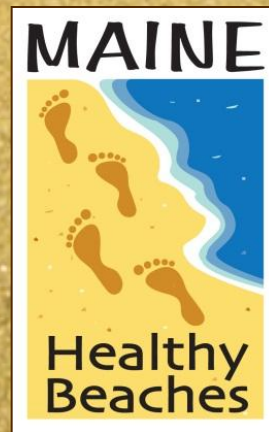


Strategies to identify sources of bacterial pollution impacting coastal beach water quality

US EPA Sanitary Survey Webinar

Keri Kaczor

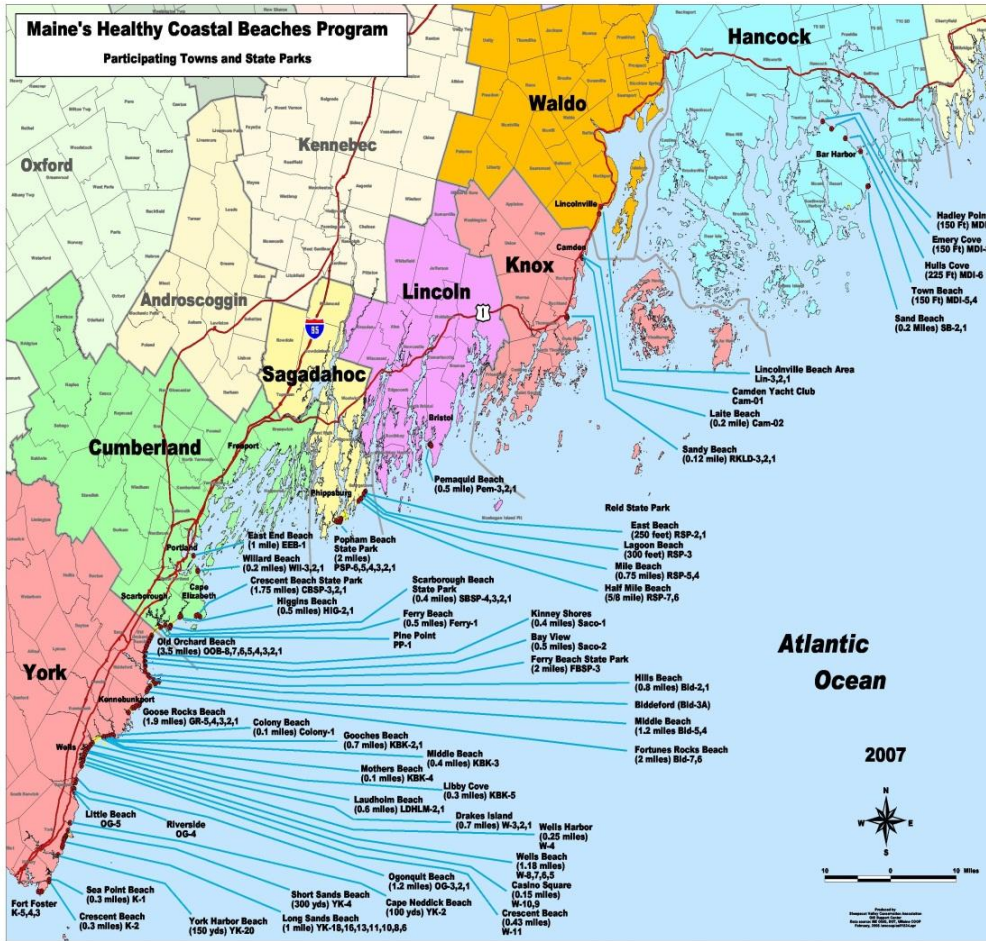
UMaine Cooperative Extension



March 25, 2014

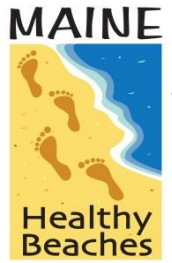
Funding provided by: US EPA/Maine DEP

