Baltimore Data Jam: Fecal Bacteria in Baltimore’s Waters

The Baltimore Ecosystem Study (BES) is a Long Term Ecological Study funded by the National Science Foundation. Their goal is to conduct long term research at ecological sites in Baltimore City and the surrounding areas. They broaden the idea of ecology to not only focus on the natural world, but include the people and the cities they live in, to better understand their role in the environment. These data represent fecal bacteria colony counts per 100mL of water sampled at various locations within Baltimore’s waters.

* **Dataset Variables:**
  + Date – date sample was collected
  + stations – name of station where sample was collected
  + colonies per 100mL of water
* **Dataset Timeframe:** 
  + These data were collected approximately twice monthly from May 1, 2013-November 12, 2014.
* **Data Collection Methods:**
  + Fecal bacteria are measured through the collection of a water sample for analysis by a laboratory. Water samples were collected from halfway between the water’s surface and river bottom at each station. Samples were placed on ice and delivered the same day to the lab. Enterococcus fecal bacteria data is assessed using the State of Maryland’s numeric human health thresholds for body-contact water recreation (“Low Risk” < 61 colonies/100mL; “Medium Risk” 61 - 151 colonies/100mL; “High Risk” > 151 colonies/100mL).
* **Information About Sites** 
  + Fort McHenry Channel
  + Jones Falls Outlet
  + Patapsco Outlet
  + Ferry Bar Park
  + Middle Branch A
  + Northwest Branch A
  + Canton Park
* **Contact Person for Dataset:**
* Blue Water Baltimore, [www.bluewaterbaltimore.org](http://www.bluewaterbaltimore.org)
* **Background Information**
* Fecal bacteria are bacteria from animal (including human) waste or feces, and are measured as a concentration of bacterial colonies (colonies/100mL) present in the water. Fecal bacteria are a diverse group of microorganisms, and there are several different groups of fecal bacteria that are used for monitoring water. For this study, we measure the concentration of Enterococcus fecal bacteria, which are used as an indicator for potential sewage contamination and human health risk from water contact. Fecal bacteria enter waterways through stormwater runoff that carries fecal bacteria from animal waste deposited throughout the environment, such as pet waste, and through overflows of human sewage from septic tanks, sanitary sewer pipes, and wastewater treatment plants.
* Enteroccocus fecal bacteria are a reliable indicator for waterborne pathogens that are excreted by mammals and humans, such as Staphylococcus, Hepatitis A, Cryptosporidium, West Nile Virus, and other microorganisms that can cause gastrointestinal illness and skin and eye infections. For this reason, collection of this data is important for assessing the human health risk of recreational water contact.
* **Link to Maryland State Curriculum**

**Goal 3: Concepts of Biology**

* Expectation 3.2 Students will demonstrate an understanding that all organisms are composed of cells which can function independently or as part of multicellular organisms.
  + Indicator 3.2.2 Students will conclude that cells exist within a narrow range of environmental conditions and changes to that environment, either naturally occurring or induced, may cause changes in the metabolic activity of the cell or organism
* Expectation 3.5 Students will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere
  + Indicator 3.5.3 The student will investigate how natural and man-made changes in environmental conditions will affect individual organism and the dynamics of populations

**Goal 6: Environmental Science**

* Expectation 6.3 Students will analyze the relationships between humans and earth’s resources
  + Indicator 6.3.2 Students will evaluate the interrelationship between humans and water quality and quantity.
* **Inquiry Idea Starters**
  + How do fecal bacteria levels differ across sites for the same date?
  + What might cause a spike in fecal bacteria colonies at all sites on the same day?
  + Do some sites have consistently higher levels of fecal bacteria colonies than others?
  + What might explain the different levels of fecal bacteria colonies across sites or within a single site over time?
* **Additional Resources**

https://www.epa.gov/sites/production/files/2015-09/documents/ecoli.pdf

* **Source**

<http://www.harboralert.org/>