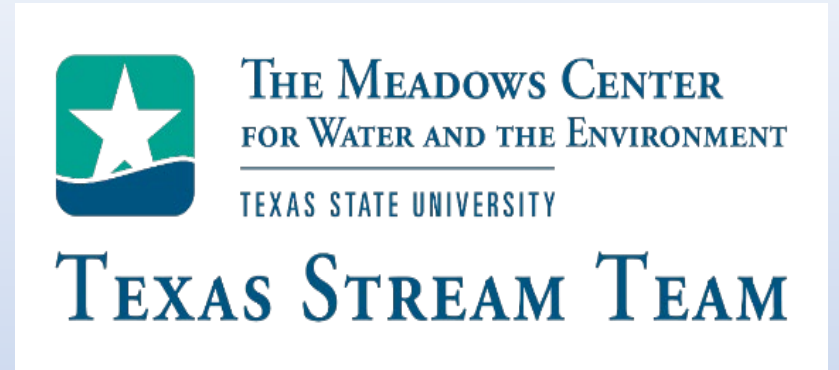


Lower Cypress Creek Pilot Project: Assessment of *E. coli* Bacteria and Optical Brighteners



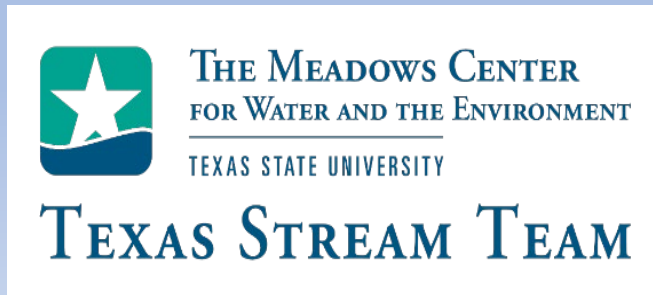
Nick Dornak, Desiree Jackson, and Sandra Arismendez
The Meadows Center for Water and the Environment
Texas State University

Guadalupe Blanco River Authority
Clean Rivers Program
Basin Steering Committee Meeting
April 2022

Lower Cypress Creek Pilot Project: *E. coli* and Optical Brighteners

Objectives:

- Conduct intensive *E. coli* monitoring to discern potential sources of bacteria.
- Conduct *E. coli* monitoring targeting different times of the week/month.
- Conduct optical brightener “tamplng” monitoring as a pollution screening tool to detect presence/absence of optical brighteners associated with wastewater contamination.



What are *E. coli* Bacteria and Optical Brighteners?

***E. coli* Bacteria:**

- Originate in the digestive tract of endothermic organisms
- Found in feces of warm-blooded animals
- Freshwater indicator of potential pathogen contamination
- Indicator bacteria for determining support/non-support of contact recreation use