Maine Healthy Beaches

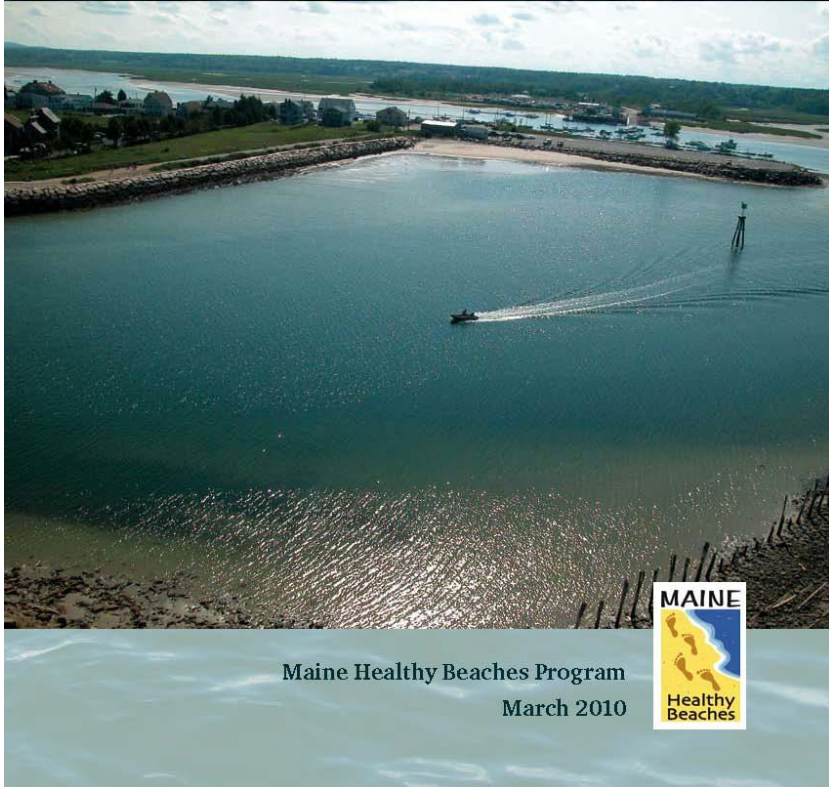


- 60 beach management areas
- Diverse partners
- “Home Rule” state; voluntary program

Addressing Bacterial Contamination



Municipal Guide To Clean Water: Conducting Sanitary Surveys to Improve Coastal Water Quality

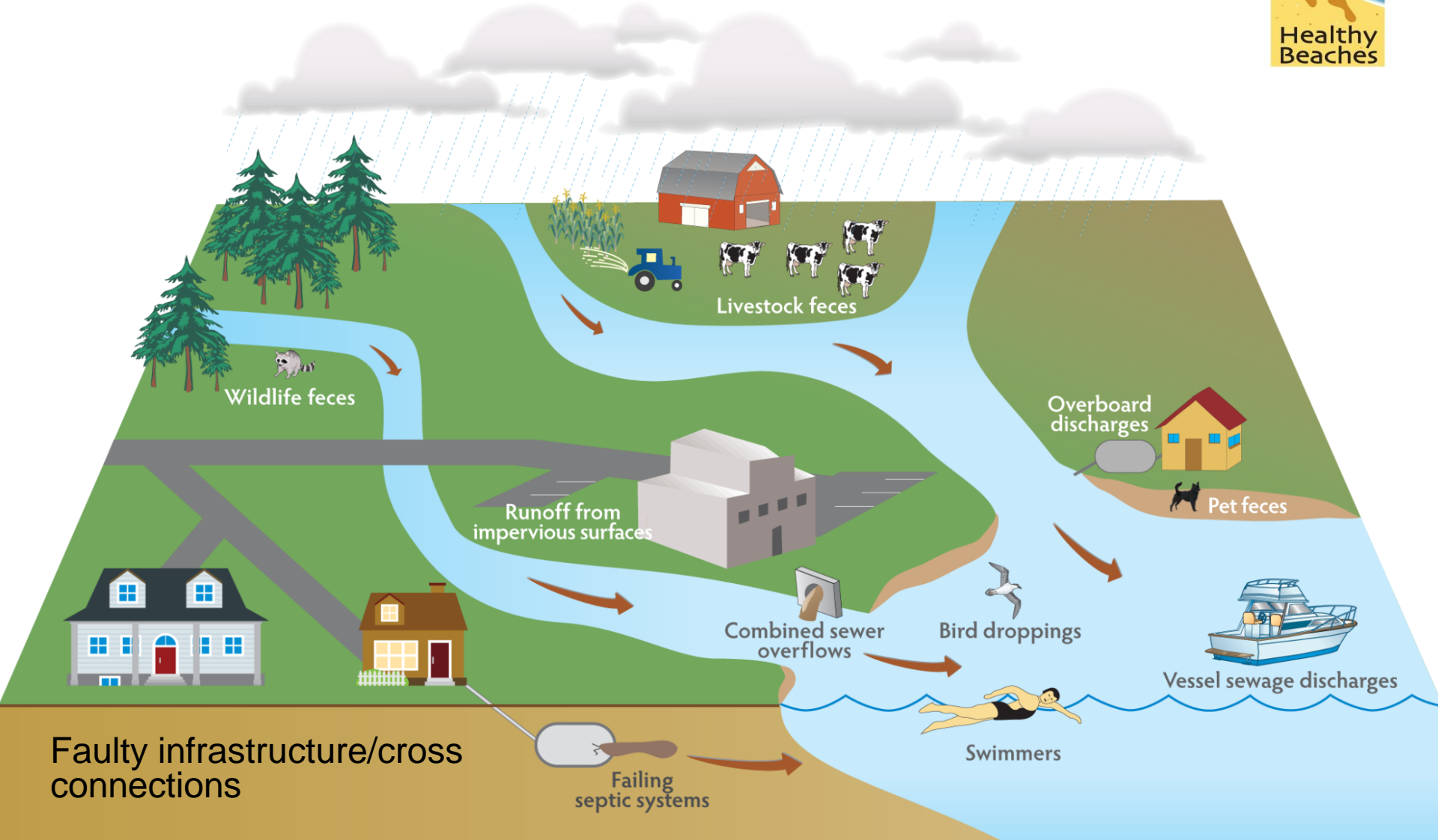
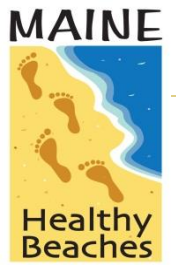


