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

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Guadalupe Blanco River Authority
Clean Rivers Program
Basin Steering Committee Meeting
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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 “tampling” 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 “tampling” 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)

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.

<table>
<thead>
<tr>
<th>Station Name</th>
<th>No. Samples</th>
<th>Geometric Mean (MPN/100 mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacob’s Well</td>
<td>21</td>
<td>3.3</td>
</tr>
<tr>
<td>Camp Judea</td>
<td>13</td>
<td>34.4</td>
</tr>
<tr>
<td>Woodcreek Dr.</td>
<td>13</td>
<td>17.7</td>
</tr>
<tr>
<td>RR12 Cottages</td>
<td>21</td>
<td>48.6</td>
</tr>
<tr>
<td>Blue Hole</td>
<td>21</td>
<td>45.7</td>
</tr>
<tr>
<td>*RR12 Wimberley</td>
<td>28</td>
<td>203.7</td>
</tr>
<tr>
<td>Blanco Confluence</td>
<td>21</td>
<td>285.7</td>
</tr>
</tbody>
</table>

[Box plots showing E. coli concentrations for different sites]
### Lower Cypress Creek Pilot Project Results

(June 27, 2021 – April 7, 2022)

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

![Bar chart showing E. Coli levels at different sites](chart.png)
Lower Cypress Creek Pilot Project Results
(June 27, 2021 – April 7, 2022)

![Graph showing E. Coli (MPN/100 ml) from January to December. The y-axis represents E. Coli levels, with a threshold marked as WQS. The x-axis represents the months from January to December.]

- **January (JAN):** 161 MPN/100 ml
- **February (FEB):** 113 MPN/100 ml
- **March (MAR):** 49.5 MPN/100 ml
- **April (APR):** 60.5 MPN/100 ml
- **May (MAY):** 77.5 MPN/100 ml
- **June (JUN):** 103 MPN/100 ml
- **July (JUL):** 169 MPN/100 ml
- **August (AUG):** 210 MPN/100 ml
- **September (SEP):** 428 MPN/100 ml
- **October (OCT):** 187 MPN/100 ml
- **November (NOV):** 99.9 MPN/100 ml
- **December (DEC):** 99.9 MPN/100 ml
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 ‘Tampling’ 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

• Tampling 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 ($r^2 = 0.50$)

Sampling 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!

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