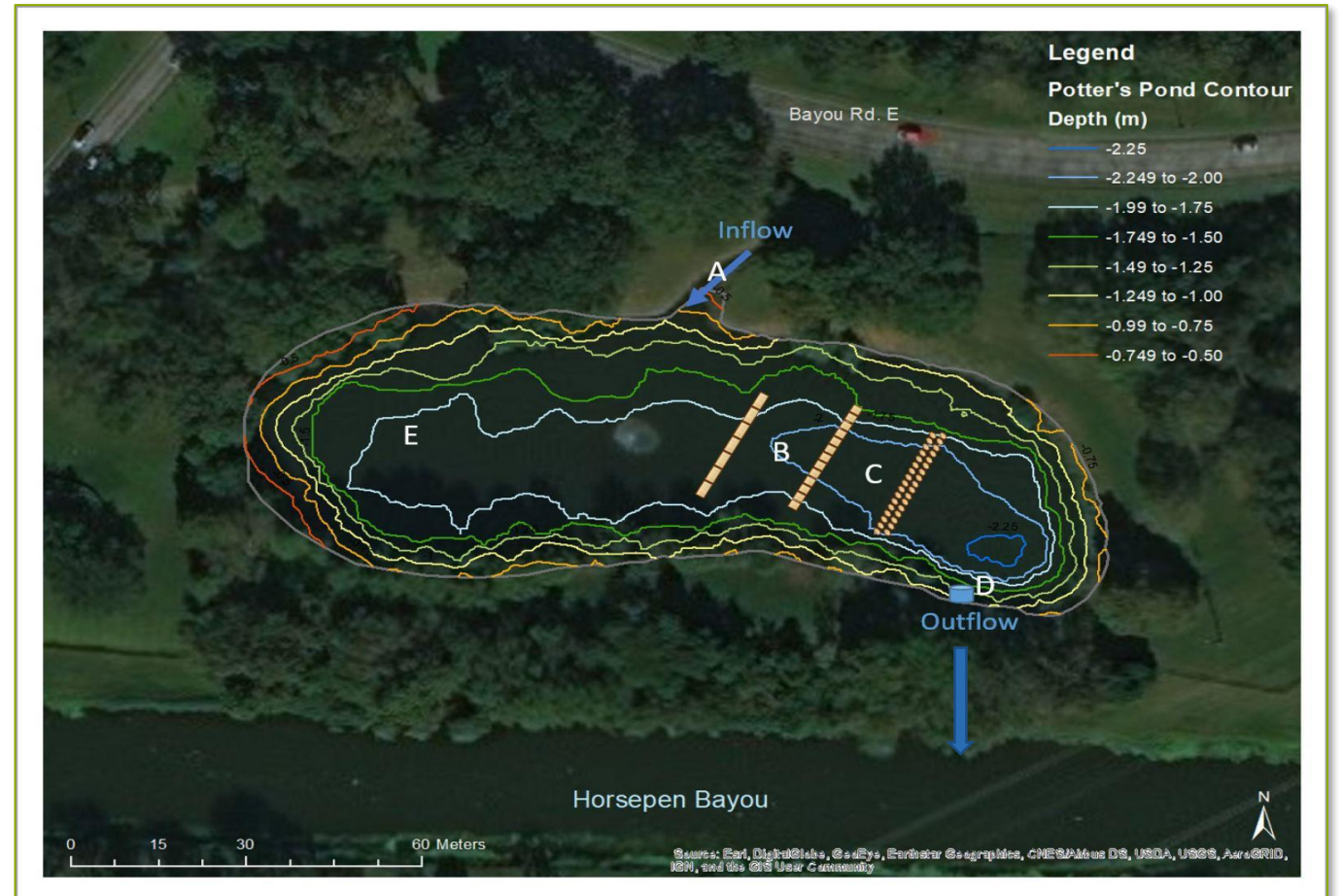


Figure 2 shows the UHCL watersheds

# Methods of pilot-study continued

- **Monitored rain events and ambient conditions with and without the FTWs installed**
  - Measured flow (during rain events)
  - Collected sonde readings
    - Temperature
    - Conductivity
    - pH
    - Dissolved oxygen
    - Turbidity
  - Collected secchi readings
  - Collected water samples
    - bacteria
    - suspended solids
    - nutrients
    - oil and grease
  - Game cameras to monitor wildlife activity
  - Monitored vegetation composition and growth
  - Tracked needed maintenance for mats
  - Noted any degradation or malfunction



