

# **Tracking Watershed Sources of Fecal Pollution to Santa Monica Bay**

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**Southern California Coastal Water Research Project**

**[www.sccwrp.org](http://www.sccwrp.org)**

# Cast Of Characters

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- **John Griffith (SCCWRP)**
- **Angie Bera (Santa Monica Baykeeper)**
- **Jed Fuhrman, Ximena Hernandez, Anand Patel, Xiao Liang, Sheila O'Brien (USC)**
- **Rachel Noble, Angela Blackwood, Jason Gregory (U Chapel Hill)**
- **Jay Shrake (MacTec Engineering)**

# Background

- **Santa Monica Bay is an important recreational resource**
  - 50 million beachgoer-days per year
- **13% of the shoreline mile-days exceed water quality thresholds for fecal indicator bacteria**
  - 50% near storm drains
- **Santa Monica Bay beaches have been subjected to a total maximum daily load (TMDL) for bacteria**
  - Identify and eliminate sources

# Source Tracking Issues

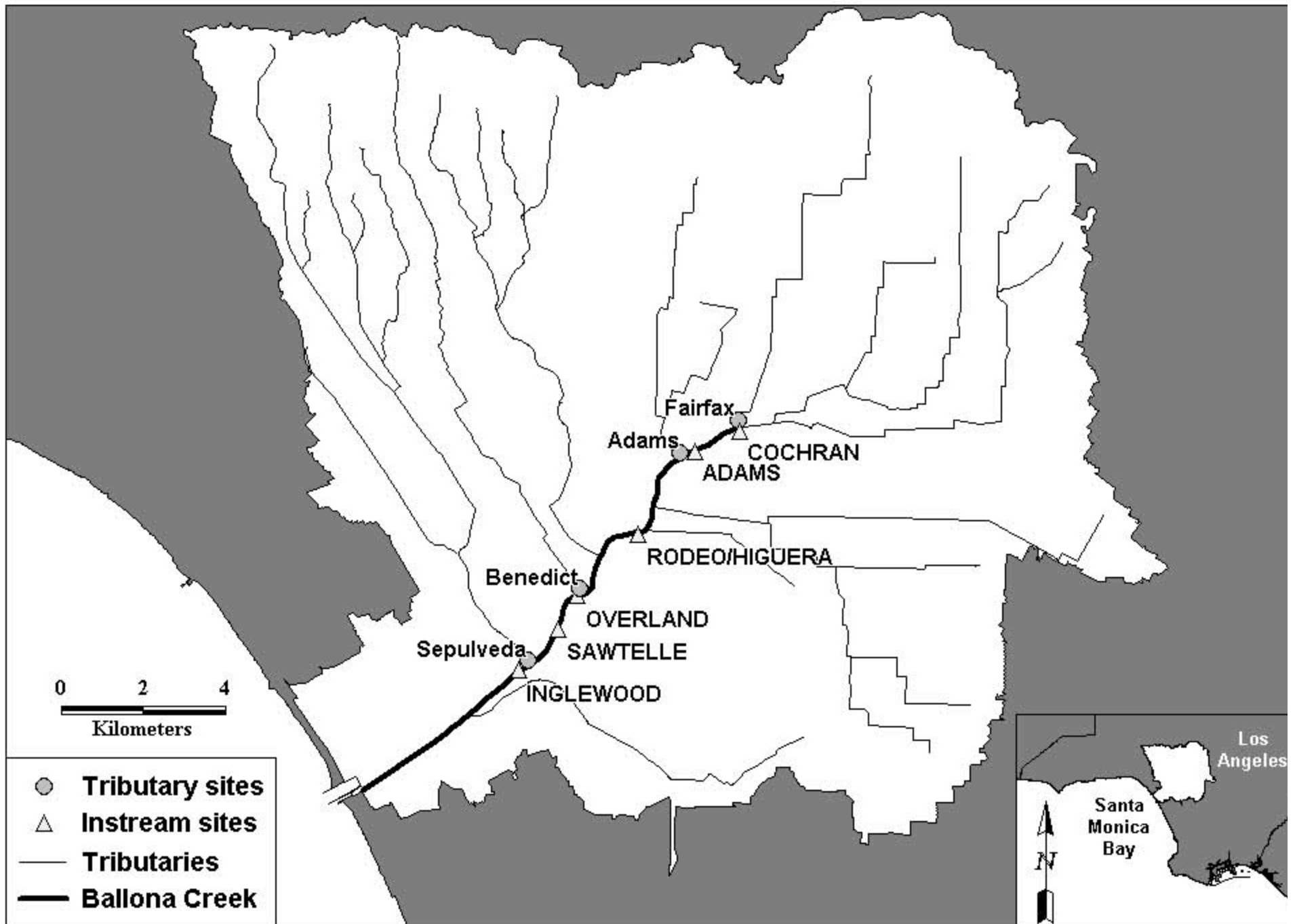
- **Not all indicator bacteria come from humans**
  - many inputs are episodic
- **Other source tracking tools are being developed**
  - Alternative methods for traditional indicators
  - Alternative bacterial indicators
  - Human specific virus
- **No tool is perfect**
  - intercalibration studies demonstrate potential bias

