Nov 16:
Ideas
- Filter that removes carbon from air
- Filter that removes carbon from water
- Filter that adds healthy minerals to improve aquatic plant life growth/wellbeing

Nov 17:
Creating a Filter that removes microplastics from the ocean that doesnt remove necessary organisms from the ocean.

Dec 19:

<u>Creating an efficient ecologically friendly filter to remove microplastics from seawater to reduce the impact of microplastics on the world.</u>

Big issues:

How to filter the plastics ?
What will the filter look like?
How will the plastics be analyzed for removal?

What are microplastics
As the name suggests, microplastics are small plastic particles. Officially, they are defined as masses of plastic less than five millimeters (0.2 inches) in diameter, smaller in diameter than a common pearl used in jewelry. There are two categories of microplastics: primary and secondary. Primary microplastics are small particles intended for commercial use, such as cosmetics. Further another example is microfibers separated from clothing and other textiles, such as fishing nets. Secondary microplastics are particles produced by the breakdown of larger plastic particles such as water bottles. This degradation is caused by exposure to environmental factors, mainly solar radiation and ocean waves. The problem with microplastics is that like plastic items of all sizes, they do not easily break down into harmless molecules. Plastics can take hundreds or thousands of years to break down and destroy the environment in the meantime. On beaches, microplastics appear as small multicolored pieces of plastic in the sand. In the oceans, marine animals often ingest microplastic pollution. Some of this environmental pollution is caused by litter, but much of it is caused by storms, water currents and wind that carry plastic, both whole objects and microplastics into our oceans. Single-use plastics are items designed to be used only once and then thrown away, such as straws. As a result, this causes a major source of secondary plastics in the environment. Microplastics have been found in marine organisms from plankton to whales, commercial seafood and even drinking water. Alarmingly, standard water treatment plants cannot remove all traces of microplastics. To further complicate matters, ocean microplastics can bind to other harmful chemicals before being consumed by

marine life. After they are consumed by smaller animals the chain only grows as it moves on into the cycle of life. In a recent review published in 2023, titled "Potential Health Impact of Microplastics: A Review of Environmental Distribution, Human Exposure, and Toxic Effects," the authors concluded that the toxicity research on microplastics show that the exposure will cause intestinal injury, liver infection, flora imbalance, lipid accumulation, and then lead to metabolic disorder. In addition, microplastic exposure increases the expression of inflammatory factors, inhibits the activity of acetylcholinesterase, reduces the quality of germ cells, and affects embryo development. As a result, many countries are taking steps to reduce microplastics in the environment. A 2017 UN resolution addressed microplastics and the need for regulations to reduce this threat to our oceans, their wildlife and human health.

Nov 27:
We are unable to see microplastics within water without a microscope so to test for results I need to use scanning or a microscope.

Good options for filter parts of in general

Reverse osmosis filters = a reverse osmosis water filter works as water is forced across a semipermeable membrane, leaving contaminants behind that are flushed down the drain. The clean drinking water collects in a holding tank.

Dec 21:

Scoop up ocean water filter then output clean water

Dec 31:
Materials for filtering
-mesh
- sand / pebbles/ small rocks/ fish tank rocks
- activated carbon filters
- gravel

Jan 12:
How to make some of the microplastics

In the production of microplastics for later use in a model experiment, known plastic everyday objects are coarsely reduced in size with secateurs and ground with an electric coffee grinder to a grain size of 0.5 – 2 mm. Then, the microplastic particles are transferred into small snap-top vials and labeled (Figure 1).
Site to buy microplastics if can’t make them
micFluorescent Beads with Custom Ex/Em

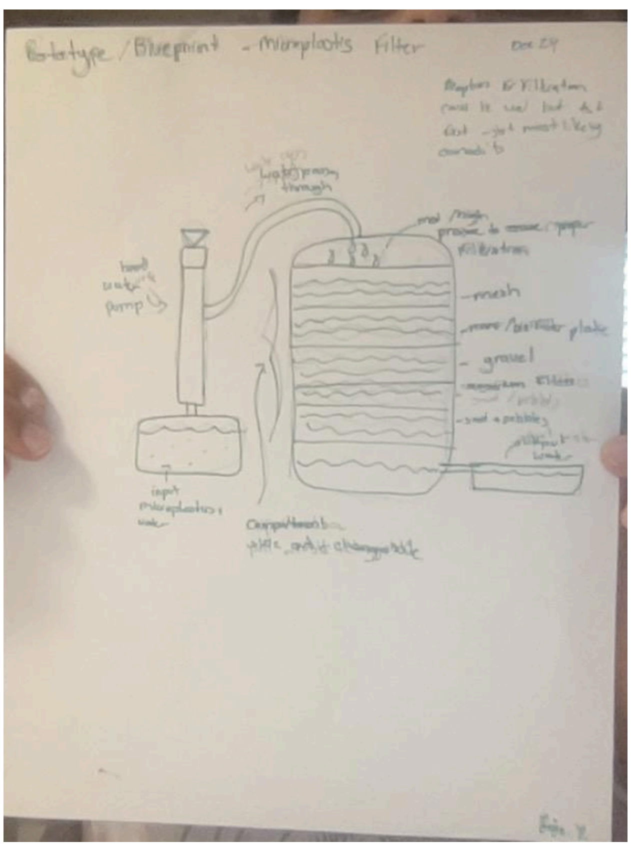
Plastic or metal outside of the filter?????

