

Bight '18 Microbiology

February 21, 2018

MONITORING QUESTIONS

- **What is the occurrence of coliphage in beach water?**
- **Is coliphage a viable indicator for monitoring shellfish?**
- **Source tracking**
 - What is the contribution of homeless populations to human fecal loading in stormwater conveyances?
 - Can biofilm shed from the inside surfaces of sanitary collection systems be used as a tracer of sanitary sewer exfiltration to stormwater conveyances?
 - What is the exfiltration rate of sanitary sewer pipes during simulated storm surcharge conditions and how much do they contribute to flows in stormwater conveyances?

COLIPHAGE

- **Question: What is the occurrence of coliphage in beach water?**
- **EPA is proposing a coliphage as a beach water quality indicator**
- **Many of you participated in EPA's lab intercalibration study**
- **Multiple agencies (OCHCA, OCSD, LACSD, CSD, RWQWB) committed to devote resources to a study**
- **Design: Paired samples for FIB and phage**
 - 10 sites across region
 - 30 samples in both wet and dry weather at each site

NEXT STEPS

- **Site selection**

- Collecting more information
- Participating agencies to provide sites for map

- **Design intercalibration study**

- SCCWRP designing draft intercalibration study
- Will present at next meeting

SHELLFISH

- **Is coliphage a viable indicator for monitoring shellfish safety?**
- **Triennial review of Ocean Plan (2013) suggested adopting 14 fecal coliform/100ml standard for shellfish harvesting waters**
 - Also written into TMDL's for Newport and San Diego Bay
 - Review of available data suggest few if any sites could meet standard
- **FDA has adopted F+ coliphage as a surrogate for viral pathogens in shellfish tissue**
- **Only OCHCA expressed willingness to invest resources**

DESIGN

- **Share samples with HAB's group**
- **Paired measurements of FIB and coliphage in mussel tissue and water before and after storm events**

HUMAN SOURCE TRACKING

- **Contributions from Homeless**
- **Biofilm community as a marker for exfiltration from sanitary collections systems into stormwater**
- **Physical testing sanitary sewer pipes for exfiltration to stormwater conveyances**

HOMELESS

- **Question: What is the extent of fecal loading to stormwater conveyances from homeless populations?**
- **Broad support from multiple agencies**
- **Homework:**
 - Agencies collecting information on number, location, sanitary habits of homeless

DESIGN

- **Sample upstream and downstream of homeless encampments during both wet and dry weather**
- **Measure FIB and HF183 human marker**
- **30 samples in wet weather, 60 samples in dry weather**

SITE SELECTION INFORMATION

- **Ventura – highest concentrations of homeless along SCR**
 - Given orders to vacate on 11/17
 - Annual count scheduled for 1/23/18
- **Orange County - about 500 living along SAR**
 - 400 between Chapman and Ball, 100 in Fountain Valley
 - About 80% use restrooms or other means to contain feces
- **City of Los Angeles – Waiting for response from homeless services agencies**
- **Encinitas – provided contact info for homeless assistance services**
- **San Diego City/County – no information as yet**

BIOFILM

- **Question: Can biofilm shed from the inside surfaces of sanitary collection systems be used as a tracer of sanitary sewer exfiltration to stormwater conveyances?**
- **Need a marker that can differentiate between sewer leaks and direct deposits**
 - Biofilm has been used successfully to track CSO in great lakes
- **Pilot project to determine feasibility of using biofilm as a marker for sewer pipe exfiltration under way in San Diego**
 - High interest from LA County Public Works

BIOFILM STUDY DESIGN

- **At least 30 paired biofilm and water samples from sewer pipes and stormdrains from each participating agency**
- **Use DNA sequencing to characterize bacterial communities**
- **Compare community fingerprints**
 - Does sewer biofilm profile match those found in other studies?
 - Is sewer biofilm profile consistent locally?; regionally?
 - Is sewer biofilm different from that found in stormdrains?
- **Data analysis to determine if biofilm signal has potential for use as a marker for sanitary sewer exfiltration**

HYDROTESTING

- **Question: What is the leakage rate and of sanitary sewer pipes during simulated storm surcharge conditions and how much do they contribute to flows in stormwater conveyances?**
- **Greatest human health risk is from municipal sewage**
 - Sanitary and storm water collection systems often run in parallel
 - Current testing procedures do not detect small cracks and defects where microbial pathogens may escape
- **Last meeting: CSD, SD County, Encinitas, Oceanside were willing to commit resources**
 - LACSD expressed interest

PROPOSED STUDY DESIGN

- **Select sites based on risk factors for exfiltration**
 - Age, construction material, proximity, geologic setting, etc.
- **Isolate discreet sections of sanitary sewer pipe adjacent to stormwater conveyances**
- **Fill with water and measure volumetric loss over time**
- **Use tracer (KBr or other salt) to detect leakage into storm channel using conductivity probes**

EXFILTRATION RISK FACTORS

- **Materials of construction (clay, concrete, PVC, CIP lining)**
- **Age (<10, 10-25, >25 years)**
- **Condition scores (no action, maintenance required, repair/replace)**
- **High frequency cleaning list**
- **Groundwater height**
- **Soil type**
- **Land use**
- **Flow rate**
- **Depth of pipe relative to storm drain**
- **Proximity to surface water**

NEXT STEPS

Commitment from agencies in San Diego, others interested.