# Project Objectives

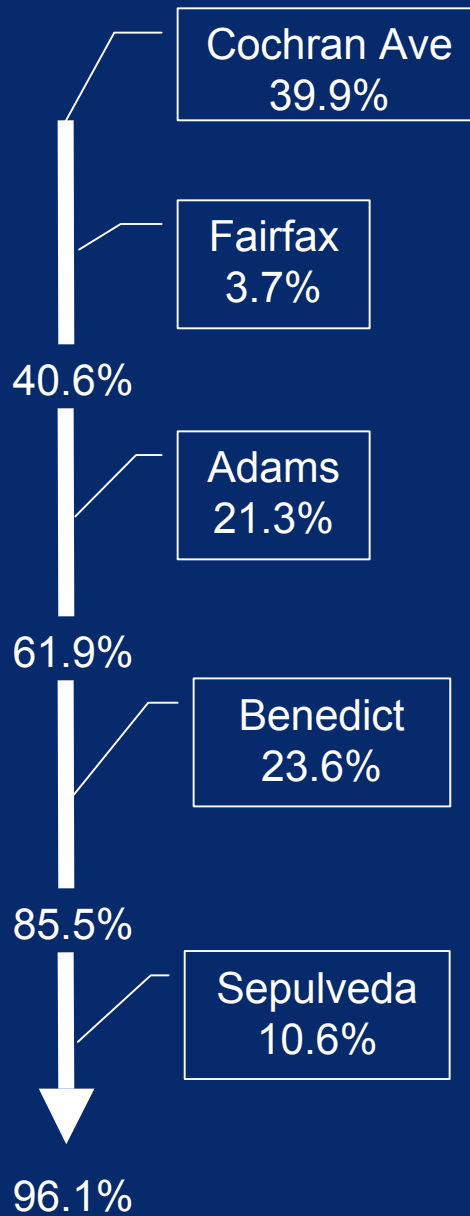
- Quantify the loading of bacteria from different area sources using a multi-tiered approach
- **First Tier: traditional fecal indicator bacteria**
- **Second Tier: new source tracking tools**
  - polymerase chain reaction (PCR)
  - enterococcus, *Bacteroides*, human specific enterovirus
- **Third Tier: viral confirmation**

# Project Design

- **Apply source tracking in Ballona Creek**
  - largest watershed to Santa Monica Bay
- **Mass based approach**
  - Six sites along the main stem, Four major tributary inputs
- **Sample every six minutes**
  - Hourly composites for six hours
- **Measure flow, traditional fecal indicator bacteria, new tools**
  - subset of samples for viral confirmation