Make a filter myself?????
 Water pump needed
https://www.amazon.ca/BISupply-Water-Hand-Siphon-Bailer/dp/B0B1PJ28BS

Filter needs to have compartments to slide out materials / change

Materials to test for use

- Moss
- Gravel
- Sand and small pebbles
- Mesh
- Activated carbon plate
- Aquarium filters



Jan 13:

What to use as base for filter ????
Cup filter
Acrylic drawers
Tupperware

Can see results after with fluorescent light (blue light) if we buy fluorescent micro plastic beads

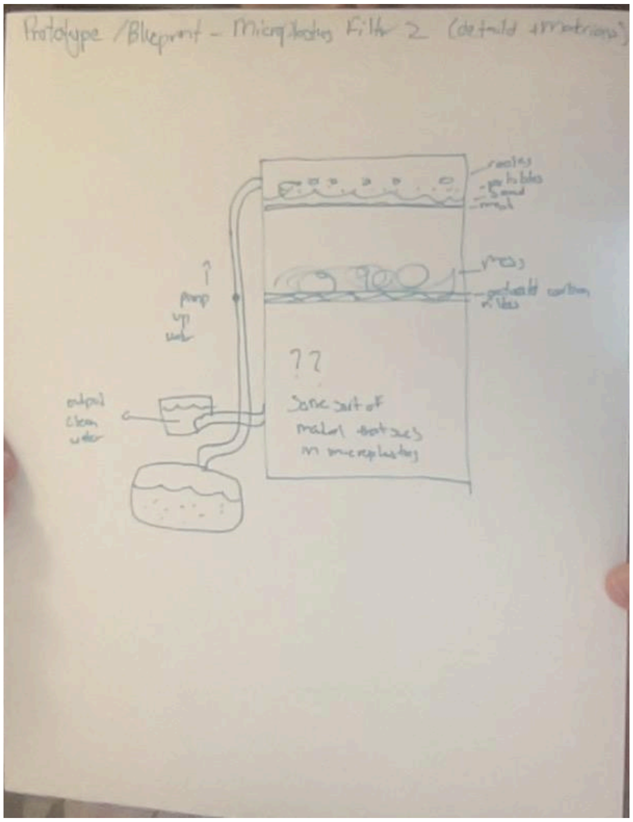
Figured out
Drip box / trickle filter - attach pump to it let water drain ou bottom -
https://www.amazon.ca/Hitommy-Aquarium-External-Trickle-Supplies/dp/B07VCN8KSH?th=1

Jan 21:

Different box that has pumps

Layout plan

1) Sand rocks pebbles with mesh underneath (rocks cant have coating bc plastics won't stick).
2) Dried moss for non water absorbent and won't fall apart as well as activated carbon sheets beneath.
3) ???? Some sort of thing that abroad microplastics or attracts them.



Jan 29:

Sponge
Cloth

Tree roots (mangrove may be a viable option for trapping the plastics as they tangle up in them and stick to them).

How to simulate seawater at home
https://manoa.hawaii.edu/exploringourfluidearth/physical/density-effects/density-temperature-and-salinity/practices-science-making-simulated-seawater

Good idea to stick sponge above drain and stick tree roots to holes in sponge

Feb 10:
Buy materials that can be bought in store and order ones that are online

Feb 13:

Materials I have

Sponge
Filter base
Pumps
Clay absorption beads - found at canadian tire and decided to include
Sand
Gravel

<u>To get</u>
Microplates - too expensive to buy so make through coffee grinder and colored toothbrush bristles
Moss
Carbon filters
Organic lettuce (leaves and roots) - some study said they attract and stick to microplastics through roots and leaves

To simulate the seawater might just add salt to water (appropriate amount)

Add aloe vera on top of sponge or something

Feb 17:
Get rid or aloe vera and lettuce to make filter concise (already biological component - moss and aloe vera will leak into the water)

Feb 18:

Get carbon filters moss and 8l buckets for output water

Feb 19:

Test ordered water pump for filter
Does not work because 120v in Canada and pump is 220 because it came from China
Go to Canadian tire to get new pump
Get coffee grinder to make the microplastics (grind plastics - from laundry detergent bottles yogurt etc) in a STAINLESS STEEL coffee grinder

Test the water filter to make sure no leaks and proper flow- work with slow flow - cut the cord so larger pressure
Increase pump pressure

Water pump / flow is working perfectly

Aim to do testing on friday with all filtration materials

To test microplastics result look at samples under microscope draw samples and also pictures of output water

Add saline to water but not test for it after - salt e is only to simulate the ocean water

To bottom layer add fish tank absorption pillars to support sponges and to increase water flow because right now on its own water has to pile to a certain volume to spill out but when pillars added volume of water needed is less so less water needed and less left at the end

Video of filter running (without any filtration materials just water)
https://drive.google.com/file/d/1IcgkRgmpQLQ86Oly6Z_qLLKeSlfKmA9n/view?usp=sharing

February 21:

For salt measurements - include
Measure sup of salt before and after each tests +boil them

Feb 22:
For salt measurements - include
Measure up of salt before any tests , run just that solution through a filter then boil to check for salt loss. Then proceed with microplastics testing cant boil after all tests with microplastics because microplastics will melt
For microplastic testing take pictures after as well as samples under microscope (fixed amount I don't know what it will be yet just wait until testing

Feb 23:

Types of plastics that I will grind up

Activia Yogurt Drink container (HDPE)

Activia Yogurt container (PP)

Dasani Bottle and Cap (PET)

Crest Mouthwash Cap (PP)

Downy Detergent (HDPE)

Use a spoon full on each batch of water for testing

February 24:

One day at school my teacher brought up microplastics in our oceans and food. Since I always had an interest in the ocean and marine life (as shown as I did my last 2 science fair projects on marine life). I went home and started to do research on microplastics. I found out that not only were they affecting us but they were destroying oceans, killing animals and even making their way into humans. Microplastics are also destroying job industries like fishing. I found that news shocking as I love seafood. Specialists are now saying that humans can have up to 20% microplastics in their body. I also noticed that for such a large problem there was no research being done to solve it. That's why I decided to take the initiative to solve this big crisis.

