Comparing the Amount of Microplastics in Our Local Water Pipe to Our Local Harbors

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Introduction:

Microplastics are small plastic particles with a size of less than 5 mm. They originate from multiple sources: breaking down of larger plastics, the deterioration of synthetic fabrics, and the disposal of plastic objects. For humans, the long term health implications from the consumption of microplastics are still somewhat unknown, but they have been proven to be connected to inflammation and endocrine disruption, which is an interference with the body's hormone system (Dzierżyński et al., 2024). In animals, the release of toxins absorbed from the microplastics into the tissue of the consumer could have negative effects, the entanglement of plastic pollution can limit movement and affect food consumption, and the accumulation of microplastics in the intestines of smaller species can cause blockage and malnutrition.

Studying microplastics in our local water pipe is interesting because it reveals how everyday activity can directly affect our water systems. The 10-Mile Pipe is used by many people in our community, so people would like to know what is in their water, and how they could help keep it cleaner. Research shows that microplastics are now widespread in drinking water systems and can originate from common sources: trash, cosmetics, synthetic clothes, and tires (World Health Organization, 2019). It connects to cultural resources by highlighting how communities value clean water as part of their heritage, health, and shared responsibility for the environment. This research matters beyond our community because there are different types of water systems everywhere, and understanding how they can be contaminated can help inform broader efforts to protect ecosystems and public health worldwide. Though we don't understand completely all the effects of microplastics, it's important to learn about them and stay informed if future studies confirm negative health effects of them.

Hypothesis:

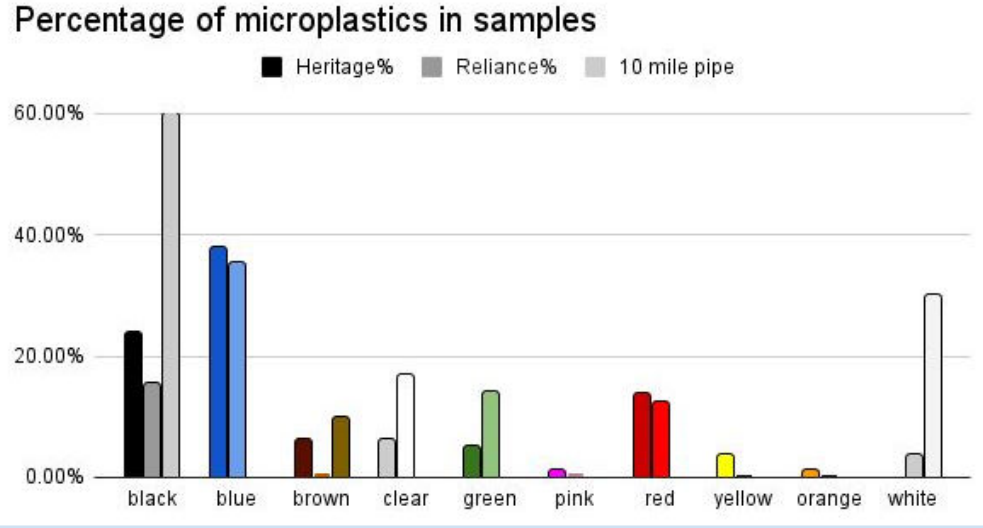
Wrangell, Alaska's 10-Mile Pipe self-hauling water source will contain more black microplastics at the outflow in late winter and early spring than the average number at the Wrangell harbor because of tires from the highway.

Methods:

- Water samples were collected from the 10-Mile Pipe. Prior to sampling, all collection equipment was rinsed three times with water from the pipe to minimize contamination.
- At the sample site (10-Mile Pipe), water was passed through a plankton net with a #20 micron mesh for 1.5 minutes per sample. The contents captured in the net were then transferred into labeled collection jars. This process was repeated 3 times to obtain three separate samples. Each sample represented about 8 oz of filtered water.
- After collection, the three samples were combined into a single sample to ensure that each of the filters were similar. The combined sample was then processed using a vacuum filtration system. During filtration, 200 mL of the sample was passed through paper filter membranes, which captured suspended particles, including potential microplastics.
- The filter papers were removed and allowed to dry at room temperature. Once dry, the filters were examined under a microscope at 10x & 20x magnification.
- To identify potential microplastics, the hot needle test was used. In this method, a fine metal needle was heated gently and brought into contact with suspected particles on the filter. If the particles were plastic, it would typically melt, deform, or curl when touched by the hot needle. In contrast, natural materials such as sand, organic debris, or plant matter would not melt under the same conditions. This test helped distinguish microplastics from non-plastic materials.
- Any microplastics found were recorded on data sheets including the type, color, size.

Figure One :includes a photo of our site on a map
Figure Two :includes a better photos of the pipe and how we collected samples

Results:



- No tire remnants were identified
- Most microfibers found were black
- 90% of microplastics found were microfibers

Discussion:

The hypothesis is not supported because no tire remnants were identified. An explanation for this would be the wind carries most of the microplastics away from the source of the water coming from the pipe. Though we didn't find any tire remnants most of the microfibers were black or white, this raises the question of what is the source of these black microfibers if not tires? The next step would be to try and identify what these microfibers are, by looking at them through better microscopes. We could also try the hot needle method on microfibers that we were unsure about. An important caveat would be not having powerful enough microscopes to see smaller microplastics. Another important consideration would be the samples being taken at different times of the year and in a limited number.

References:

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