# Flow and Volume Balance In Ballona Creek

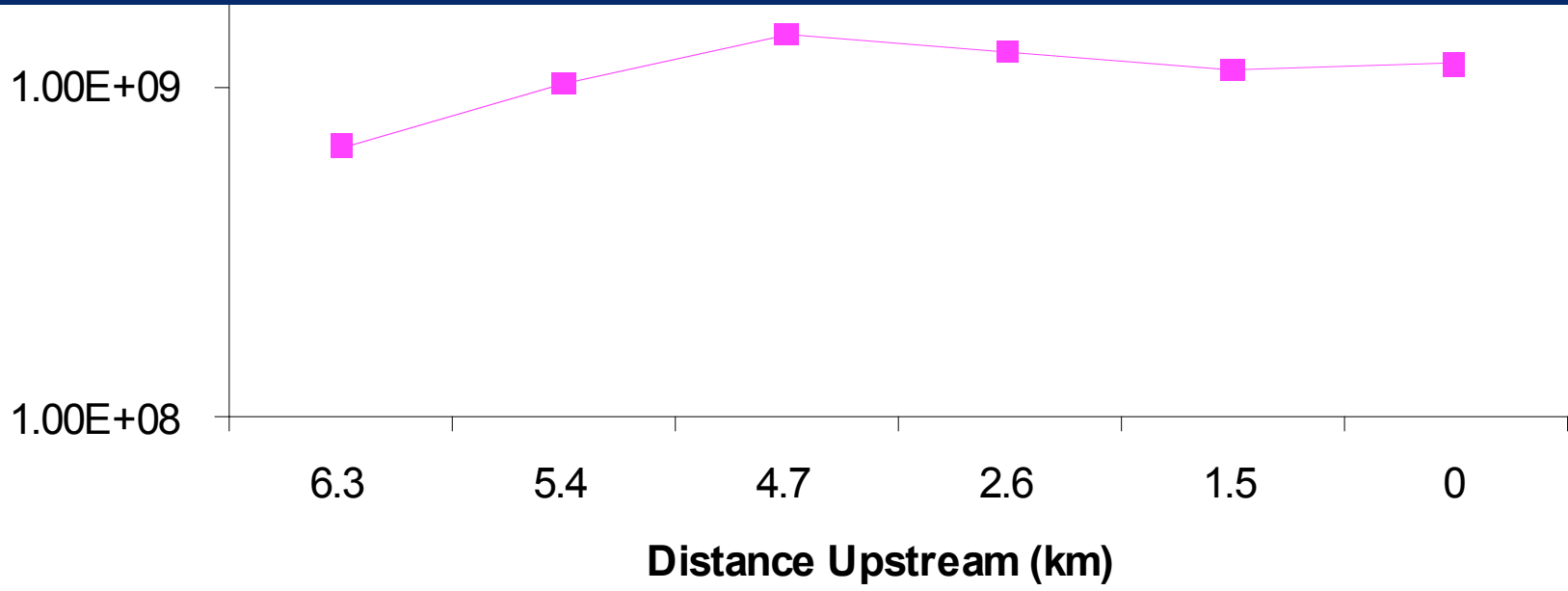


# Results

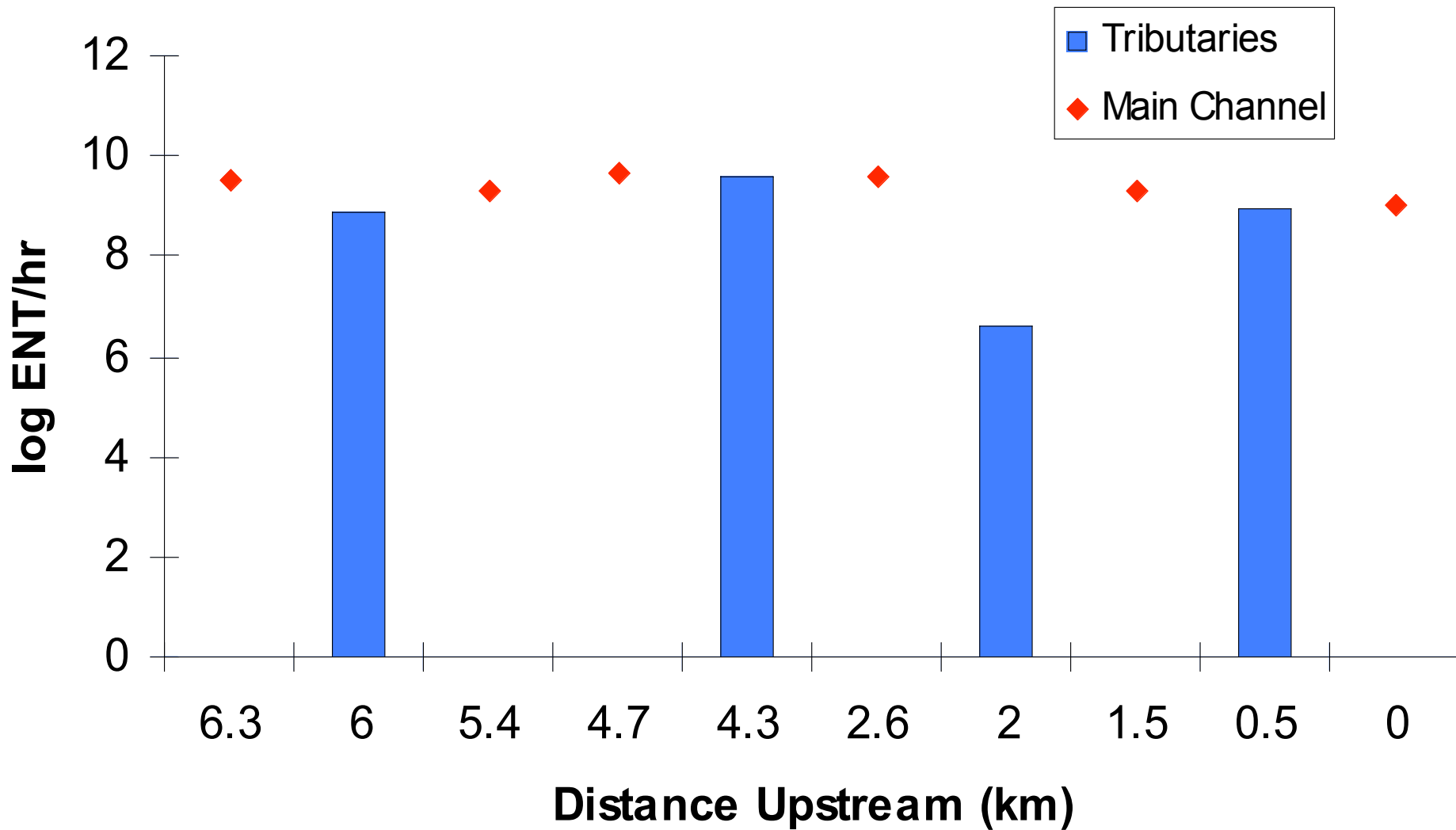
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- **Spatial flux estimates**
- **Temporal flux estimates**
- **New tools**
  - virus confirmation