Water + salt calculated =
35 g/L

8l per trial

8Lx 35 g/L = 280g

Total amount of salt needed = 280g

Make microplastics

Cut into small pieces

Grind in coffee grinder

Strain to ensure small enough

Before:

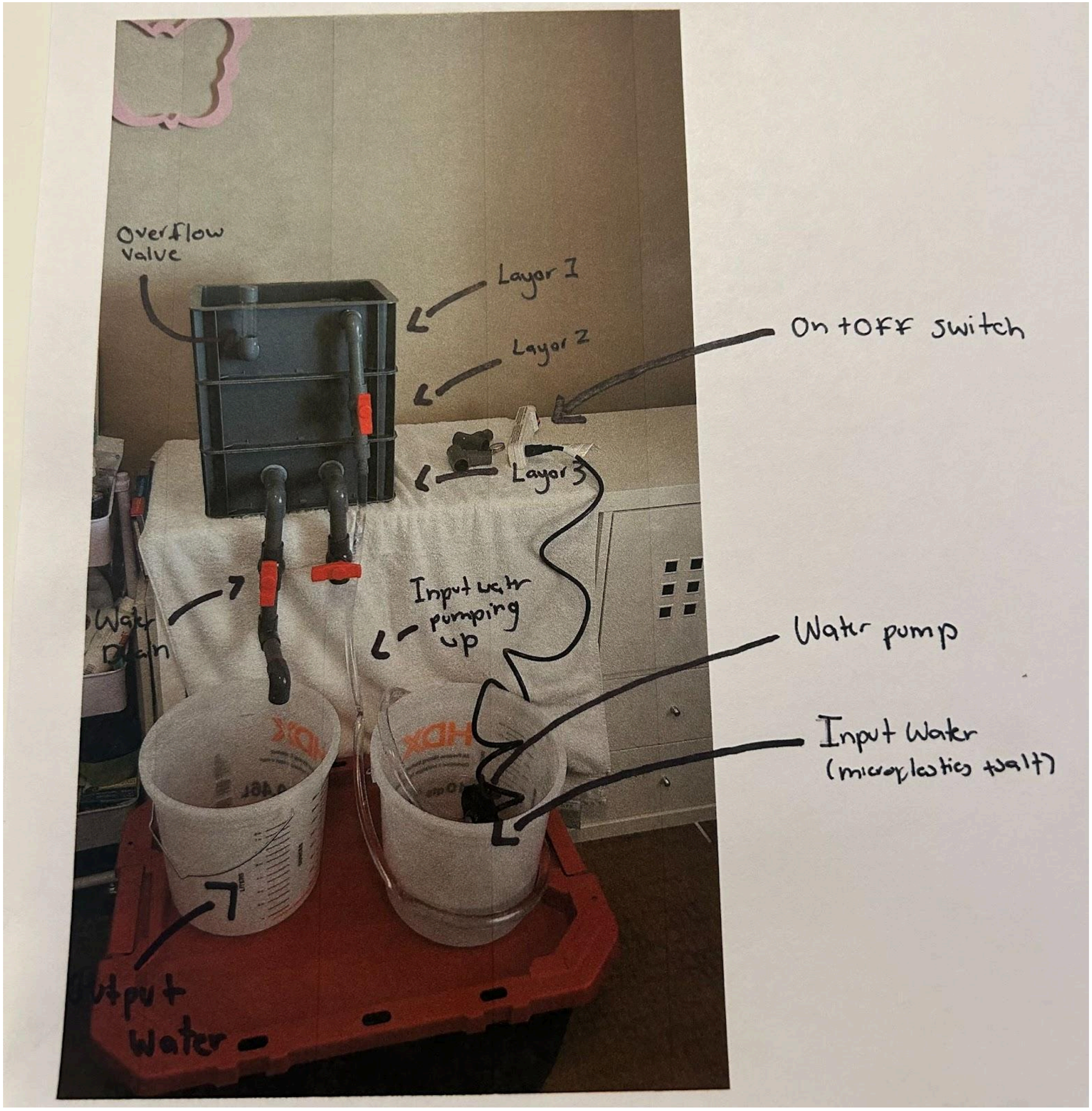
Video compared to hand -
https://drive.google.com/file/d/1FKnRgkEA6OLvs4BNJCgiIcUnkXAokKxx/view?usp=sharing

After
Video compared to hand -
https://drive.google.com/file/d/1WZpXM8D29oerBwKXZd48oJZGAc6pWSV3/view?usp=sha

ring

Feb 25:

Saline testing use hydrometer instead of boiling for better results
Commence test with all materials but just salt solution - moss is leaking color onto water - fine for saline test but have to get new moss for microplastics tests otherwise will leak into water which won't make it ecologically friendly



After a trial was done to measure salt levels before and after and the salinity was tested through a hydrometer it was off the charts so we decided to decrease the salt levels to 250g.

Feb 27:

Test 1 and 2 performed and analyzed
Took about 2 hours

Feb 28:
Test 3 performed and analyzed
Took 1 hour

Feb 29:
Test 4 preformed and analyzed
Took 1 hour

March 1:
Test 5 performed and analyzed
Took 1 hour

Note
- Have to stir plastics around to ensure evenly spread
- Clean all materials in between
- Lengthy process
- Salt decreased to 250g
- Samples taken after every trial and analyzed under microscope on same day

Ps salt decreased yo 250 bc when tested in hydrometer high so decreased for all tests

Full Method

How will the prototype be made to represent real life usage?

In the real world the filter would be attached to boats roaming the ocean. The water would travel up a tube into the filter then out the other end back into the ocean. Right now there are methods put in place to remove microplastics from controlled lab water such as reverse osmosis, lab created metallic powders and bacteria that slowly eats away at the microplastics. Unfortunately all of these theories have major flaws if they were to be used in our oceans. Reverse osmosis needs heavy machinery usually found in controlled labs in order for the process to work. Metallic powders are great for removing microplastics by attracting them and can not be put into a filter that would be used in the ocean as it would interrupt delicate balances. Bacteria that would eat away at microplastics take way too long. The rate at which they would remove the plastics would be too slow compared to the rate at which the plastics are being produced.

