



# New Genetic Profiling Approaches to Source Tracking for Human Fecal Contamination

September 7, 2018

# The Old Question: Are There Human Fecal Sources?

- Wet weather indicator bacteria concentrations nearly always exceed objectives, regardless of location
  - Approximately 2/3 of beaches from Bight regional monitoring
- We have found human fecal markers (HF183) in stormwater discharges throughout So Cal
  - 14 of 16 discharge locations from Ventura to San Diego
- Body contact recreation increased illness risk following wet weather compared to no exposure
  - Measured human pathogens in the stormwater discharge

# The New Question: Where Is the Human Fecal Source(s) Coming From?

- Public Sewers
- Private Sewers/Laterals
- Septics/On-site Wastewater Systems
- Sanitary Sewer Overflows
- Homeless
- Illicit Connections
- Illegal Dumping

# Searching for Source Tracking Tools

- Traditional approaches for contaminated runoff
  - Hotlines
  - IC/ID surveys
  - Cameras, smoke and dye testing
- Non-traditional approaches for human sources
  - Chemical markers
- New research looking for human source signatures
  - Microbial community profiling (genetic sequencing)
  - Chemical contaminant profiling (non-targeted analysis)

# How Do We Exploit Biofilms?

- Unique microbial community may be growing on the inside of sewer pipes
  - Not in storm drains
- If sewer microbial community found in runoff, then sewer contributions likely
  - Potential to estimate dilution or back track to source
- Similar approach for non-targeted chemistry



# Microbial Community Research Development Questions

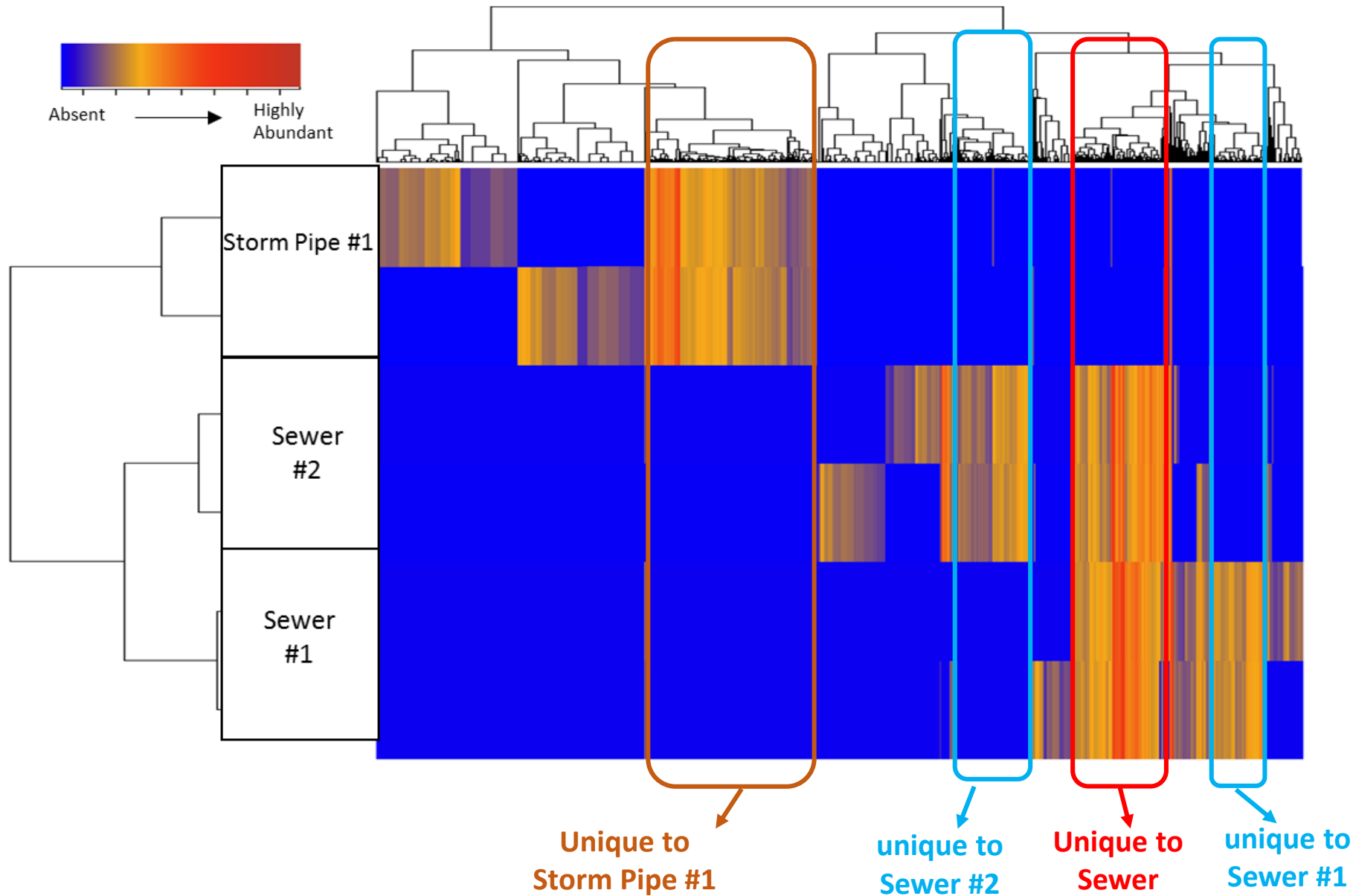
- Are microbial communities different between sanitary sewer and storm drains?
- How sensitive are microbial community measurements?
  - Dilution
- What is the degradation of microbial community measurements?
  - Persistence

