# Quantity of fecal coliforms on a well-used dog trail in Wrangell, Alaska

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## Hypothesis

We predict that water samples collected along a well-utilized dog trail, known as the Volunteer Trail, will have a higher population of fecal coliforms than an area without a developed trail system due to more feces from dogs.

## Methods


Figure 1

Figure 2

Figure 3

Figure 1 shows a sample being taken from the Rasor 1 site on 11/8/21. Figure 2 shows the GPS locations of our 4 sample sites. Figure 3 shows an incubated sample from 11/22/21.

1. On 11/8/21, 11/15/21, and 11/22/21 the class met at the following locations: Rasor 1 (56° 28'33.32"N and 132°22'19.60"W), Rasor 2 (56°28'22.16"N and 132°22'8.17"W), Rasor 3 (56° 28'15.48"N and 132°22"4.91"W), and Rasor 4 (56°28'17.51"N and 132°22'14.16"W).
   a. Rasor 1 was our expected control site, as it was a location we assumed was mostly free of dogs. Rasor 2,3, and 4 were expected to have a higher coliform count, as those locations frequently have dogs near them.
2. Taking a sample: The sampler used hand sanitizer and put on gloves before opening the pipette and sample bottle. The pipette was filled ten times at 3 different locations throughout the puddle and 30 mL of water was placed in the sampling bottle. Then, the sampler placed the lid on the sample bottle and put it in a cooler with an ice pack. This process was repeated at 4 sample locations.
   a. Time, water temperature, air temperature and weather observations were recorded.
3. After the samples were obtained, they were brought to the Wrangell Cooperative Cultural Center and plated.
   a. Plating: First, hand sanitizer was applied and gloves were worn. Four petri dishes were labeled with the name and date of the sample they were intended for. The easygel bottle was obtained and 5 pipettes of water from the sample bottle were placed in the easygel container. The bottle was turned several times and then slowly poured into a petri dish. This process was repeated for each of the four samples and they were placed in the 44.5℃ incubator.
4. After 24 hours, the samples were taken out of the incubator and placed over a grid paper. Each petri dish was mapped and counted multiple times, and the average number of colonies per 100 mL of liquid was calculated.
5. After obtaining samples over the course of 3 weeks, the average number of coliform colonies for each sample location was determined.

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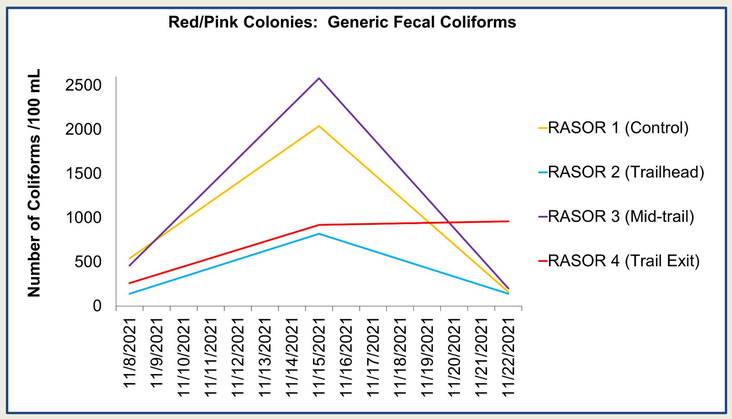
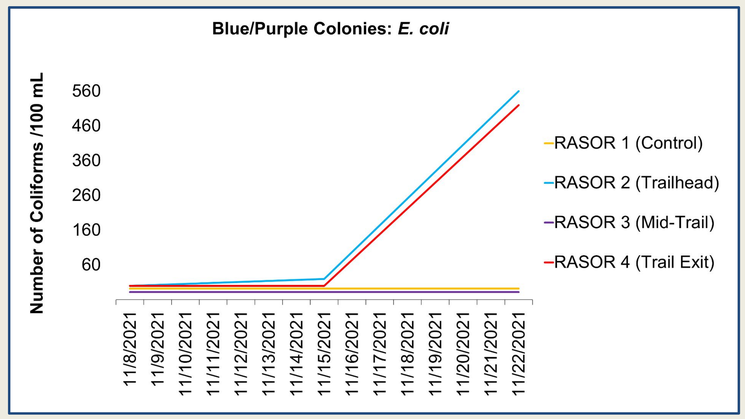
## Introduction

Fecal coliforms are microscopic organisms that live in the intestines of warm-blooded animals. Coliform contamination is a growing health concern in our community, brought to light by Wrangell Parks and Recreation, who has spent numerous hours removing pet waste from the Volunteer Trail system in Wrangell, Alaska. Bodies of water throughout the world contain levels of fecal coliforms considered to pose high health risks (Schenone et al., 2015). Animal feces are a contributing source of coliform contamination in the environment (Gordon, 2001). There are many gaps in the knowledge we currently have regarding the amount of fecal coliforms humans and animals come in contact with, as well as the effects this contact may have. According to the EPA, bacterial, viral, and protozoan infections are all possible dangers of contact with fecally polluted waters (Tompkins, 2004). Humans can be affected by cholera, salmonellosis, and gastroenteritis, as well as eye, ear, and respiratory tract infections (Tompkins, 2004). Our study aimed to collect data to show the level of fecal coliforms in the surrounding environment.

## Results




- All four sampling sites consistently had pink/red coliforms throughout the sampling period
- We saw a spike in pink/red coliforms in all our sample sites on November 15th
- RASOR 3 had the largest range of pink/red coliforms
- RASOR 4 had a very similar number of pink/red coliforms on November 15th and 22nd
- RASOR 1 and 3 had no blue/purple coliforms on any sampling date
- RASOR 2 and 4 both saw sharp spikes in their blue/purple coliform counts on November 22nd

## Discussion

Our hypothesis was not supported because our control site had as many as or more fecal coliforms than our other sampling sites. We found evidence of geese, which are a source of fecal coliforms, near our control site. We could test multiple control sites to obtain a representation of the average quantity of coliforms in the environment. We also know that weather greatly affects samples. If we had sampled in the summer season, how would our results have differed? Lastly, we could test the nearby creek to determine if the fecal coliforms present on the trail are represented there. Our next step would be to take samples of water clearly contaminated with fecal matter to compare with the data we collected.

References:

Gordon, D. M. (2001). Geographical structure and host specificity in bacteria and the implications for tracing the source of coliform contamination. Microbiology, 147(5), 1079–1085. https://doi.org/10.1099/00221287-147-5-1079

Avigliano, E., & Schenone, N. F. (2015). Human health risk assessment and environmental distribution of trace elements, glyphosate, fecal coliform and total coliform in Atlantic Rainforest mountain rivers (South America). Microchemical Journal, 122, 149–158. https://doi.org/10.1016/j.microc.2015.05.00

Tompkins, E. L. (2004). *Fecal coliforms in the rio grande: A risk to human health* (masters thesis, University of North Texas).