Microplastics in Alpine

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Introduction:

- Microplastics are in every part of the environment, from the bottom of the sea to the top of Mount Everest, and everywhere in between, particularly your drinking water
- Microplastics are plastic debris that are 5mm or smaller with the smallest confirmed particles being recorded at 1.6 micrometers, or 1.6 thousandths of a millimeter (Conkle, 2017)
- "A growing number of studies document the omnipresence of MP in marine habitats. However, little research has been done so far on freshwater systems such as lakes, rivers and estuaries" (AWI)
- Therefore, I am studying the presence of microplastics in alpine water supplies (Niwot Ridge LTER) that become City of Boulder drinking water
- We have adapted a method of collecting and identifying microplastics and other pollutants to the tundra based on previous methods used in European Rivers (Bruge, et al., 2020)
- My project had many limitations such as resources and time. given more time, I would like to be able to refine the identification methods for greater accuracy and reliability.

Figure 1. Sampling site Green lake 1

Figure 2. Swift 380T microscope used for microplastic identification

Figure 3. Zooplankton net used to collect sample

Methods:

Field collection

- Use 80 micron zooplankton net with 10cm opening (Fig. 3)
- Pulled net across surface of whole lake (4.3 hectares)
- Placed all sample from net into glass jar with tin foil lid

Sample Processing (Digestion)

- Tare 250ml beaker on a scale and then place sample in the beaker
- Measure mass of sample
- Put on personal protective equipment
- Place potassium hydroxide equal to 20% of sample mass into the beaker
- Place magnet in the beaker
- Use heated stir plate at 60 degrees Celsius at speed 5
- Let sample digest for 72 hours
- Turn hot plate off and let sample cool

Sample analysis

- Use Micropipetter to pipette 100 microliters onto glass microscope slide
- Use second microscope slide to cover the sample
- Draw 1 cm by 1 cm square on random part of slide
- Count total number of microplastics in the square section at 40x
- Identify size on 10 random microplastic particles (1500x magnification) (Figure 2)

Results:

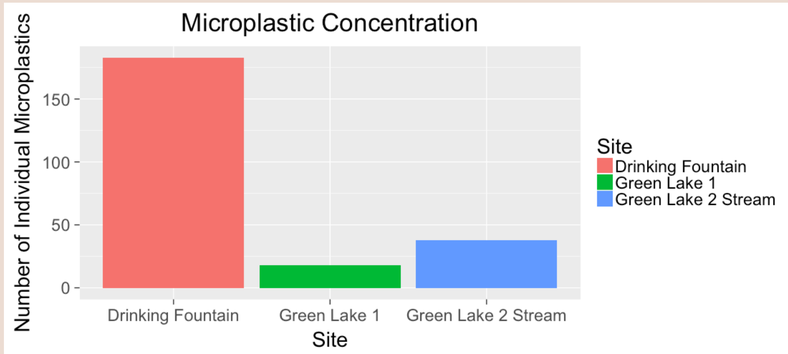


Figure 4. Depicts the number of individual microplastic particles found at each sampling site

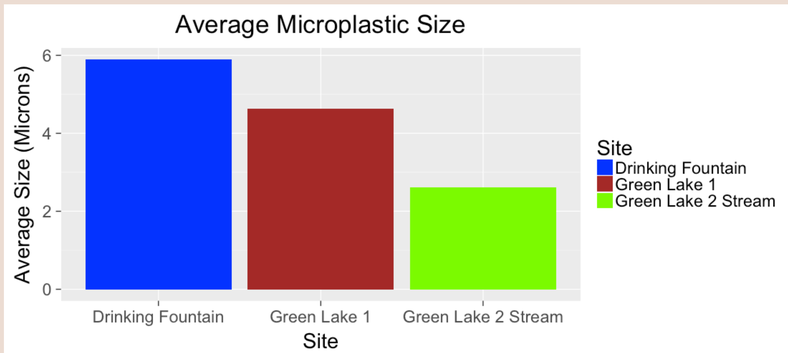


Figure 5. Depicts the average size of microplastics found at each sampling site

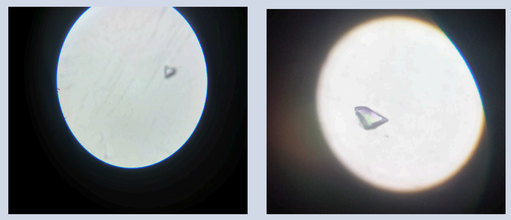
- I analyzed one alpine lake and one connecting stream for microplastics along with tap water.
- I found 180 individual microplastic particles in the tap water, 18 in the lake, and 38 in the stream (Figure 1.)
- The average microplastic size was 5.9 microns for tap water, 4.64 microns for Green Lake one, and 2.61 microns for Green Lake 2's distributaries (Figure 2.)
- Statistical analysis shows that the average microplastic size was largest in the tap water.

Discussion

- Based on my hypothesis many of the microplastics are indeed flowing downstream into the drinking water
- Though impacts on health are largely unconfirmed, a filtration level of 2 microns for drinking water may very well provide people with greater piece of mind until the health effects are known.
- Limitations were primarily time. There was a small window to collect samples along with a long time to process each sample for examination
- Assuming plastic is from upstream contamination when in reality, plastic pipes could be responsible for contamination of the tap water sample. From this point it could be difficult to tell how much is from the natural waterways and how much is from the pipes.
- Next steps study a way to destroy the microplastics without harming local organisms or better still aid the plastic in decomposing.

Figure 6 Microplastic breakdown cycle

Various Microplastics:



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NSF Award number: 2224439

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