

MICROBIAL SOURCE TRACKING AS A TOOL FOR MANAGING COASTAL WATER POLLUTION ISSUES

Maine Sustainability and Water Conference

March 31, 2017



Meagan Sims

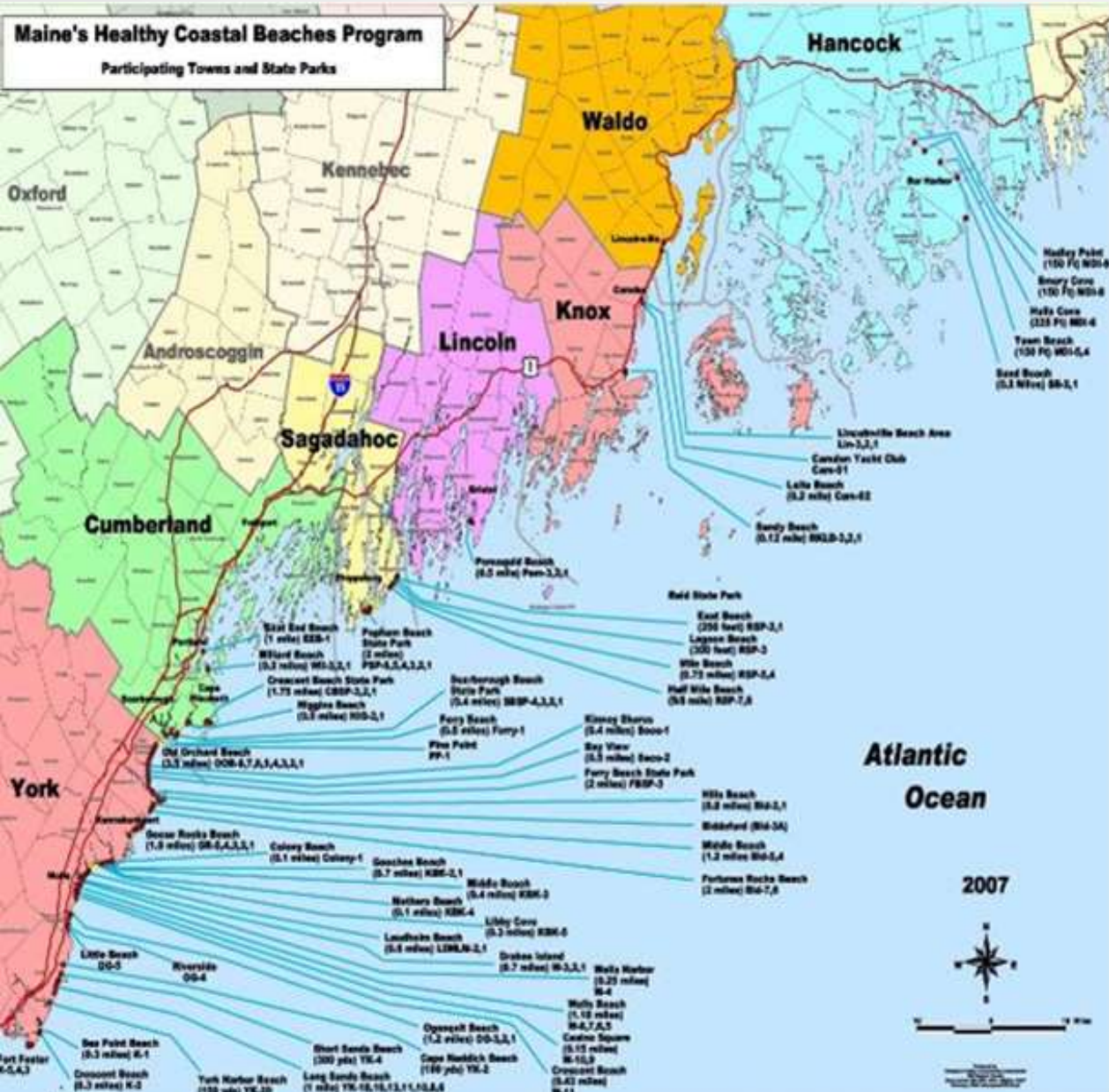
UMaine Cooperative
Extension-Maine
Healthy Beaches

Derek Rothenheber
Dr. Steve Jones

University of New
Hampshire



University of
New Hampshire



Maine Healthy Beaches

Funding-US EPA

60 BMAs
-Kittery to MDI

Beach management-
local jurisdiction

Volunteer driven

Build local capacity

Beach Management

Water Quality Monitoring

Assessment

Notification



Welcome!
This beach is part of the Maine Healthy Beaches Program.



Think Healthy. Act Healthy. Swim Healthy.

...ms of water-related illness can include stomachache, g, diarrhea, and infections of ear, eye and skin. If you y of these symptoms within 7 days of swimming and they were due to water contact at a Maine beach, notify sician and contact the Maine Department of Health & Services (800)821-5821. Risk of illness may be greater le with compromised immune systems.

...ity can change unexpectedly. Swim at your own risk.

...r more information visit:
www.mainehealthybeaches.org



Fecal indicator bacteria: enterococci

Risk assessment matrix (RAM)

Resample cleanliness rate

Rainfall data



Beach Management and Current Challenges

Timely public notification

Diverse beaches & dynamic system



Beach Management and Current Challenges

Build local capacity to identify and address pollution

Questions:

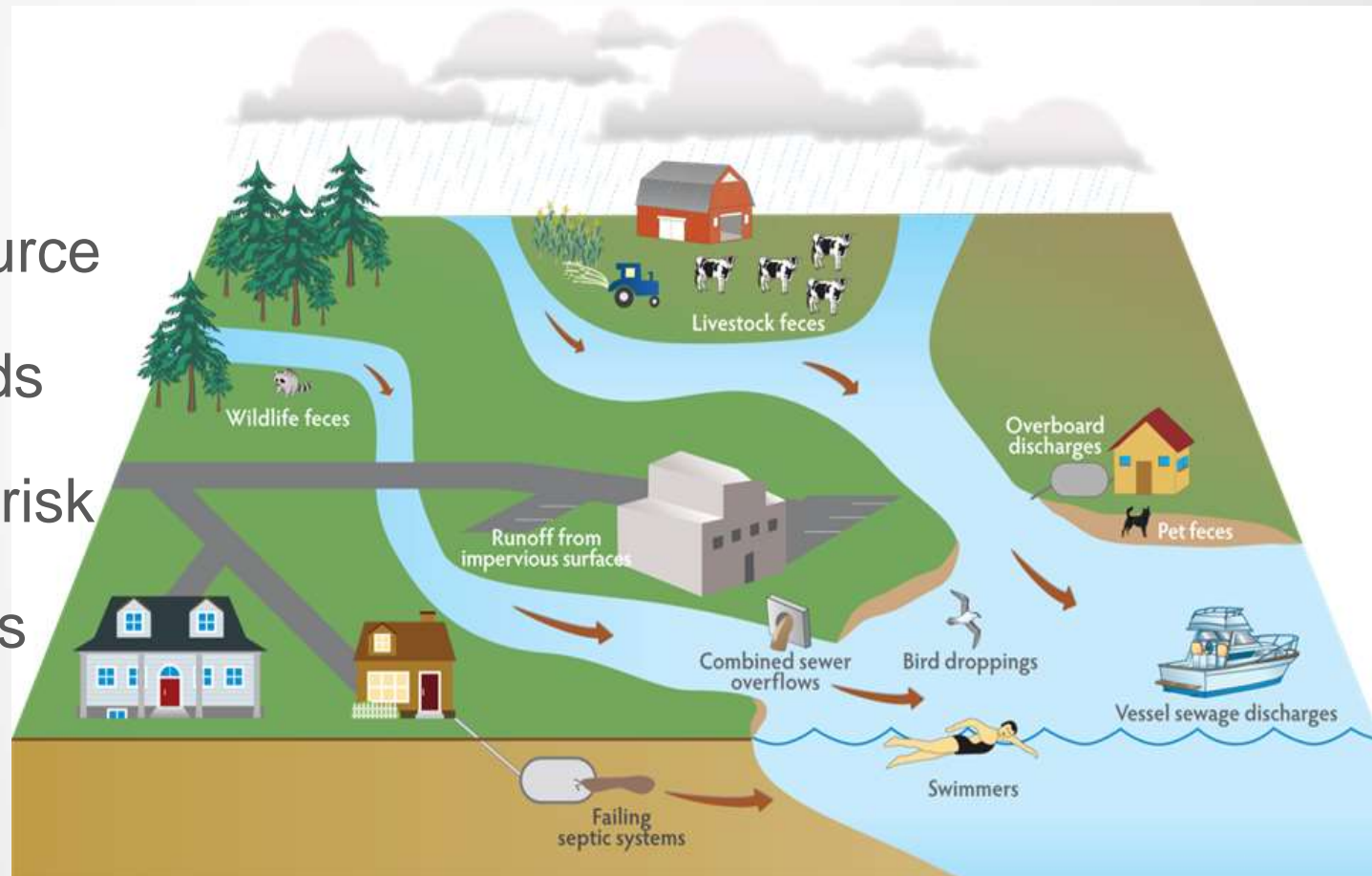
Source(s)