Maine Healthy Beaches Program
March 2010



- Identify
- Eliminate
- Prevent

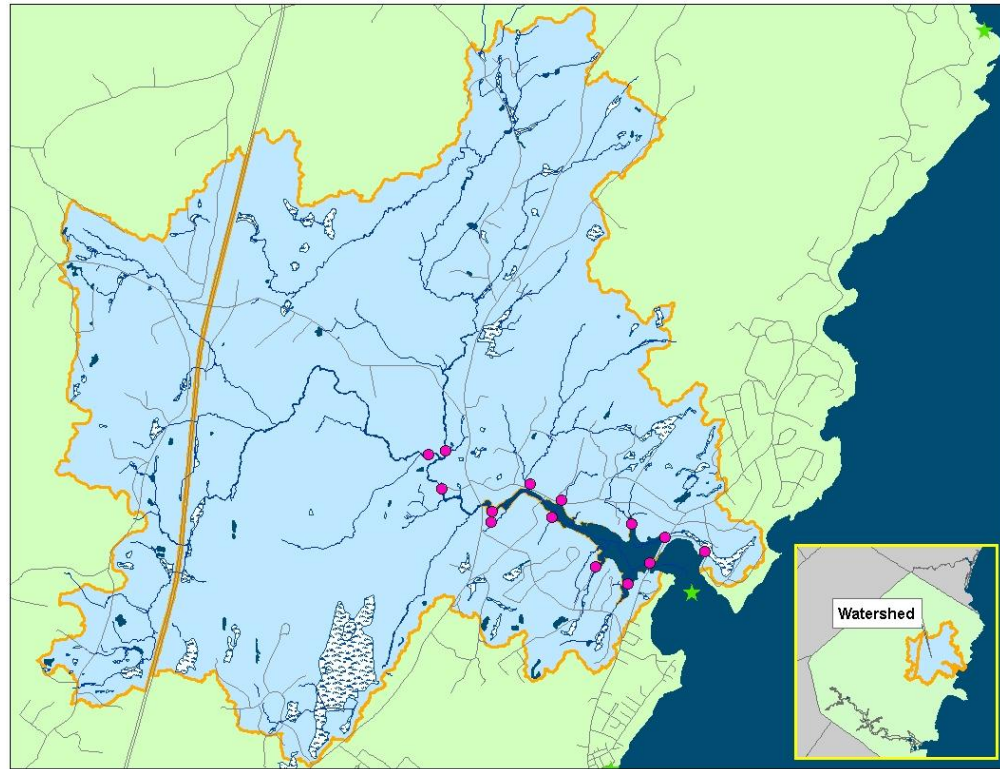
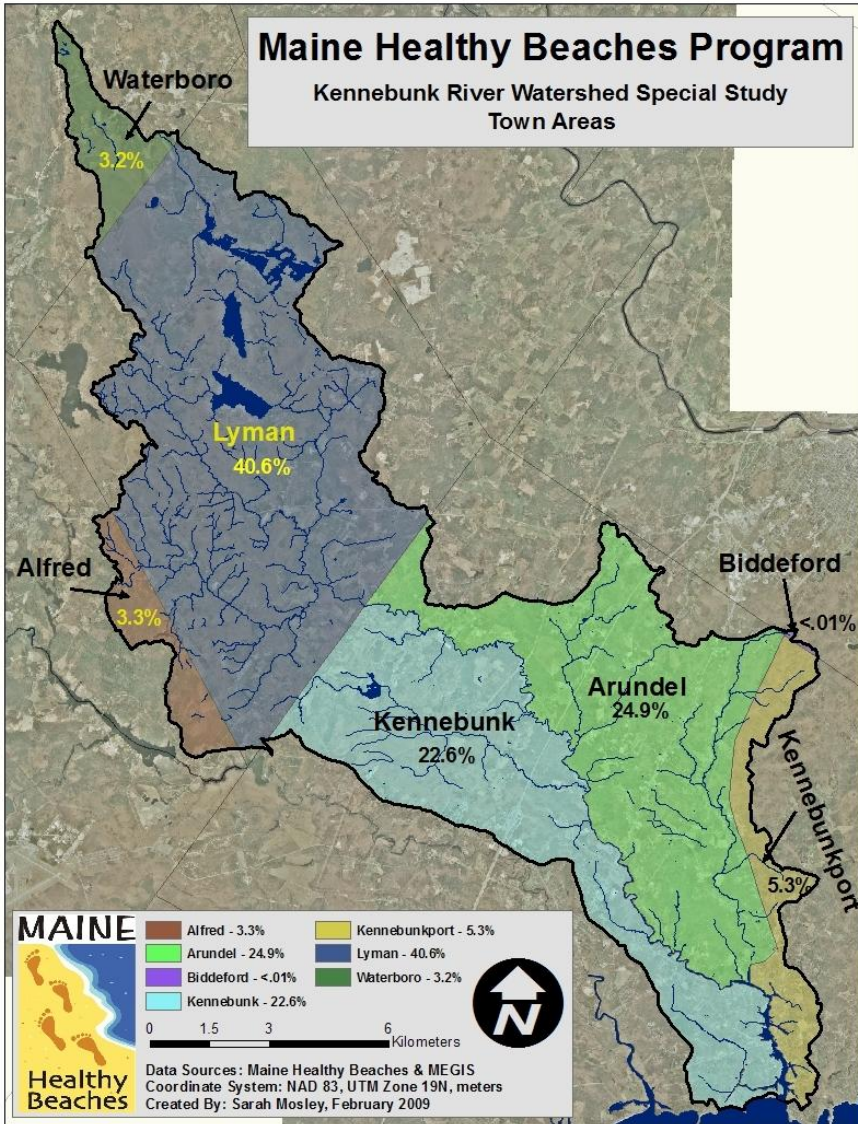
Sources of Bacterial Pollution