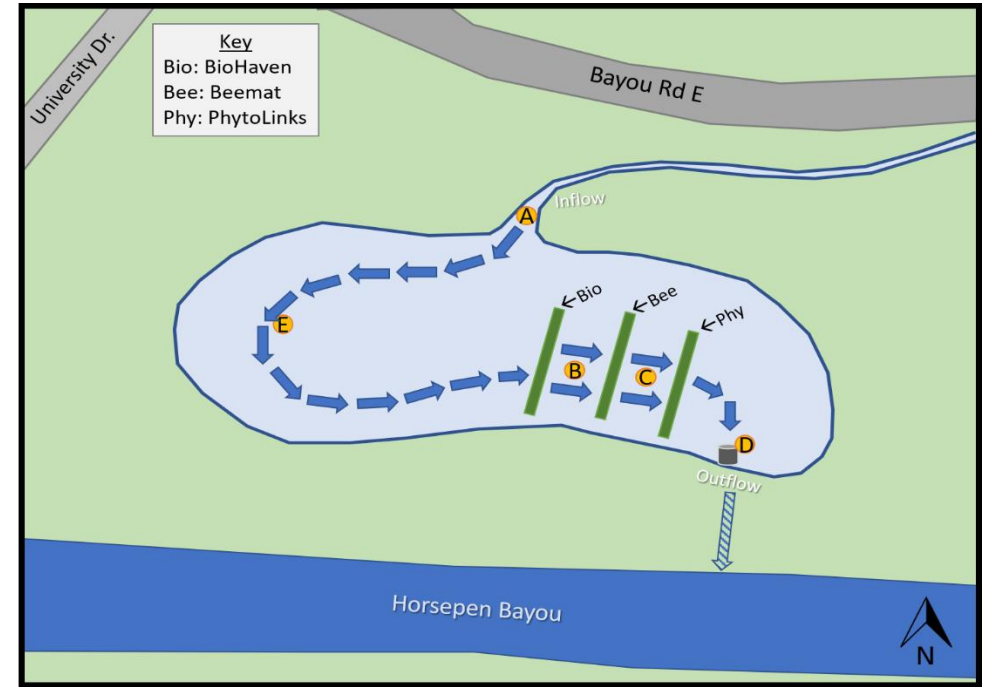
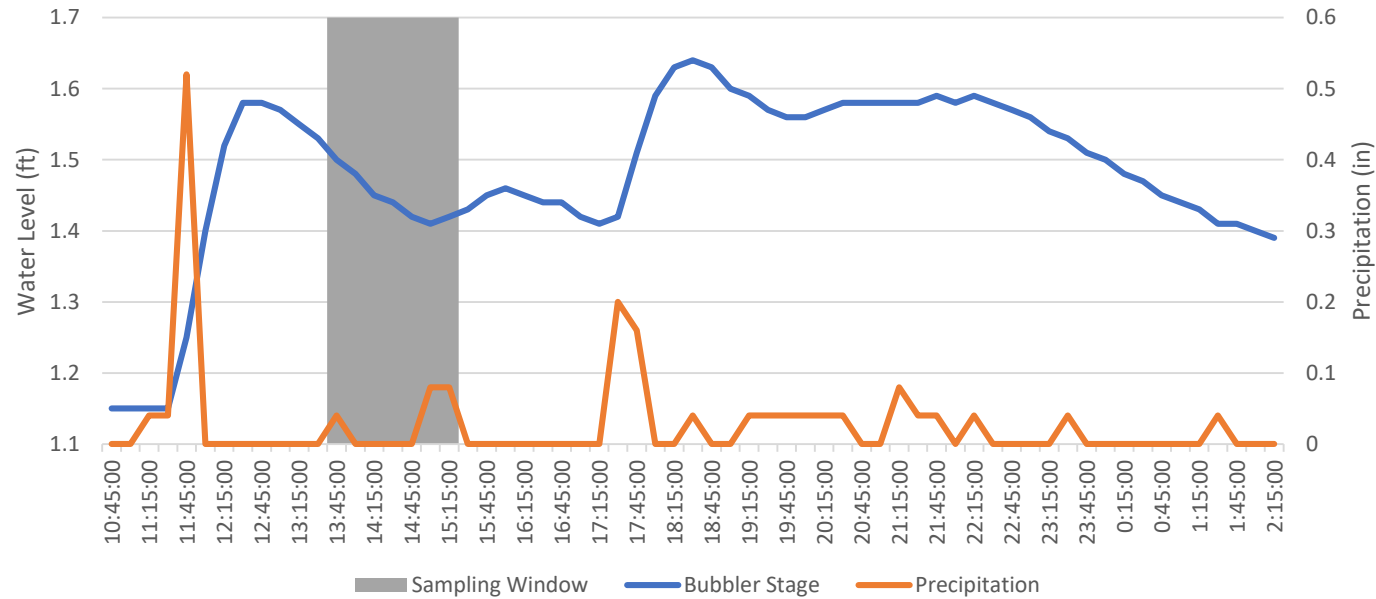


