Microbial Source Tracking in Short Beach

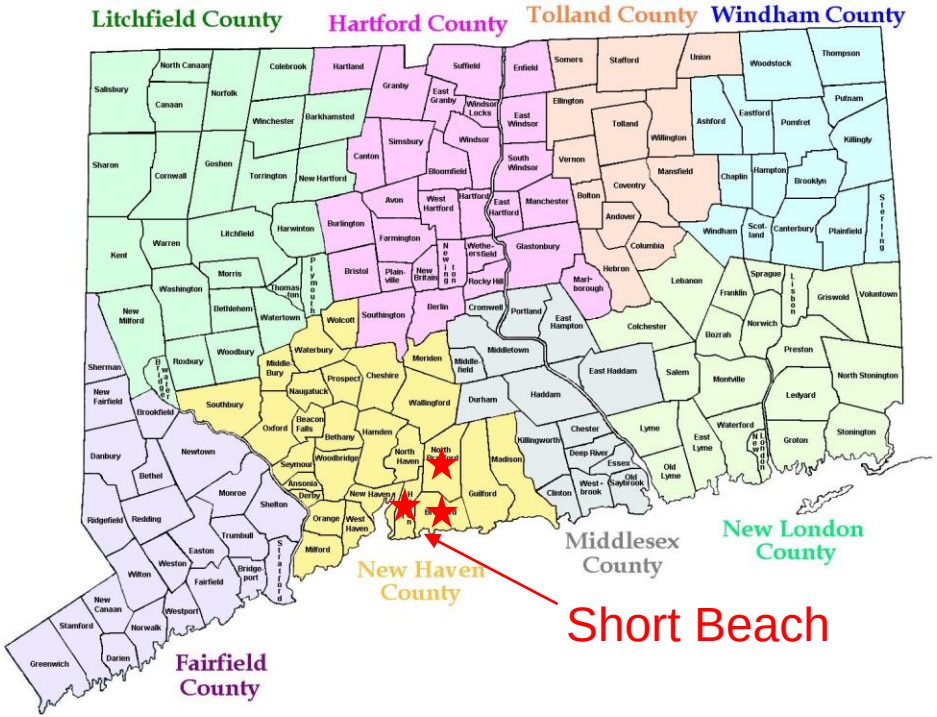
Sarah Esenther and Michael Pascucilla

- What is the Root Cause?