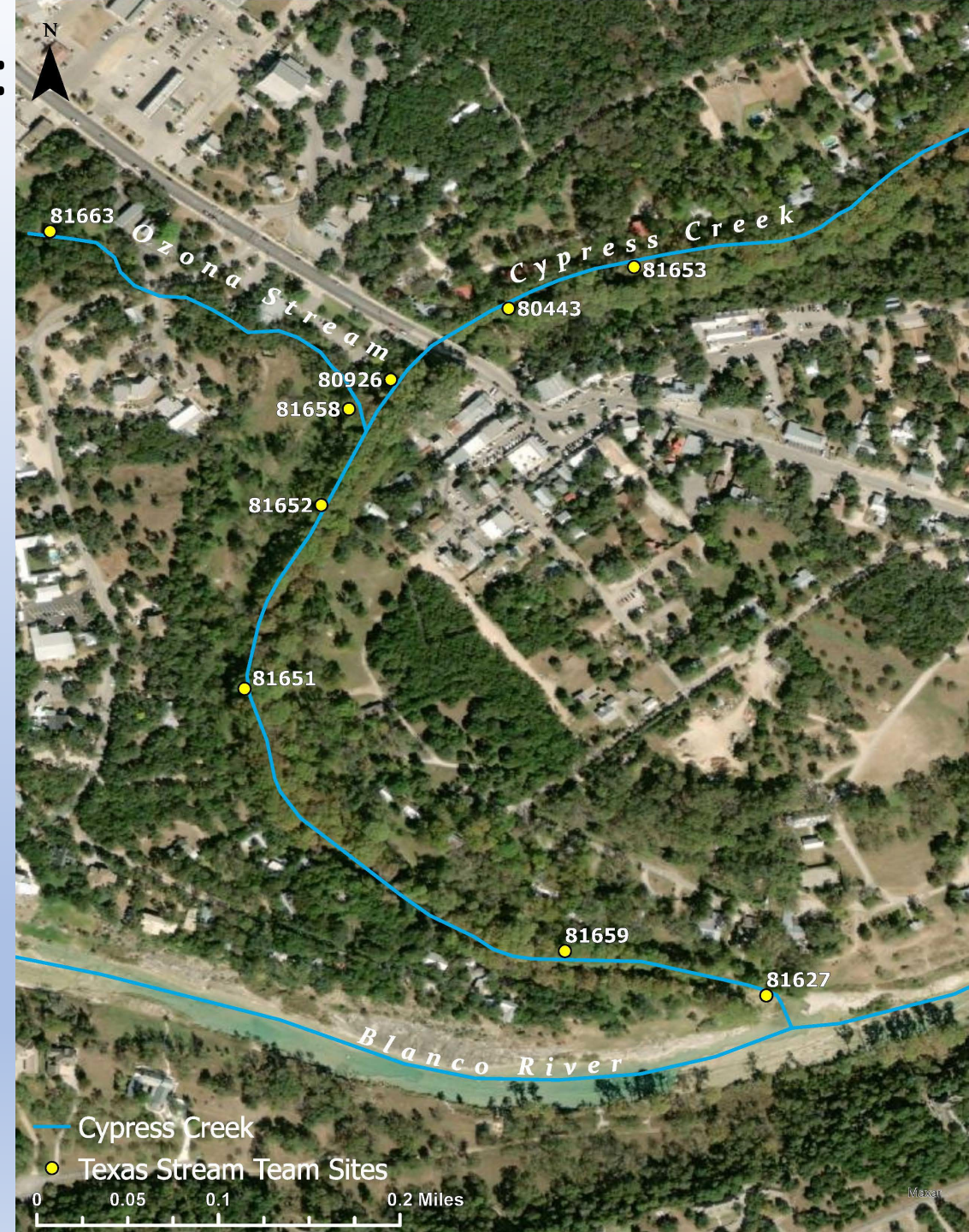
Optical Brighteners:

- Chemical compounds or dyes added to laundry detergents, cleaning agents, textiles, synthetic fibers and many kinds of paper including toilet paper
- Used as a surrogate of wastewater contamination from illicit discharges in storm drains and failing septic systems
- Adsorb to cotton
- Fluoresce under ultraviolet light
- Where fecal contamination is known to occur, optical brighteners can assist in pollution screening and source identification

Lower Cypress Creek Pilot Project: E. coli and Optical Brighteners

Project phases:

- Phase I: June – September 2021
 - Six sites
 - Sampled twice a week (Sunday and Thursday)
- Phase II: September 2021 – March 2022
 - Eight sites + one supplemental spring site (81663)
 - Sampled once a week (Thursday)
 - Suspended “tamplng” monitoring
- Phase III: April 2022 - present
 - Eight sites
 - Sampling every other week (Thursday)
 - Developing protocol for fluorometric analysis of optical brighteners



Cypress Creek Clean Rivers Program

Quarterly Monitoring Data
(Sep. 2016 – Mar 2022)