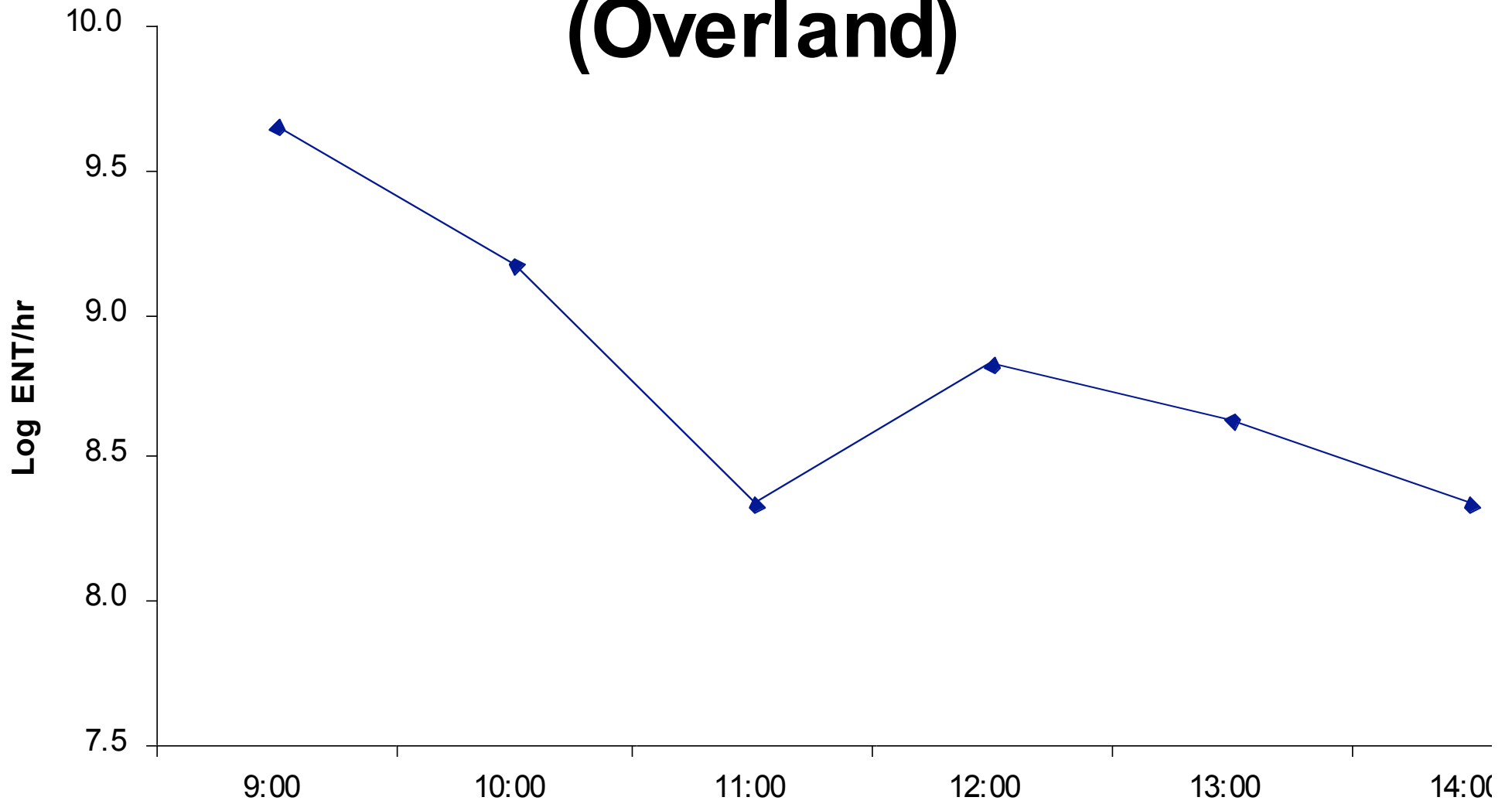
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