

Maine – New Hampshire Beaches Conference 2017

Wells, Maine

NOTES submitted by Julia Peterson

Session 7: - Tracking Bacterial Water Pollution to its Source

Laura Diemer: Using co-indicators along with traditional source tracking methods to better pinpoint human sources of fecal contamination: a case study in Rye, NH

Laura described a study conducted by FB Environmental Associates. She showed maps of ME and NH bacteria TMDL areas. Large portion of waters are impacted by elevated bacteria levels which can affect shell fishing and recreational contact activities.

Laura noted that the type of bacteria monitored is based upon a waterbody's designated use and type (fresh or estuarine/marine). She showed a chart (EPA) that illustrates the relationships among indicator bacteria. Bacteria serve as indicators, but many swimmer illnesses are viral in origin rather than bacterial. Studies typically associate illness with bacteria (mostly related to point sources). Association with illness is a bit weaker when talking about non-point sources. Challenges include "False exaggeration", "False Underestimates", variability between samplers and between replicate lab analyses, and distinguishing human from wildlife sources. Interpretation must include large error bracket. **Supplemental indicators may help reduce uncertainties.**

Case study occurred around Parsons Creek in Rye, NH (impaired for primary contact). Within the watershed and along the beach, monitoring and investigations have been going on since 2008. Rye has taken steps to address the impairment including requiring regular septic pumpout, establishing a water quality committee and targeting certain septic systems for replacement. FBEA is working with Rye to reduce risk associated with bacterial contamination. They used canine detection to help locate human sources. Elevated levels were throughout watershed. Wet weather may be activating subsurface sources. FB Env Associates developed a

The methods for the case study included sampling during storm events, identifying contaminant sources through mitochondrial DNA analysis, determining transport of septic waste through enterococci and nitrate analysis, and characterizing tidal flux.

Laura outlined the study design and methodology used for 2 storm events (including parameters). She showed results indicating that more intense storms mobilized more sources of fecal waste. Some sites maintained high levels for some sites for at least 2 days.

Mitochondrial DNA testing indicated that two sites seemed to reflect human sources and two relatively undeveloped sites reflected wildlife sources. Tide in tidal creeks needs to be taken into consideration for timing of sampling (based on delay).

Conclusions and recommendations included adjusting wet weather thresholds, adjusting low tide sampling, adjusting advisories based on lingering presence, and repeating sampling at variable precipitation thresholds. Laura reviewed limitations of this particular study as well as next steps which include sampling more sites for more parameters in Parsons Creek and Little River (including sucralose).

Steve Jones: Application of a robust microbial source tracking method for identifying bacterial contamination sources near Maine's beaches.

Steve described work primarily associated with the Master's thesis of UNH student, Derk Rothenberger and colleagues. The overall goal of the study is to develop affordable and reliable microbial source tracking (MST) applications to address water quality problems at beaches and in coastal watersheds. Steve presented background information on the connection between fecal pollution and public health risk. Total coliform bacteria are monitored to manage drinking water. Fecal coliforms are a bit more specific to fecal contamination, and E. coli is even more associated with illness and particular strains are even more so.

Microbial source tracking is evolving. Techniques now target non-indicator bacteria that are anaerobic. There is a range of detectable source targets, well developed and field tested.

Type of information sought:

Type of source must be able to be determined i.e. human, birds, dogs, etc., as well as patterns in location and season as well as fecal “hot spots”. New work includes next generation of sequencing.

Steve showed the areas of study and application of the studies.

Case Study 1: was a 2014 enterococci study conducted in York, ME. Looked at storm drains and decaying seaweeds which are contributing to bacteria loads. They conducted a MST study in 2015. Source presence indicates presence of the source, not necessarily pathogenic organisms. Study also included assessment of fecal indicator strength (based on gene markers). Can look at fecal source changes over time. Different source contributions change over time (seasonal patterns).

Case Study 2: was conducted in an estuary in Wells, ME. The investigators anticipated contributions from freshwater sources. Results showed a high contribution from dog sources during month of July. Study wanted to use regional studies to provide some context for levels of MST source markers because none currently exist (unlike what is available for entero). Different types of markers showed different levels at different sites. Still trying to figure out risk associated with different levels of markers.

Steve outlined the strengths and limitations of MST application and reviewed a summary of findings.

Meagan Sims: Integrating microbial source tracking tools into local remediation strategies in the Goosefare Brook watershed.

Meagan works with UMaine Cooperative Extension - Maine Healthy Beaches Program. She opened by reviewing economic impact of beaches and ME tourism data. Beaches are a very important economic asset. Maine has 60 beach management areas. Healthy Beaches program is funded by EPA and includes water quality monitoring, assessment and notification, although notification is not guaranteed. Survey work concludes that most coastal residents do not seek WQ information, those that do look for it in local news and think ME's WQ is good.

The Goosefare Brook watershed encompasses parts of the towns of Saco and Old Orchard Beach. It drains to the popular Old Orchard Beach. The project developed watershed based management plan with multiple partners. Sampling occurs along brook in multiple places. They use a multi-indicator approach. Identified 2 primary hot spots to target microbial source tracking (MST) resources. Meagan reviewed the limitations of fecal indicator bacteria including inconsistent association with human health pathogens. Contamination sources matter (e.g. septic, wastewater, animals, stormwater) because they affect the management tools that are available to address a problem. The project team focused in on anaerobic conditions for MST portion of study to identify the specific fecal sources present. They investigated source, persistence, season trends, strengths of source, human health risk and prioritized efforts. Used MST to confirm hot spots. Seasonal trend indicates that human sources are probably driving mammal source component. Signals are mostly parallel. Currently, team is refining hot spot analysis and providing additional evidence to help build buy-in to transform data to action. Team is preparing to use multiple testing approach.

Meagan reviewed important considerations for folks interested in identifying bacterial sources, such as considering the range of possible sources and the watershed characteristics; the cost, specificity and technical assistance available for different testing methods; location of priority sites; and identifying the target audience who can do something with the information that

results from the study. Meagan showed recommendations that were given to towns, including delineating sub-watershed areas and sewer/stormwater infrastructure; maintaining septic inventory pump out records, if possible; building plans into MS4 plans and permits; permanent signage; using priority sites to inform investigations, and following up on smoke tests. She emphasized the importance of outreach and education to build support for action.

QUESTION SESSION for panel:

1. *Do towns usually have septic records?* Some towns do and some don't. Septic data may be in any number of forms.
2. *How do towns fund testing efforts?* Rye applied for grant to work with FB Environmental Associates. Phase 2 and 3 of project will be funded ??
3. *How does pump out ordinance work?* Started in 2016 in Rye. Property owners contact town prior to pumpout and they send out an observer. Pumpout required every 3 years. Made it a town ordinance in order to use the opportunity to educate. York has pumpout ordinance as well. Waivers are available for both towns for exceptional circumstances.
4. *Evidence of human bacteria in stormwater?* Not sure, although influence may grow with rising groundwater levels (FB Env Assoc study) from very wet weather. Some Rye study showed other bacterias more closely associated with very wet weather.
5. *Role of tides?* Jones – very high tides are an influence. Tidal cycle appears to play a role. Implications are different with shellfish beds vs beaches.