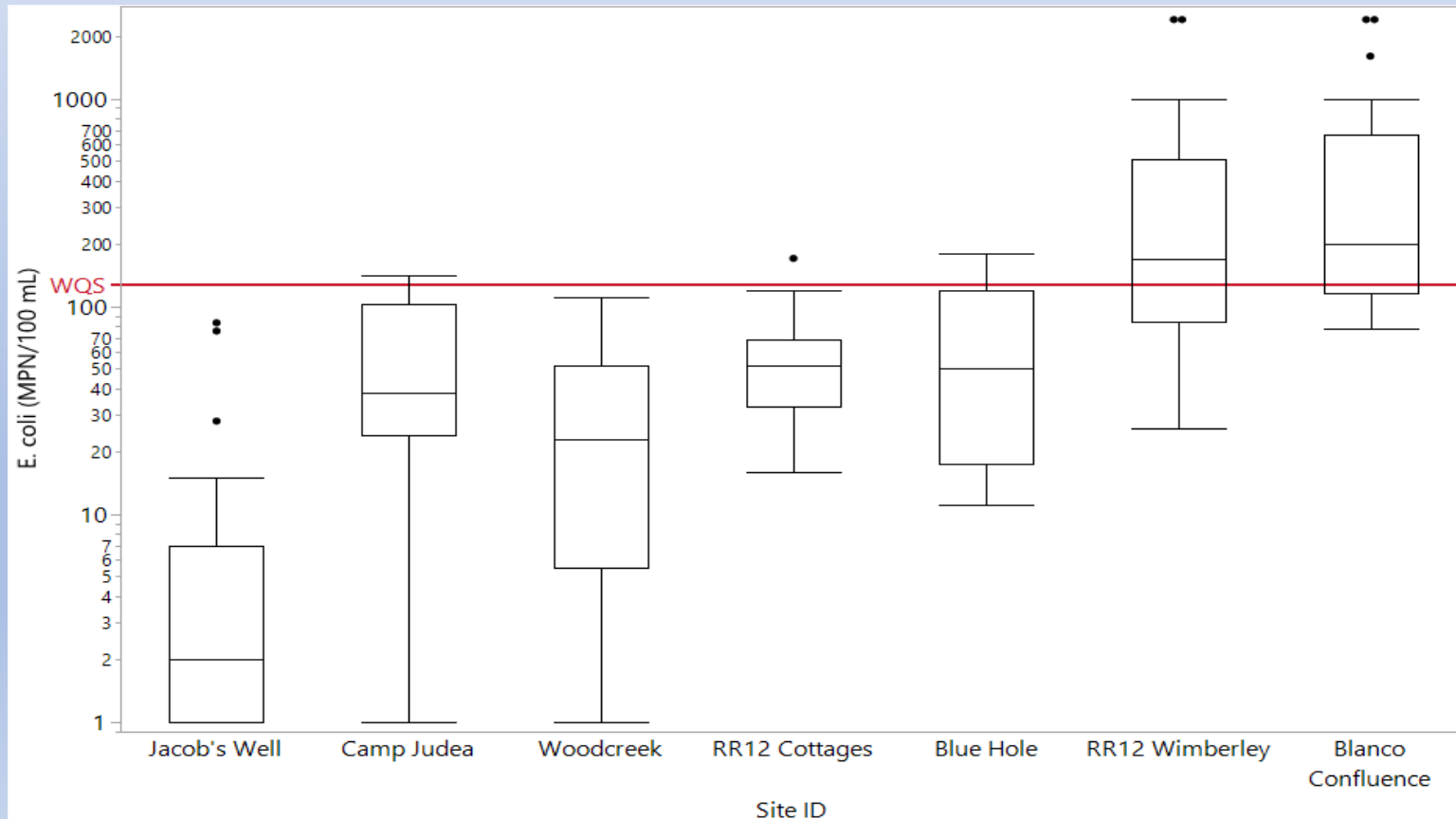


| Station Name | No. Samples | Geometric Mean (MPN/100 mL) |
|-------------------|-------------|-----------------------------|
| Jacob's Well | 21 | 3.3 |
| Camp Judea | 13 | 34.4 |
| Woodcreek Dr. | 13 | 17.7 |
| RR12 Cottages | 21 | 48.6 |
| Blue Hole | 21 | 45.7 |
| *RR12 Wimberley | 28 | 203.7 |
| Blanco Confluence | 21 | 285.7 |

E. coli (MPN/100 mL)

- WQS is 126 MPN/100 mL
- Geometric mean for all sites combined (N=138) is 49.2 MPN/100 mL
- Geometric mean above WQS at two sites:
 - RR12 Wimberley
 - Blanco River Confluence