My filter design aims to do the following:

(1) remove the plastics at a faster rate than they are being produced,

(2) perform the task effectively.

Where does eco friendliness come in?

In this specific situation, eco friendliness means not removing matter that is crucial to ocean water like salt, yet still filtering out microplastics as well as using materials that do not dissolve into water or leave products in water.

Filter creation process/design

1) Create model

2) Find/Research for materials suitable for filtering out microplastics and efficiency

3) Test for seawater loss to test for ecologically friendliness

4) Put chosen materials into filter (creation process)

5) Test and revise the filter (tweaks for design)

6) Analyze results

7) Create a conclusion

Seawater simulation process:

To simulate my seawater, I am including the saline portion but unfortunately a limitation for my project is that I cannot include any microbes (algae, bacteria) in my simulated seawater.

Salts such as table salt, kosher salt, sea salt, and rock salt can all be used to create the illusion of the ocean. The least murky salt water will be made using kosher salt, although any kind of salt solution will become less foggy after sitting for a few hours or, ideally, overnight.
For this project 8 liters of water will be used. Since the instructed amount of water to be used does not match up with the amount I need, calculations will be performed.

Instructions:

Seawater ranges in salinity from 33 to 38 ppt (SF Fig. 2.3). The average salinity of ocean water is 35 ppt.

1. Weigh 35 g of salt.
2. Add the salt to a beaker and add fresh water until the total mass is 1,000 g.
3. Stir with a stirring rod until all the salt is dissolved.

<u>My calculations</u>

35 g/L

8l per trial

8Lx 35 g/L = 280g

Total amount of salt needed = 280g

After a trial was done to measure salt levels before and after and the salinity was tested through a hydrometer it was off the charts so I decided to decrease the salt levels to 250g.

Measuring the water before and after it goes through the filter created a way for me to check whether vital nutrients in the water (like salt) are being pulled away in the filter. To measure this amount, I will measure a cup of the solution before and after it goes through the filter. I will then check both solutions with a hydrometer to check for salinization loss.

Microplastics

To create microplastics that will be used in the project, common plastic objects are chopped into coarse pieces using scissors and then ground into 0.5 – 2 mm grains using a stainless steel electric coffee grinder. They are then sifted through a strainer to ensure they are the smallest they can be.

Before grinding and sifting

Video compared to hand -
https://drive.google.com/file/d/1FKnRgkEA6OLvs4BNJCgiIcUnkXAokKxx/view?usp=sharing

After grinding and sifting:

Video compared to hand -
https://drive.google.com/file/d/1WZpXM8D29oerBwKXZd48oJZGAc6pWSV3/view?usp=sharing

For every gallon of water in the sea there are about 4-6 microplastics. I am using 8 liters of water for my experiment. I will use 1/4 tsp of microplastics for each test. Please note that the amount of microplastics have to be exaggerated so they can be better analyzed. This would also happen in the ocean as there is not exactly 4-6m microplastics per each gallon yet instead some areas might be more contaminated like places near human inhabited lands.

Measurements

I will take samples of the water before filtration and after each trial. With those samples I will look at them under a microscope,draw them and then analyze them to see changes. I will also take pictures of the output water to see if we can see any changes,

Types of plastics that I will grind up

Activia Yogurt Drink container (HDPE) - **High Density Polyethylene**

Activia Yogurt container (PP) - **Polypropylen**

Dasani Bottle and Cap (PET) - P**olyethylene Terephthalate**

Crest Mouthwash Cap (PP) - **Polypropylen**

Downy Detergent (HDPE) - **High Density Polyethylene**

Efficiency

Obviously to remove microplastics from water you could just use a lot of very thick materials in a large and bulky filter. The outcome of this may be effective, but is not reasonable for real use. The materials that I chose should promise effective filtration while being efficient. This can be measured by the overflow valve on the filter. If the flow is too slow the water in the valve will be high. That way I can monitor how efficient the filter is.

<u>Filter Creation Method</u>

A filter should include a sedimentation, biological, surface capture, absorption, straining and flocculation filtering methods. I cannot include chemical filtration as any chemicals added would seep into the ocean water and disturb its natural balance.

The filter should be concise and items added in should be kept to a minimum.

<u>Materials</u>

Level 1 - Sedimentation- Mesh (Surface Capture/ Absorption)

1) Clay Absorption Pellets - Known to absorb impurities in water because it is porous and made out of clay.

2) Rocks - Captures larger plastics

3) Sand - Captures larger plastics

4) Mesh - Holds sediment and captures fine plastics

Sand, silt, loose scale, clay, and organic materials are examples of suspended materials that sediment filters remove from water. In this case, I am hoping that the microplastics will be trapped in place of the sand, silt, loose scale, clay, or organic materials.

Level 2 - Moss-Carbon Filter (Straining / Flocculation)

1) Dried Moss - Fine particles may be naturally absorbed by moss, which then breaks it down into safe, organic biomass. It stores the particles as sediment that it cannot utilize. Since moss is very dense and compact the plastics should also get stuck in it.

2) Carbon Filters -Through absorption, pollutants are eliminated by carbon filters. Absorption is the process by which impurities are drawn to the activated carbon's surface and retained there, much to how a magnet draws and retains iron filings. Additionally, carbon filters function as a catalyst to alter the chemistry of some pollutants.

Level 3 - Sponges - Absorption Pillars (Biological Component / Absorption)

1) Sponge - Sponges are useful because their pores are big enough to absorb large pollutants, such as microplastics (micrometer scale), without clogging. The core concept is that they fill with polluted water, then the pollutant sticks to the sponge surface.

2) Absorption Aquarium Pillars - Used to absorb small particles in the water. (In this case the small microplastics.)

