The presence of microplastic in freshwater systems:
Snake River and Palisades Reservoir

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Objectives
To inspect water samples from the Palisades Reservoir and Snake River to understand the abundance and distribution of microplastic in the Palisades reservoir and Snake River.

Introduction
The problem of marine debris in marine systems is gaining ever more attention, especially plastic debris which comprises 60 -80% of all marine debris (Derraik, 2002). Of increasing concern are small pieces of plastic referred to as microplastic (< 5 mm). Plastic debris pose a threat to marine biota not only because they are consumed but also because they sorb potentially harmful toxins such as POP’s and metals while leaching out additives such as phthalates and bisphenol A, both of which could cause adverse effects (Rochman et al, 2013). Microplastics enter the environment in three main ways: 1) as small manufactured pellets or microbeads (found in cleaning or industrial products) that escape wastewater treatment facilities and 2) as broken fragments that result when large plastic debris is exposed to UV light and weather and 3) as microplastic fibers via effluent from washing machines (Eerkes-Medrano et al 2015).

Despite studies focusing on microplastics in marine systems, knowledge of microplastic accumulation and abundance in freshwater systems is lacking. Of the few studies conducted, results show high concentrations of microplastics in the Great Lakes (Eriksen et al, 2013), in Lake Geneva (Faure et al, 2012), and in Lake Hovsgol, a remote lake in the mountainous region of Mongolia (Free et al, 2014). Wagner et al (2014) expressed that to understand the full impacts of microplastic in the environment, freshwater monitoring for the presence and abundance of microplastics is necessary. In this study, water samples from the Palisades Reservoir and the Snake River were analyzed for the presence of microplastics. This study will be of value to understanding the prevalence and abundance of microplastic in freshwater systems and eventually lead to mitigation efforts.

Methods
Collection:
- 1,750 mL water samples were collected from specific points along the Snake River and Palisades Reservoir.

Processing:
- Samples were filtered through a 0.45 μm filter using vacuum filtration
- Filters were then placed in a petri dish previously inspected for presence of fibers and inspected with stereo scope for presence of microplastic
- Any possible microplastics were removed from the filter with inspected probes onto a clean glass slide for closer inspection under a compound light microscope
- The following criteria were used to help identify plastics: color unity, unified width, no “hocks” on surface of fiber, no cellular structure or presence of medulla
- If the particle was large enough, a hot needle test was performed (plastic melts or curls under intense heat) in some cases.
- Any possible microplastics were saved on a prepared slide for further analysis

Risk of Contamination Control Test:
- 1,750 mL of purified water was filtered through a 0.45μm filter via vacuum filtration
- The filter was placed in a petri dish and examined immediately for presence of probable microplastics under a stereo scope, then left exposed to air for 1 hour and then reexamined.

Results
- Of the 11 samples, 8 (72.7%) contained probable microplastics.
- 2/8 (25%) of the probable microplastics were films
- 2 clear films, 2 clear fibers, 2 blue fibers, 3 yellow fibers

Discussion
The following conclusions can be drawn from this study:
- Microplastics are present in the Snake River and Palisades Reservoir
- Majority were fibers most likely entering the environment from washing machine effluent

The relatively small volume of water sampled in this study makes the number of microplastics found alarming. Based on the number of fibers lost while transferring to a slide for further inspection, our data underestimates the number of probable microplastics. Future data collection is necessary to understand the source of fibers how they might affect freshwater biota. Removal of microplastic fragments or fibers is not viable due to their extremely small size and continuous evolution from the breakdown of larger items (Eerkes-Medrano, D., Thompson, J.C., Aldridge, D.C. 2015). Along with long term efforts to completely stop plastic debris pollution, mitigation efforts to remove large plastic debris from the environment or stop the use of plastic based products that shed large quantities of plastic fibers is essential to decrease microplastic proliferation. This initial study to understand the presence of microfibers and other microplastics is just the first step to mitigation efforts.

Future Research
- Use of protease K enzyme in order to further concentrate samples by digesting biological matter
- Finding correlations between abundance of microplastics and waste water effluent
- Identification of microplastic with infrared spectrometry to understand what types of plastic are in the study area
- Conducting plankton tows to increase the volume of samples
- Conducting sediment and beach surveys for presence of microplastic

Works Cited: