

Testing the capability of freshwater algae to remove lead (Pb) from water.

Amanda Minke

Co-Authors: Robert Root, Jean McLain, Joel Cuello, and Jon Chorover

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University of Arizona, Hydrology

Background

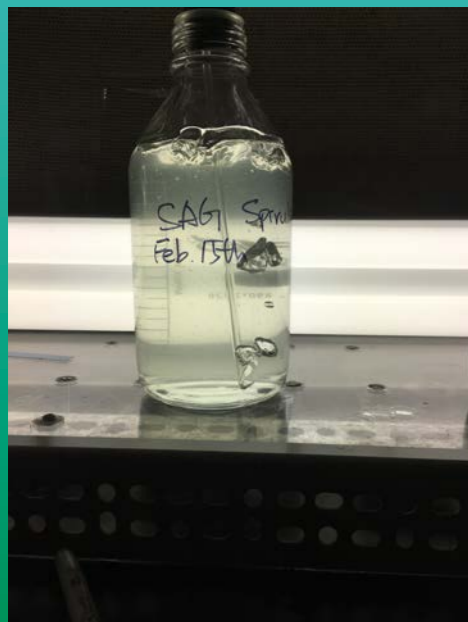
- I started this project as a freshmen in high school I built a system that uses algae to filter lead out of water.
- I have been working on this project for six years.
- I started out with 'pond algae' and now I am using Spirulina to filter the lead.
- The contaminate tested was $\text{Pb}(\text{NO}_3)_2$



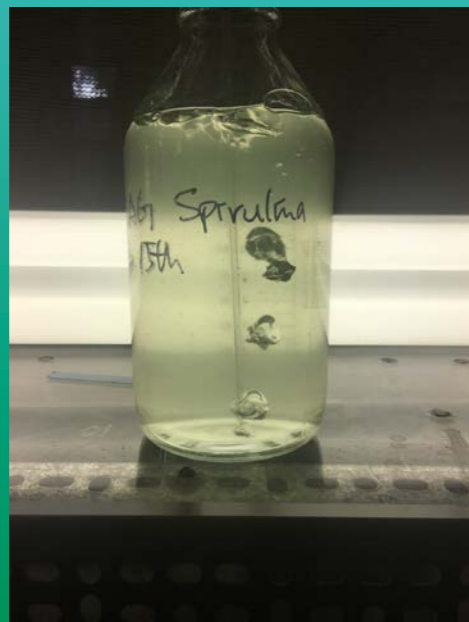
Growing Algae

- Spirulina was the species used in this testing. This is a commonly found freshwater species.
- A medium was made for the algae to grow.
- The algae had been growing nicely under lab conditions.

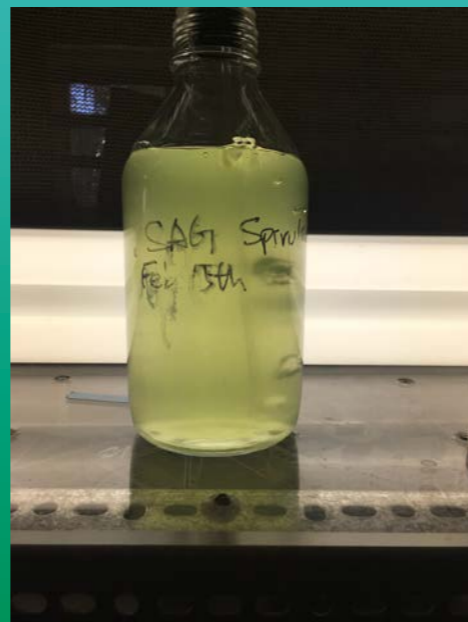
Day 1



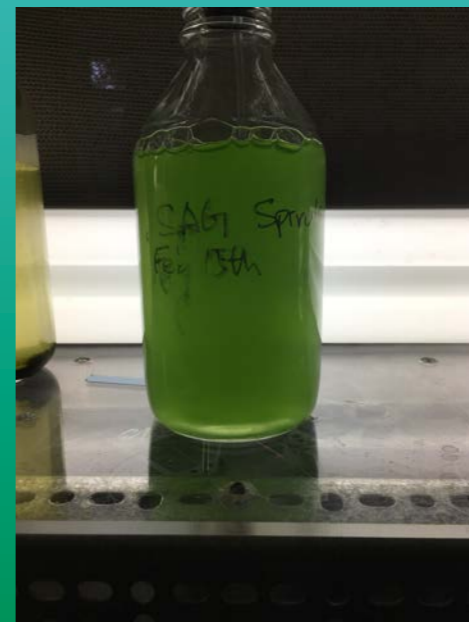
Day 3



Day 5



Day 7



Day 10



Testing Procedures

- Two layers were used in creating the filter.
- The first is a metal or plastic housing that had a fiberglass filter in it that the algae was pressed onto (1 μm).
- The second is a nylon filter to trap any escaping algae (0.2 μm).
- Each housing holds an average of 0.23 gram of wet algae.
- 10 ml of lead contaminated water was sent through each filter set up.