# Methods continued -

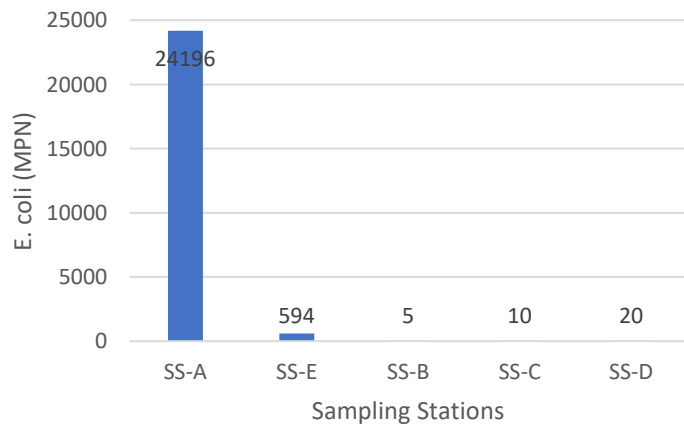

$$\% \text{ Removal Efficiency} = \frac{(\text{Influent concentration} - \text{Effluent concentration})}{\text{Influent concentration}} \times 100$$


# Rain Event – 6/3/21

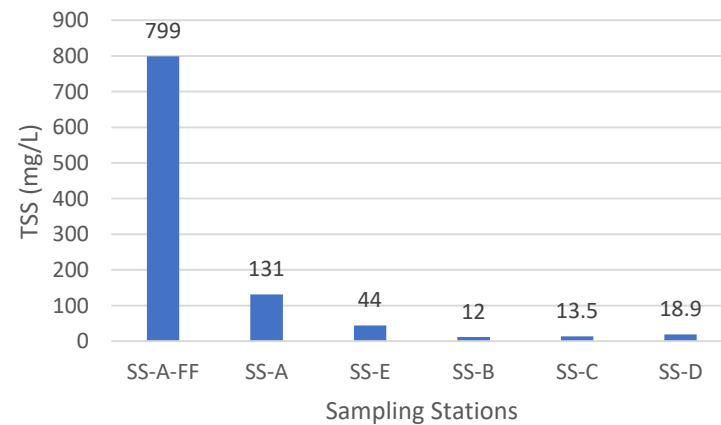
MS1 Post-Install Rain Event 1



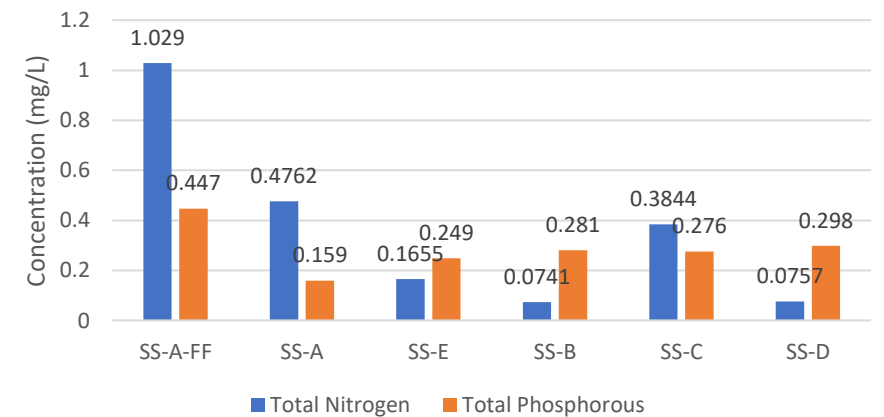
E. coli



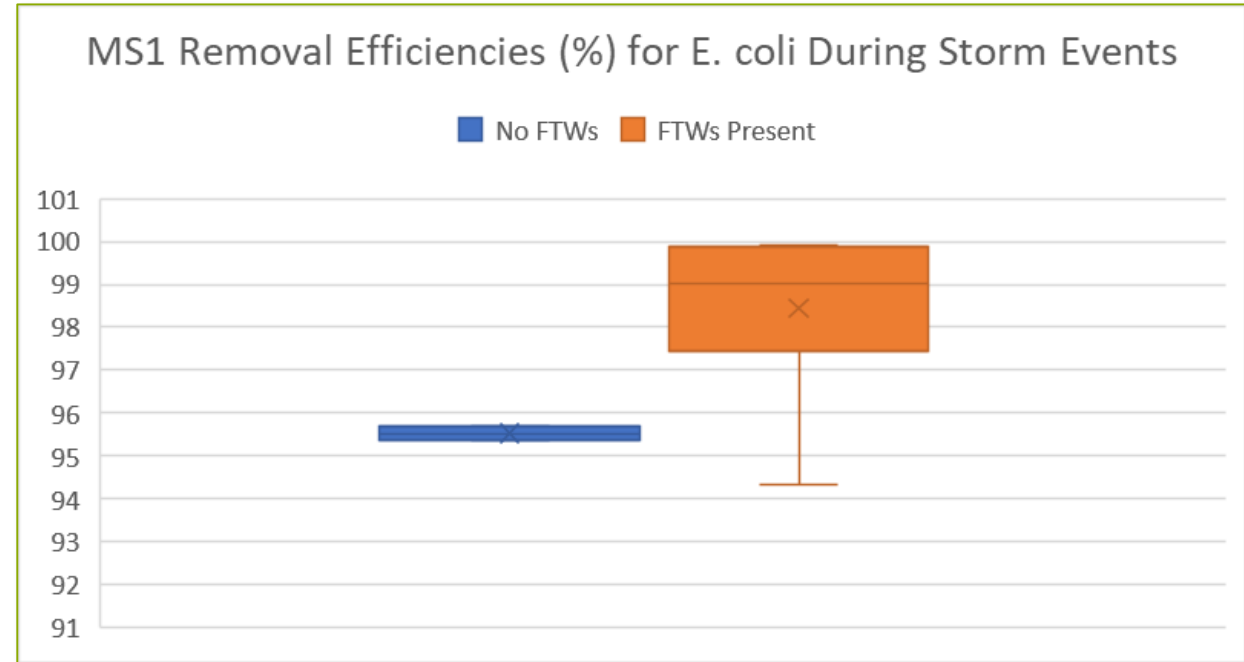
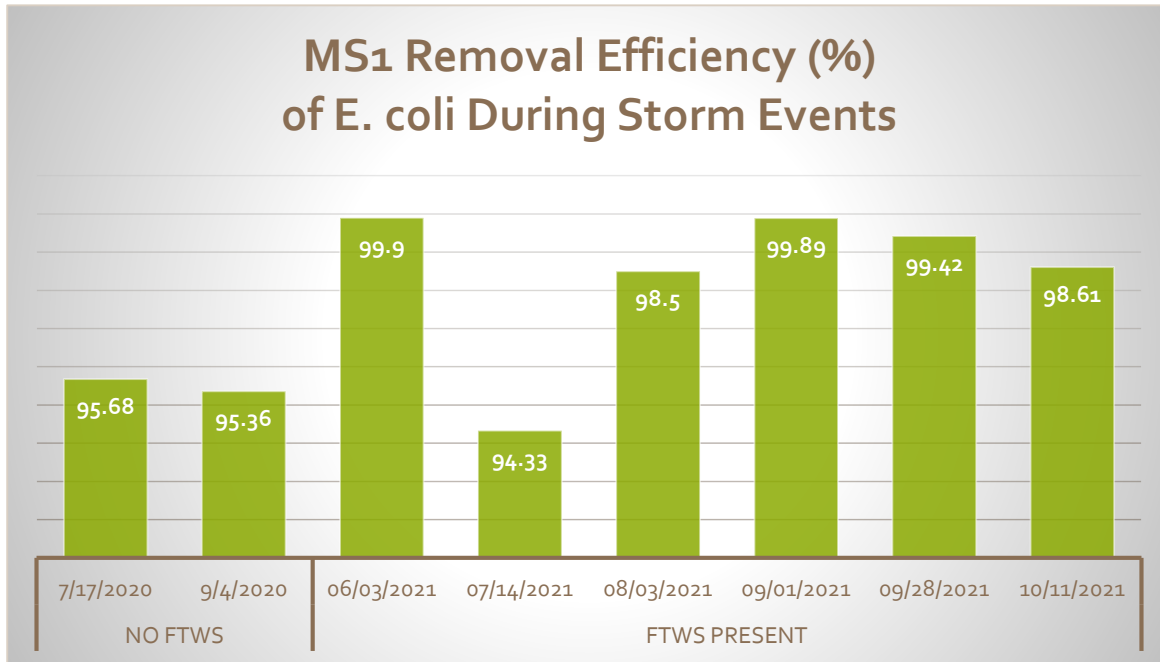
Total Suspended Solids