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.

Watershed Health = Beach Health



Addressing Bacterial Contamination



- Risk Assessment Matrix
- Circulation studies
- Pollutions source tracking toolbox
- GIS risk analysis
- Sanitary (wastewater) surveys



Keri Kaczor

Risk Assessment Matrix

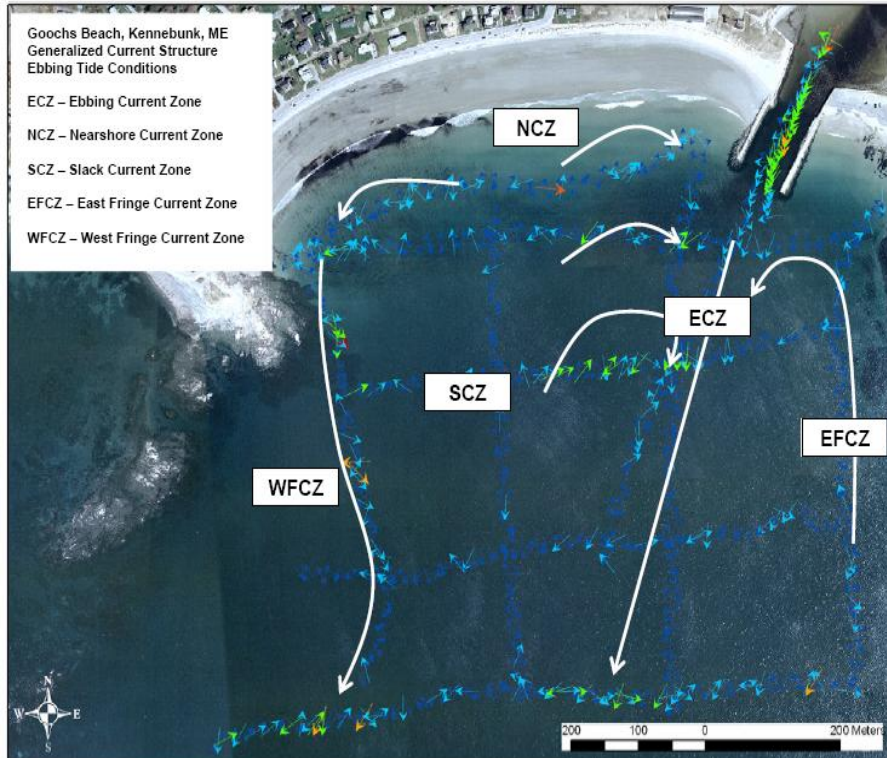


- Similar to US EPA Sanitary Survey
- Focus on shoreline
- 60 completed by local managers/MHB staff
- Informs tiered monitoring plan
- Identifies priority areas



Keri Kaczor

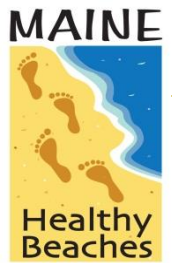
Circulation Studies



Pollution Source Tracking Toolbox



Pollution Source Tracking Toolbox



	High Bacteria	Low Bacteria
High Optical Brightener	Black water (e.g. human sources-malfunctioning septic system, sanitary sewer cross connection)	Grey or Gray water (e.g. laundry, wash water)
Low Optical Brightener	Human or non-human sources	Potentially low or no fecal contamination