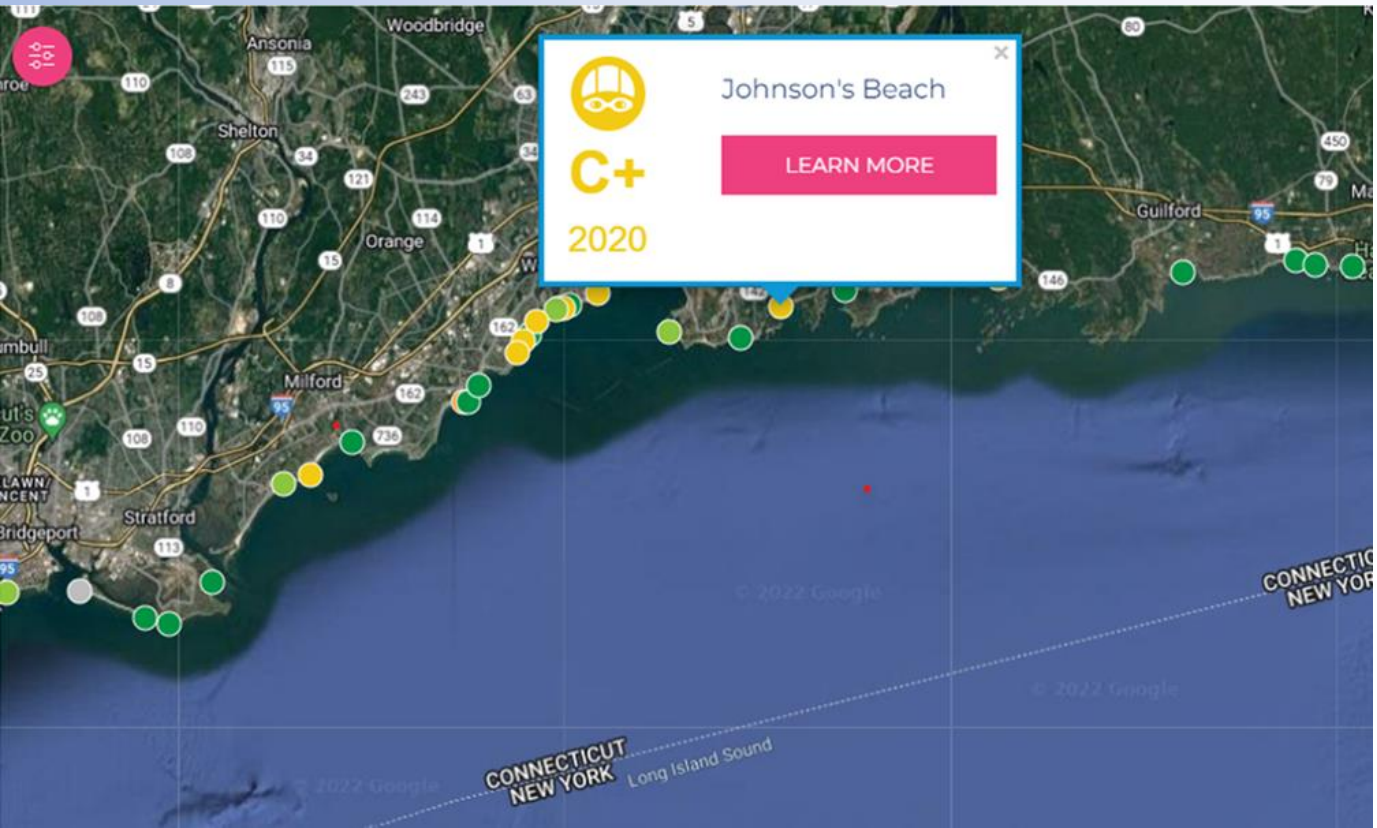
East Shore District Health Department

The East Shore District Health Department serves the Towns of Branford, East Haven, and North Branford.

All of these border the Farm River, which flows into the Long Island Sound. The Short Beach neighborhood of Branford is a coastal community.

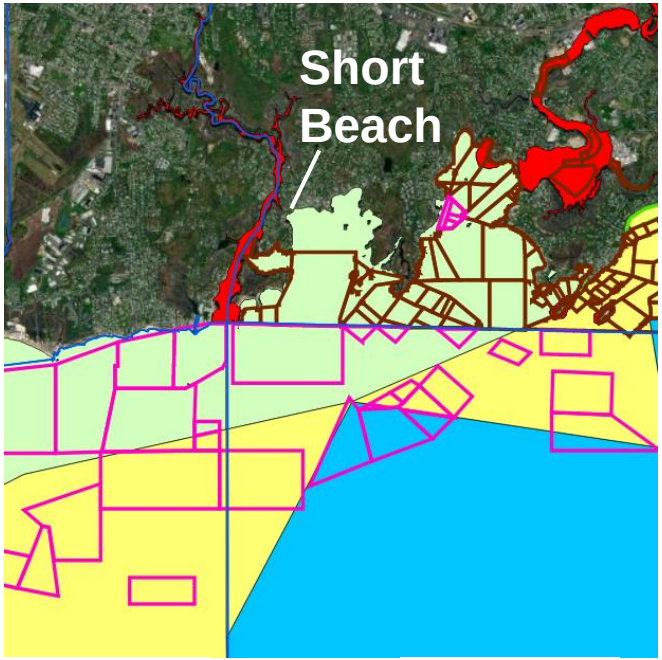


Johnson’s Beach



Within worst four beaches out of 37 based on 6 years of data (2016-2021)

