

# Water Exclosure Treatment System (WETs) to Minimize Beach Closings



Presented at:

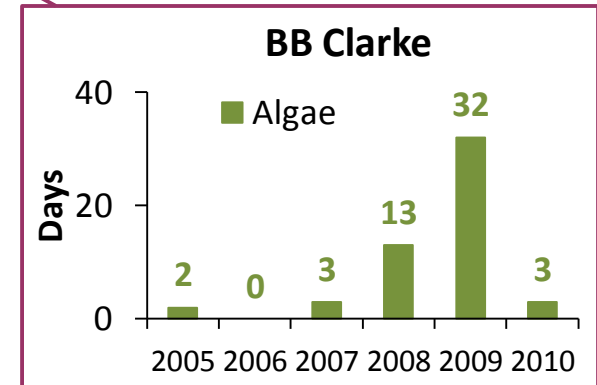
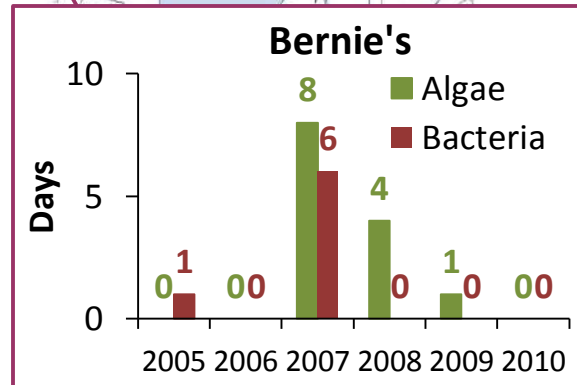
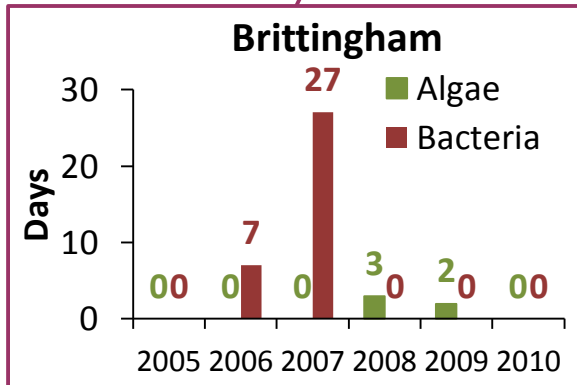
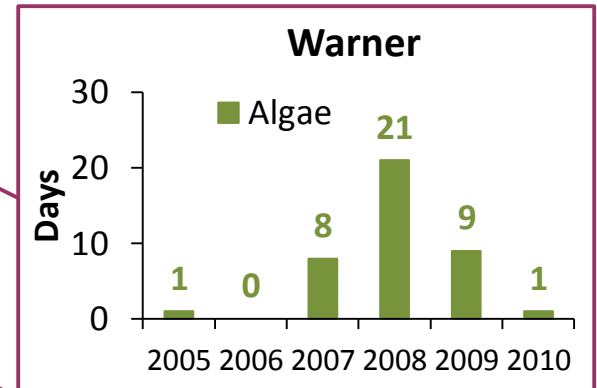
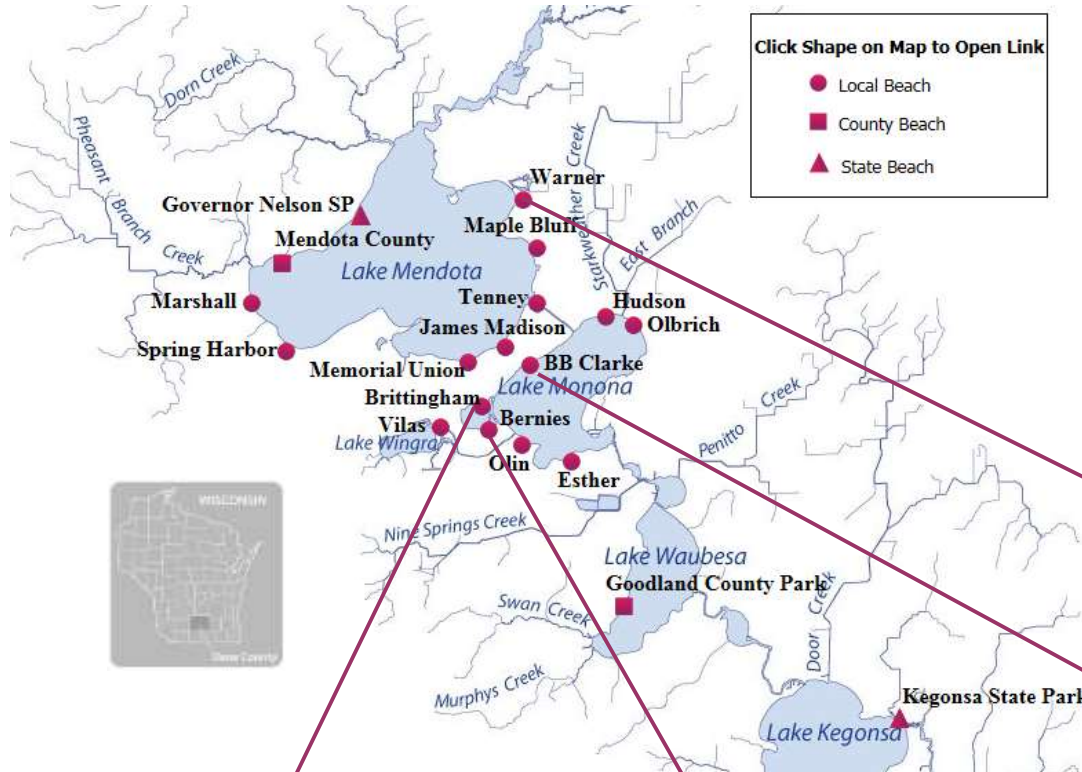
AWRA-Wisconsin, 39<sup>th</sup> Annual Meeting March 5<sup>th</sup>, 2015