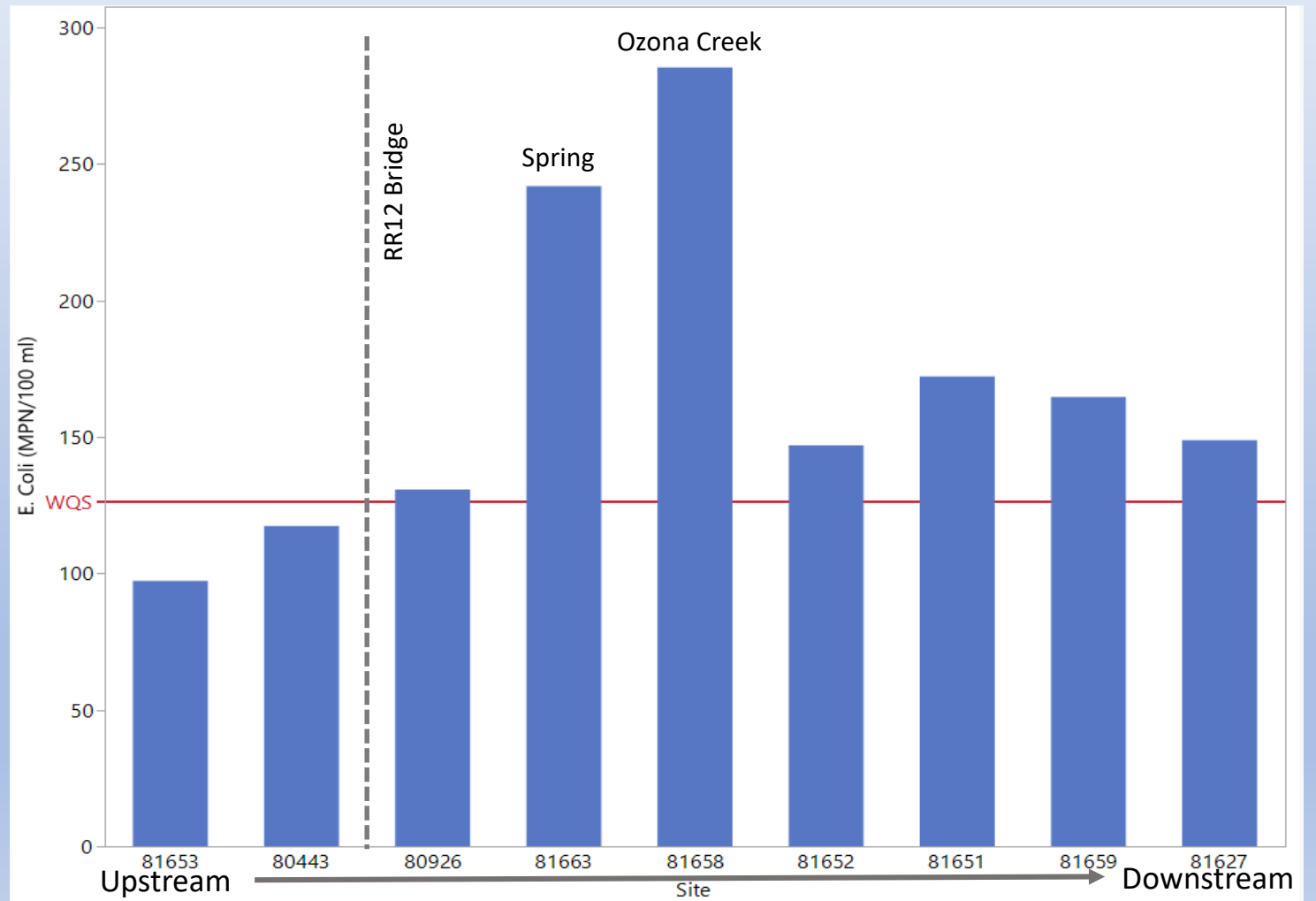
*Period of record for monitoring data at GBRA site is Aug 2016 – May 2021.