Pollution Source Tracking Toolbox



Pollution Source Tracking Toolbox

Pharmaceutical and personal care products

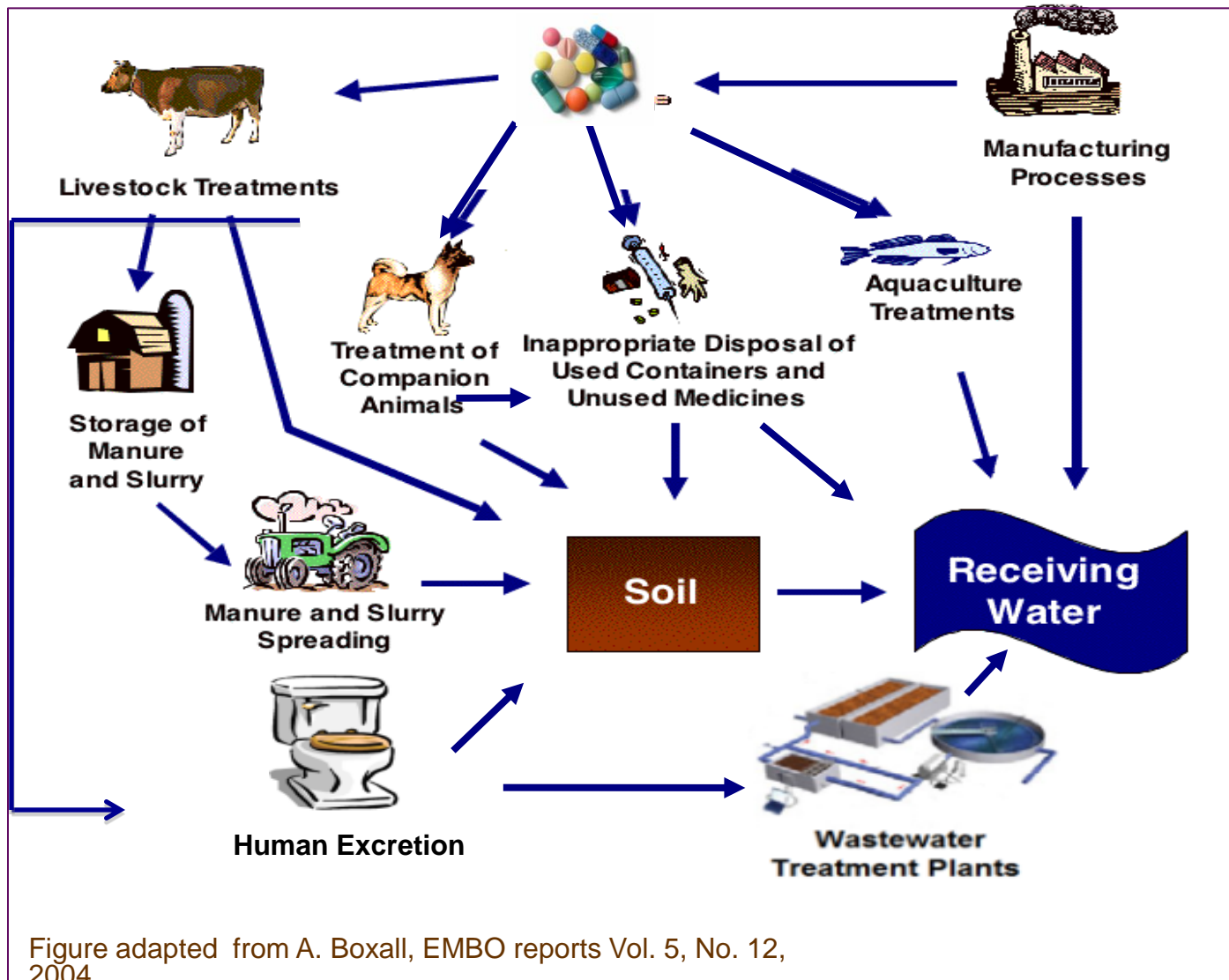
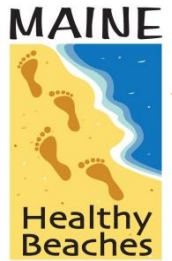