**John Reimer, Chin Wu**  
University of Wisconsin, Madison



# Motivations

## Causes



Madison Beaches were **Closed** ~120 days/year or ~10 days/year/beach

# Motivations

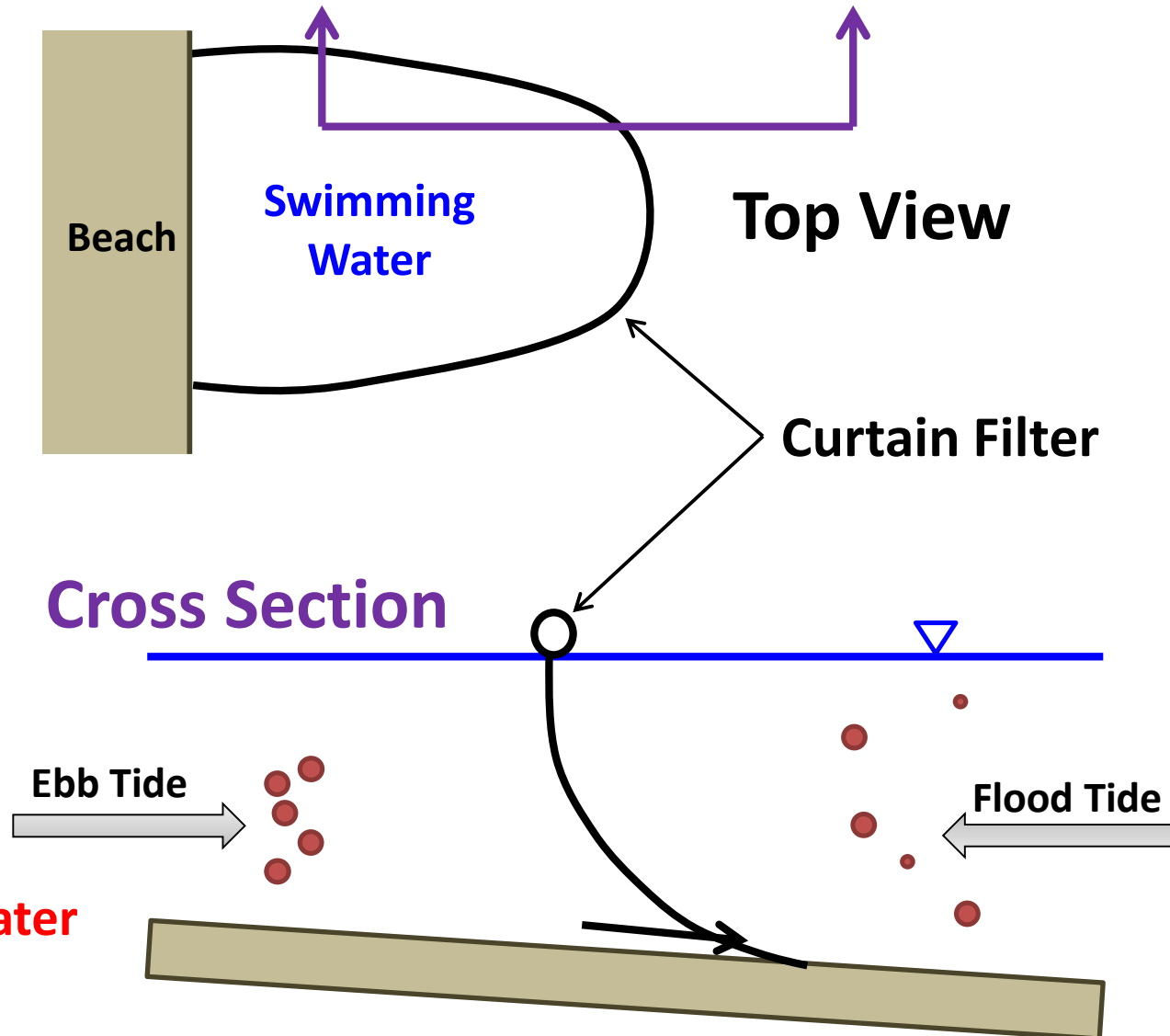
## Passive



Harbor Island Beach, NY  
82% Reduction *E. coli*

Calumet Beach, Chicago, IL  
No Reduction

## Active



## Findings:

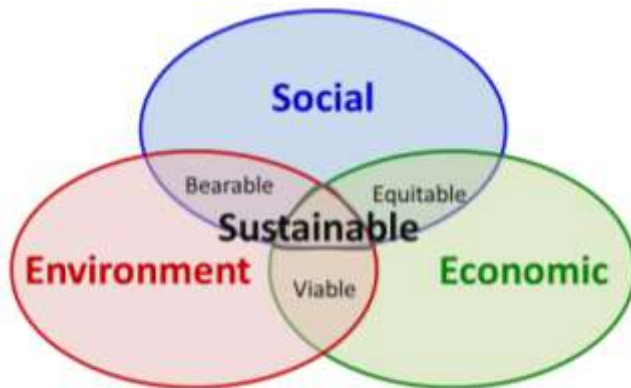
- Ocean and not freshwater
- Safety concerns

# Research Objectives

- Develop **active** approach for minimizing **beach closings** within freshwater.