Strength of source

Seasonal trends

Human health risk

Prioritize efforts



Disease-causing pathogens can enter Casco Bay coastal waters from multiple sources, leading to potential public health risks.

Illustration by Waterview Consulting including symbols adapted from the Integration and Application Network, University of Maryland Center for Environmental Science.

Microbial Source Tracking (MST)

Goal: Identify specific fecal sources present

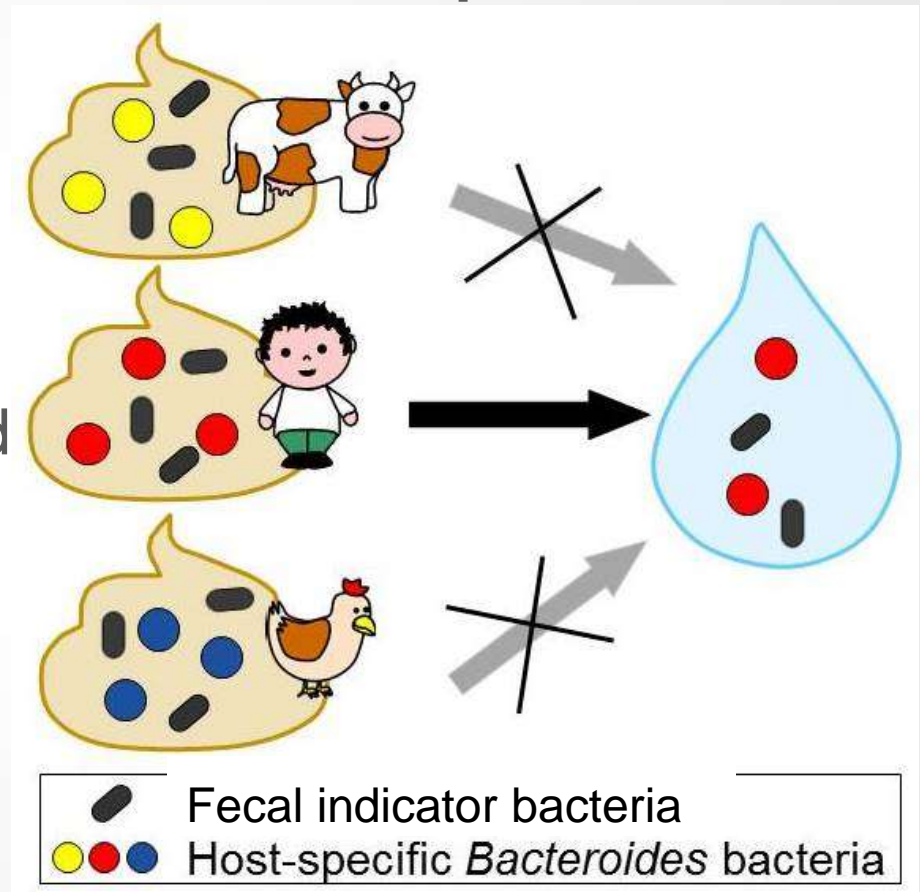
Targets alternative organism
(*Bacteroides sp.*)

Anaerobic environment required

Wide range of source targets

Well developed and field tested

Complements FIB methods



PCR Sources: Mammal, Human, Dog, Gull, and Ruminant

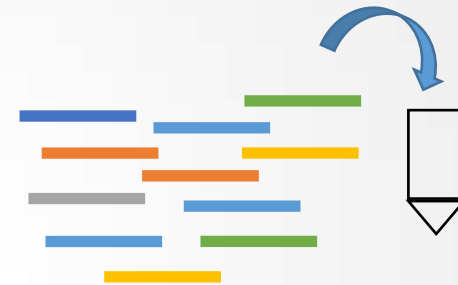
qPCR Sources: Mammal, Human, and Bird

FIB Enumeration and MST Assays

Water Sample

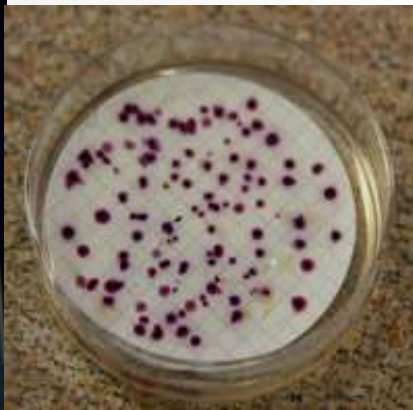
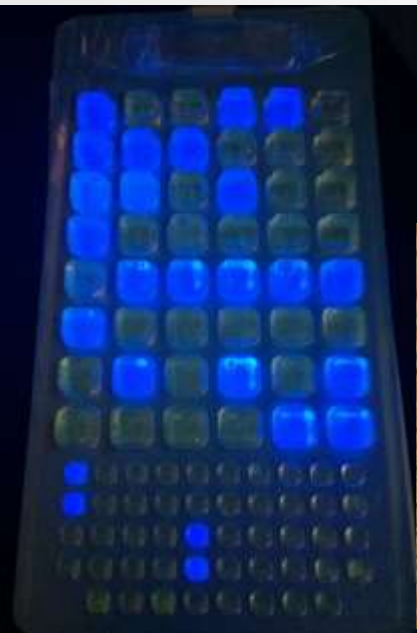


Filter 500mLs of water & extract DNA.