Nutrients

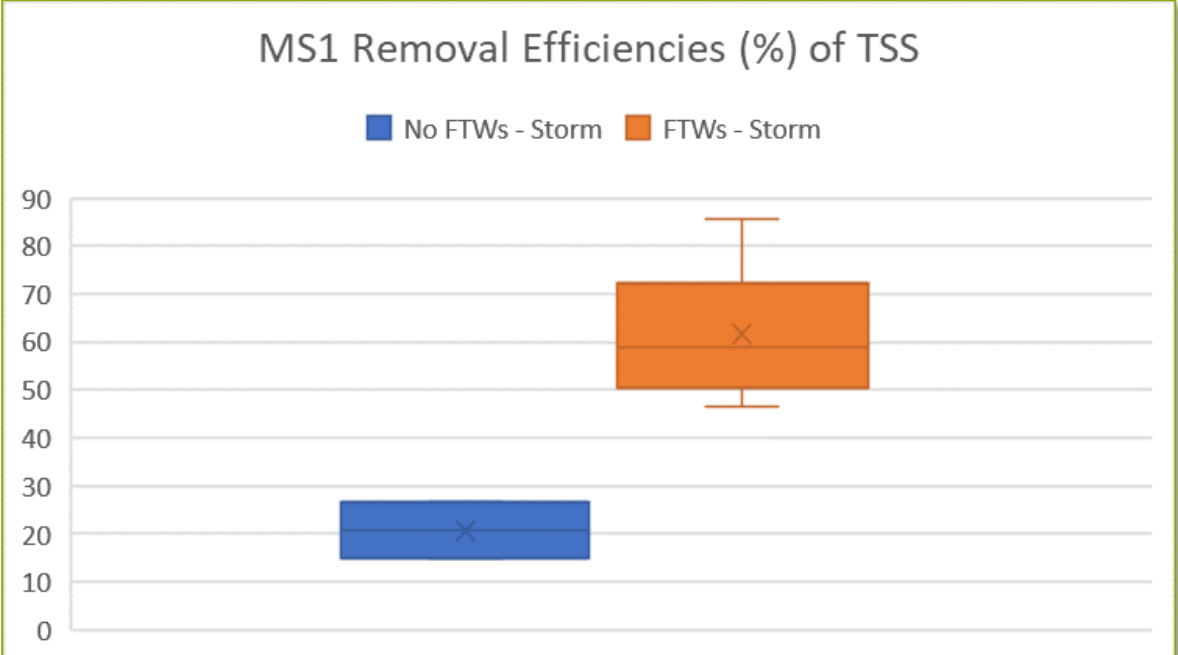
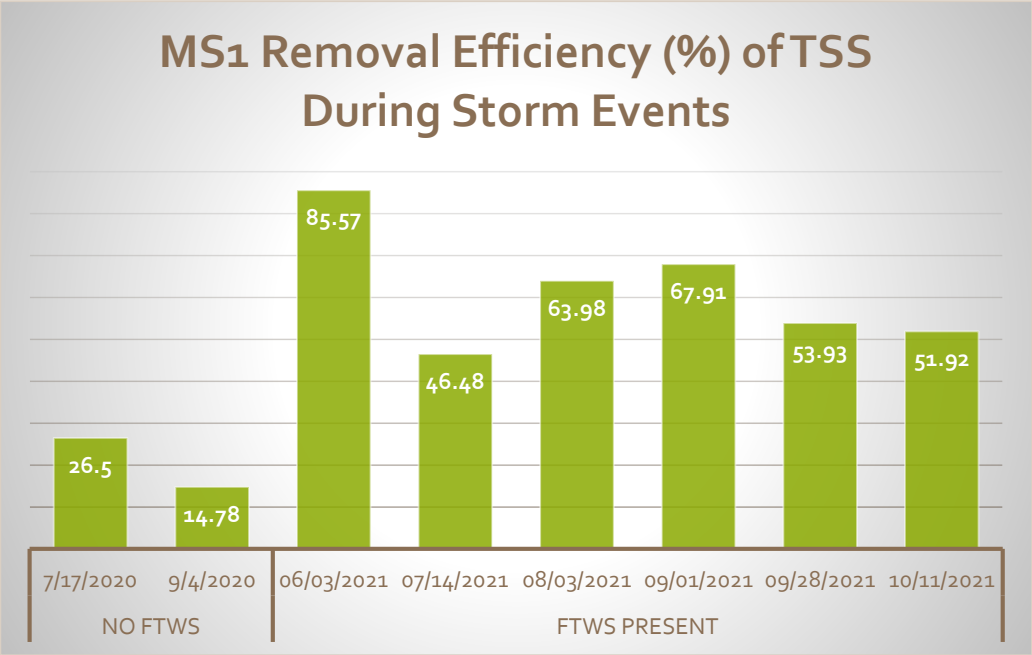


# Water Quality – E.coli



p=0.0204

# Water Quality - TSS



p=0.0155

# Goals other than water quality improvement

## Potter Pond (MS<sub>1</sub>)

- Evaluated 3 commercially-available mats
  - Durability/longevity
  - Cost-effectiveness
  - Plant success
  - Wildlife use
- Assess plant growth and success of 7 native wetland plant species grown together
- Make maintenance recommendations

## Alligator Pond (MS<sub>2</sub>)

- Evaluate DIY mats
  - Durability/longevity
  - Cost-effectiveness
  - Plant success
  - Wildlife use
- Evaluate pollutant removal efficiency of individual plant species:
  - (1) Swamp Lily
  - (2) Virginia Iris
  - (3) control mat with no vegetation