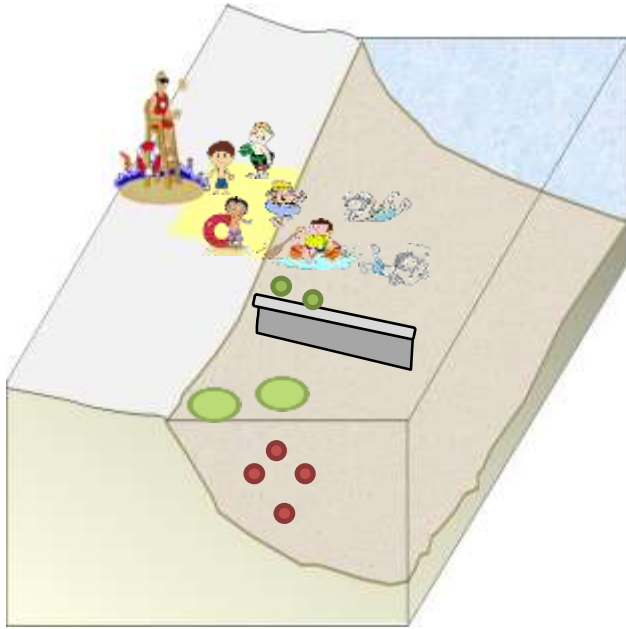


- **Sustainable** solution

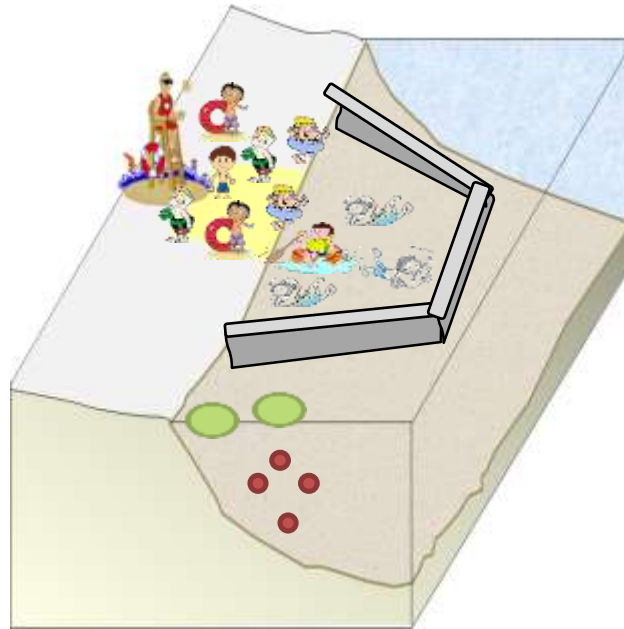


# Alternatives for Active Approach

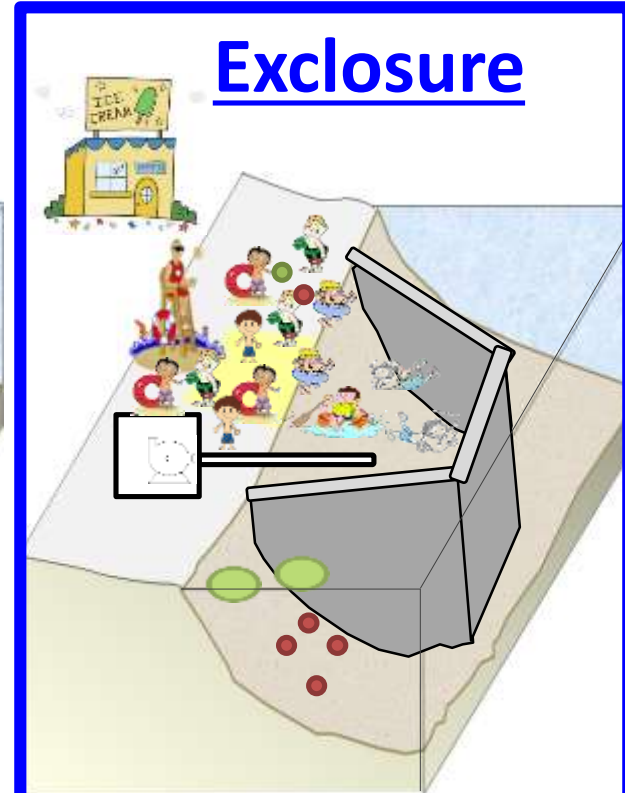
## Interceptor



## Deflector



## Exclosure



BACTERIA

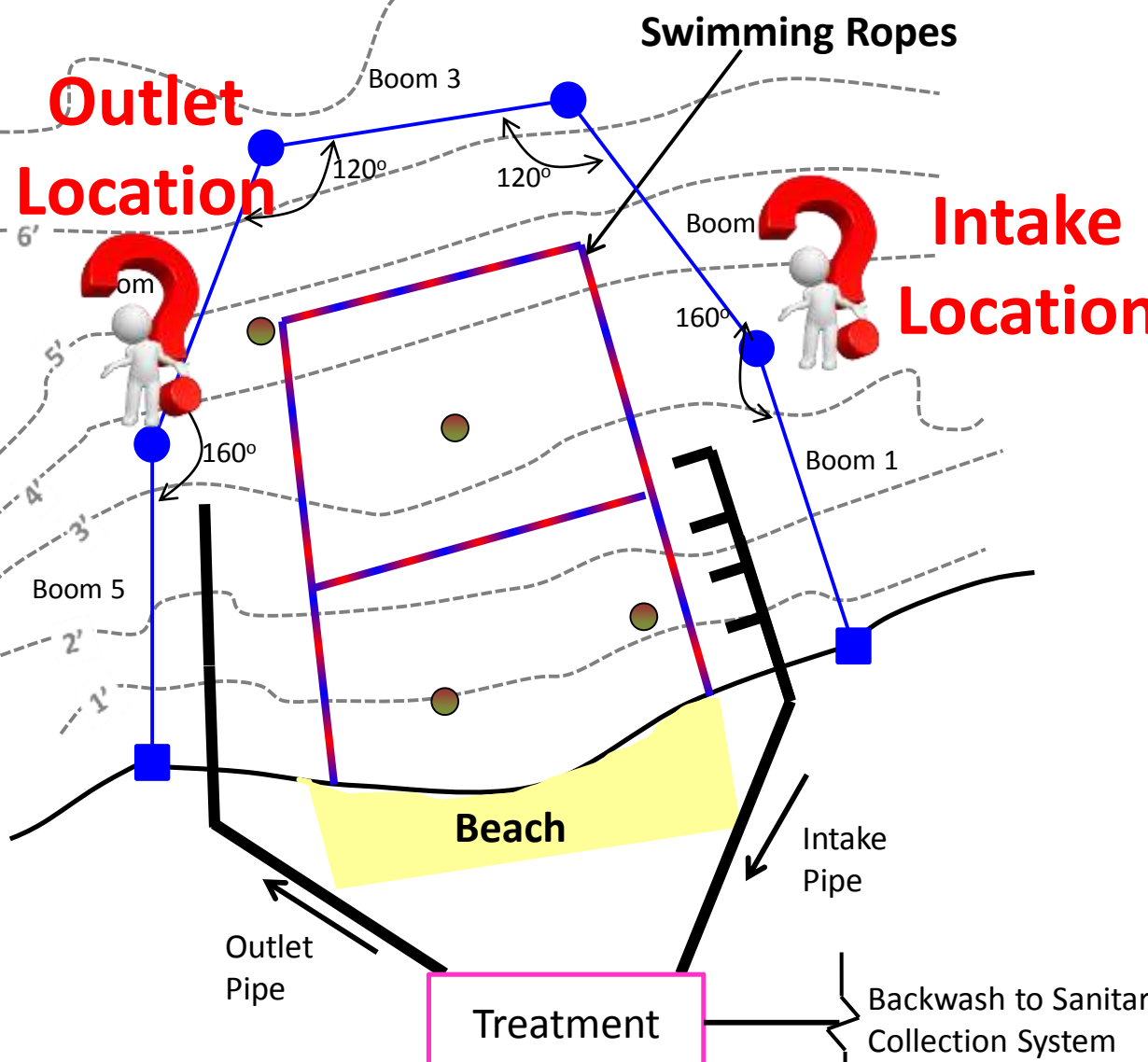


ALGAE

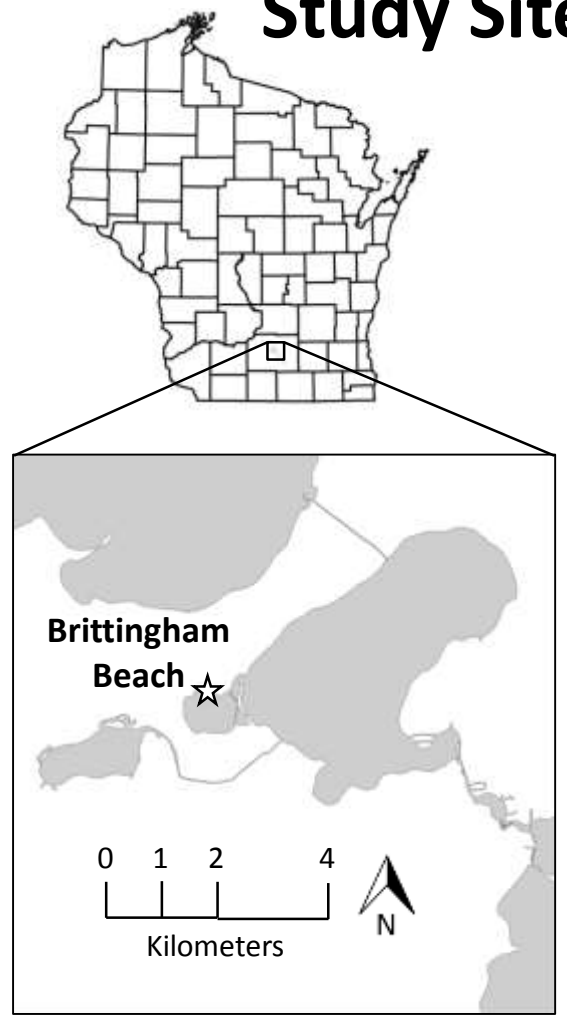


# Water Exclusion Treatment System (WETs)

Contaminant



## Study Site



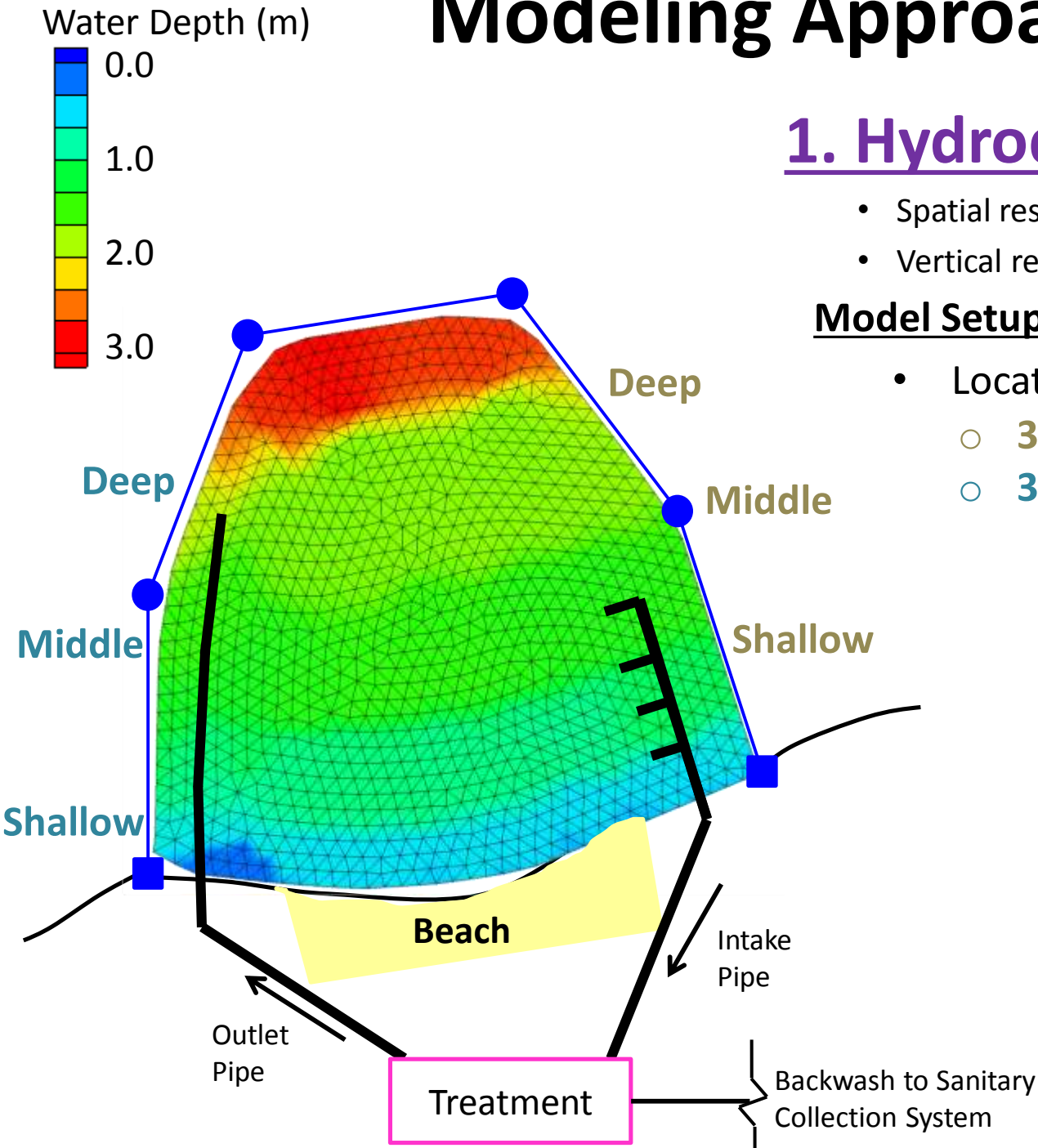
# Modeling Approach

## 1. Hydrodynamic model

- Spatial resolution: 1 meter
- Vertical resolution: 0.5 cm

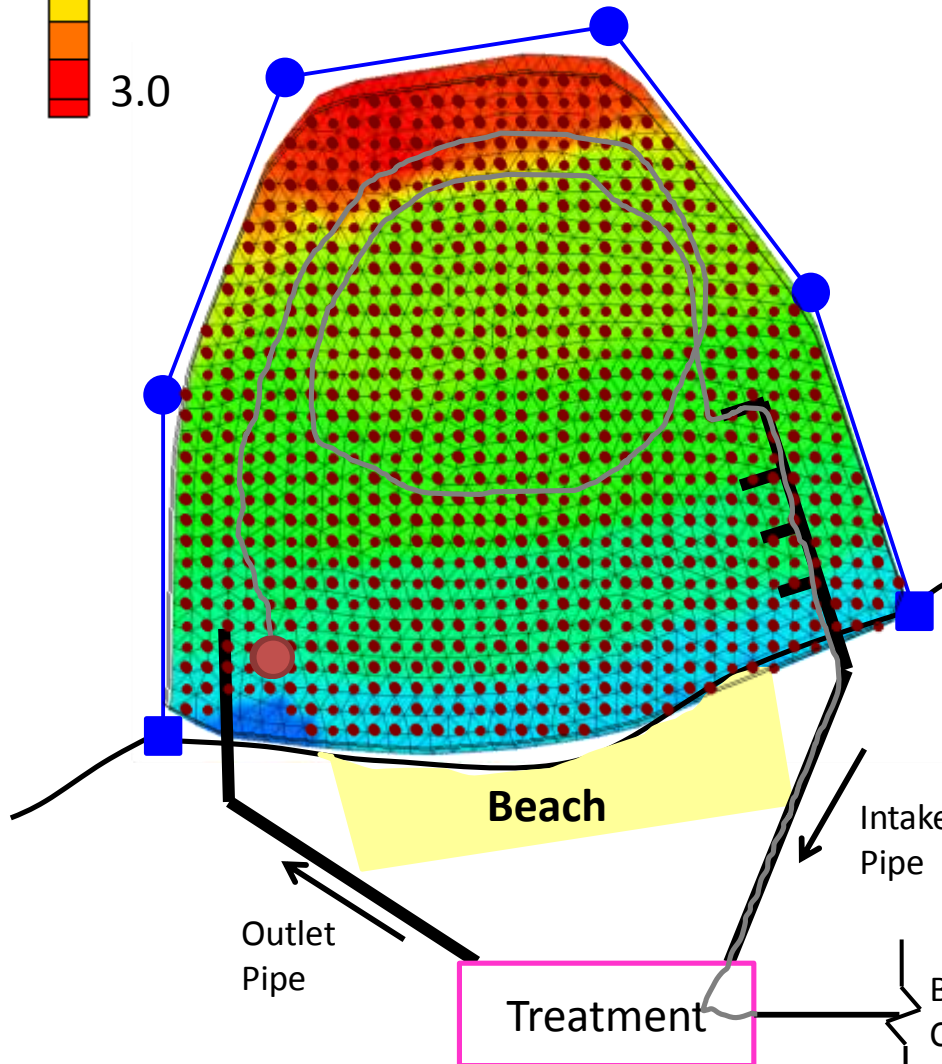
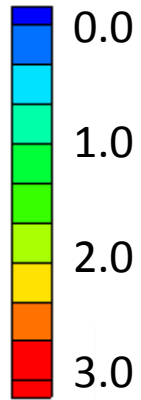
### Model Setup

- Locations
  - **3 Intakes**
  - **3 Filtered Outlets**

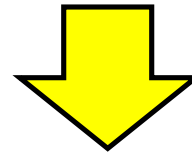


# Modeling Approach

Water Depth (m)