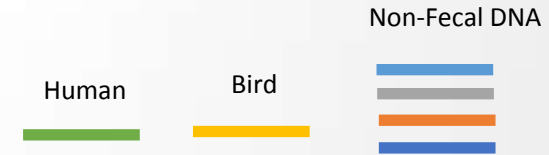


IDEXX MPN kit or membrane filtration

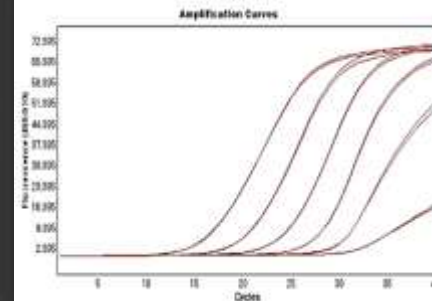
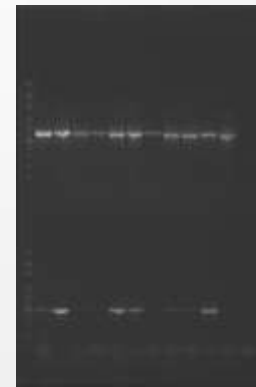
Enumerate viable fecal indicator organism

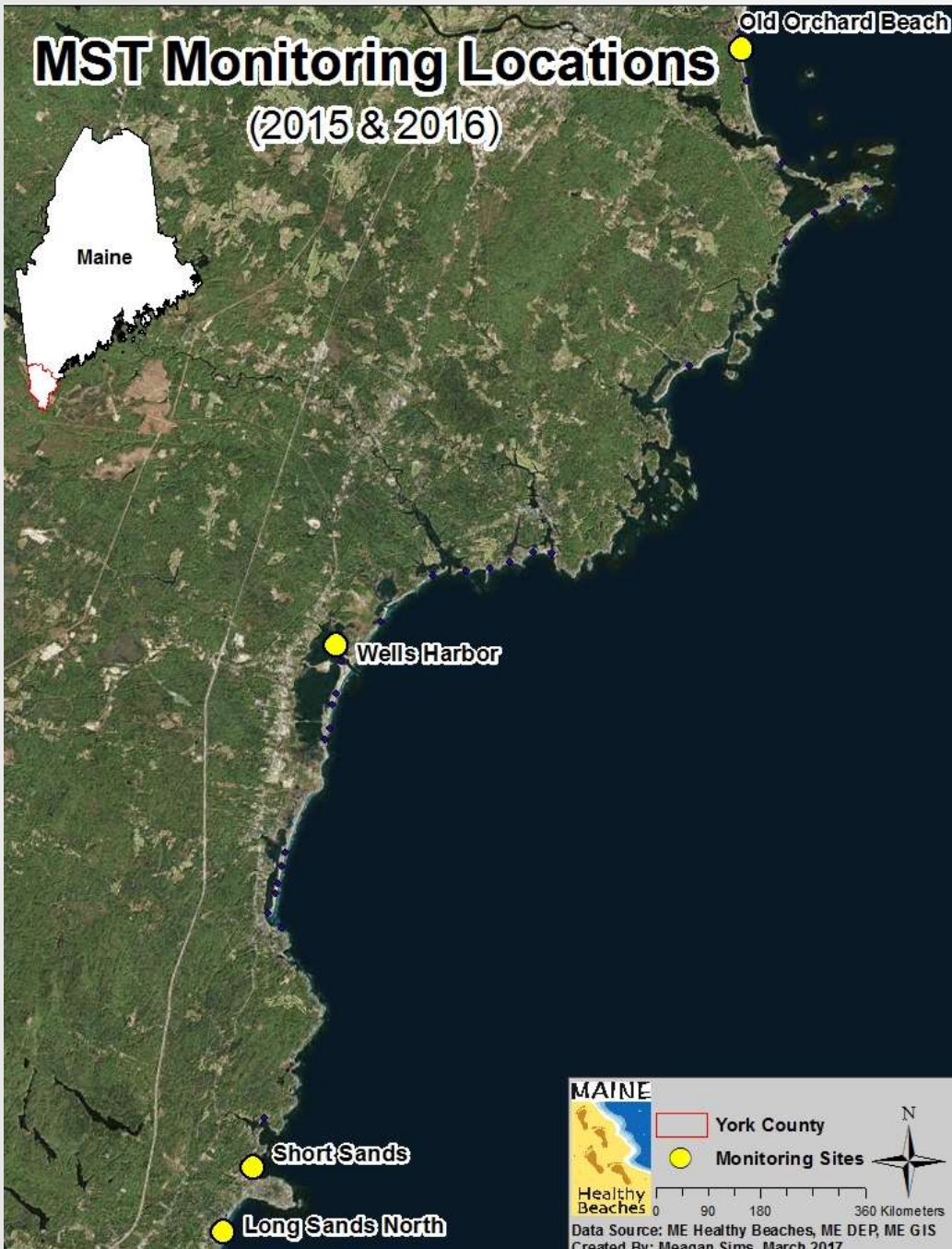


MST assays target DNA associated with specific fecal source



Determine +/- or quantify





Microbial Source Tracking (2015 & 2016)

York (2015)

- Storm drains
- Beaches

Wells (2016)

- Estuary
- Beaches

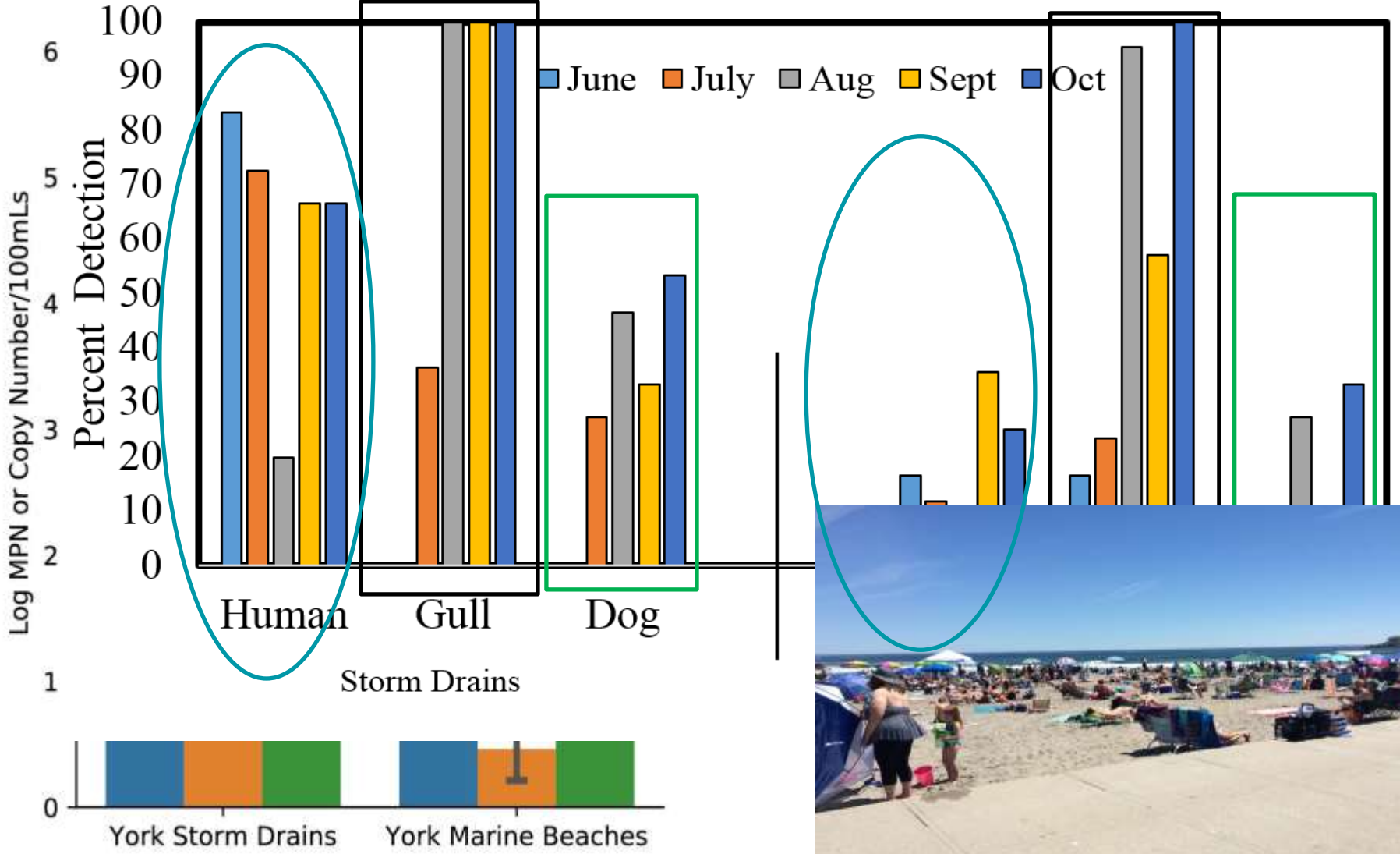
Old Orchard Beach (2016)

Goosefare Brook Watershed

- Marsh (upstream)
- Mouth (outlet to beaches)

Key Findings: York 2015

Storm Drains vs. Beach Water

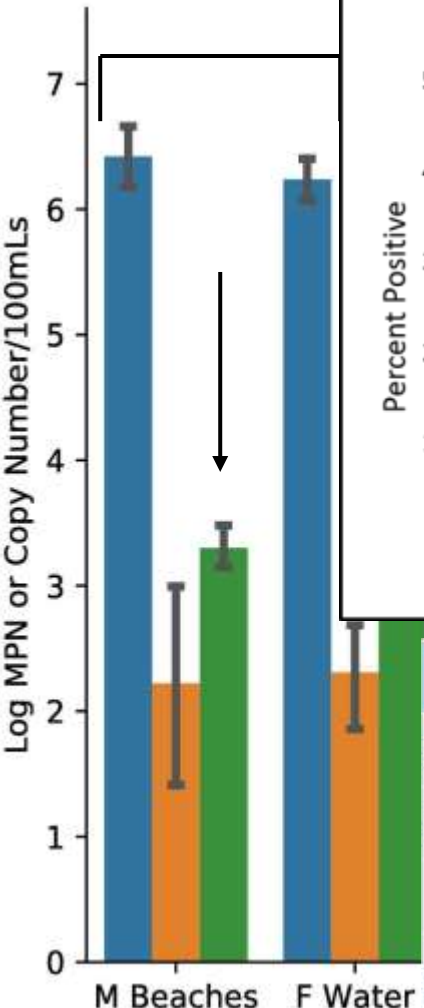
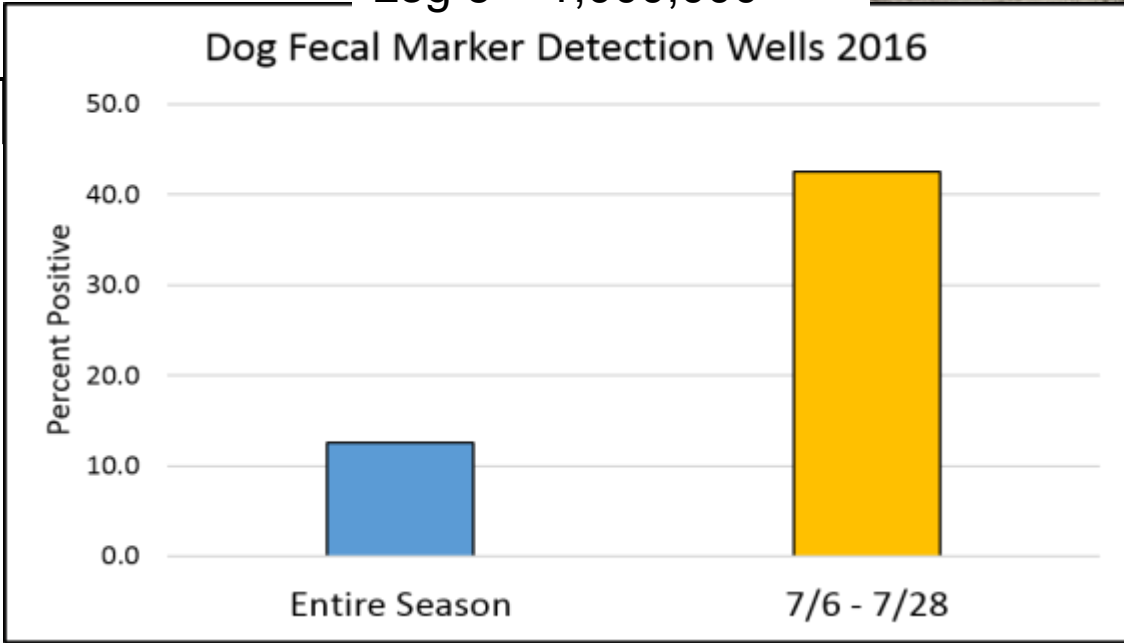


Key Findings: Wells 2016

Higher Mammal in Estuary

Log 7 = 10,000,000

Log 6 = 1,000,000



	Entire Season	7/6 - 7/28
Positives	19	17
Sites	151	40
Percent Positives	12.6%	42.5%

Matrix

Goosefare Brook

Saco/OOB

Impaired Stream

Elevated bacteria at beaches

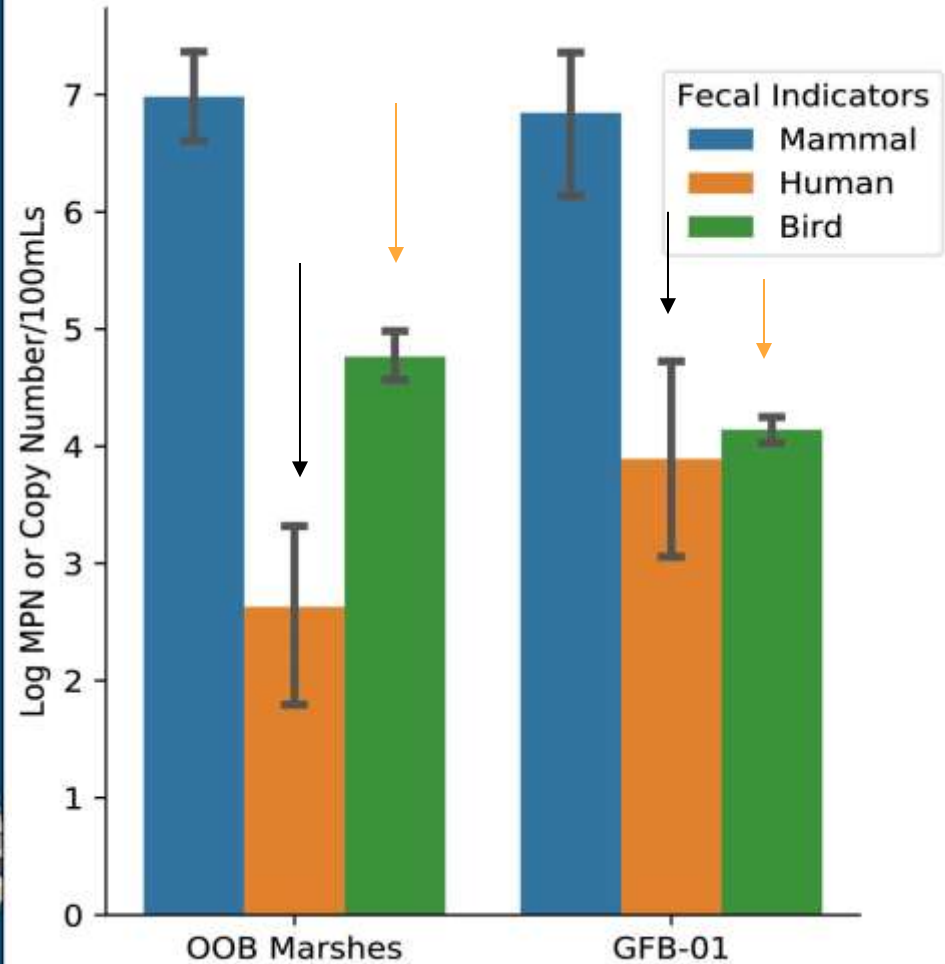
Enhanced Monitoring
(2010-2016)