Lower Cypress Creek Pilot Project Results

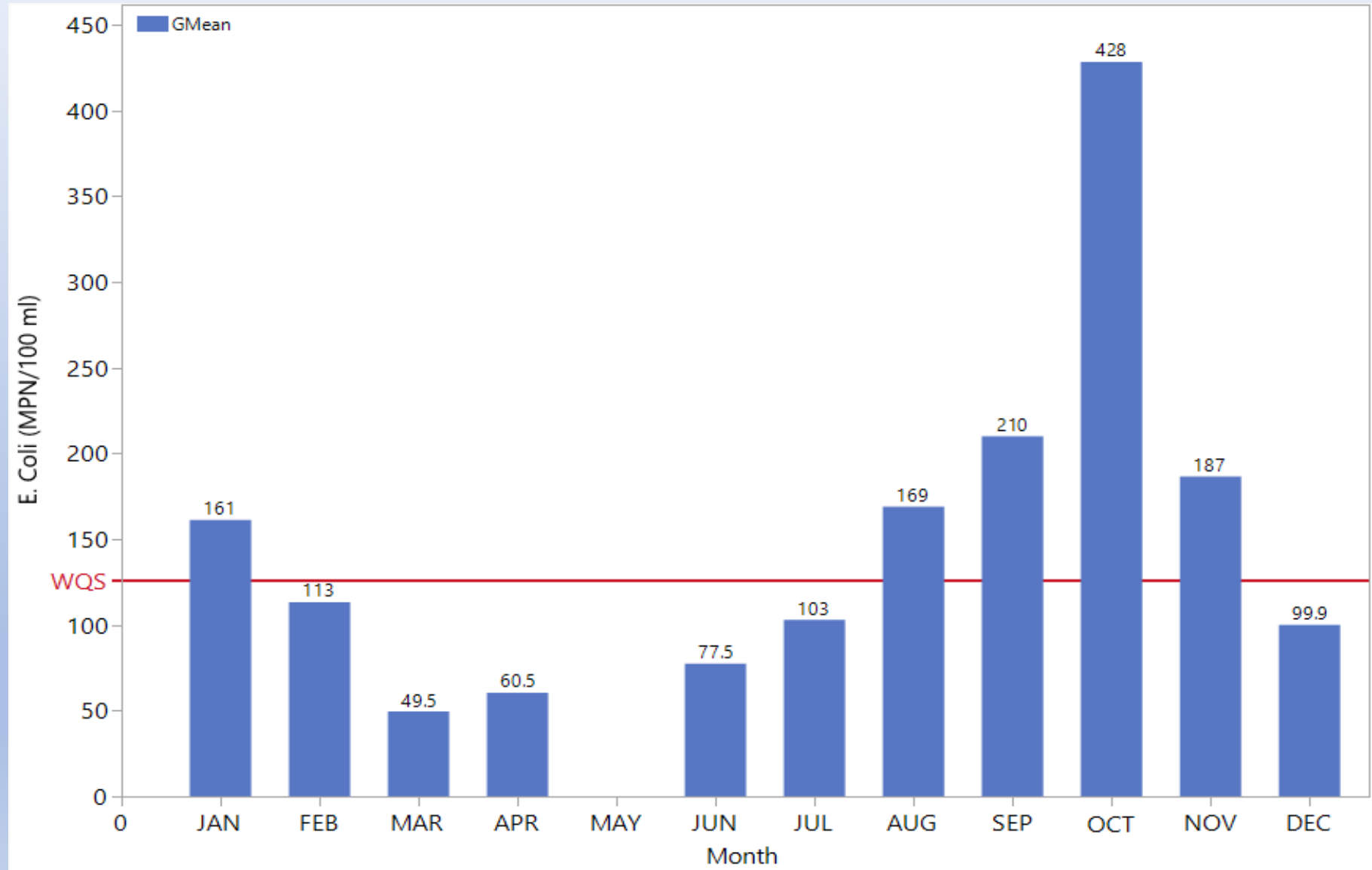
(June 27, 2021 – April 7, 2022)

| Site | N | E. Coli (MPN/100 ml) Geo Mean |
|---------------------|----|-------------------------------------|
| 81653 – upstream | 47 | 97 |
| 80443 – upstream | 47 | 117 |
| 80926 – downstream | 47 | 131 |
| 81663 –Spring | 5 | 242 |
| 81658 – Ozona Creek | 35 | 285 |
| 81652– downstream | 46 | 147 |
| 81651– downstream | 47 | 172 |
| 81659– downstream | 34 | 165 |
| 81627– downstream | 47 | 149 |