## 1. Hydrodynamic model



## 2. Particle Transport Model



Algae



Bacteria

Particle

○ Monte Carlo

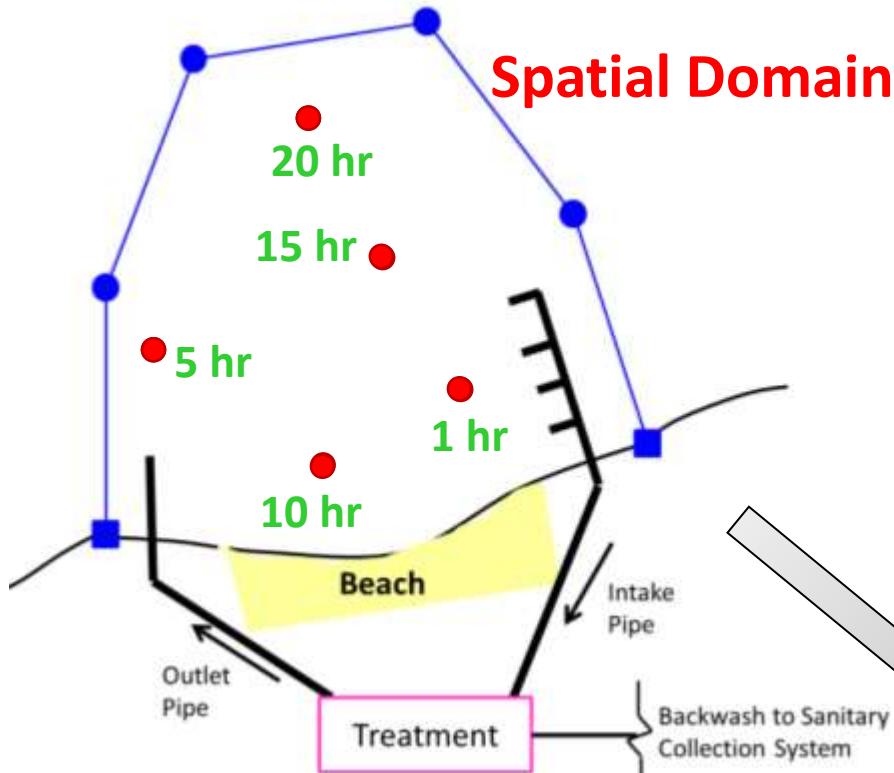


How much **time?**



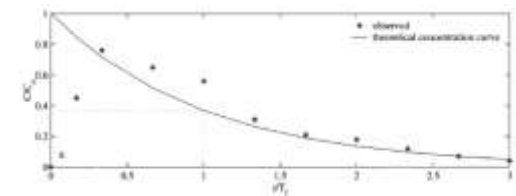
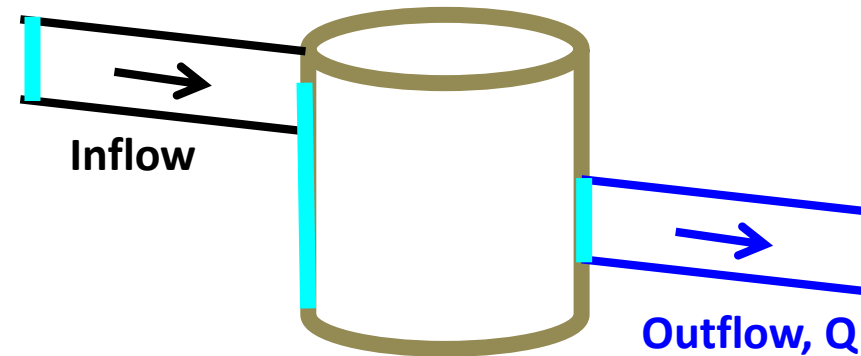
# Water Renewal Times