Figure adapted from A. Boxall, EMBO reports Vol. 5, No. 12, 2004

Pollution Source Tracking Toolbox



Microbial Source Tracking



500 mL water sample



Filter – discard water



DNA Isolation

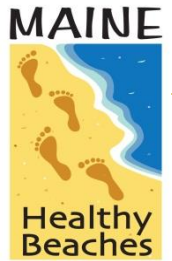


Detect human
Polyomavirus
DNA

Detect human
Bacteroidales
bacterial DNA

Detect ALL
Bacteroidales
bacterial DNA

Pollution Source Tracking Toolbox



Canine Detection Services



BACTERIA SOURCE TRACKING AND CANINE DETECTION

*LONG SANDS BEACH,
SHORT SANDS BEACH, AND THE
CAPE NEDDICK RIVER*

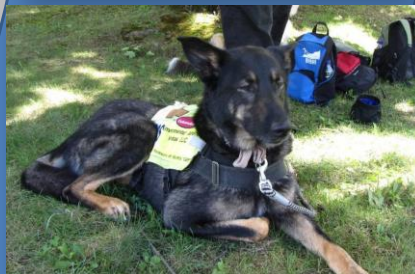
YORK, MAINE

JULY 30, 2013



Prepared for:
Town of York
186 York Street
York, ME 03909

Prepared by:
FB Environmental Associates
1950 Lafayette Road, Suite 102
Portsmouth, NH 03801



Pollution Source Tracking Toolbox



Pharmaceutical & Personal Care Products

PPCP	Description
<i>Atenolol</i>	Control high blood pressure
<i>Acetaminophen</i>	Pain killer
<i>Cotinine</i>	Metabolite of nicotine
<i>1,7-Dimethylxanthine</i>	Caffeine breakdown (after goes through body)
<i>Caffeine</i>	Stimulant
<i>Carbamazepine</i>	Control seizures
<i>Metoprolol</i>	Control high blood pressure

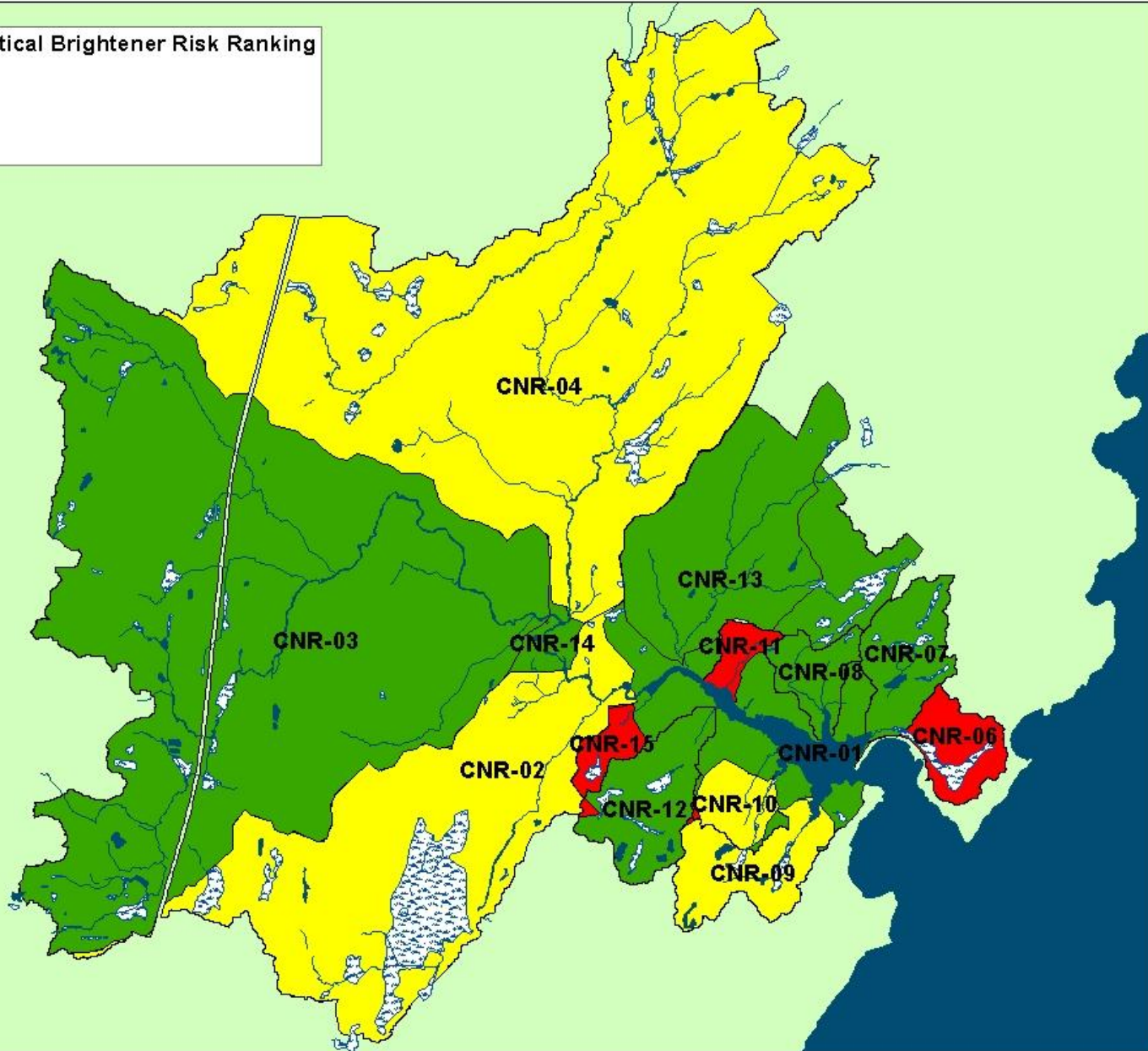
MONITORING STATION	ENT ≥ 33 MPN/100ml	OB ≥100 µg/l	+ Dev. from ENT Mean	+ Dev. from OB Mean	≥4 PPCPs ng/l	+ Canine Det.
GFB-01	Y	N	Y	Y	N	Y
GFB-01-0	Y	Y	Y	Y	N	N
GFB-01-0B	Y	Y	Y	Y	N	-
GFB-01-1	Y	Y	N	Y	N	N
GFB-04	Y	N	Y	Y	-	N
GFB-04-0	Y	N	N	N	N	N
GFB-04-0-1	Y	N	Y	N	Y	Y
GFB-04-1	Y	N	Y	N	-	N
GFB-04-2	Y	N	Y	N	N	N
GFB-04-3	Y	N	N	N	N	N
GFB-05	Y	Y	Y	Y	-	N
GFB-05-0	Y	Y	Y	Y	Y	N
GFB-05-1	Y	Y	Y	Y	Y	Y
GFB-05-2	Y	N	N	N	N	N
Saco-00	Y	N	N	N	-	N