- Enterococci
- Optical brighteners
- Pharmaceuticals & personal care products
- Sewage sniffing canines

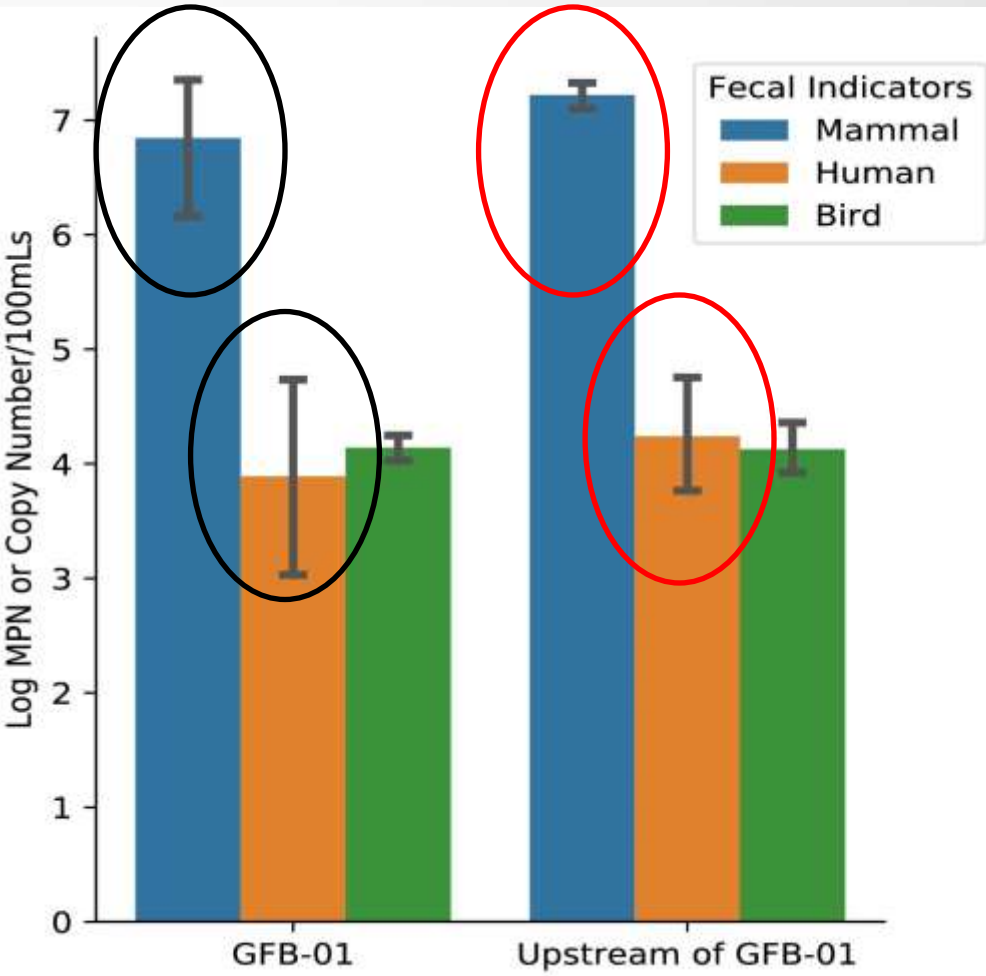
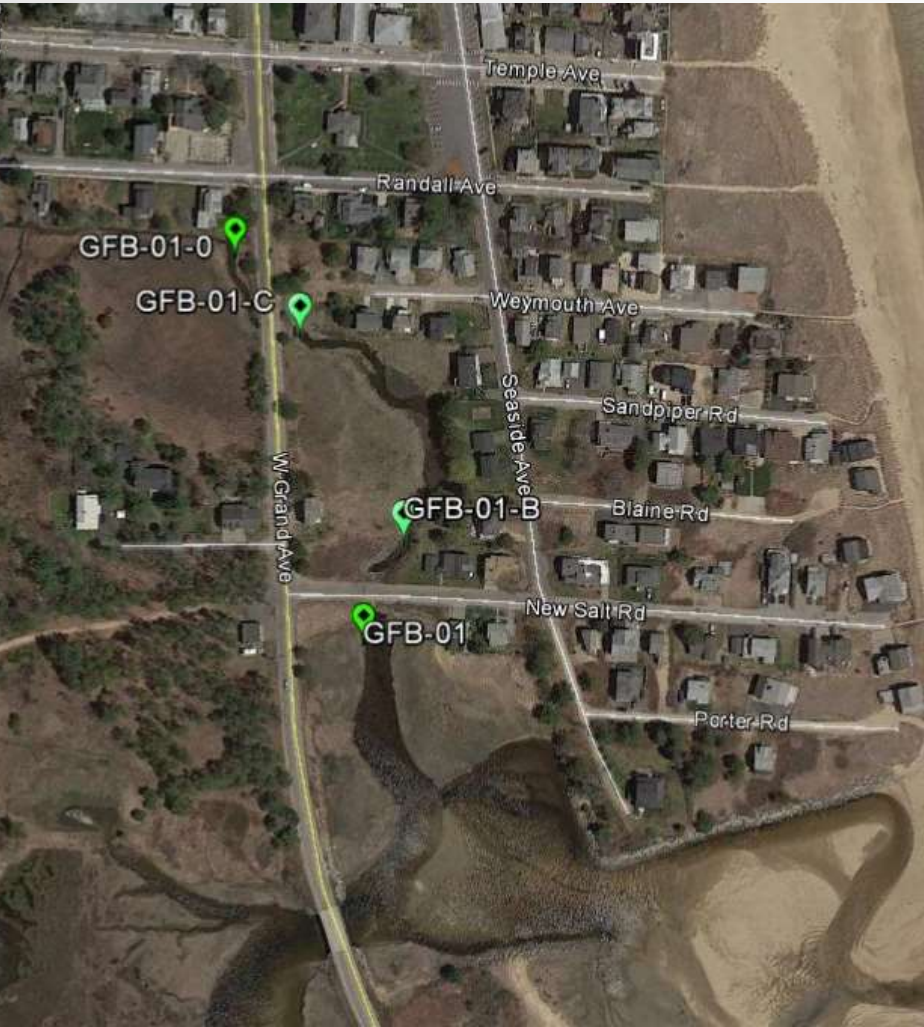
Microbial Source Tracking
(2016)



Goosefare Brook Identification of “hot-spot”



