Clearwater Resource Council

Microbial Source Tracking Proposal

Overview

Microbial source tracking (MST) identifies particular traits in fecal bacteria that are associated with specific hosts. In other words, scientists are able confirm the source of feces by looking at specific parts of the DNA extracted from the water. Figure 1 shows an overview of the microbial source tracking process. First, feces are deposited into the lake from animals such as dogs, deer, geese, and humans. Then, a water sample is taken from the lake and sent to a lab. There, lab personnel are able to extract the DNA associated with feces in the water. Finally, they match the extracted DNA with its original source. In result, you have a clear and quantitative comparison of the fecal contamination sources. The hypothetical example in Figure 1 shows that 45% of the fecal contamination is coming from humans, 16% from geese, 24% from deer, 7% from dogs, and 8% from all other sources.

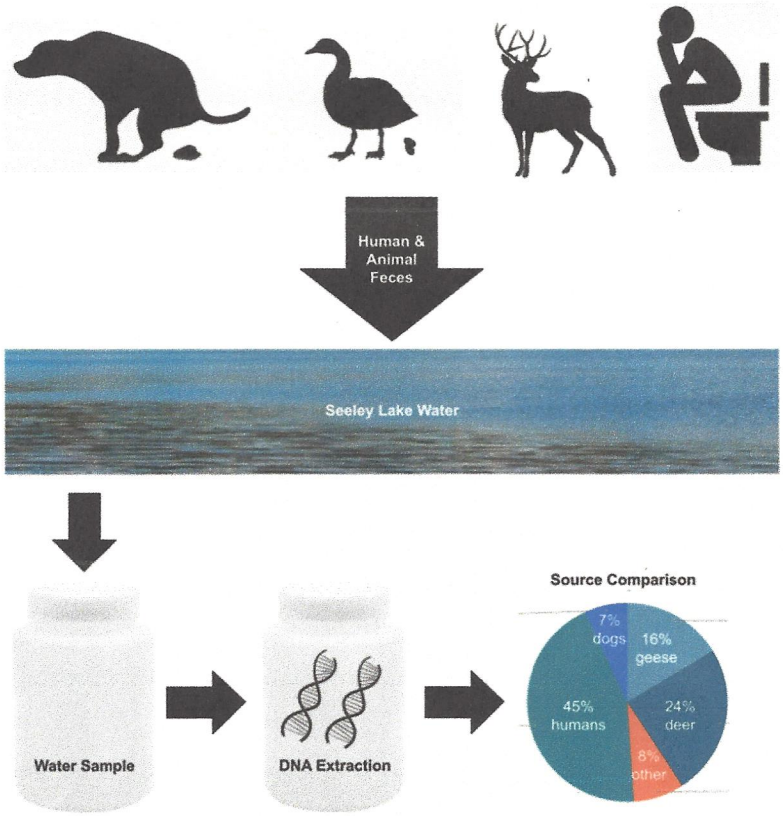

Figure 1

Testing Proposal

WHAT

CRC is proposing to test for 4 different sources of fecal contamination in Seeley Lake.

1. Geese
2. Dogs
3. Humans
4. Deer
5. All other sources

As mentioned in the overview, testing for all these sources of fecal contamination will allow us to compare the relative amounts from each source. In conjunction with the microbial source tracking, CRC plans to conduct E. coli testing (paid for by a separate, lab-funded grant). The E. coli testing will allow us to double check that the microbial source tracking is identifying the largest sources of fecal contamination. For example, if testing shows that there is a lot of E. coli in the water but the microbial source tracking shows that it is not coming from geese, dogs, humans or deer, then we know there is a different source that we had not considered. In addition, E. coli is a fecal indicator bacteria meaning we can compare the E. coli results to existing water quality criteria. Thus, the E. coli data will contextualize the microbial source tracking results. Care will be taken to analyze both the E. coli results and the microbial source tracking results to ensure that the testing identifies the sources of fecal contamination in Seeley Lake.

WHERE

CRC is proposing to test for each of the sources (dog, deer, human, geese, other) at 4 different locations on Seeley Lake. The rationale for each site selection is outlined in Table 1 below, and Figure 2 shows the sites on a map. Note that sites were not selected at the outlets and inlets of the lake because these locations experience rapid change. Contamination from the rivers and streams should be reflected at the other testing sites.

Site ID	Rationale
Mid-lake Control	This site serves as a control because it is likely furthest away from any potential sources.
South Bay	This site is located close to the Seeley Lake downtown and business district. It was chosen because of the high density of development nearby.
Southwest Cabins	This site is located in an area with a high density of residential homes and cabins.
Northwest Homes	This site is located in an area with high density of residential homes and cabins. Additionally, this site is located in the northern half of the lake.

Table 1

Figure 2

WHEN

CRC is proposing to do 1 round of testing (1 sample taken at each of the 4 sites) in the month of June. This month is ideal for doing the first round of microbial source tracking because it is a time of high usage of Seeley Lake.

NEXT STEPS

After the first round of testing is completed, CRC will analyze and present the results to the Seeley Lake Sewer District. It is suggested that further rounds of testing are completed to verify results. In addition to the microbial source tracking, testing Seeley Lake for formaldehyde could provide insight into potential RV tank contamination of lake water. While the details about this testing are not yet compiled, CRC is in the process of outlining the cost, procedure, and rationale for formaldehyde testing. At a later date, the details about formaldehyde testing can be presented to the Seeley Lake Sewer District Board for further consideration.

SOURCES

Shanks, Orin. Senior Research Geneticist. *US Environmental Protection Agency*.

Hsu, David and Wu, Meiyin. Directors. *New Jersey Center for Water Science and Technology*.