## Residence Time



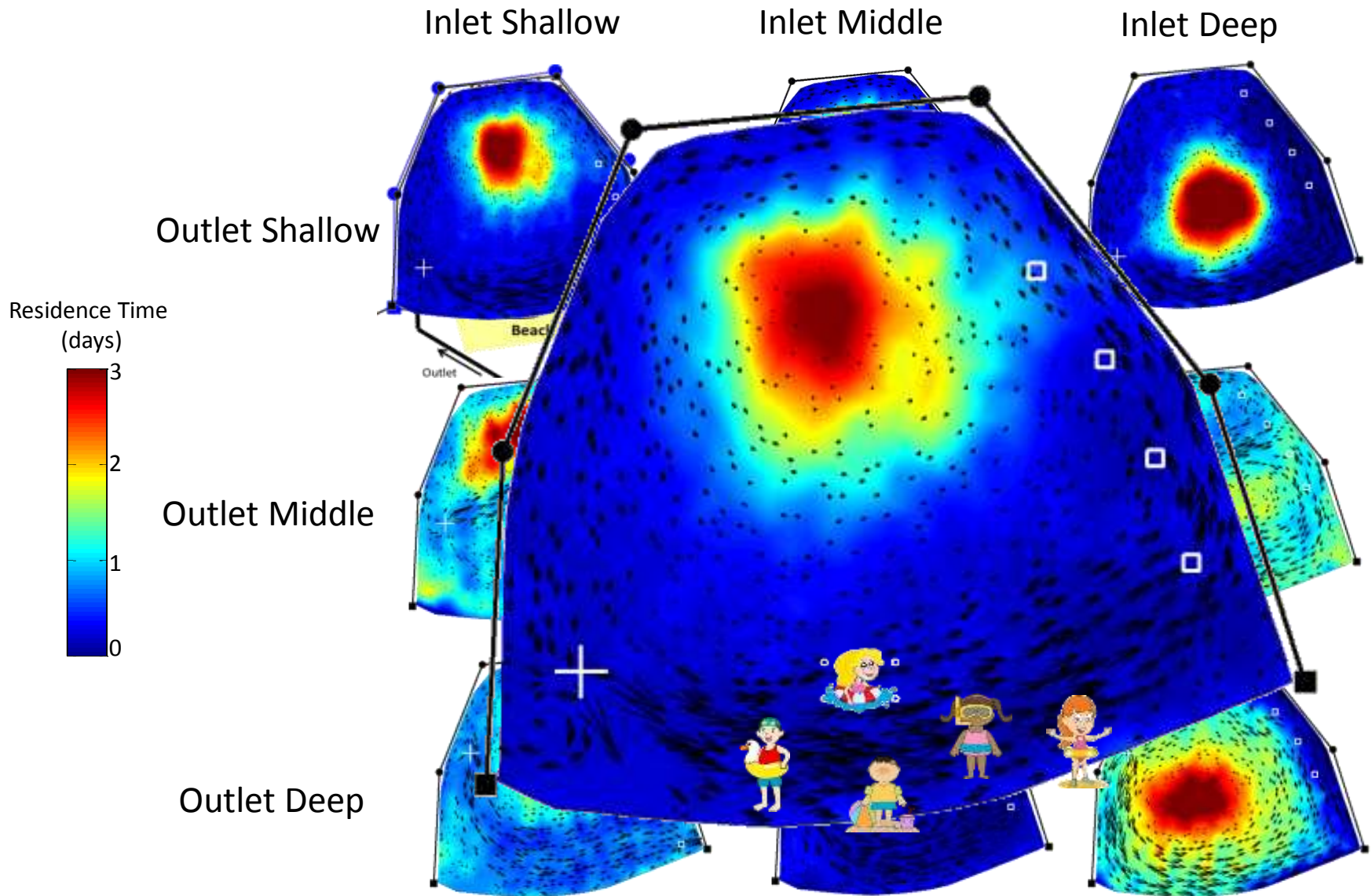
Time at each water parcel

## Flushing Time



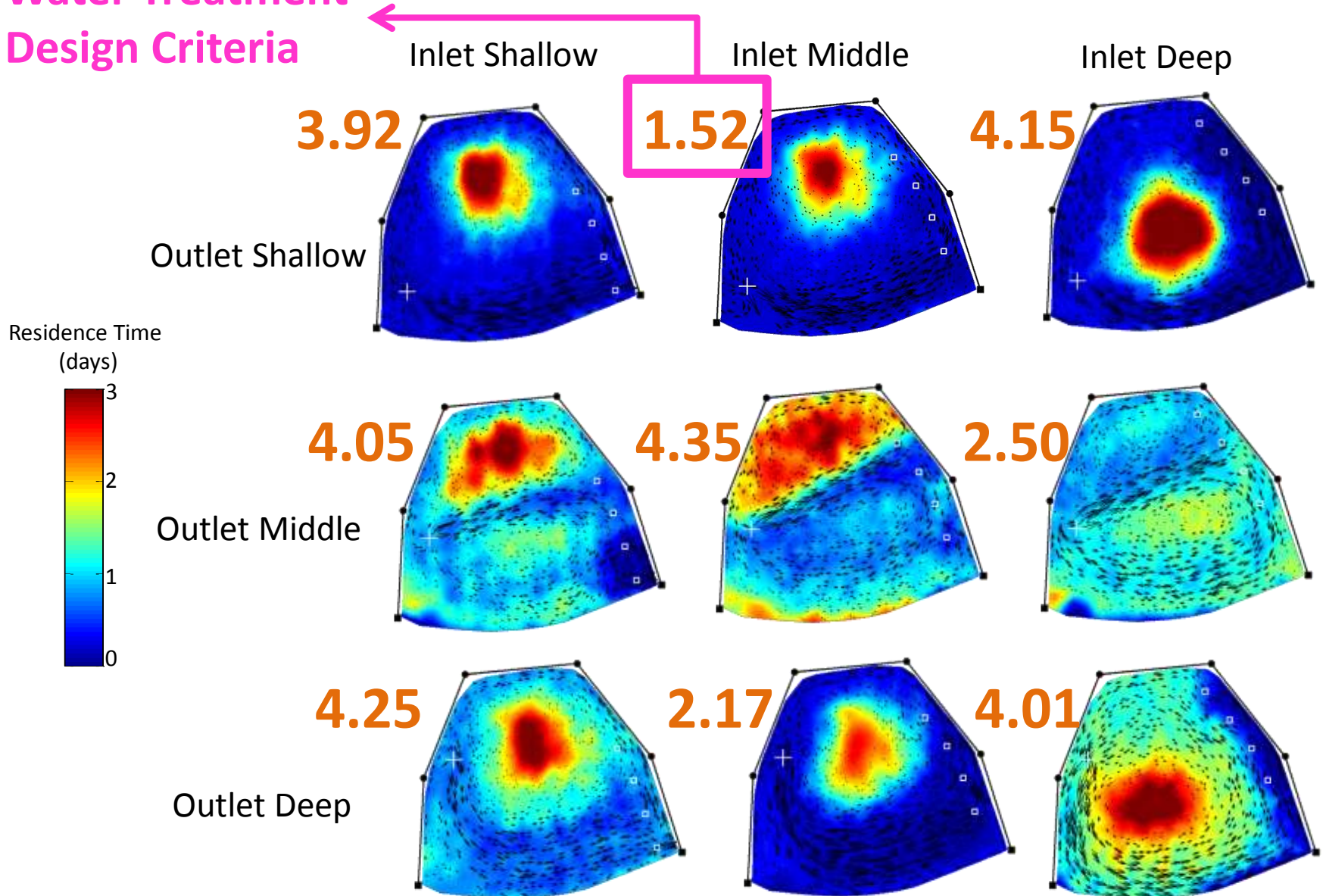
Time for ~2/3 of particles to leave

# Residence Time

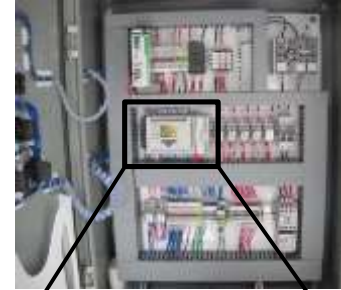
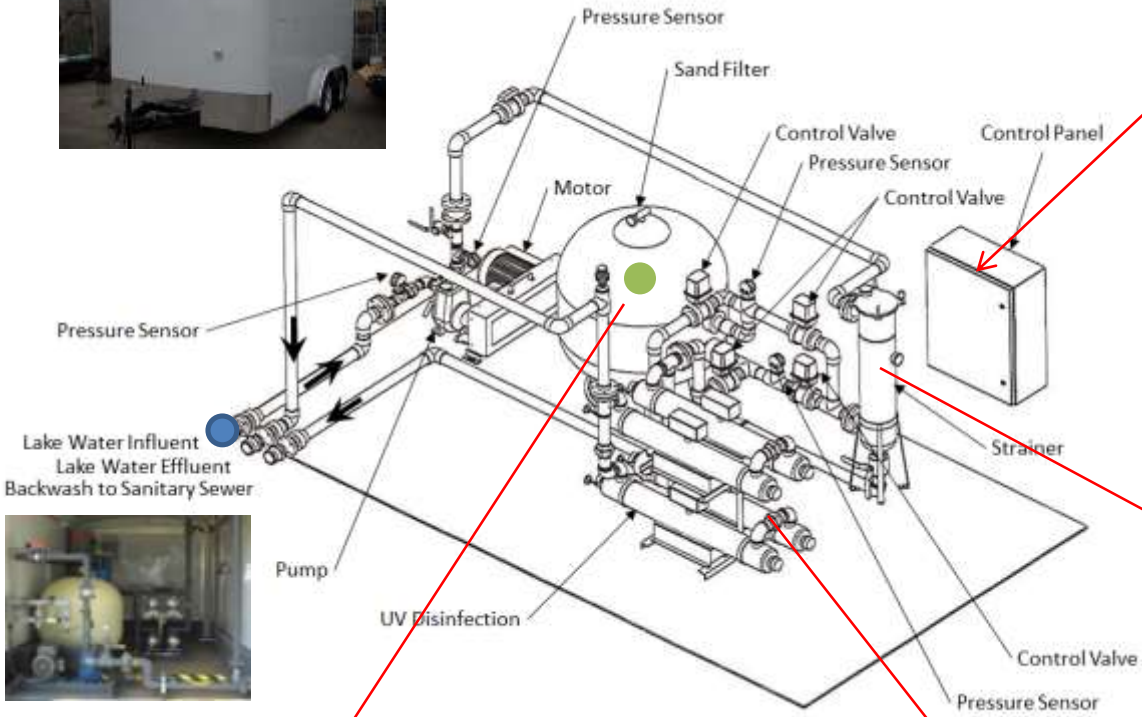


