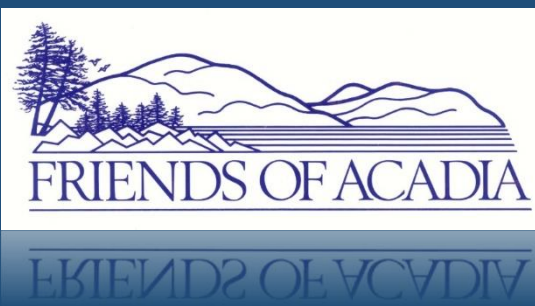


Insights into Stream Water Quality: Bacteria Sampling at the Cromwell-Kebo Watershed through Summer Storm Events

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1. Introduction

- Friends of Acadia runs multiple programs to protect natural resources facing heavy anthropogenic pressures, such as watersheds in and around Acadia National Park
- Monitoring water quality at multiple sites in the Cromwell Brook watershed helps the park identify sources of bacterial contamination
- Data on turbidity and bacteria levels can help predict bacterial peaks, aid in decision-making, and inform best management practices

2. Methodology

- Weekly discharge measurements based on depth, width, and velocity of streams using the OTT Hydromet's MF Pro flow meter
- Stream stage and water temperature recorded every minute with Onset HOBO data loggers installed in stilling wells
- Turbidity and bacteria sampling through storm events, processed at MDI Biological Laboratory (MDIBL) (Fig. 1)
- Water Quality parameters measured with a YSI ProDSS and YSI Exo meters (Fig. 2, 3)
 - Temperature
 - Turbidity and Total Dissolved Solids
 - Dissolved Oxygen
 - Conductivity and Salinity
- GIS Mapping with Trimble equipment and ArcGIS Pro software



Figure 1: Bacteria sample in a whirl bag.

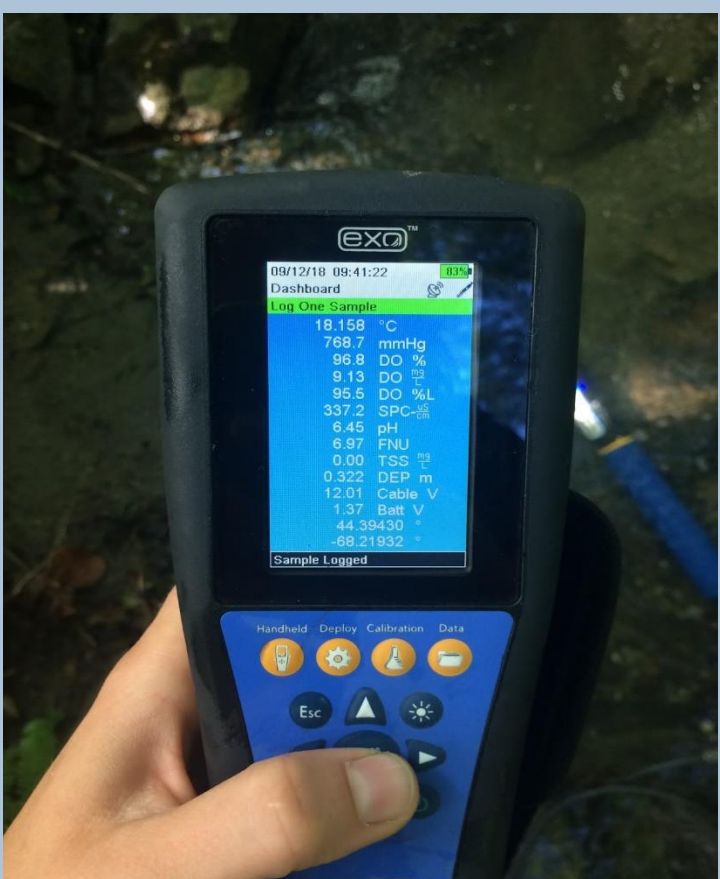


Figure 3: YSI Exo multivariable meter.



Figure 2: Celeste handling the YSI probe for water quality samples.

Figure 4: Measuring discharge with OTT Flow Meter.



Figure 5: Annotated map of Cromwell/Kebo Watershed, showing bacteria sample sites.