# Wildlife Sightings



Banded sphinx caterpillar  
on BioHaven



Great egret with sunfish  
on PhytoLinks



4 juvenile alligators on  
BeeMats

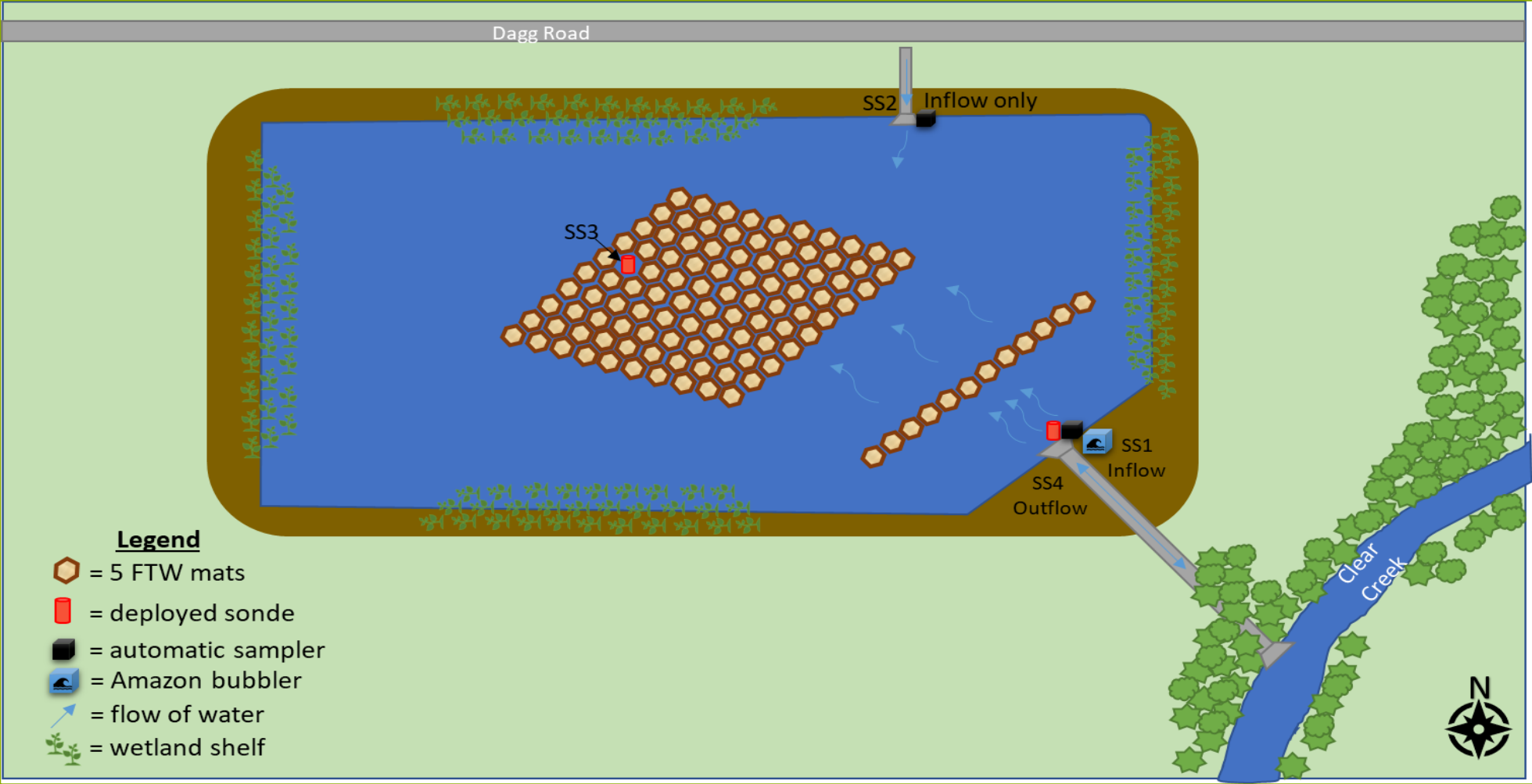
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# Phase 2: Large-scale field trial in Pearland, TX



# Lawson Basin layout and treatment system design





# Phase 2 Methods

- Water level monitored at inflow/outflow
- Water quality measurements recorded at all 4 sampling stations
  - Temperature
  - Conductivity
  - pH
  - Dissolved oxygen
  - Turbidity
- Water samples collected at
  - Sampling station 1 (inflow)
  - Sampling station 2 (secondary inflow from roads)
  - Sampling station 4 (outflow)





# Questions?

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