# Flushing Time

## Water Treatment Design Criteria



# Treatment System

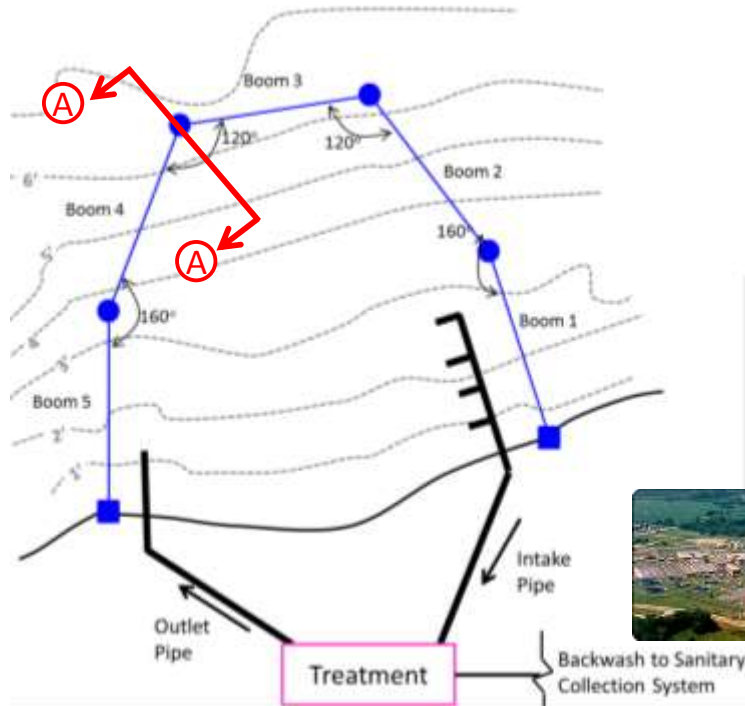




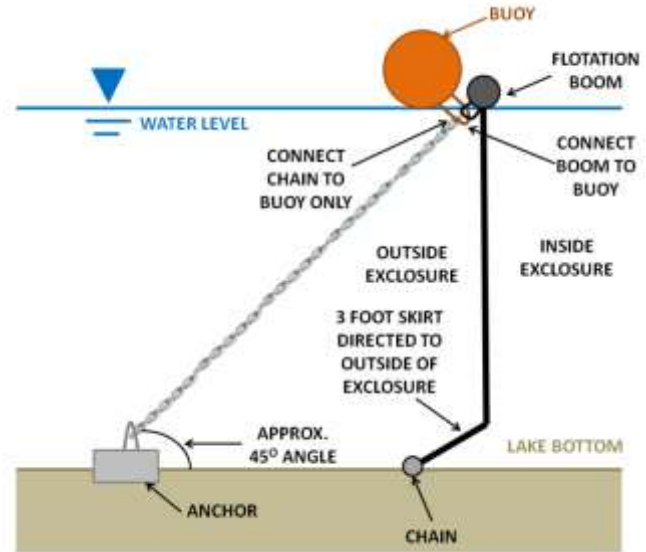
# WETs Implementation



Friends of Monona Bay



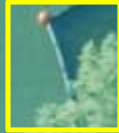
## Section A-A



# BRITTINGHAM BEACH



2



3



1



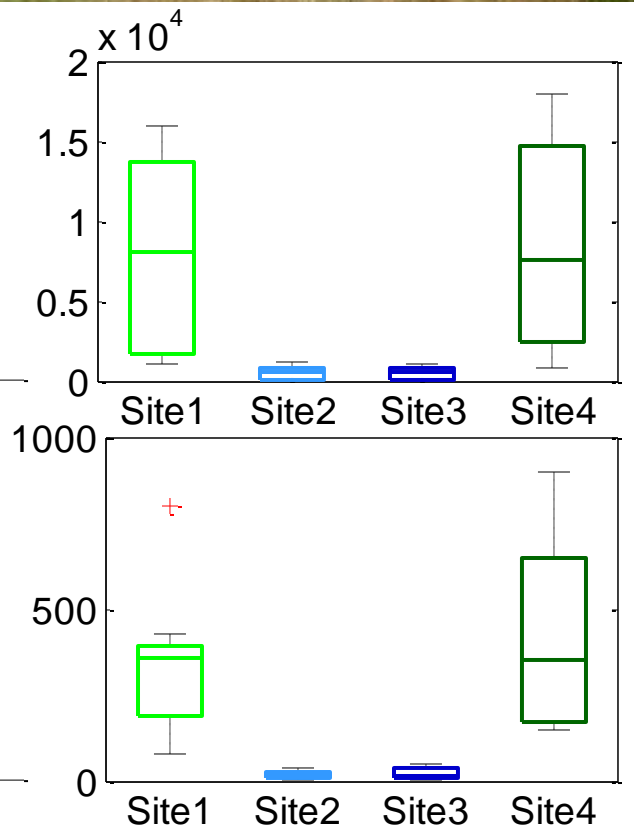
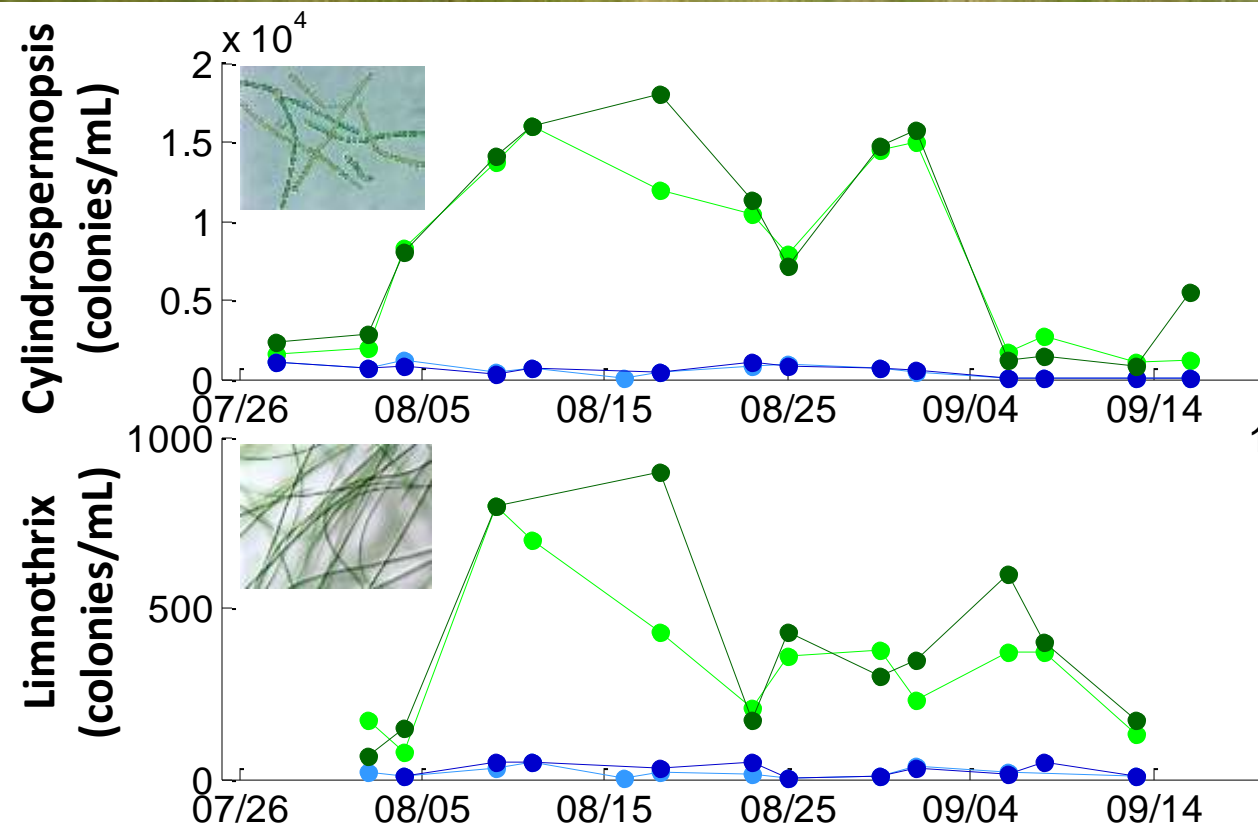
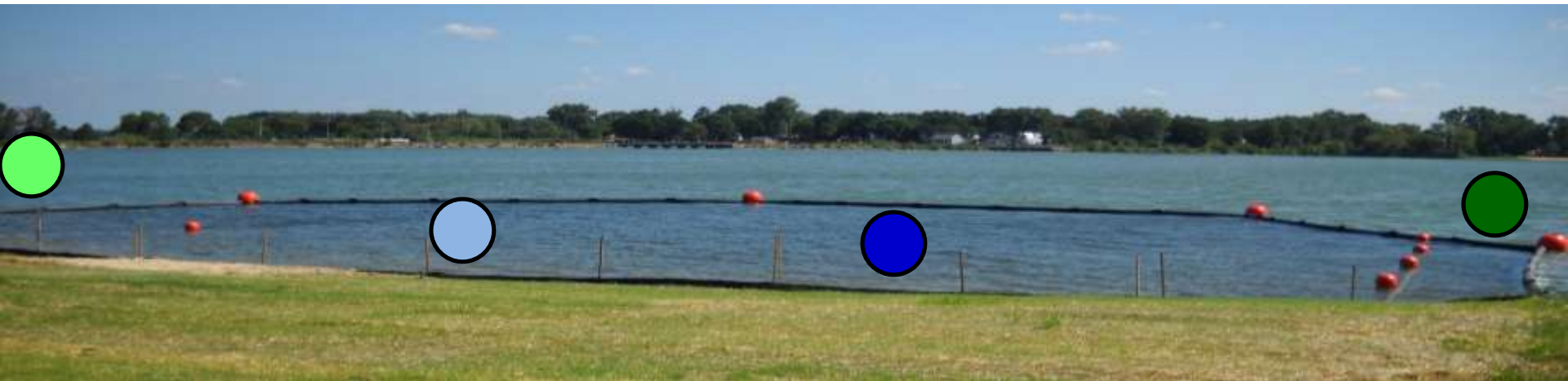
1