Procedure for Operating the Filter

1) Create the salt water solution

2) Add 1/4 tsp microplastics to solution

3) Place the bucket down and add in the water pump

4) Connect the pump to the filter

5) Put a bucked near the water drain to collect the output water

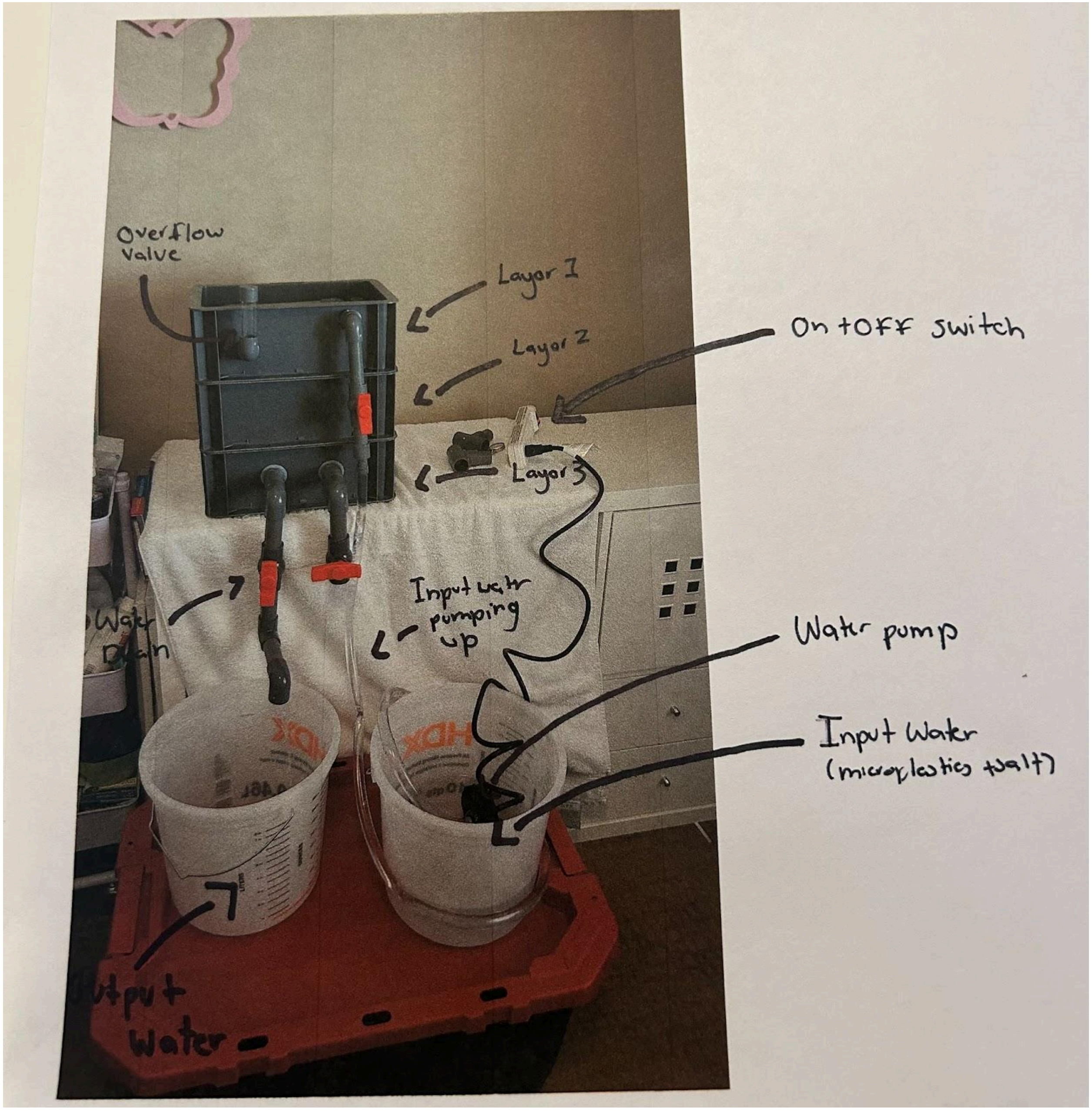
6) Switch on the power

7) Put in 1/4 tsp of microplastics

8) Stir water + microplastics to ensure they are spread evenly throughout the water

9) Stop when input water level is at 2l

10) Collect samples and analyze



Full Analysis

Water salinity loss = After being measured by the hydrometre the input water (salt solution before running through filter) was at 42 ppt, while the output was at roughly 41.7ppt. This means that not alot of salt was lost and the filter can be considered ecologically friendly.

Video of how the filter runs. -
https://drive.google.com/file/d/1IcgkRgmpQLQ86Oly6Z_qLLKeSlfKmA9n/view?usp=sharing

There will be 4 material changes in total. There will be 20 test runs in which samples will be taken in between tests.

This way of analyzing the water ensures :

1)The effectiveness of how well the materials hold up to see if after a long time the filter won't be as effective because the materials are old.

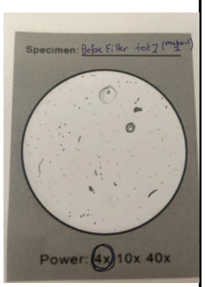
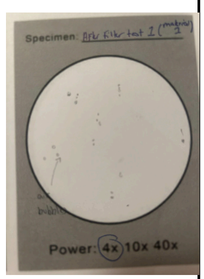
2) Effectiveness of the removal of microplastics

How will the results be analyzed for effectiveness? = There should be no particles in the samples except the plastics so that gives us an accurate way to determine the amount lost by counting all the particles drawn and seen in the microscopic samples (The salt is dissolved and you can't see any of the minerals that would be in water under the 4x zoom paired with our microscope eyepiece). To make sure that the filter is not leaching any particles a run of just water will occur and be samples/analyzed.

Qualitative and Quantitative results are being taken as the particle count is quantitative and the drawing of the observation sample is qualitative.