Aquaculture in Branford, CT



Shellfishing in Branford, Connecticut is a lucrative, historical industry. The waters in the Short Beach neighborhood have experienced elevated bacteria levels for decades, negatively impacting local shellfishing

A 2019 spatiotemporal analysis of bacterial contamination in Short Beach indicates nonpoint sources are responsible

Approved
Conditionally Approved
Restricted
Prohibited
State Managed Shellfish Beds
Town Managed Shellfish Beds

http://cteco.uconn.edu/viewer/index.html?viewer=aquaculture

How does fecal bacteria enter the water?

Sewer overflow

Stormwater runoff

Septic system failure

Vessel discharge

Wild animals

Pet waste

Upstream agriculture

Industrial discharge

Background

- Short beach bathing waters have more bacterial contamination than many other Connecticut beaches
- Not a new problem: has persisted since at least the 1990s

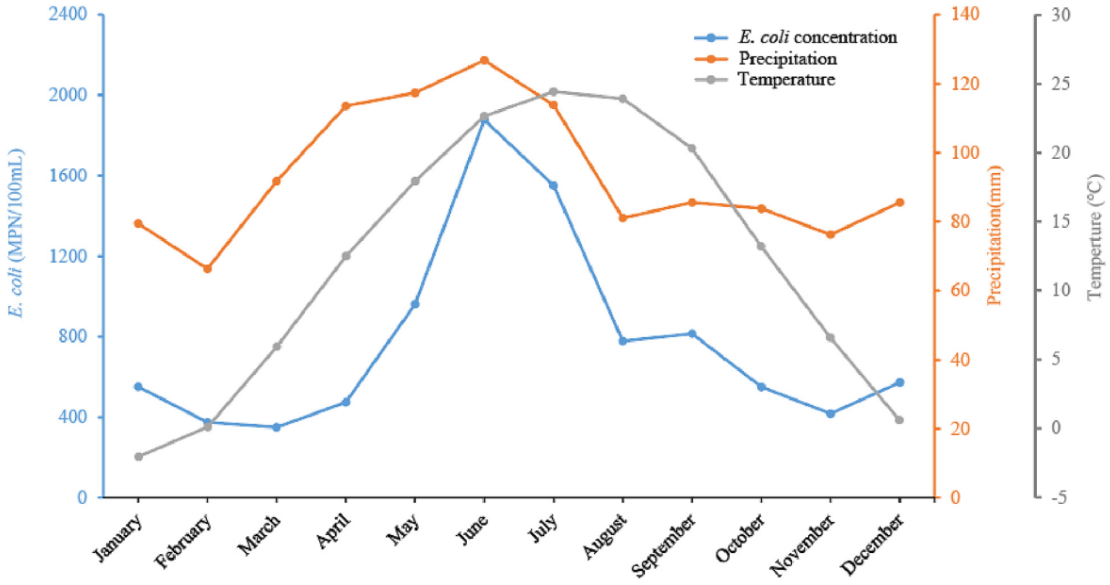
2019 Short Beach study:

- Precipitation is strongest driver of bacteria levels
- Nonpoint source: instead of single leak, the fecal bacteria is likely coming from multiple distributed sources

Predictors of High Fecal Indicator Bacteria

Increased bacteria level is correlated with increased temperature and precipitation

- ~8% increase in diarrheagenic *E.coli* for each 1°C increase in mean monthly temperature
- Precipitation: Spikes in bacteria counts follow precipitation (runoff washes fecal matter into waters)



The Problem

- The Short Beach neighborhood of Branford and the Farm River have chronic bacterial contamination issues
- While beach closure (testing-based or preemptive) can reduce exposure to high bacteria counts, they don't explain why it is happening
- Spatiotemporal analysis can tell us it is a nonpoint source problem, but not beyond that
- Climate change will exacerbate bacterial contamination issues

Project Overview

Our goal was to identify which animal species are causing fecal contamination in Short Beach waters.

Microbial Source Tracking (MST): Identifies whether bacteria from a chosen species is present in a water sample, quantifies bacteria level.

Tested for **human, avian, and canine** bacteria. Non detectable ruminant, dropped early.

Sample Site Locations

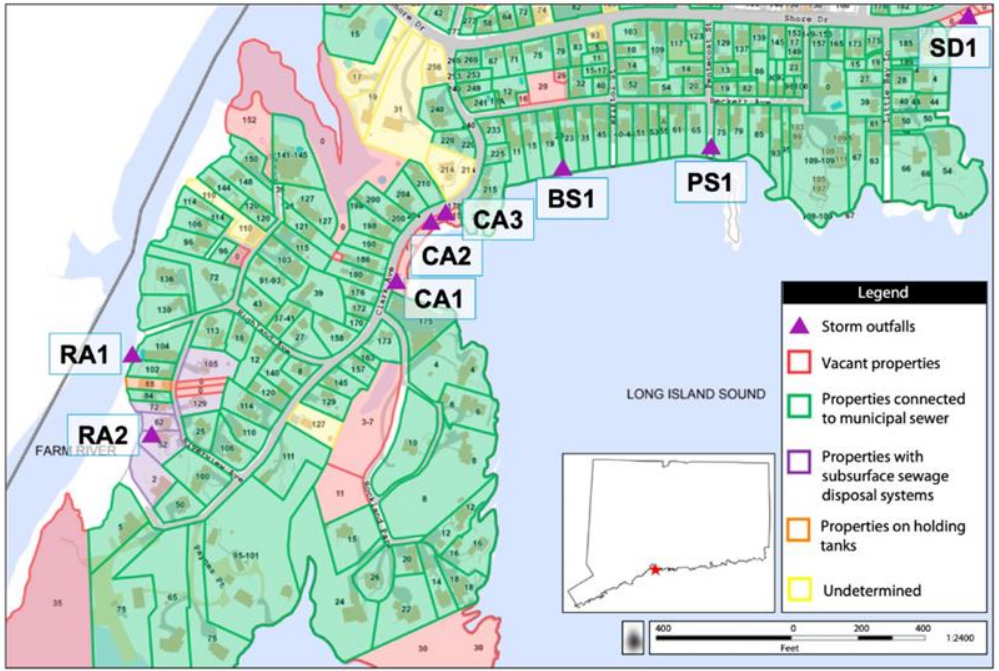
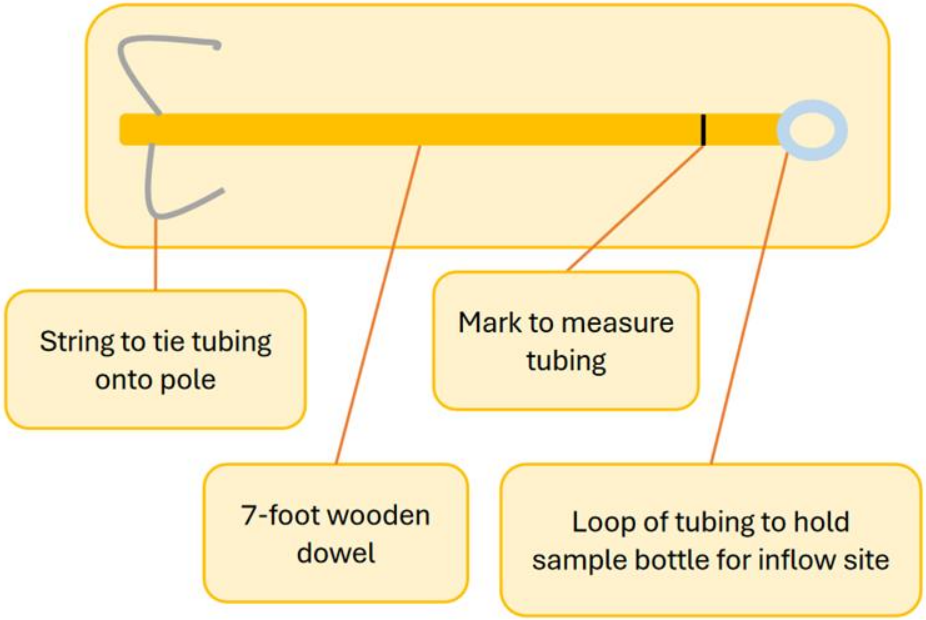


FIGURE 1— Map of Short Beach Neighborhood: Branford, CT, 2019

Site Name	Sample ID
Riverview Avenue	RA1, RA2
Clark Avenue	CA1-SD, CA1-OF, CA2-SD, CA2-OF, CA3-OF, CA3-SD, CA3-RO
Bristol Street	BS1-SD, BS1-OF
Pentecost Street	PS1-SD
Shore Drive	SD1-OF
Granite Bay Park*	GB1-IF

*Additional investigation is necessary

Materials Used



The pole is used to reach storm drain and inflow sample sites

Sterile sample bottle

Peristaltic pump

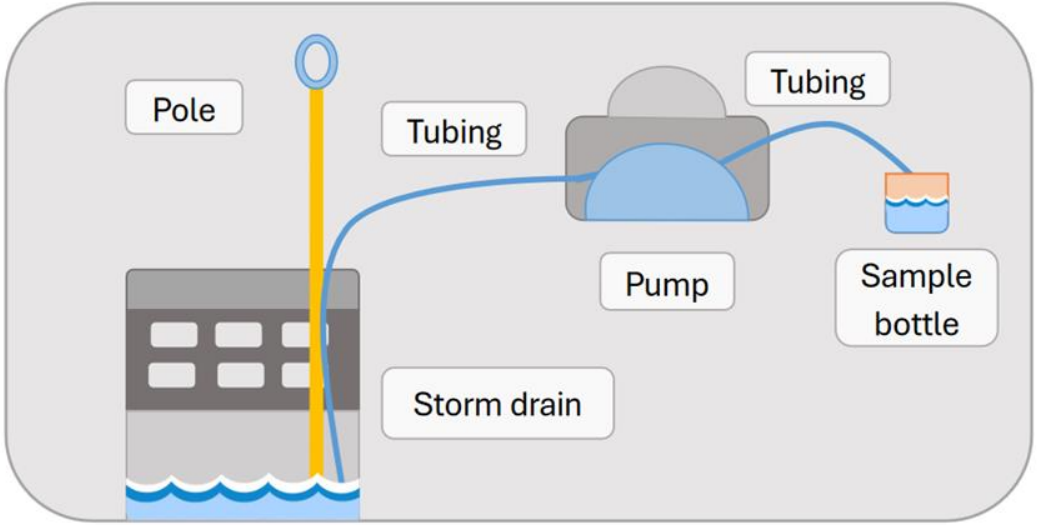
Sterile PVC tubing

Using the Pole-Pump System

Pole reaches the bottom of storm drains

Pump generates force to bring water upwards

Two samples per site



Results

EPA recommendations:

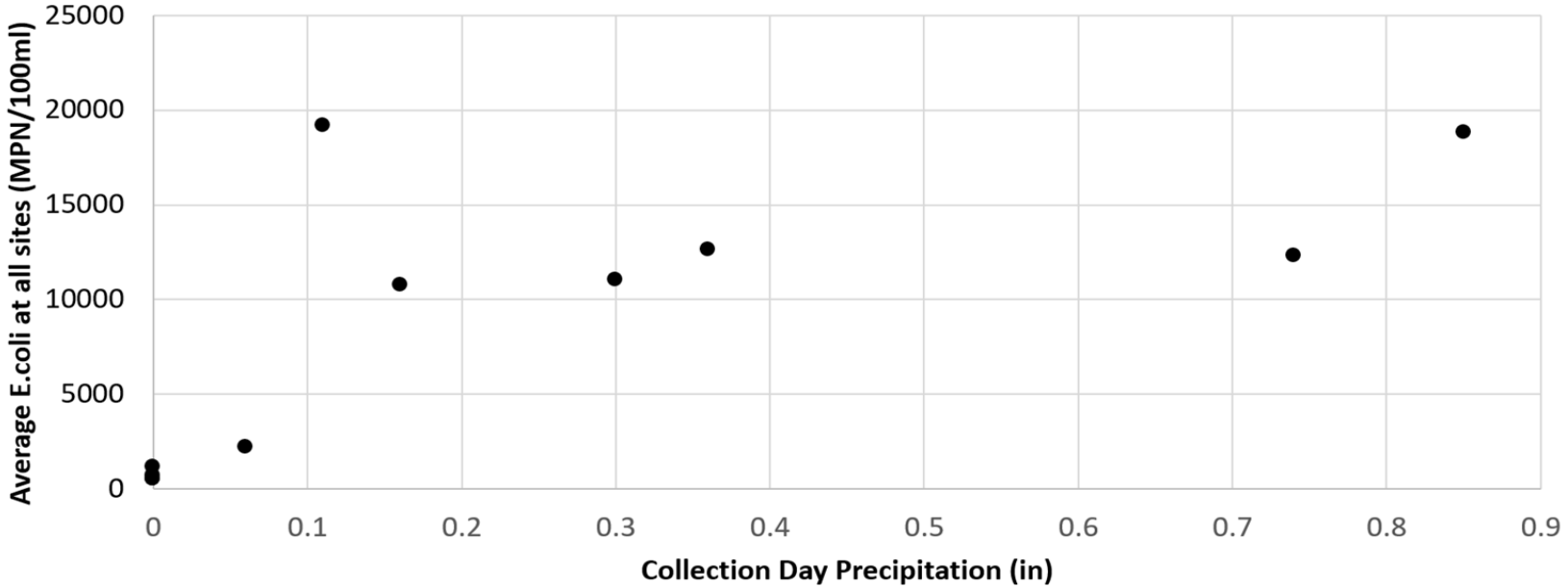
- Bathing water: 235 E.coli/100ml
- Recreational water: 410 E.coli/100 ml

We samples storm drains, not waters: expect higher counts than these thresholds

Samples with the highest E.coli counts were sent for MST testing

E.coli Results: Rain Drives High Bacteria

As expected: E.coli increases with precipitation, some background E.coli is present even without precipitation



MST Results

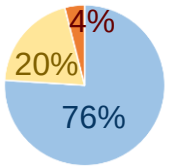
- MST is a new technology: no EPA guidelines
- Different species can't be directly compared
- Informal recommendation from the lab to use the Ct value
  - Ct = Cycle threshold (how many times bacteria is doubled before it is visible)
  - Lower Ct value = higher bacteria

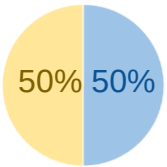
Ct greater than 35	Low abundance
Ct between 30 and 35	Medium abundance
Ct less than 29	High abundance

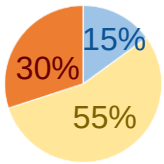
MST Results

Out of high E.coli samples, the high dog counts were most common (and the counts were the highest). Low category includes non detects.