3

2

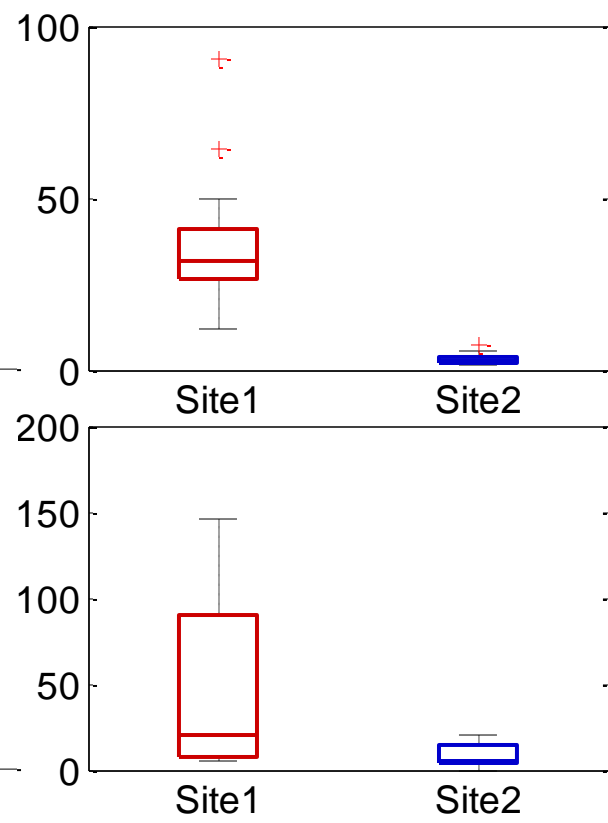
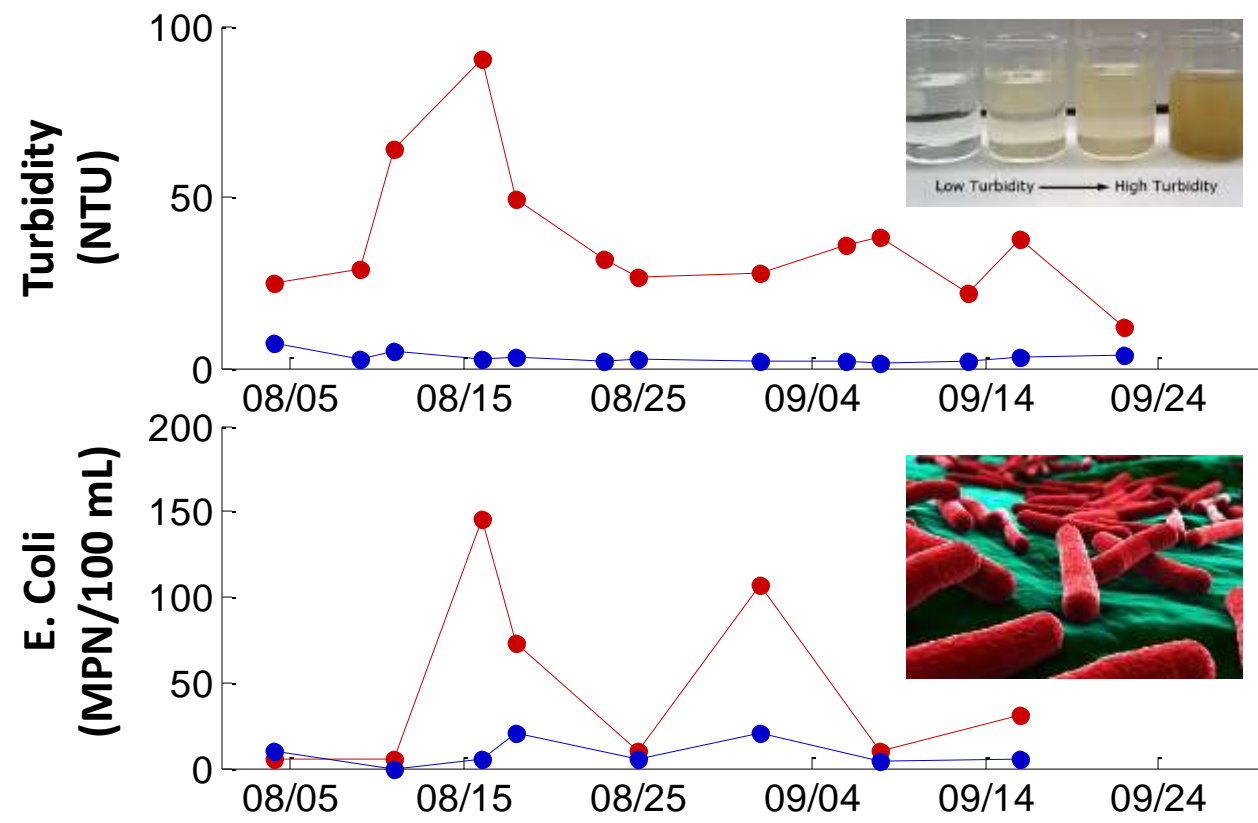
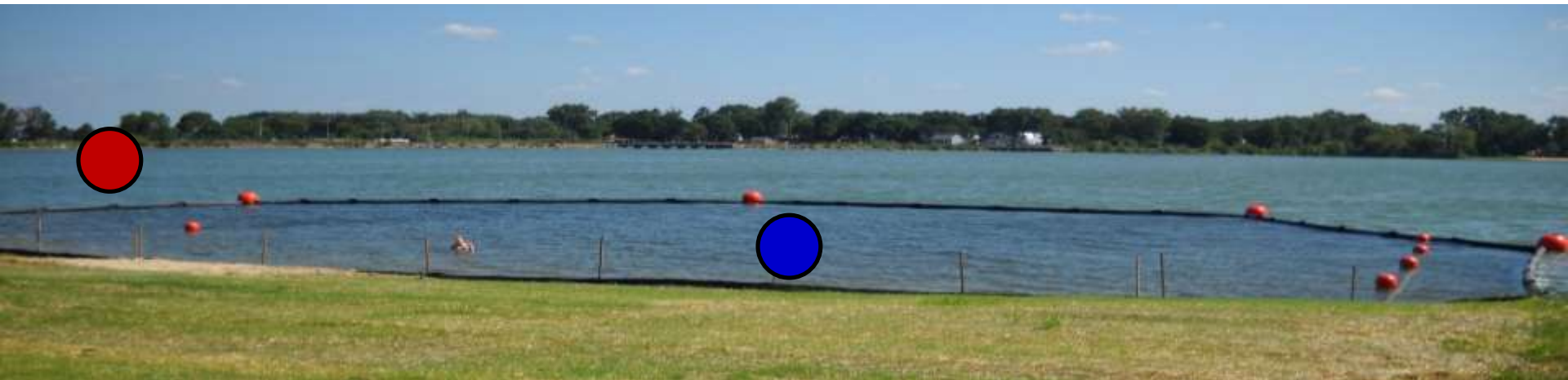


# Algae Species Monitoring





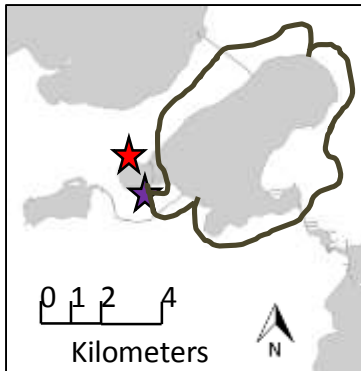
# Turbidity / E. Coli Monitoring



# Summary

Recall: Research Objective

- Develop **active** approach for minimizing **beach closings** within freshwater.



Brittingham (2011)



Bernie's (2012-Present)

## Sustainable & Innovative WETs



Portable



Community



Brittingham Boats



~ \$5 per day



# QUESTIONS ?

## Acknowledgements

Funding and support is greatly appreciated