1st set of materials

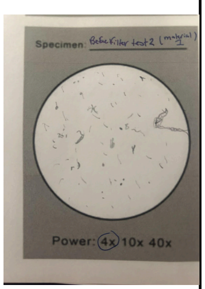
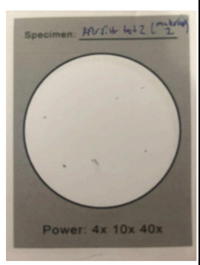
1

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall
Trial 1 - Material set 1			118	16	86.44% effectiveness

<u>Water Sample (Jar) Observations:</u>

Before - Lots of plastics on top of sample,different colors,plastic stuck to sides of sample jar, significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall
Trial 2 - Material set 1			76	6	92.11% effectiveness

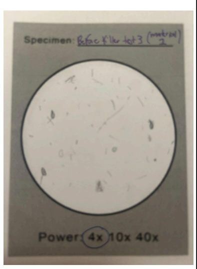
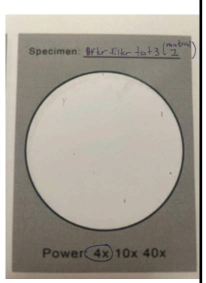
Notes:

<u>Water Sample (Jar) Observations:</u>

Before - Lots of plastics on top of sample,different colors of plastics, plastic size varies, plastic sticks to sides of sample jar, significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

3

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope **(After)**	Overall
Trial 3 - Material set 1			58	8	**86.207% effectiveness**

Notes:

<u>Water Sample (Jar) Observations:</u>

Before - Lots of plastics on top of sample, different colors, plastic stuck to sides of sample jar, significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

<u>Material after use observations: -</u>

<u>1st layer (sediment)</u>

- Larger Microplastics seen, Multicolored

<u>2nd layer (carbon and moss)</u>

- Small Particles seen when wringed out.

- Small microplastics seen when wringed out.

<u>3rd layer (sponges and filtration pillars)</u>

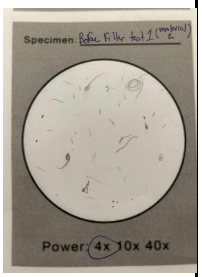
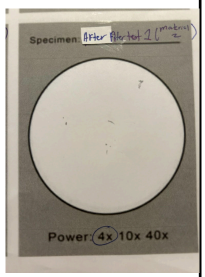
- Small microplastics seen when wringed out.

- No way of checking for microplastics

2nd set of materials - replaced

1

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before**)	Approximate Count of Particles Under Microscope (**After**)	Overall

Trial 1 - Material set 1			49	7	**85.71% effectiveness**

Notes:

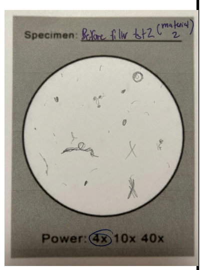
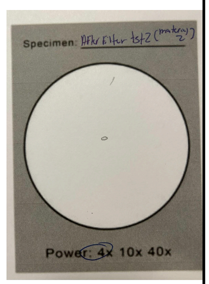
Water Sample (Jar) Observations:

Before - Lots of plastics on top of sample, different colors, plastic stuck to sides of sample jar, significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

2

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall

Trial 2 - Material set 2			43	3	**93.023% effectiveness**

Notes:

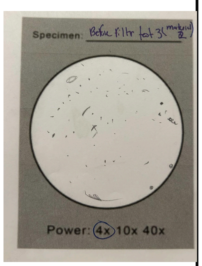
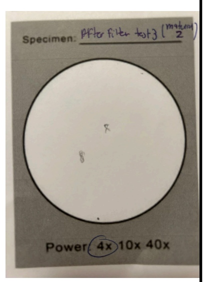
<u>Water Sample (Jar) Observations:</u>

Before **-** Lots of plastics on top of sample,different colors,plastic stuck to sides of sample jar,significant amount can be seen.

After **-** Water slightly tinted yellow (because of moss), no particles are seen.

3

Trial Number / Material Set number	Before Drawing of Particles	After Drawing Drawing of Particles	Approximate Count of Particles Under	Approximate Count of Particles Under	Overall

	Under Microscope	Under Microscope	Microscope (**Before)**	Microscope (**After)**	
Trial 3 - Material set 2			71	4	**94.37% effectiveness**

Notes:

<u>Water Sample (Jar) Observations:</u>

Before - Lots of plastics on top of sample,different colors,plastic stuck to sides of sample jar,significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

<u>Material after use observations: -</u>

<u>1st layer (sediment)</u>

- Larger Microplastics seen, Multicolored

<u>2nd layer (carbon and moss)</u>

- Small microplastics seen when wringed out.

- Small microplastics seen when wringed out.

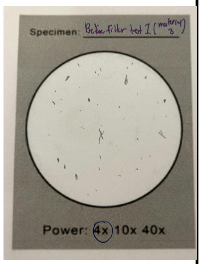
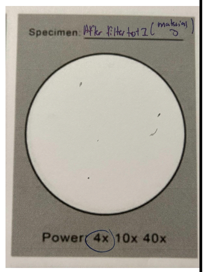
<u>3rd layer (sponges and filtration pillars)</u>

- Small microplastics seen when wringed out.

<u>3rd set of materials - replaced</u>

1

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall
Trial number 1 Material set 3			45	5	**88.889% effectiveness**

Notes:

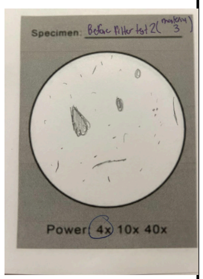
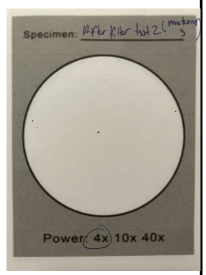
Water Sample (Jar) Observations:

Before **-** Lots of plastics on top of sample,different colors,plastic stuck to sides of sample jar,significant amount can be seen.

After **-** Water slightly tinted yellow (because of moss), no particles are seen.