Date	# Sites Sampled	Human			Bird			Dog		
		Low	Med	High	Low	Med	High	Low	Med	High
6/13/2023	2	2	0	0	0	2	0	0	2	0
6/27/2023	3	3	0	0	0	3	0	1	1	1
7/10/2023	6	3	2	1	3	3	0	2	2	2
8/8/2023	8	5	3	0	6	2	0	0	6	2
8/22/2023	4	4	0	0						
9/25/2023	2	2	0	0	1	0	0	0	0	1
	Occurrence of count	76%	20%	4%	50%	50%	0%	15%	55%	30%



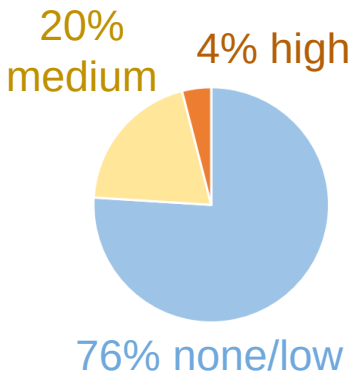




Human MST Results

Not a major concern at this time (some background presence is expected)

Will continue monitoring the situation in collaboration with the town

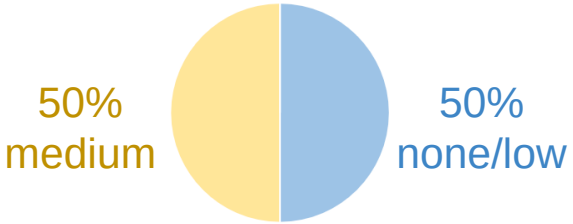


Actions: Continue regular ongoing maintenance

- Camera sewer lines in the area
- Reline a section of public sewer line
- In recent years, homes with holding tanks have hooked up to sewers

Avian MST Results

- Moderate presence at multiple locations and multiple dates
- Combination of multiple bird species are contributing to bacteria
- Tested for gull, goose, and chicken specifically: below detectable levels individually



Actions:

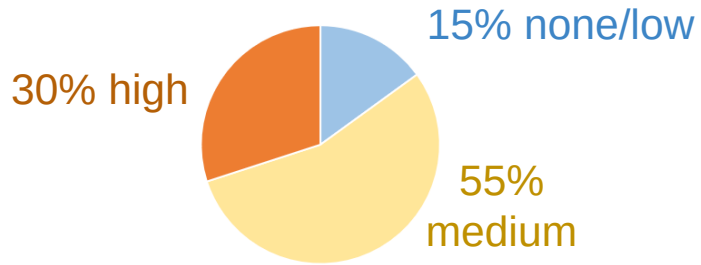
- Signage to discourage feeding birds at beaches
- Education about bird feeder placement: not directly next to water or runoff paths
- Encourage best practices for chicken owners

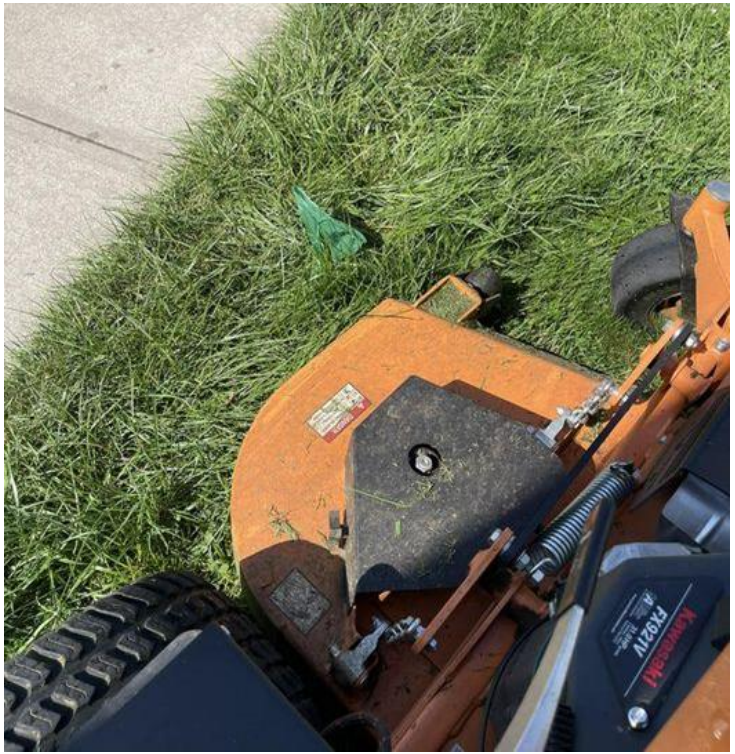
Canine MST Results

Dogs are the major bacterial concern

85% of samples tested for canine found moderate to high abundance

Samples from CA3, RA1, PS1 had the highest E.coli and the lowest Ct values for the dog tracer