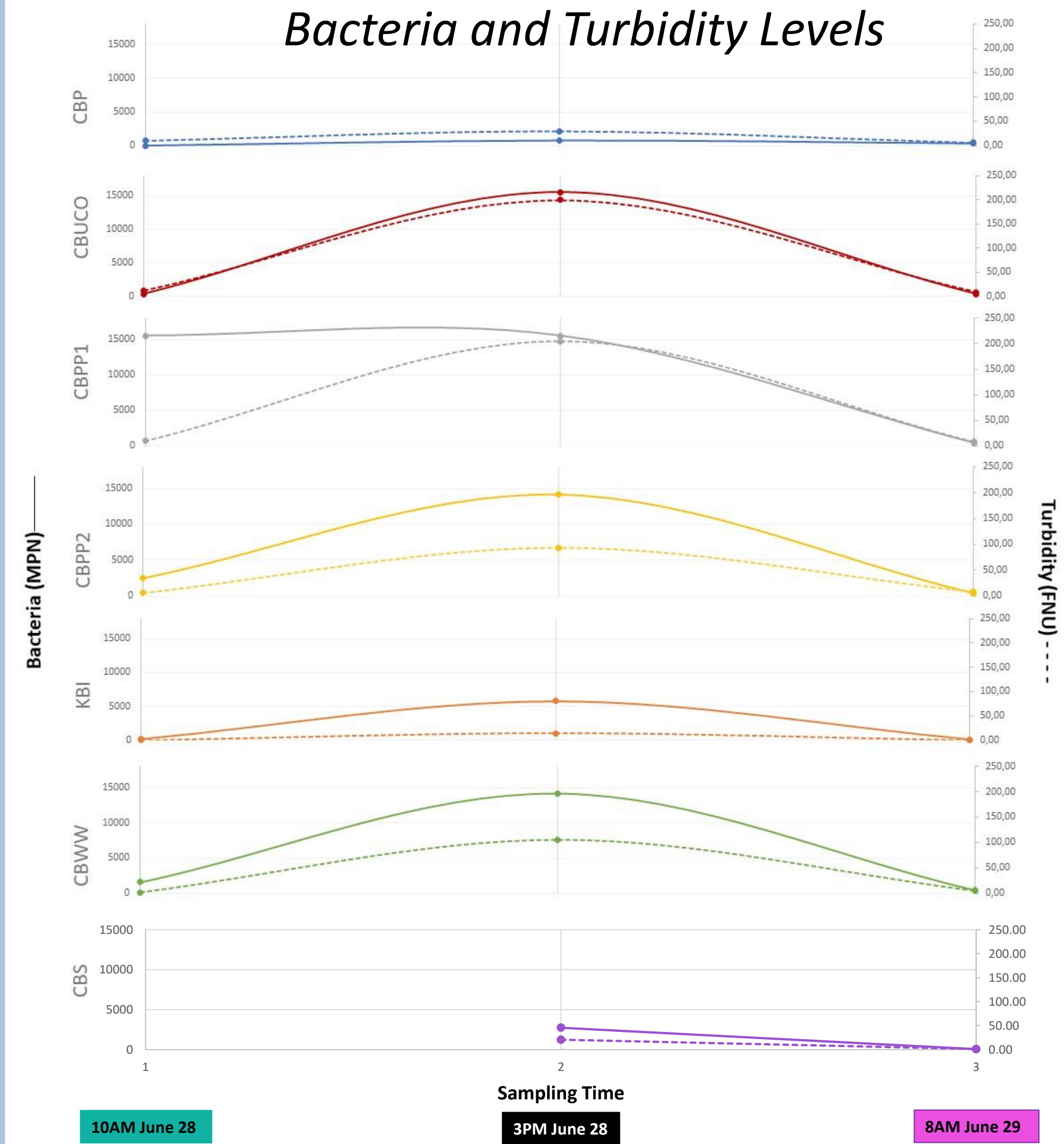


Figure 6: Bacteria (solid line) and turbidity (dashed line) levels measured during June 28-29th 2018 at multiple sites. Most sites show elevated bacteria levels along with high turbidity metrics.