2

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall

Trial number 2 Material set 3			48	5	**89.583% effectiveness**

Notes:

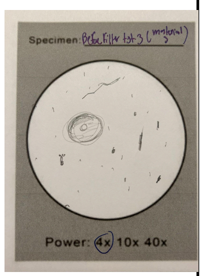
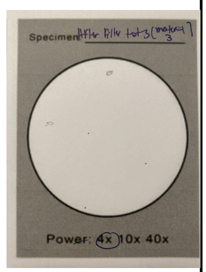
<u>Water Sample (Jar) Observations:</u>

Before **-** Lots of plastics on top of sample, different colors, plastic stuck to sides of sample jar, significant amount can be seen.

After **-** Water slightly tinted yellow (because of moss), no particles are seen.

3

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall

Trial number 3 - Material set 3			36	5	**86.111% effectiveness**

Notes:

<u>Material after use observations: -</u>

<u>1st layer (sediment)</u>

- Larger Microplastics seen, Multicolored

2nd layer (carbon and moss)

- Small Particles seen when wringed out.

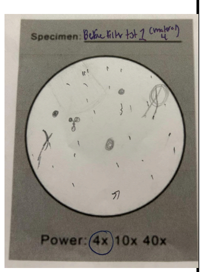
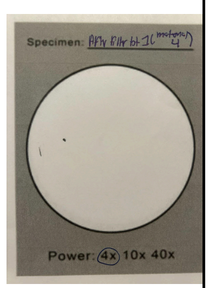
- Small microplastics seen when wringed out.

3rd layer (sponges and filtration pillars)

- Small microplastics seen when wringed out.

4th set of materials - replaced

1

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall
Trial 1 Material set 4			45	2	**95.556% effectiveness**

Notes:

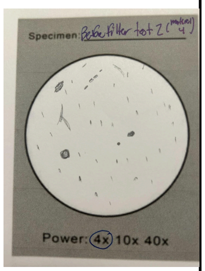
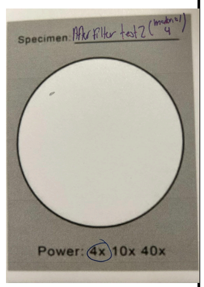
Water Sample (Jar) Observations:

Before - Lots of plastics on top of sample, different colors, plastic stuck to sides of sample jar,significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

2

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall

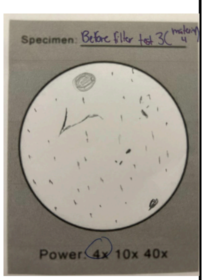
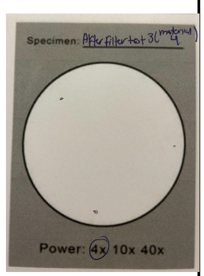
Trial 2 Material set 4			52	1	**98.077% effectiveness**

Notes:

<u>Water Sample (Jar) Observations:</u>

Before - Lots of plastics on top of sample,different colors,plastic stuck to sides of sample jar,significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall
Trial 3 Material set 4			66	3	**95.45% effectiveness**

Notes:

Water Sample (Jar) Observations:

Before - Lots of plastics on top of sample,different colors,plastic stuck to sides of sample jar,significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

Material after use observations: -

1st layer (sediment)

- Larger Microplastics seen, Multicolored

2nd layer (carbon and moss)

- Small Particles seen when wringed out.

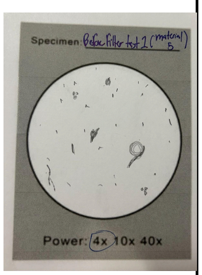
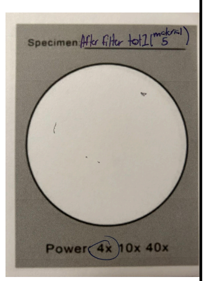
- Small microplastics seen when wringed out.

3rd layer (sponges and filtration pillars)

- Small microplastics seen when wringed out.

5th set of materials

1

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall
Trial 1 Material set 5			49	4	**91.84% effectiveness**

Notes:

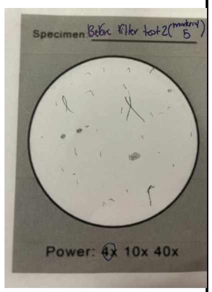
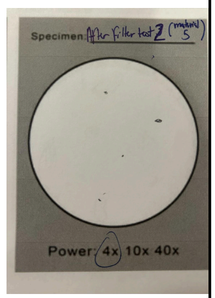
Water Sample (Jar) Observations:

Before - Lots of plastics on top of sample, different colors, plastic stuck to sides of sample jar,significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

2

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope (**Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall

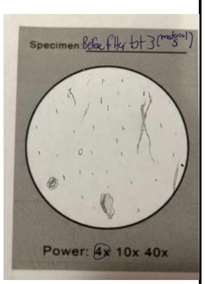
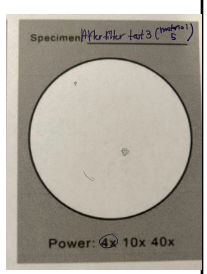
Trial 2 Material set 5			39	5	**87.179% effectiveness**

Notes:

<u>Water Sample (Jar) Observations:</u>

Before - Lots of plastics on top of sample,different colors,plastic stuck to sides of sample jar,significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

Trial Number / Material Set number	Before Drawing of Particles Under Microscope	After Drawing Drawing of Particles Under Microscope	Approximate Count of Particles Under Microscope **(Before)**	Approximate Count of Particles Under Microscope (**After)**	Overall
Trial 2 Material set 5			44	3	**93.182% efficiency**

Notes:

Water Sample (Jar) Observations:

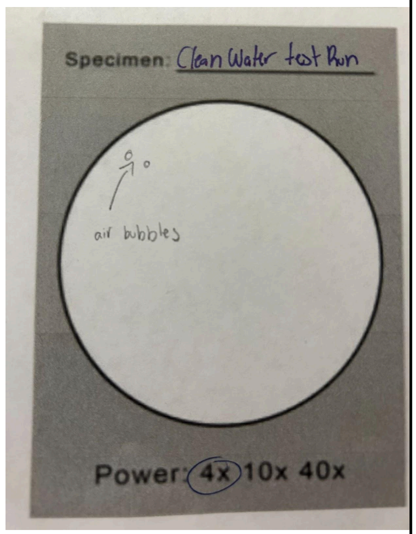
Before - Lots of plastics on top of sample,different colors,plastic stuck to sides of sample jar,significant amount can be seen.