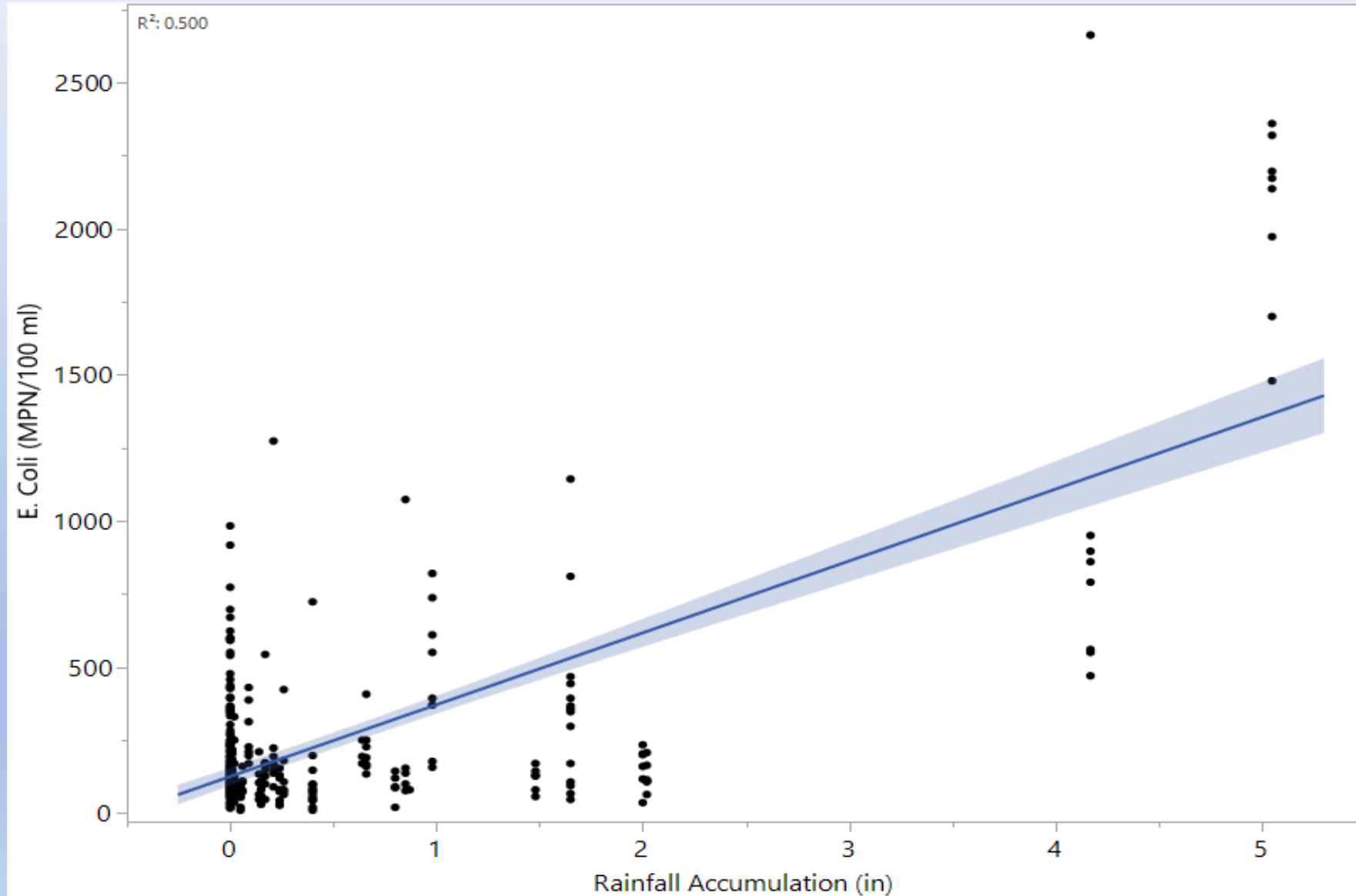
Lower Cypress Creek Pilot Project Results

(June 27, 2021 – April 7, 2022)