Preliminary Results

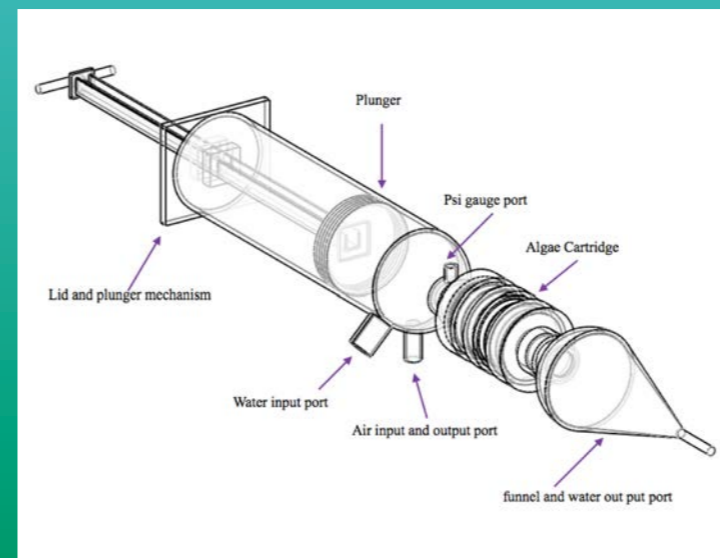
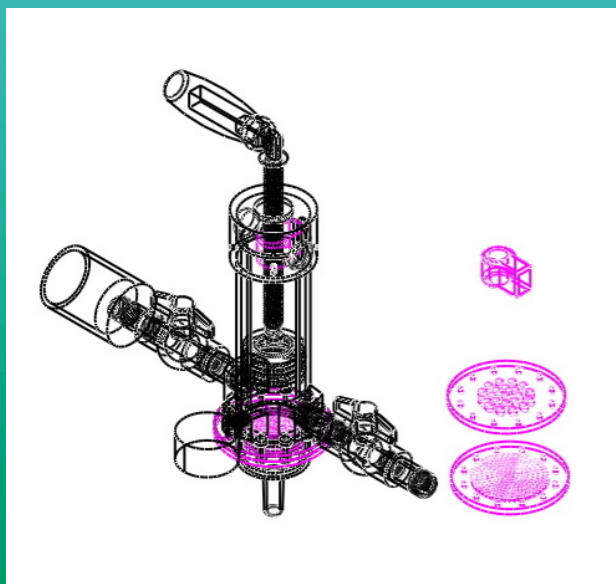
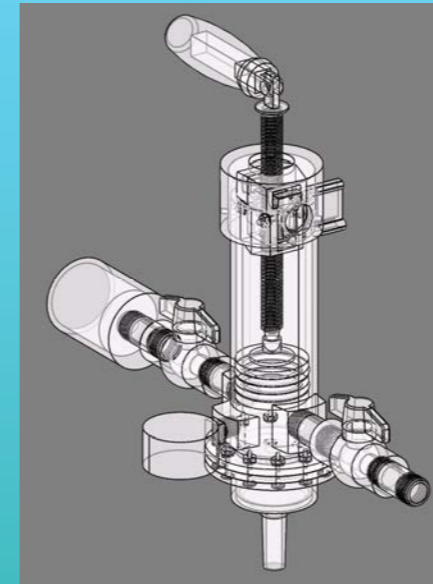
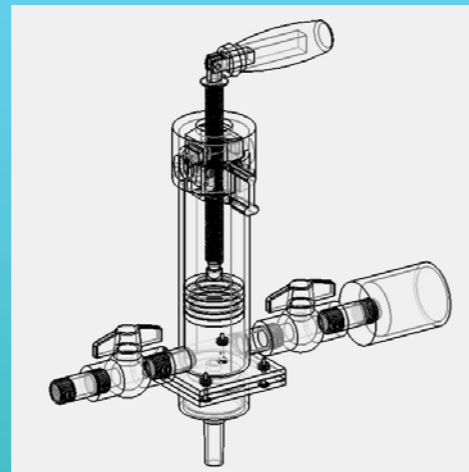
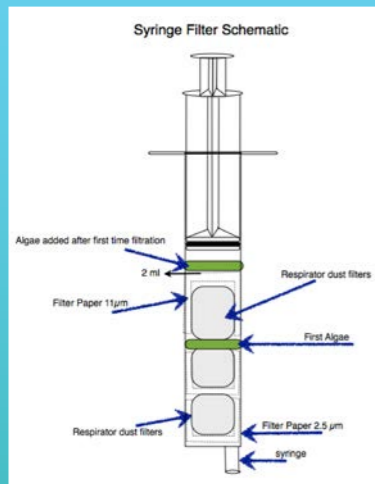
- There was a average of 95.46% decrease in lead contamination after filtration by the algae.
- Samples 2, 3, and 5 were reduced below the EPA limit and are considered drinkable water.
- Sample 1 was not run on the vacuum set up which had an effect on the lead removed. Sample 6 broke the filter paper resulting in the contaminate having less contact with the algae.
- The ratio of algae to lead for Spirulina is 1 gram can remove 402.22 ppb of lead.
- The ratio for 'Pond Algae' is 1 gram of algae can remove 71 ppb of lead from water