GIS: Risk Analysis

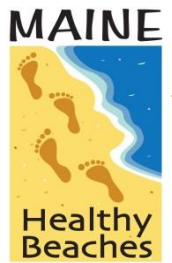


Enterococci + Optical Brightener Risk Ranking

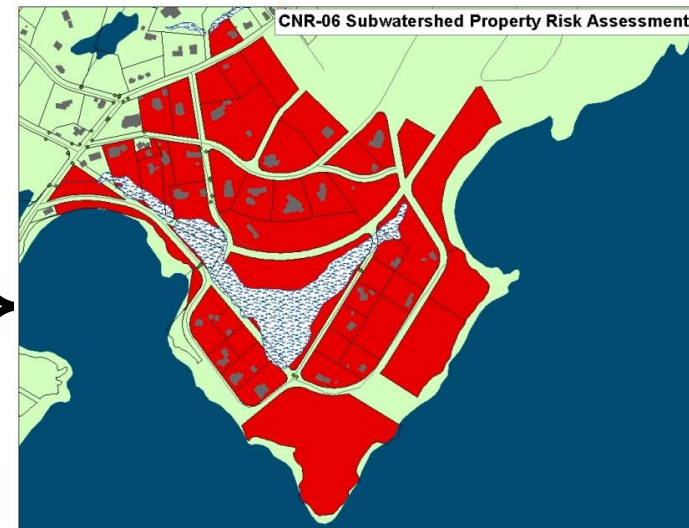
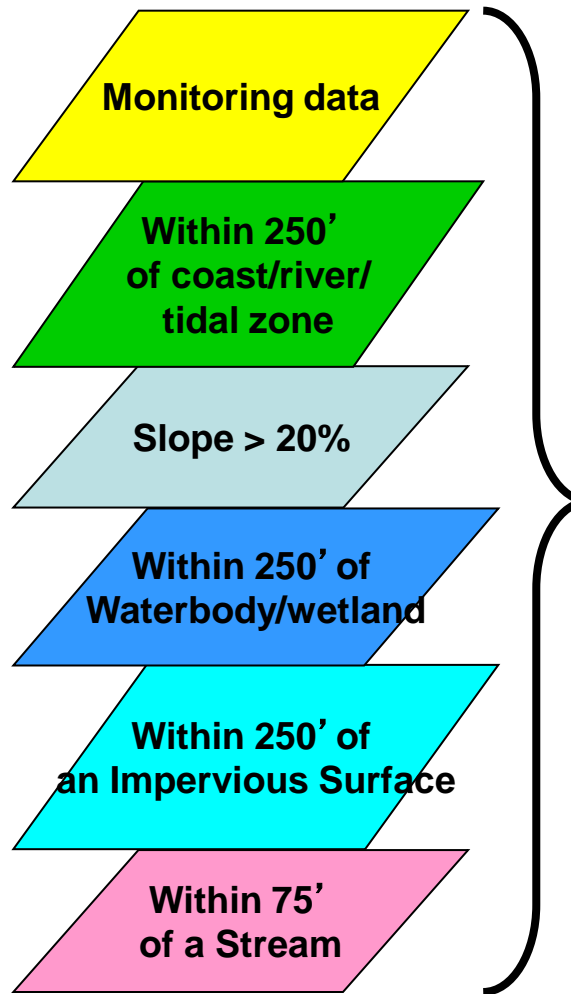
-  Low
-  Medium
-  High