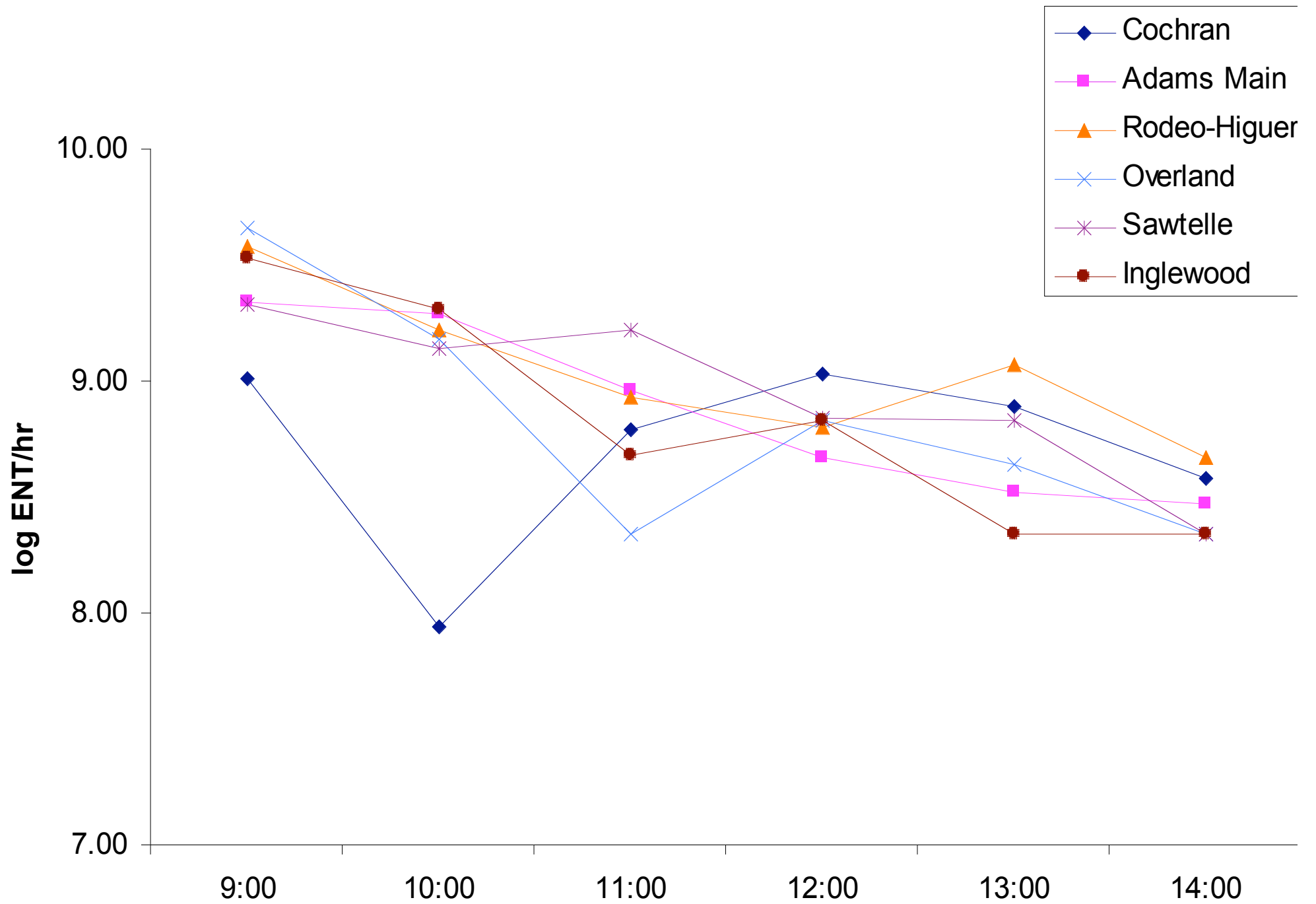