3. Results

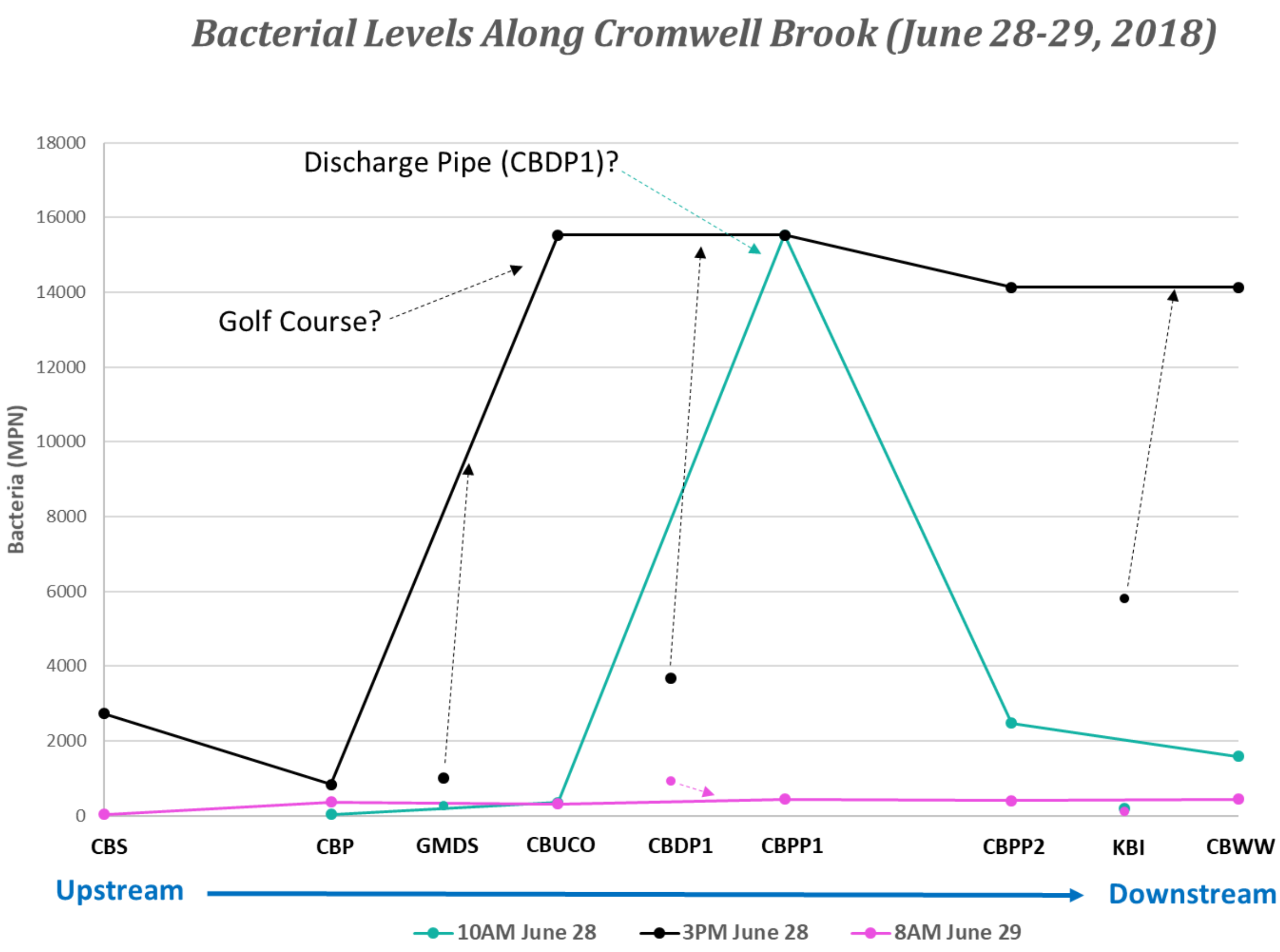


Figure 7: graph showing how bacteria levels changed throughout the Cromwell Brook watershed, from upstream to downstream, during the three sampling events in June 28-29. Bacteria levels exceeding 15,000 MPN per 100ml were measured at 4 sites, but very low values were measured inside ANP boundaries (CBS, CBP, KBI)

