Background

• Molecular tools such as qPCR have been developed and showed great advantage over culture methods in microbial water quality testing
  • Faster *Enterococcus* monitoring
  • Specific identification of fecal sources

• Bight’13 Microbiology is an opportunity
  • To transition these tools to local labs
  • To use these tools to answer regional management questions
Prelude

- Our member agency labs can do it
  - 2 dozen staff from 14 California labs graduated from SCCWRP 3-day training workshop
  - 1-2 month hands-on practice in each lab
  - Labs demonstrated proficiency via inter-lab calibration study
Good accuracy and reproducibility

HF183 concentration (log10 copy per filter)

High concentration
Medium concentration
Low concentration

Day of study
Replicate

Two research questions

• At how many beaches is it appropriate to use qPCR?
  • Prevalence of sample interference of qPCR
  • Comparability of qPCR and culture results
Two research questions

• At how many beaches is it appropriate to use qPCR?
  • Prevalence of sample interference of qPCR
  • Comparability of qPCR and culture results

• How many streams/drains discharging to beaches have a substantial human component to their bacterial contamination?
Study plan

• Local agencies sample drainages throughout southern California
  • Summer dry and winter storm conditions

• Assess extent of human contamination
  • Use HF183 human marker
  • HF183 performed exceptionally well in SCCWRP MST Marker Evaluation Study

• Design
  • Sample within the drain/stream above tidal influence
  • 50 samples per site per season
  • Sample collection and human marker analysis by qPCR by local labs
Good participation = good coverage

<table>
<thead>
<tr>
<th>County</th>
<th>Dry Weather Sites</th>
<th>Wet Weather Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventura</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Orange</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>San Diego</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

- Participating Agencies
  - Ventura Countywide Stormwater Quality Management Program
  - Ventura County Public Health Lab
  - City of Malibu
  - City of Los Angeles
  - LA County Sanitation District
  - LA County Flood Control
  - Orange County Sanitation District
  - Orange County DPW
  - Orange County Public Health Lab
  - City of Oceanside
  - City of Encinitas
  - City of San Diego
  - Weston Solution
  - NOAA
The challenge

• How much is “too much”
  • This is currently no definition for “too much”

• EPA suggested 20% human component is too much

• EPA did not define 20% of what
  • Frequency at which human contamination is detected
  • Concentration at which human contamination is detected
Preliminary findings

• The Bight’13 Microbiology committee is still helping refining data analysis

• Only data from 19 out of 24 sites are available

• Sufficient work has been done to give you a preview of main findings
### Frequency-based Criteria

<table>
<thead>
<tr>
<th>Concentration-based Criteria</th>
<th>Minimally Human Influenced</th>
<th>Intermediate</th>
<th>Clearly Human Influenced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimally Human Influenced</td>
<td>8</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Intermediate</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Clearly Human Influenced</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Sensitivity to the EPA suggested 20% rule

<table>
<thead>
<tr>
<th>Concentration-based Criteria</th>
<th>Minimally Human Influenced</th>
<th>Intermediate</th>
<th>Clearly Human Influenced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimally Human Influenced</td>
<td>3</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Intermediate</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Clearly Human Influenced</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Frequency-based Criteria**

<table>
<thead>
<tr>
<th>Concentration-based Criteria</th>
<th>Minimally Human Influenced</th>
<th>Intermediate</th>
<th>Clearly Human Influenced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimally Human Influenced</td>
<td>8</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Intermediate</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Clearly Human Influenced</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- 10% Sensitivity
- 20% Sensitivity
- 30% Sensitivity
Dry and wet seasons differ greatly

<table>
<thead>
<tr>
<th>Concentration-based Criteria</th>
<th>Frequency-based Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimally Human Influenced</td>
</tr>
<tr>
<td>Minimally Human Influenced</td>
<td>25%</td>
</tr>
<tr>
<td>Intermediate</td>
<td>0</td>
</tr>
<tr>
<td>Clearly Human Influenced</td>
<td>0</td>
</tr>
</tbody>
</table>

Dry:
- Minimally Human Influenced: 42%
- Intermediate: 32%
- Clearly Human Influenced: 15%

Wet:
- Minimally Human Influenced: 0
- Intermediate: 0
- Clearly Human Influenced: 0
## Timeline

<table>
<thead>
<tr>
<th>Task</th>
<th>Expected Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving remaining data</td>
<td>October, 2016</td>
</tr>
<tr>
<td>Draft report</td>
<td>February, 2017</td>
</tr>
<tr>
<td>Final report</td>
<td>May, 2017</td>
</tr>
</tbody>
</table>

Thank you!