# General Approach to Question #1

- Sample many locations to evaluate spatial consistency
  - Upstream source inputs
  - Materials of construction
  - Age of pipe
- Sample over time to evaluate temporal consistency
  - Seasonality
  - Biofilm regrowth
- We've got a sneak peak!

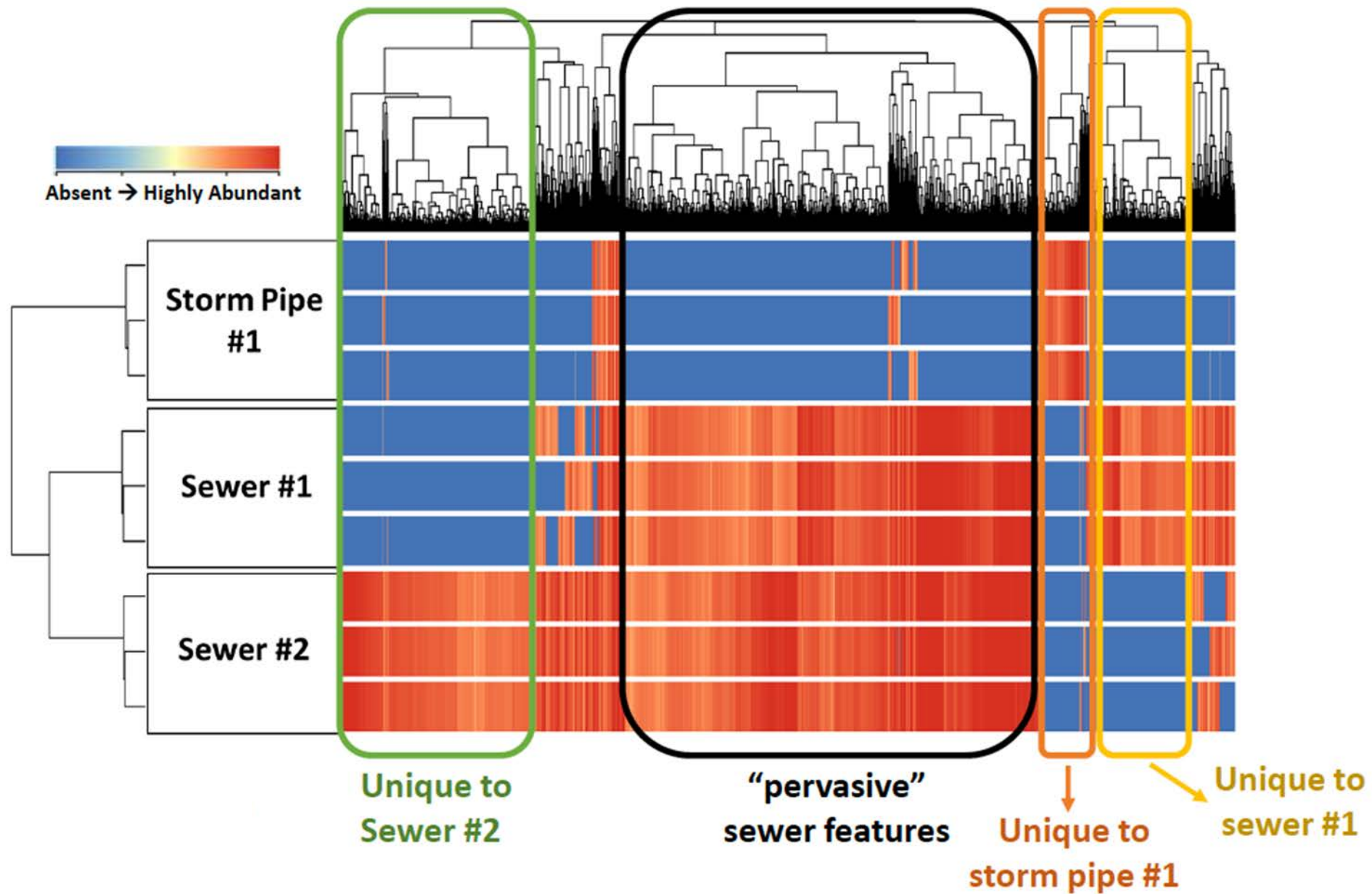


# Preliminary Results: Microbial Community Analysis





# Initial Results: Non-targeted Chemistry



# Timeline to Application

- Are microbial communities different between sanitary sewer and storm sewer?
  - 12 to 18 months
- How sensitive are microbial community measurements?
  - 12 months
- What is the degradation of microbial community measurements?
  - 12 months
- We expect field trials to begin within 24 months