- **How many sites per region?**
- **How many factors?**

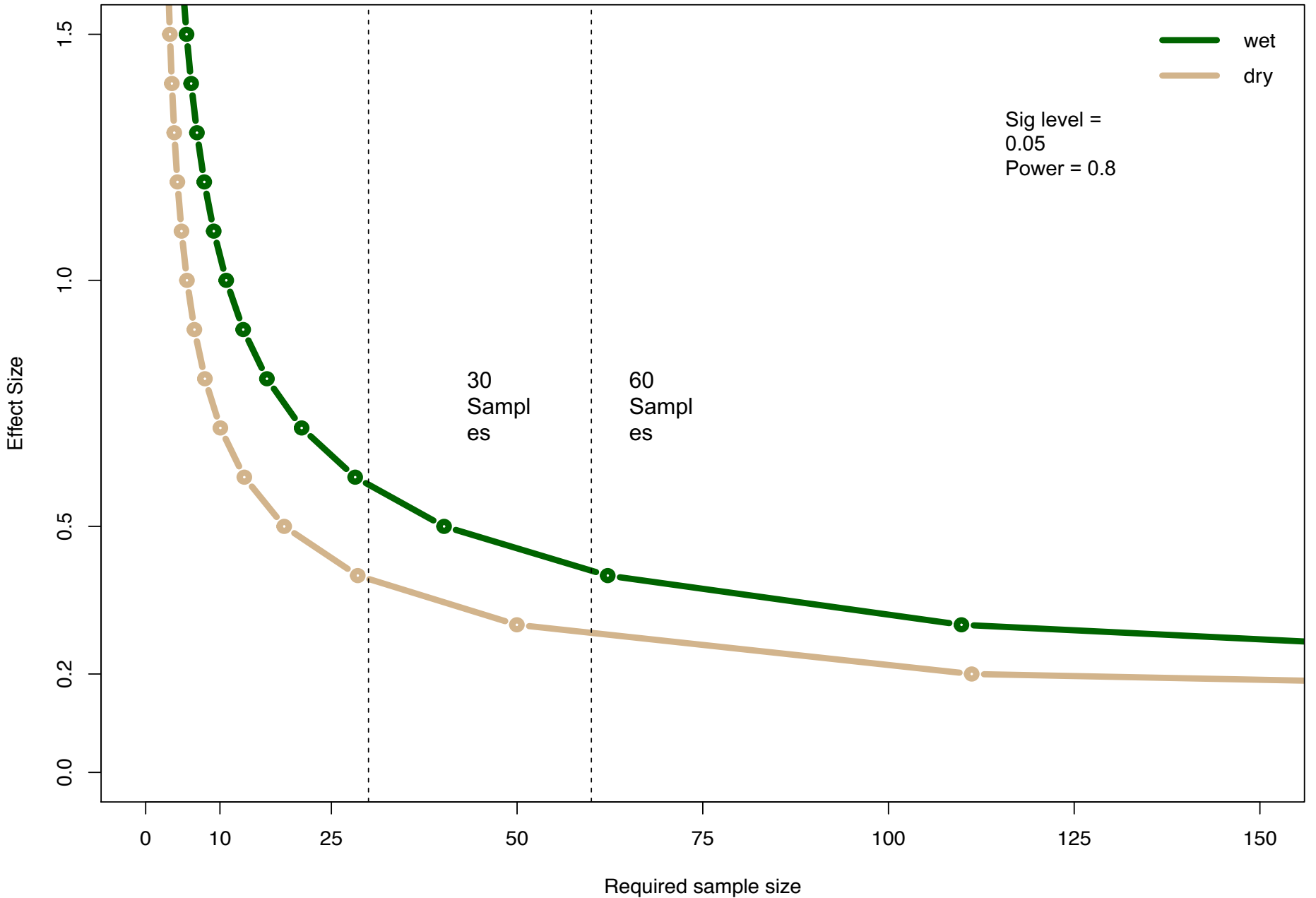
NEXT MEETING MARCH 7, 2018

QUESTIONS?

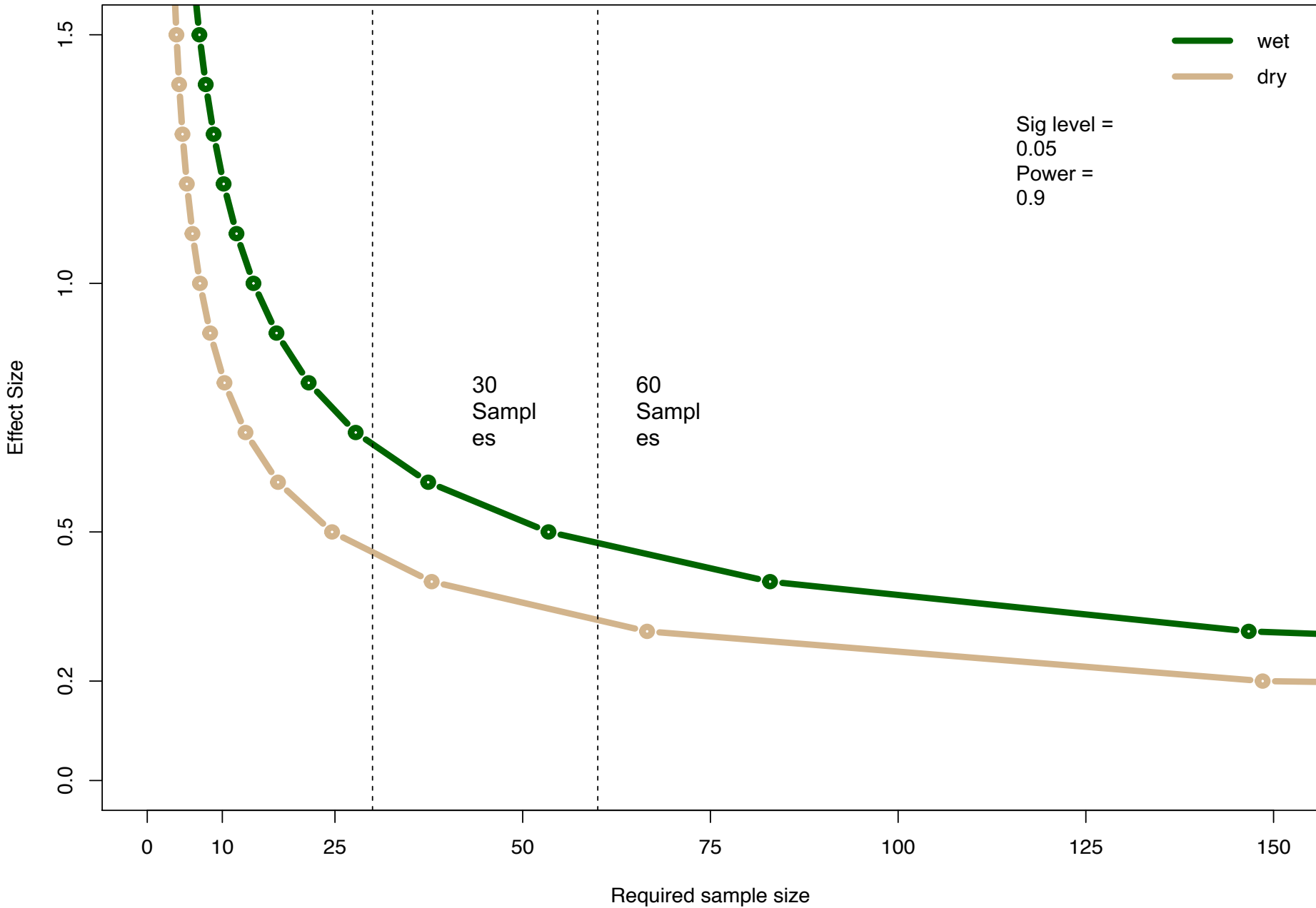
PROPOSED INTERCALIBRATION DESIGN

- **12 blind samples**
 - Combination of spiked PBS, clean seawater and blanks
 - 3 concentrations
- **Triplicate measurements of coliphage, Enterococcus, E. coli**
- **Question: Do we wish to incorporate EPA concentration method?**

Power Analysis for Wet and Dry Weather



Power Analysis for Wet and Dry Weather



FACTORIAL DESIGNS ARE MULTIPLICATIVE

| | <10 years | 10-25 years | >25 years | Total No. Tests |
|-----------------|-----------|-------------|-----------|-----------------|
| Clay | 3 | 3 | 3 | 9 |
| Concrete | 3 | 3 | 3 | 9 |
| PVC | 3 | 3 | 3 | 9 |
| CIP | 3 | 3 | 3 | 9 |
| Total No. Tests | 12 | 12 | 12 | 36 |

Includes three replicates per factor combination