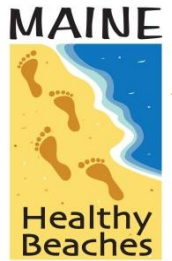
GIS: Risk Analysis



- Transforms data to usable information
- Priority survey areas



Sanitary Survey



- *Explore ALL bacterial pathways*
- Target humans sources first!
- Tiered approach
- **Malfunctioning septic systems**
- **Leaky sewers/cross connection**



Gary Curtis

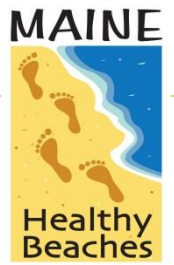
Subsurface Wastewater Disposal



K. Kaczor

- Property surveys
- Role of trained professionals
- Best tools = eyes and nose!

Subsurface Wastewater Disposal



No Two Malfunctions Are Exactly Alike!



Illicit Discharge Detection and Elimination



The Path to Clean Water is Turbulent



- Sources are difficult to find
- Requires collaboration
- Wastewater disposal is costly & options are limited
- Need for monitoring, maintenance, & expansion of wastewater infrastructure



ME DEP (J. Glowa)

The Path to Clean Water is Turbulent



- Sources are removed, new ones emerge
- Over-development & impervious surfaces
- Warmer, wetter climate

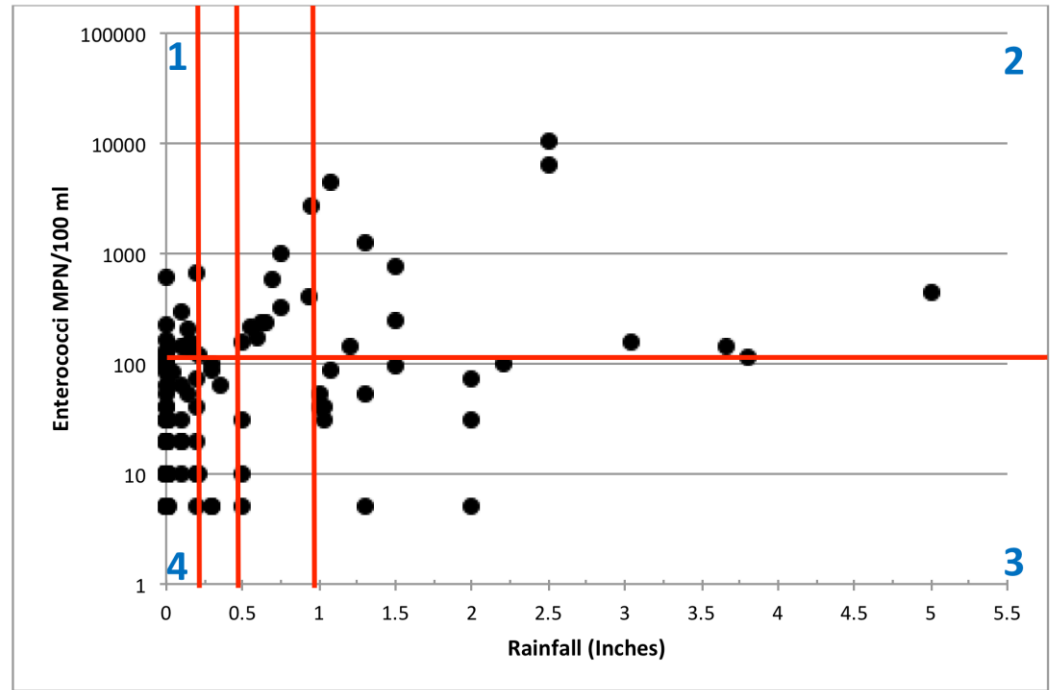


M. Warneke

Now What?



- Intensified rainfall and source tracking studies
- Precautionary rainfall advisories
- Develop beach specific management plans
- End of pipe treatment?
- Prevention



48 hr at .25 inch threshold

1= High Bac, Low Rain: 12%
2=High Bac, High Rain: 19%
3=Low Bac, High Rain: 18%
4=Low Bac, Low Rain: 51%

48 hr at .5 inch threshold

1=High Bac, Low Rain: 12%
2=High Bac, High Rain: 19%
3=Low Bac, High Rain: 13%
4=Low Bac, Low Rain: 56%

48 hr at 1 inch threshold

1=High Bac, Low Rain: 21%
2=High Bac, High Rain: 10%
3=Low Bac, High Rain: 11%
4=Low Bac, Low Rain: 58%

Sanitary (Shoreline) Surveys



- Useful assessment tool
- Important first step!
- Informs priorities and next steps
- Standardized format = transferrable data



E. Stancioff, 2003

Questions?