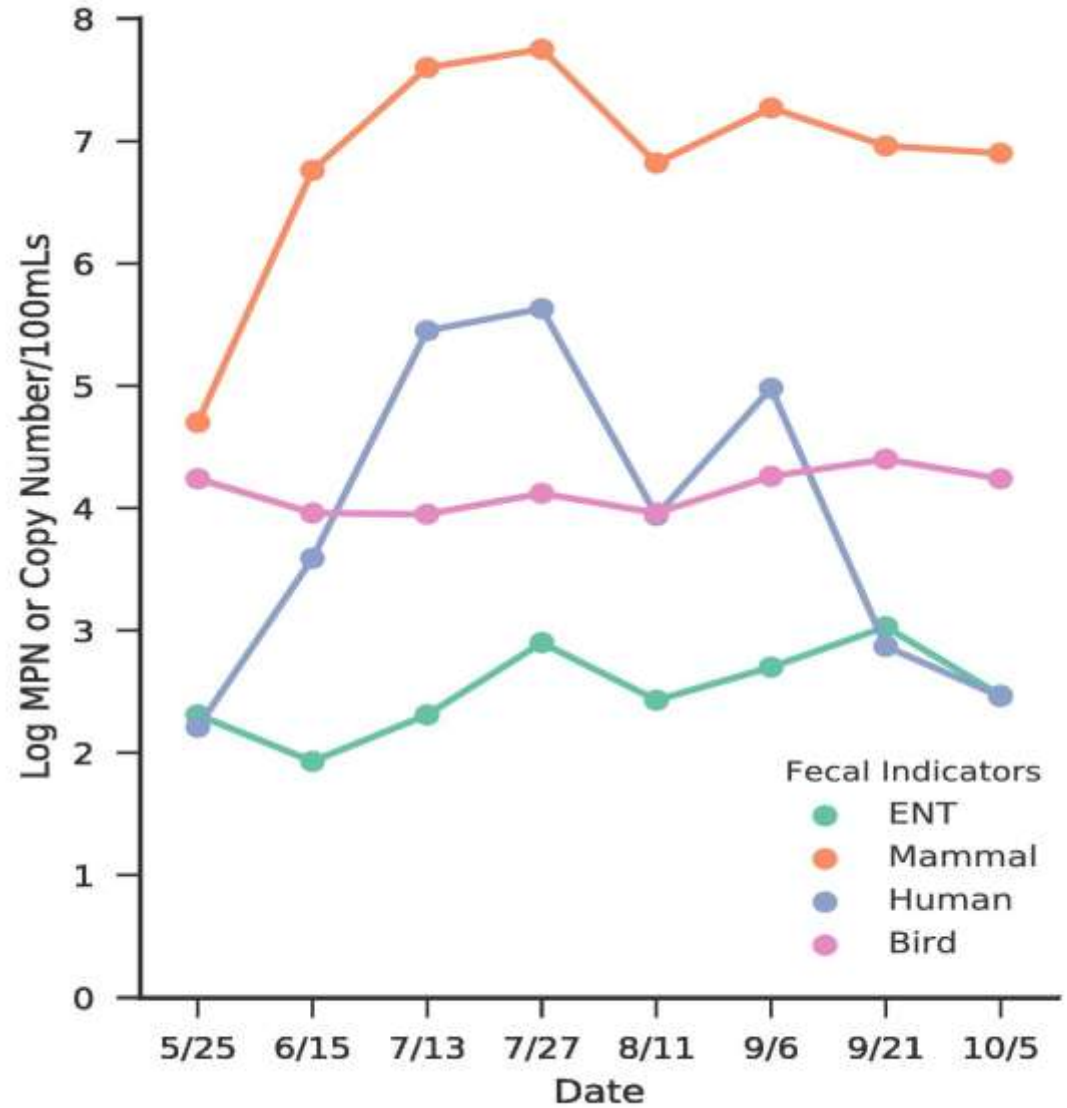
Refining "hot-spot" Location



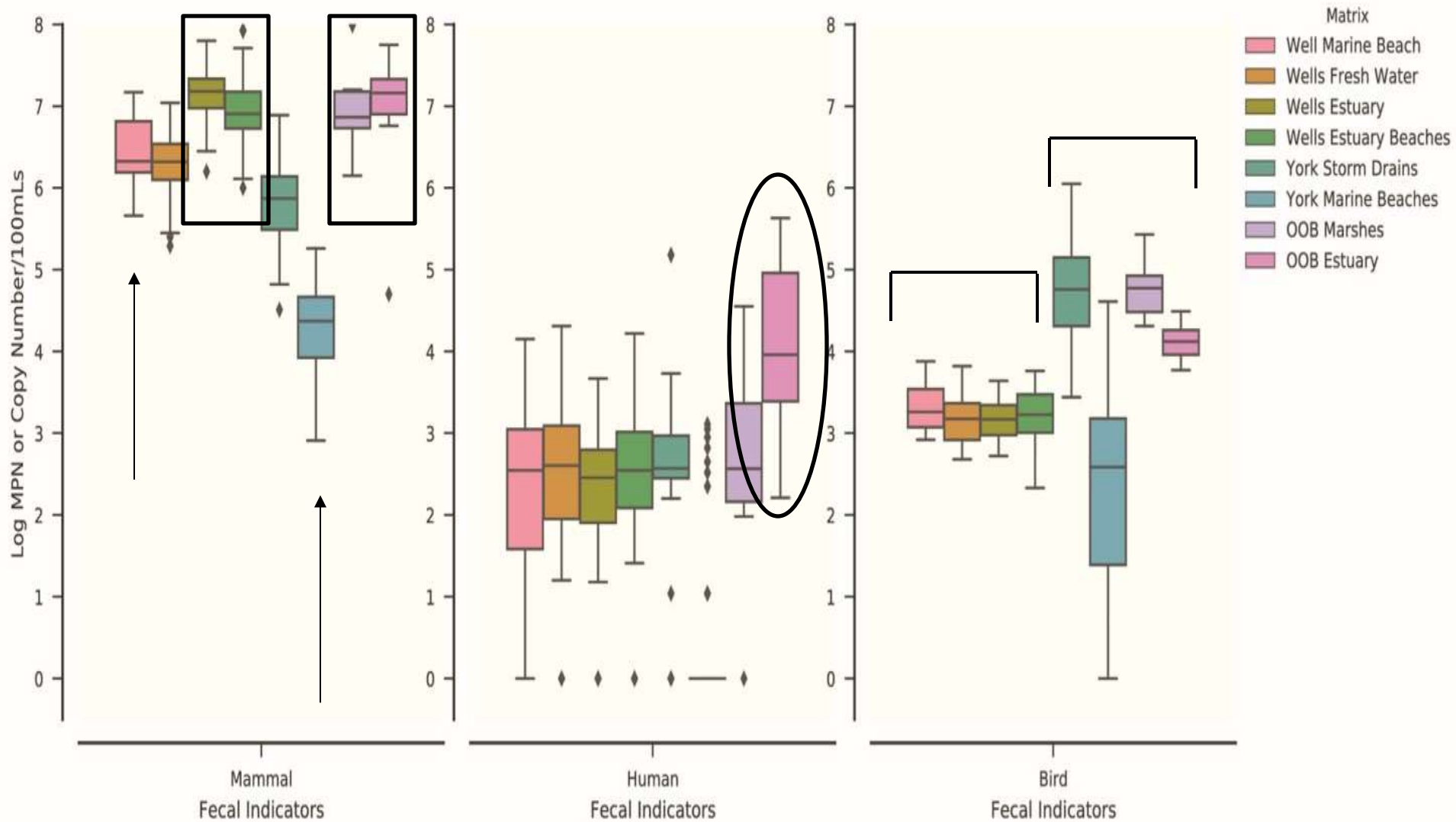
Seasonal Trend at Brook Outlet

Seasonal pattern

Mammal and human fecal source tracking



Providing Context to Copy Numbers



How Can MST Inform Management Efforts?



Municipalities

Beach Managers

Education/Outreach



How Can MST Inform Resource Management?