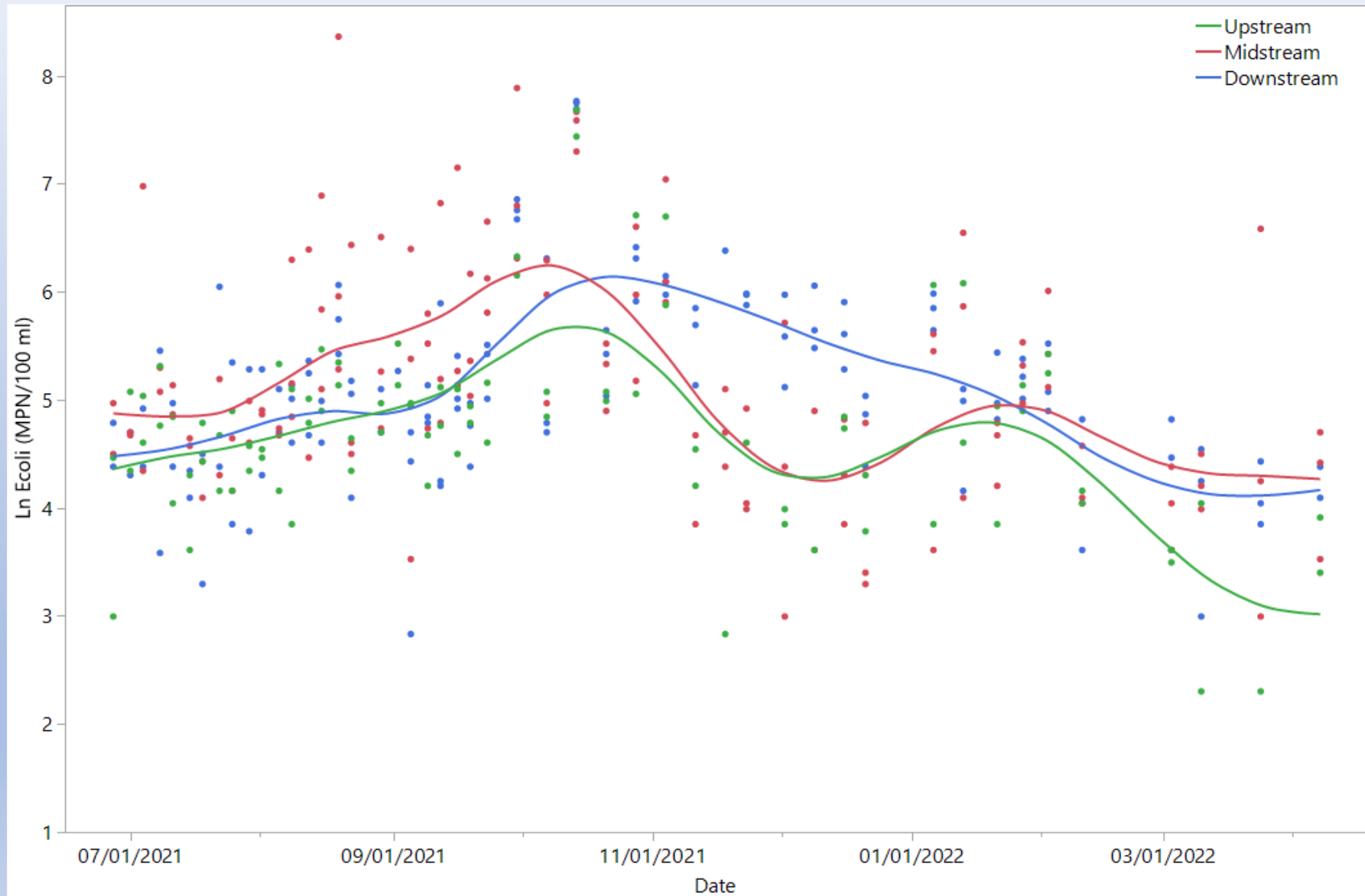
Lower Cypress Creek Pilot Project Results

(June 27, 2021 – April 7, 2022)



Lower Cypress Creek Pilot Project Results

(June 27, 2021 – April 7, 2022)