# Flux of Enterococcus

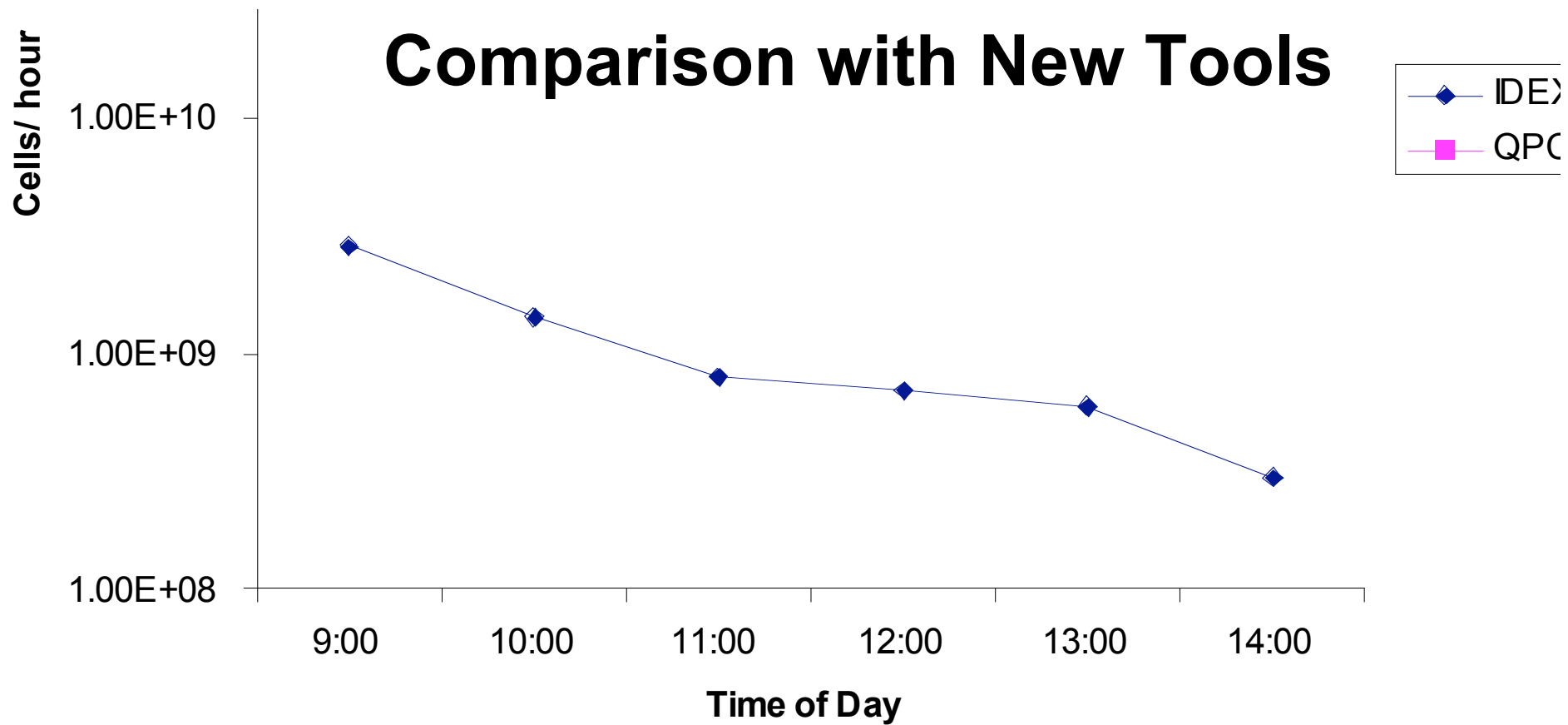


# Temporal Flux (Overland)

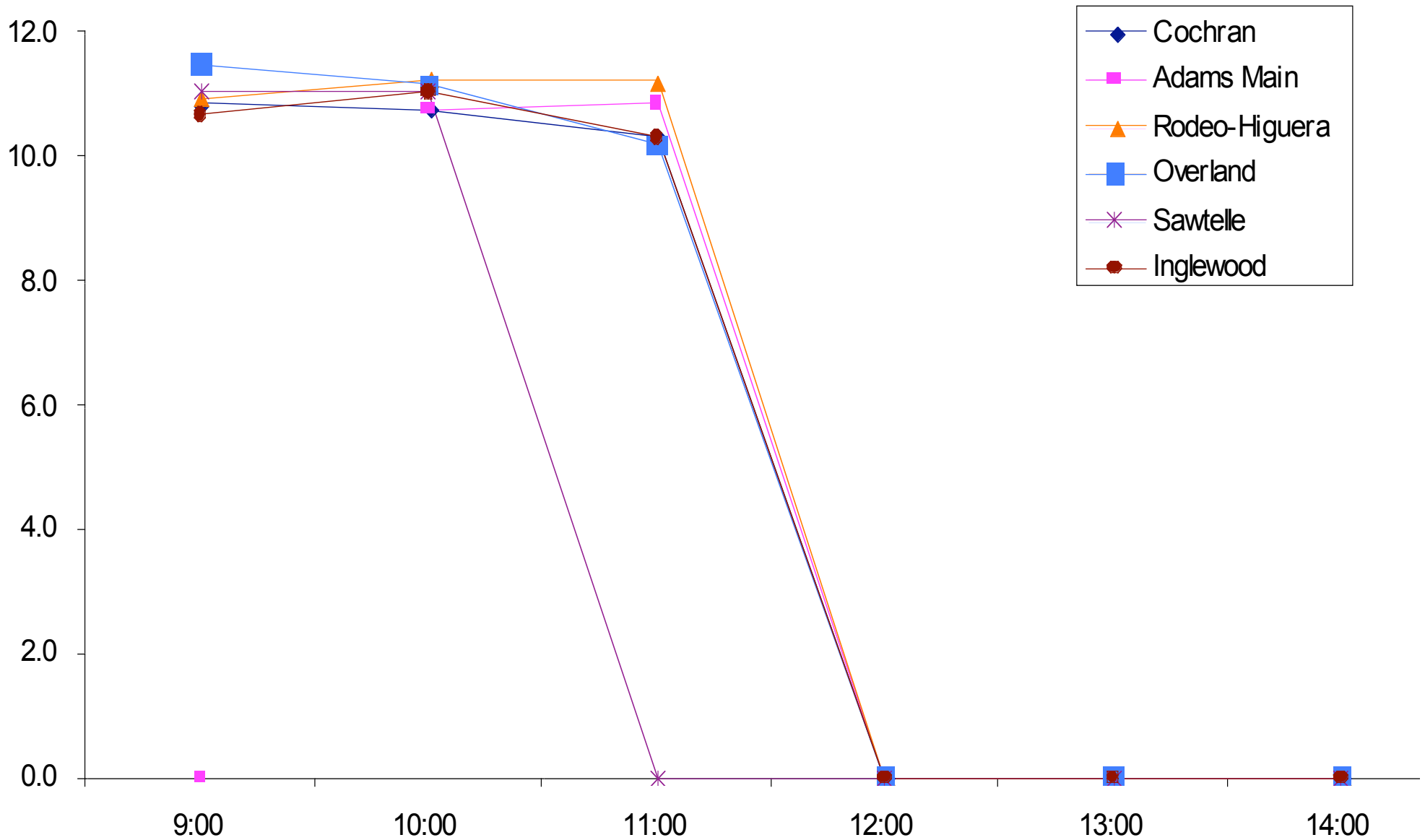




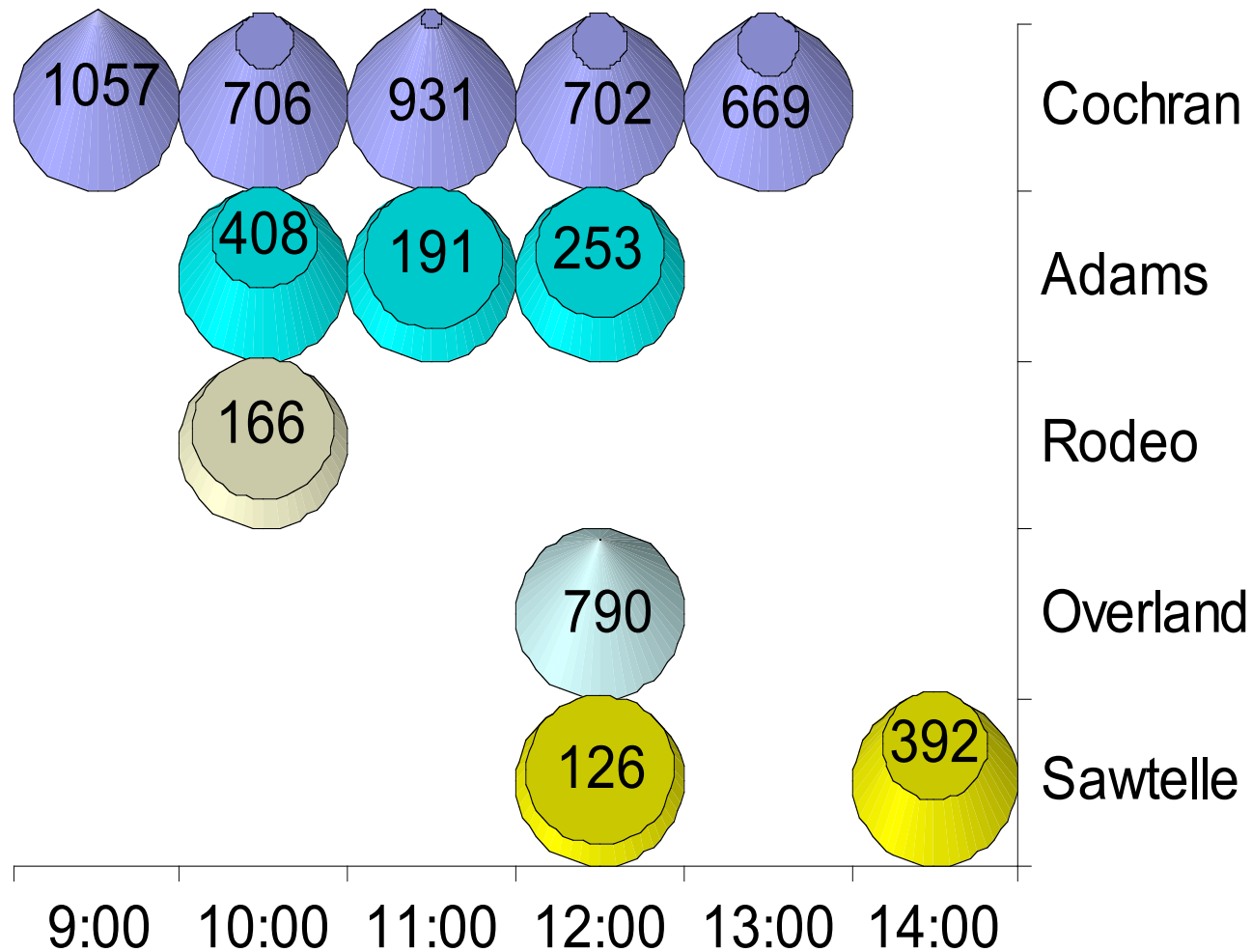
# Comparison with New Tools



## Bacteroides/Hour: Main Channel



# Human Enterovirus



# Summary and Conclusions

- **Ballona Ck is ubiquitously contaminated with fecal indicator bacteria**
  - Flux as high at the head as the mouth
- **Human sources of fecal pollution were found**
  - *Bacteroides* and enterovirus measured at most upstream site
- **New source tracking tools can help prioritize management actions**
  - Without tools, entire watershed needs to be diverted
  - With tools, focus on the section upstream of Cochran