After - Water slightly tinted yellow (because of moss), no particles are seen.

No pictures were taken after as they will be shown in the in person science fair at the olympic oval to the judges to observe.

Clear Water Trial

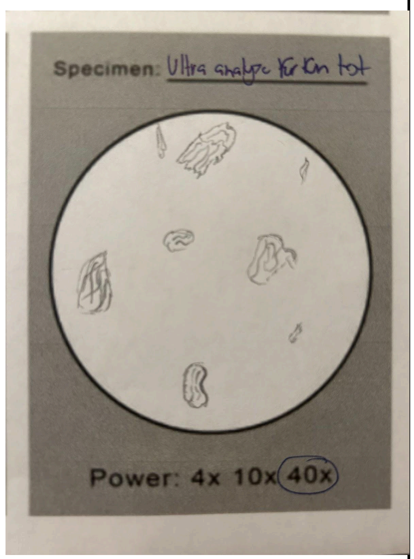
Clear Water Trial	After Drawing Drawing of Particles Under Microscope	Overall

Clear Water Trial		No particles were added which means all counts of the samples beforehand were accurate. (To make sure I took a couple samples and since none showed particles I drew one).

Notes

400X Zoom trial for fun

400X Zoom trial for fun	Drawing Drawing of Particles Under Microscope	Thoughts

400X Zoom trial for fun		Plastics that might not have been seen in the 4x zoom may be visible. More details on the plastics.

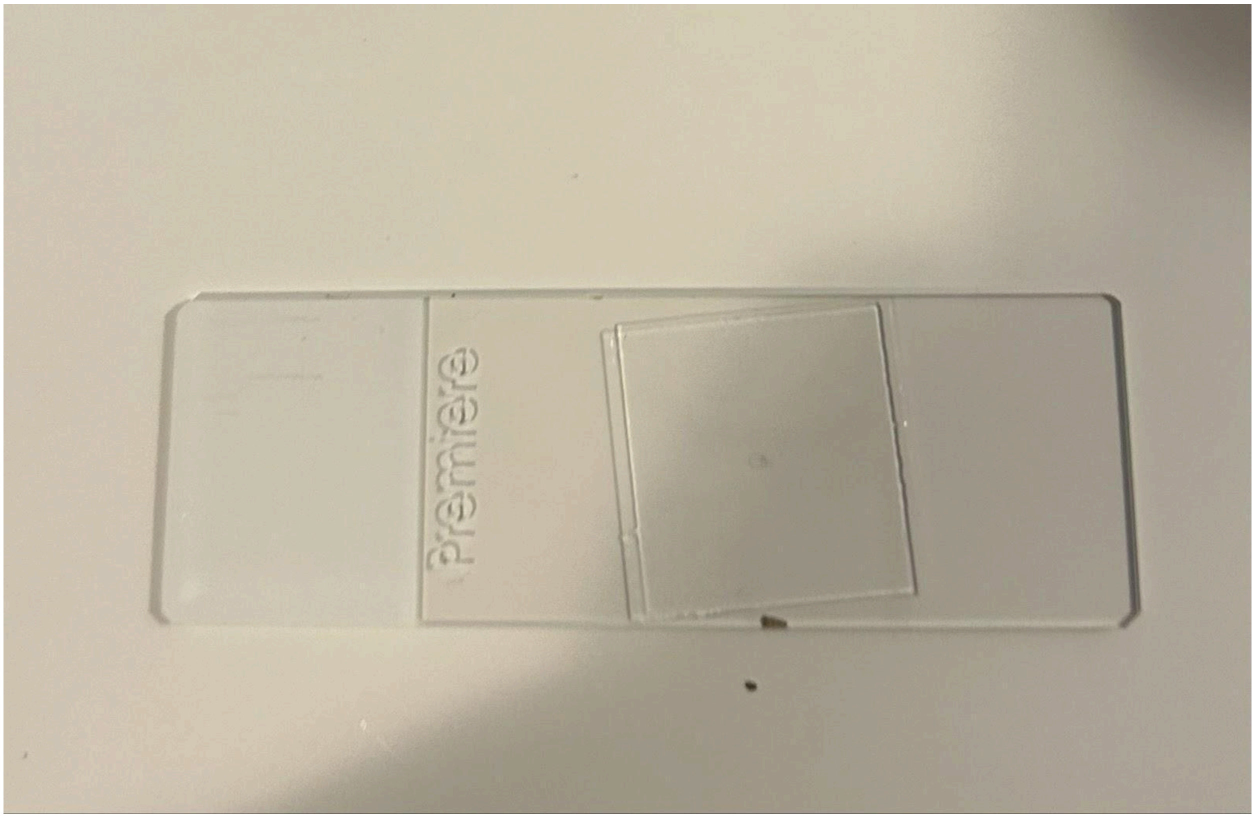
Before and after filtration input and output water buckets

Before and after sample jars

(the yellow one of after)

Before filter slide

After filter slide



Sources of Error:

1) Since the moss was not real (it would collapse) and we got it from the store Micheal's so it was colored and some of the dye leached into the output water. In the future, I will have to order organic or non-dyed moss to ensure that no leakage is caused.

2) Some of the microplastics stick to the water pump which might have caused a slight inaccurate reading in the output water.

Graph:

Comparing the % Effectiveness of Microplastic Removal of Every Trial I have performed.