Beach Bacteria
Moving Towards a Better Understanding of Bacterial Impairments at Public Beaches in Iowa

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Beach Bacteria Impairment Questions

- How do these impairments relate to the broader lake condition?
- What are the sources?
- How do we manage the issue?
Ambient Beach Program

- Covers 34~ beaches each season
- Sampled weekly from roughly Memorial to Labor day each year
- Composite of 9 points
- 30 of 34 E. coli impairments from this
Relating Beach Bacteria Impairments to the Environment

• Studies indicate *E. coli* conc. disassociate with watershed
  – (Soupir & Gali 2015)

• Evidence of sand harboring/regrowth
Goals/Design

- Gradient near to far shore H2O?
- Gradient near to far shore sand?
- Association between sand and water conc?
- Diff. between swim zone and open lake?
Site Selections

- Clear Lake
- Hickory Grove Lake
- Nine Eagles Lake
Sample Collection
Geometric Mean from Violations 2015-2016

McIntosh Woods Beach
- 1,921
- 11,659
- 14,007

Hickory Grove Beach
- 2,580
- 1,447
- 2,637

Nine Eagles Beach
- 1,762
- 390
- 241

E. coli seasonal geometric mean
Shoreline
Swimming area rope
2015-2016 Mean *E. coli* McIntosh Woods MPN/100ml

Lake transects 26

Swimming Zone 1,263
Max Beach *E. coli McIntosh Woods* MPN/100ml

Lake transects 26

Swimming Zone 10,565
Beach Sand & Water Relationships

McIntosh Woods Beach

Hickory Grove Beach

Nine Eagles Beach

E. coli seasonal geometric mean

Shoreline

Swimming area rope
Beach Sand & Water Relationships

- Reporting concentrations
- Comparison
  - Cubic CM sand = 1 ml H2O
- Averaged 500 to over 1,300 times higher in sand
- Max difference
  - Sand 86,500 time higher

Sand \(E. coli\) concentration

Water \(E. coli\) concentration
Delivery Mechanisms

- Precipitation / Runoff
- Weak or no correlation with precipitation
- Other drivers or multiple pathways
Delivery Mechanisms

Onshore waves / wind
Frequent in literature

Weak or no associations
Delivery Mechanisms

Direct deposition

Unpredictable variable
Next Steps

• TMDL development
  – Utilizing nearshore diffusion model
  – Model assimilation capacity of swimming zone
  – Relate to load potential from nearshore beach environment
  – Estimate reductions
Next Steps

• Continue analysis of data for relationships and modeling criteria

• Identify specific sources of bacteria in beach environment
  – Working on genetic fingerprinting of sources
  – Use to inform impairment status and as guide for management
0.10 in /48 hrs
1.6 in /48 hrs
0.25 in /36 hrs
1.35 in /48 hrs