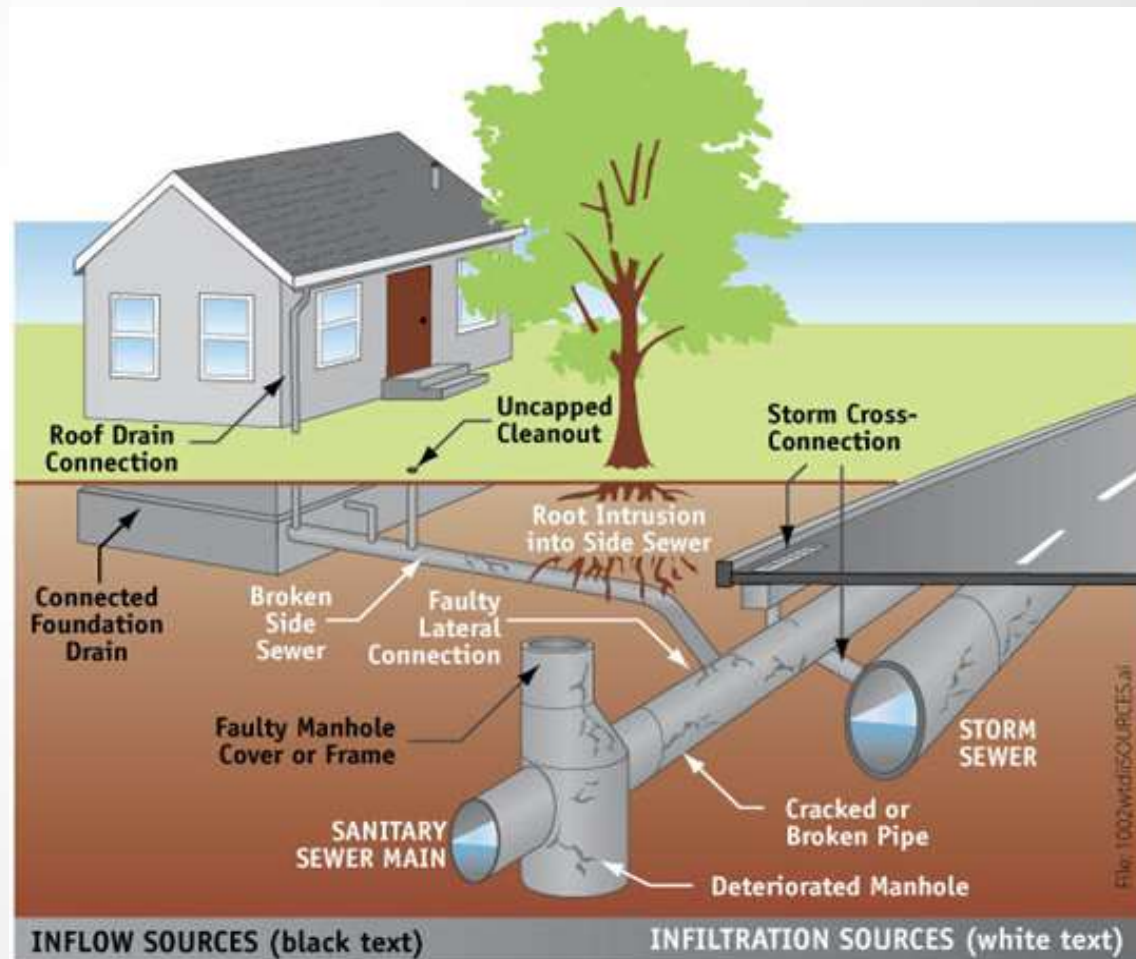
Supporting evidence= increase stakeholder buy-in

Target Specific Sources

**Priority: humans
(sewer, septic, etc.)**

- Ongoing IDDE studies
- Dye, video, smoke testing
- Cross connections, cracks, intrusions

**Infrastructure
upgrades/expansions**



How Can MST Inform Beach Management?

Welcome!
This beach is part of the Maine Healthy Beaches Program.



Bacteria levels are routinely monitored for your safety and health.



Think Healthy. Act Healthy. Swim Healthy.

Symptoms of water-related illness can include stomachache, vomiting, diarrhea, and infections. If you have any of these symptoms with suspect they were due to water contact, contact your physician and contact the Maine Human Services (800)821-5821. Refer to the website for people with compromised immunity.

Water quality can change unexpectedly.

For more information visit www.mainehealthybeaches.org

Or contact: _____



Improve RAMs

Update beach inventory

One size does NOT fit all

Tailored recommendations

Informed decision making = increased public protection

High risk vs. low risk

How Can MST Inform Education & Outreach?

Healthy Boating Equals Healthy Beaches

What to Do With Doo

Clean up after your pets and do your part to keep our water resources healthy!

A GUIDE TO SAFER SWIMMING IN MAINE

MAINE Healthy Beaches!

Please...don't feed waterfowl.



REGULAR FEEDING

- Water Pollution
- Poor Nutrition
- Overcrowding

Feeding can be harmful to waterfowl.

Septic System Inspection:

Protect your investment by minimizing the risk of costly system replacement or repair

The beach is not your bathroom.

Please keep our beaches healthy.

THINK HEALTHY. ACT HEALTHY.

SWIM HEALTHY.

Practice Healthy Beach Habits!

Use your HEAD | PUMP IT, DON'T DUMP IT!

Help us eliminate boat sewage as a pollution source.

MAINE Healthy Beaches logo and other small text at the bottom right.

Questions

Derek Rothenheber-University of New Hampshire

dte8@wildcats.unh.edu

Meagan Sims-University of Maine Cooperative Extension
(Maine Healthy Beaches)

meagan.sims@maine.edu

City of Saco

Saco Conservation
Commission

Town of Old
Orchard Beach
(OOB)

OOB Conservation
Commission



APRIL STOOLS DAY & COMMUNITY CLEANUP

SATURDAY, APRIL 23 · 9:00 AM TO NOON

KIDS AND PETS WELCOME!

Along with spring's arrival comes our 24th annual April Stools Day. As a community effort, please join in helping clean up the park and neighborhood of rubbish, refuse and dog waste.

The poster features a light blue background with silhouettes of trees, a person on a bicycle, a person walking a dog, and a child. A bird is flying on the left, and a cat is perched on a tree on the right. The text is in bold, dark blue and green fonts.