Response: Short Beach Intervention

- Trash can lids added at all beaches
- CASB working with a Yale Public Health Program Manager and a graphic designer to design a cohesive “Stop Poo-llution” behavior change campaign targeted to this community
- Mailing one-pagers to Short Beach residents (first round distributed)
- Presentations to community organizations
- Summer Dog Parade
- Press and social media coverage

THE SOUND

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In Tandem: Lockworks Tavern, SaltBrick Prime Open

By Pam Johnson
Senior Staff Writer

Based on the buzz, brilliant surrounds, and fantastic food and drink at the June 27 sneak peek celebration, Branford is going to love its tandem new eateries, Lockworks Tavern and SaltBrick Prime. Both restaurants, which opened to the public on June 28, were developed under the creative and talented guidance of long-time Branford resident and accomplished restaurateur Stephen Goglia.

“There’s a good culinary community in Branford, and we’re excited to bring something that we think really didn’t exist here, until now,” said Goglia.

On June 27, supportive Branford community members, including First Selectman James Cosgrove and Branford Economic and Business Development Manager Perry Maresca, were among a crowd of well-wishers at the new venues. Also joining in were some local business friends who joined Goglia and his Lockworks Hospitality Group (LHG) corporate partner, Chief Operating Officer Matt O’Neill, an enthusiastic participants in the venture. Goglia is president and CEO of LHG. At the Branford restaurants, Goglia’s son serves as director of operations.

“It’s really become a community team,” said Goglia. “We’re overjoyed.”

A big part of the team on the ground is Executive Chef Alex Cabrera, a seasoned pro who has

See IN TANDEM page 5

March to End ‘Poo’llution

Residents took to the streets in Short Beach on June 30 to raise awareness of water contamination caused by dog waste. The ad hoc group marched from Pardee Park down several streets, concluding at the beach.

Photo by Wesley Bunnell/The Sound

Response: Short Beach Sampling

- Resampling at the same locations as last year
- Two samplers have been hired and trained with the novel peristaltic pump outfall collection method
- Sample collection began May 6, 2024
- Collection of samples before, during, and after the behavior change campaign implementation will allow us to see the effectiveness of the intervention

Summary

- Short beach continues to see high E.coli counts, especially following precipitation
- We tested for human, avian, and canine bacteria
  - Human: Low or undetectable, consistent with background levels we would expect
  - Avian: Scattered, relatively low levels from a variety of bird species.
  - **Canine: Major concern. 85% of high bacteria samples tested moderate or high for canine markers.**
- We are here to support the CASB and the Sanitation Committee

Approved MST Procedure

Bacterial pollution has plagued Short Beach for decades and >10 previous sampling campaigns were unable to identify the source of the contamination.

We encourage the EPA and the States to consider reviewing an MST laboratory methodology for approved use so that this powerful tool will be accessible to other health departments.

Acknowledgements

This study began as a collaboration between the Darien Health Department, the East Shore District Health Department, and the Westport-Weston Health District to perform MST at three watersheds in 2016.

Special thank you to these collaborators and the Katherine A Kelley State Public Health Laboratory for their ongoing help with our water sampling studies!

Poop of Shame

Why?

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Civic Association of Short Beach

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Pat Deschamps
John Smith and Bowser
Chris Collins
Ken Engelman
Lisa Uihlein
Michalah Bracken
Steve Mentz
Susie Hemingway
Bill Kelsey

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Questions/Comments?

Sarah Esenther and Michael Pascucilla