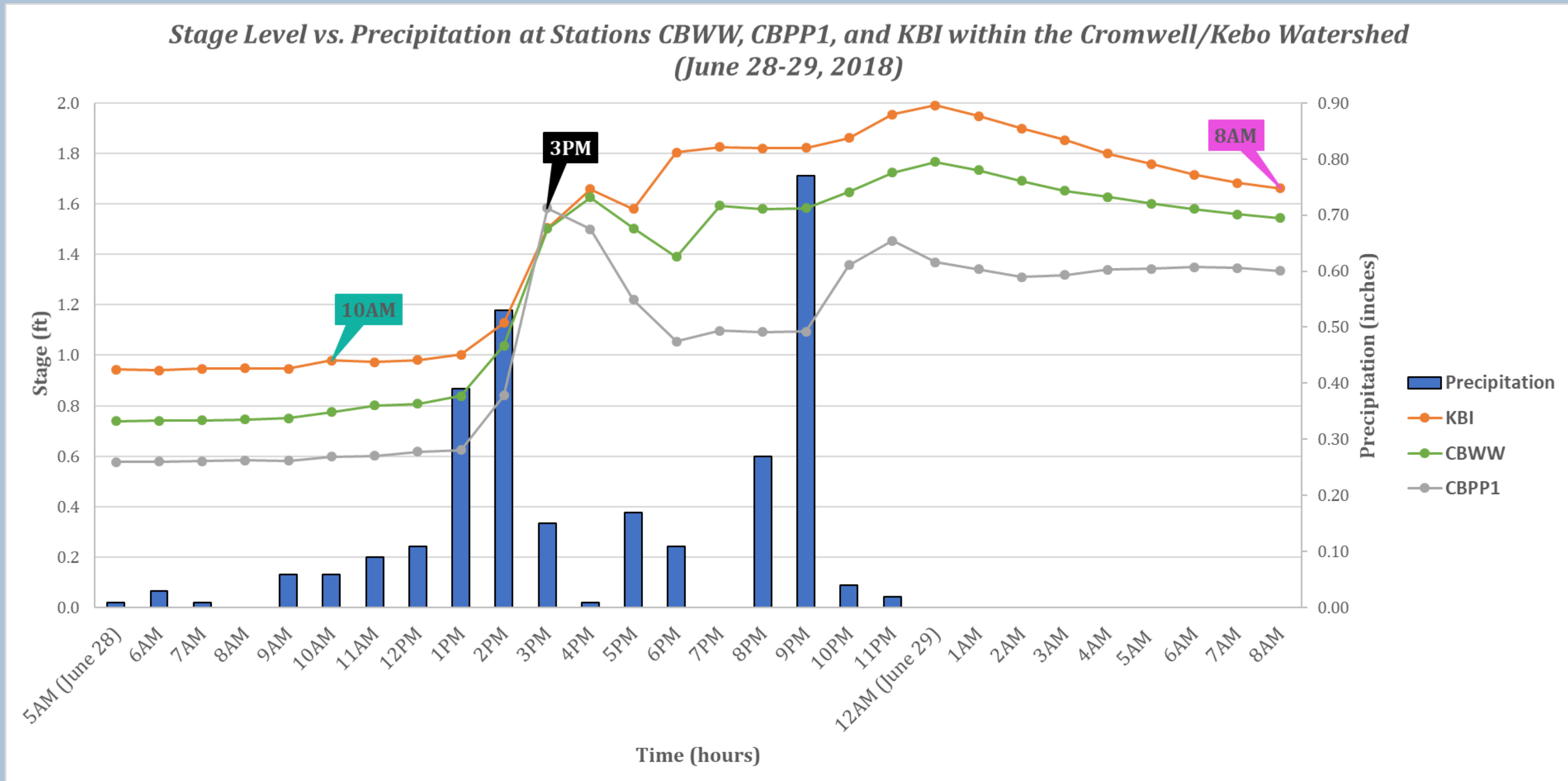


Figure 9: graph showing precipitation (bars) vs. stage (lines) over time at three sites in the Cromwell/Kebo watershed. The sampling times are shown on the graphs (Sampling time 1 = 10 am, Sampling time 2 = 3 pm, Sampling time 3 = 8 am) from the summer storm event on June 28th-29th 2018.

4. Discussion/Conclusions

- Bacteria concentration and stream turbidity levels show a statistically significant correlation at multiple sites
- At **CBPP1** we see high levels of bacteria before peak discharge while the **CBUCO** sample upstream has lower levels. This suggests **CBDP1**, a culvert draining the transfer station, inputs high levels of bacteria into Cromwell Brook after the first inches of rainfall (Fig. 7)
- High levels of bacteria at **CBUCO**, **CBPP1**, **CBPP2**, and **CBWW**, are observed near peak flow, suggesting sources of bacteria from further upstream, such as the Kebo Golf Course. We have added new sampling sites to test this hypothesis (**KBGC**, **KBC**, and **CBB**) in future storm events

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