MHB

Thorton Academy

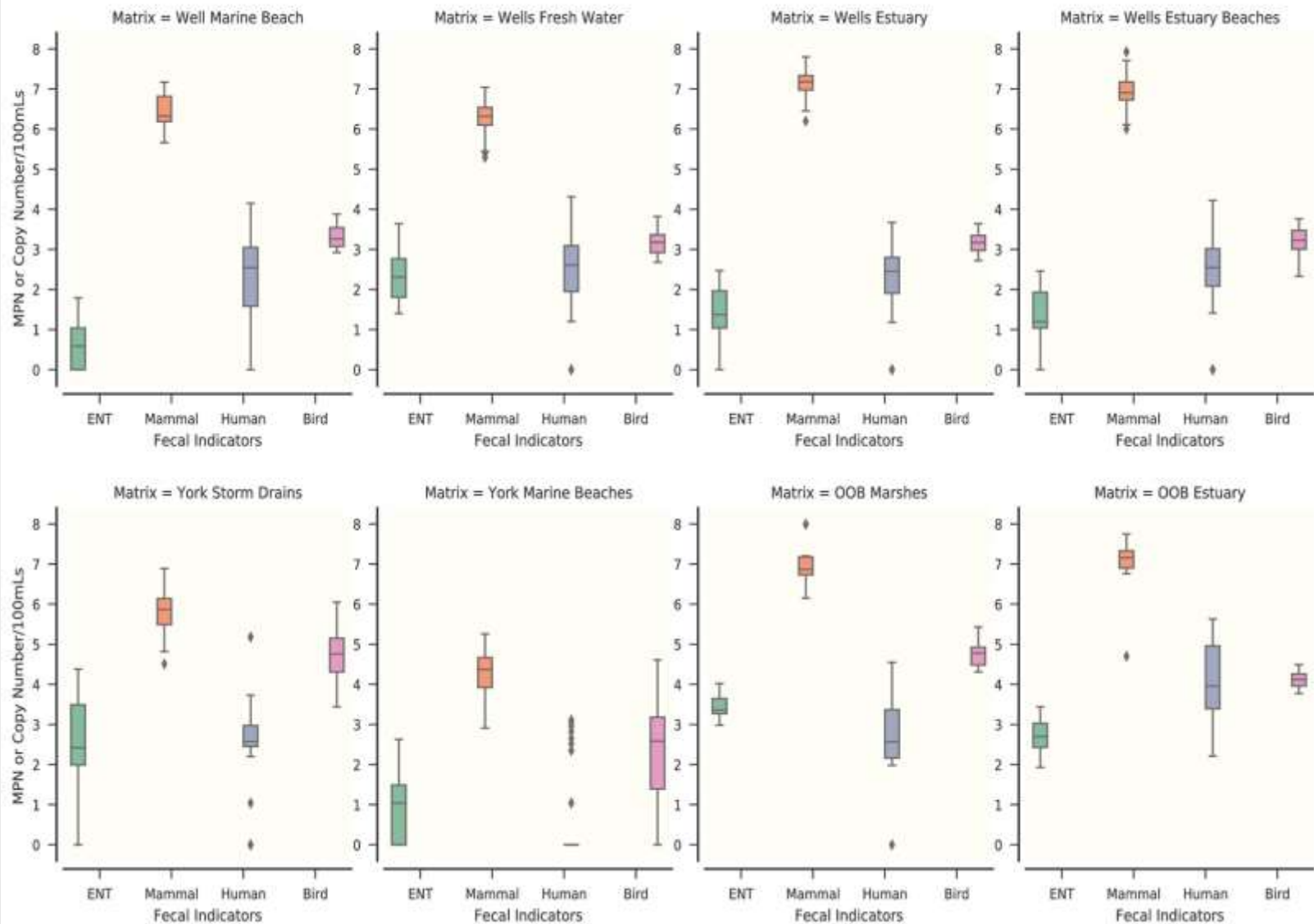
YCSWCD

Maine DEP

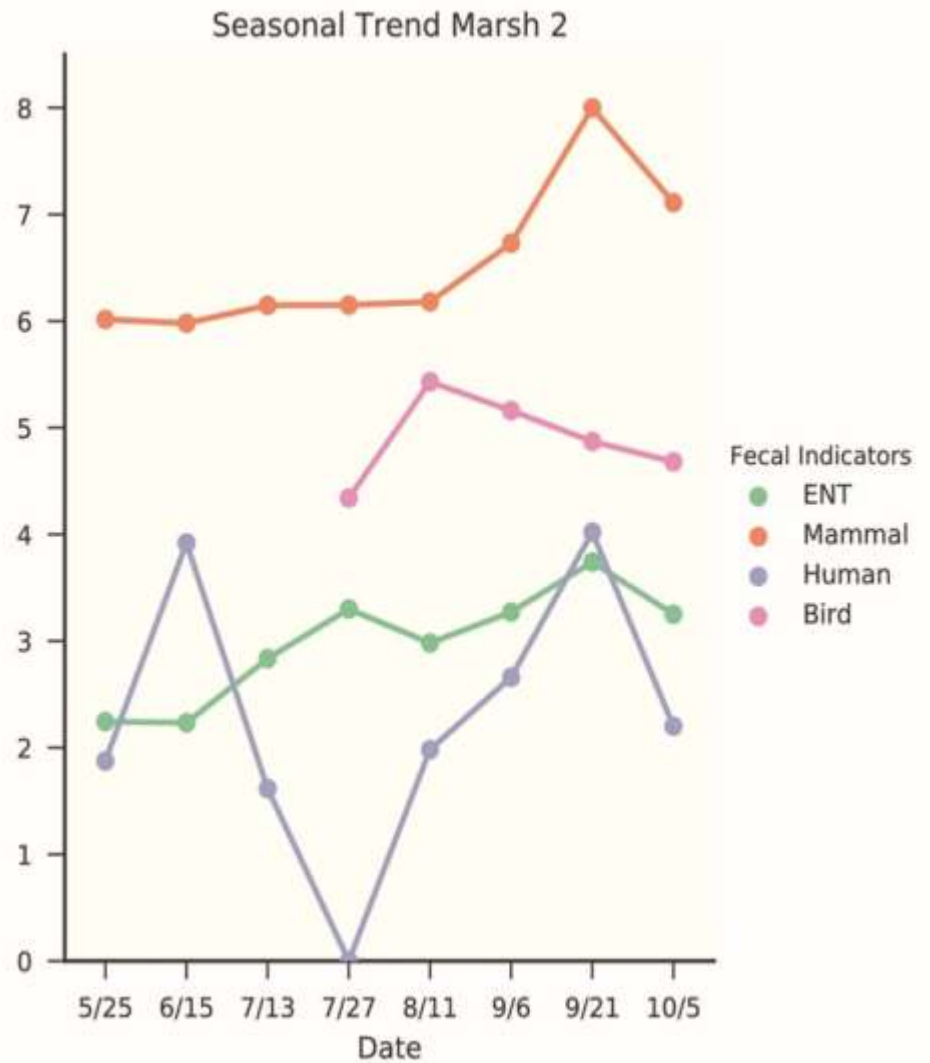
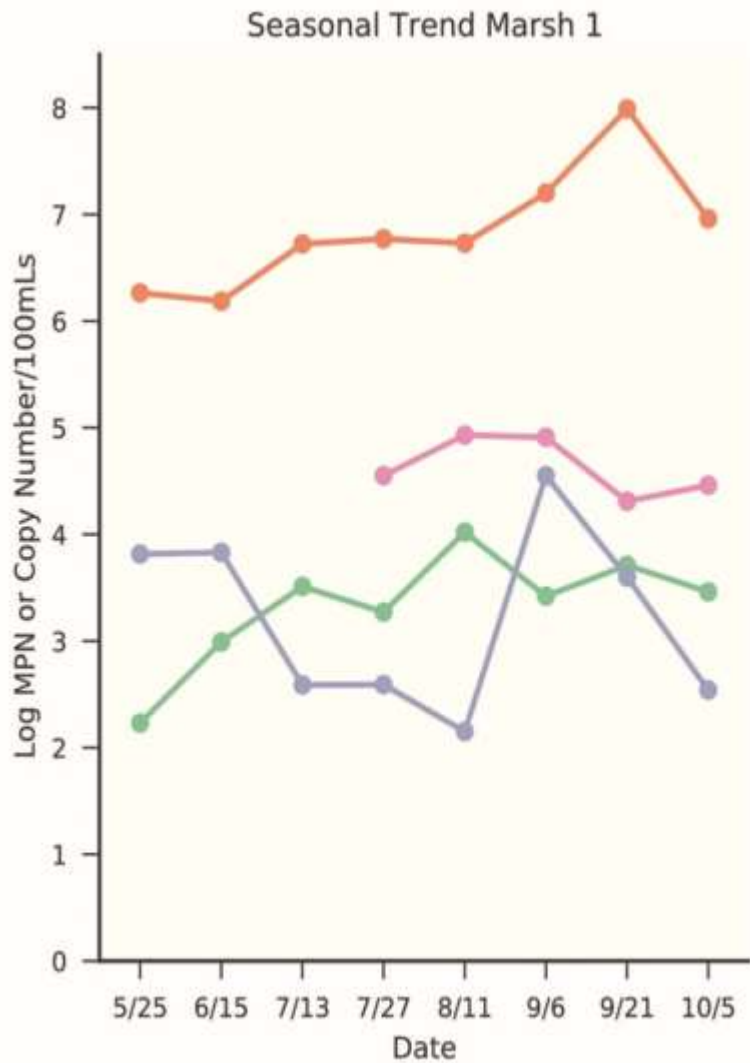
PetLife

Friends of the
Eastern
Promenade

Extra Data Slides



Extra Data Slides



Extra Data Slides