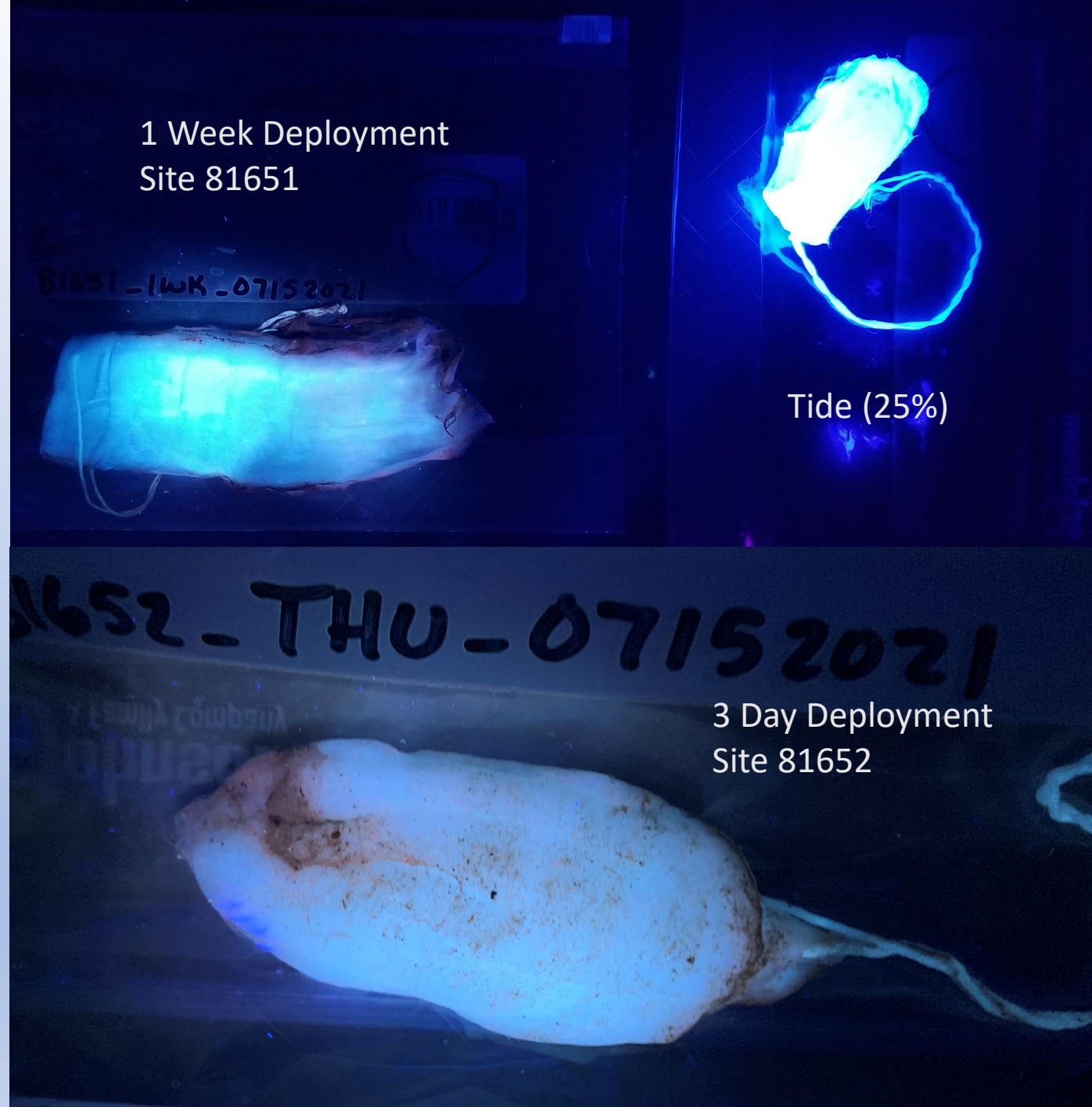
Wimberley Centralized Wastewater Collection Hookups

(December 2021)



Optical Brightener 'Tamplimg' Sampling

- Four deployment/retrieval treatments:
 - 3-day (Thu-Sun)
 - 4-day (Sun-Thu)
 - 1 week
 - 2 week
- Fluorescence observed at all sites, for all events and treatments
- Tamplimg sampling suspended as of 9/19/2021
- Developing protocol for fluorometric analysis of optical brighteners



Preliminary Observations

Bacteria geometric means were:

- Higher downstream of RR12 bridge than upstream
- Highest at 81658 – Ozona Creek
- Lowest at 81653 – most upstream site

Bacteria values:

- Fluctuated monthly – highest in October, lowest in March
- Correlated with rainfall accumulations ($r^2 = 0.50$)

Tampling sampling resulted in:

- Presence of optical brighteners detected at all sites and events

Next Steps

- Continue sampling eight sites on a bi-monthly basis (Thursdays)
- Request access to private property where Spring is located to conduct additional sampling
- Continue to track connections to central collection system
- Continue to investigate ways to discern bacteria sources such as:
 - Develop mixing model
 - Conducting dye study to identify failing septic systems
 - Delineate sub watersheds and conduct field reconnaissance to identify malfunctioning septic systems
 - Develop fluorometric sampling protocol to quantify optical brighteners
 - Continue to track bat presence/absence

Photo taken July 6, 2021



Thank you!

Nick Dornak, Director of Watershed Services

nickdornak@txstate.edu

Desiree Jackson, Student Research Assistant

desireejackson@txstate.edu

Sandra Arismendez, Senior Watershed Scientist

sandra.Arismendez@txstate.edu



THE MEADOWS CENTER
FOR WATER AND THE ENVIRONMENT
TEXAS STATE UNIVERSITY

TEXAS STREAM TEAM