Table 1: Remaining amount of lead after filtration

Sample ID	Pb(NO ₃) ₂ (ppb)	Percent removed
starting solution	209.8	
sample 1	14.54	93.07%
sample 2	7.44	96.45%
sample 3	5.81	97.23%
sample 5	4.60	97.81%
sample 6	15.19	92.76%
Average		95.46%

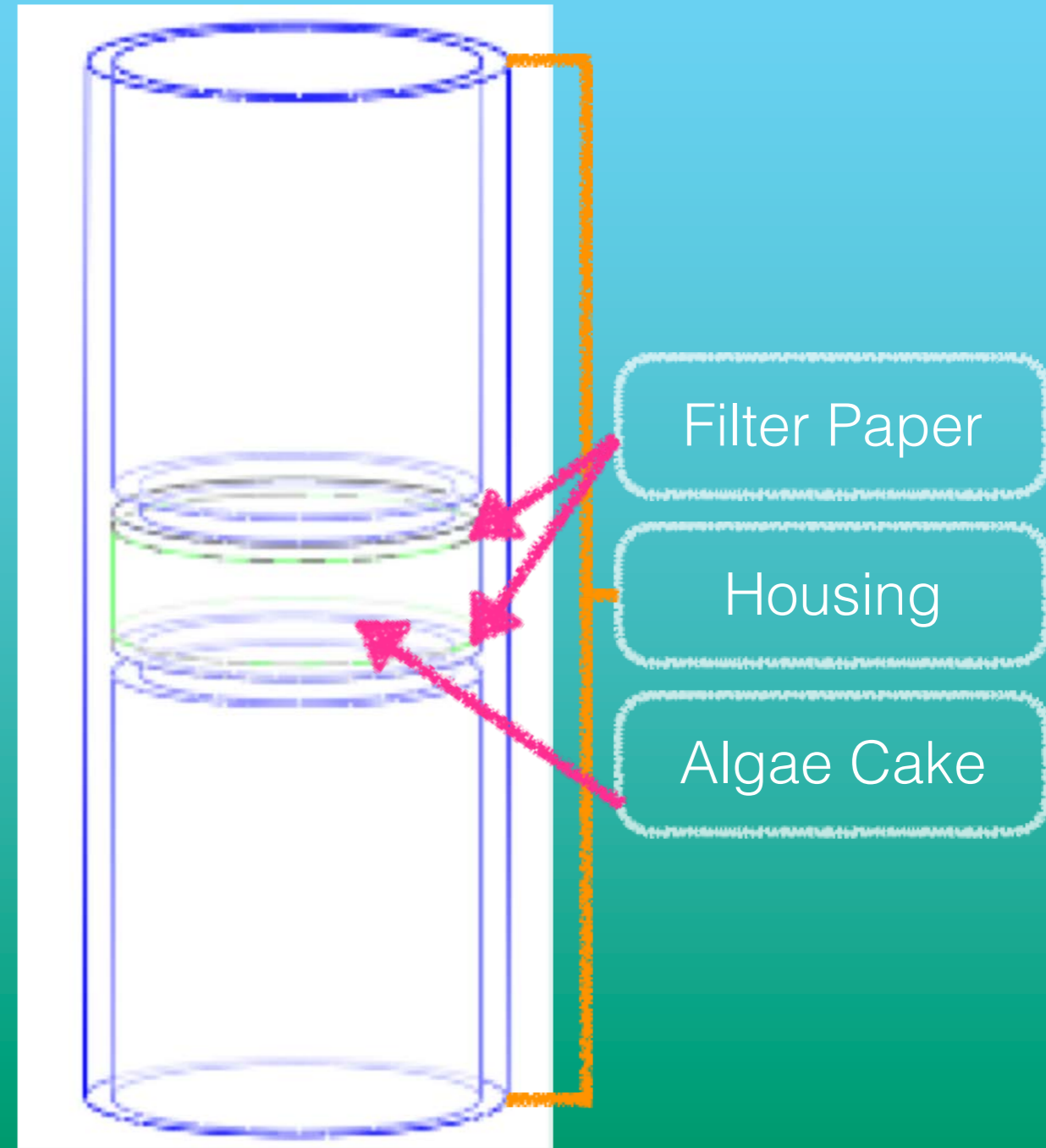
$$m = \frac{\ln y_2 - \ln y_1}{x_2 - x_1}$$

Practical Application for limited resources



Practical application for Flint, Michigan.

- The amount of lead that was tested with was within the range of lead contamination found in the homes of people in Flint, Michigan.
- With the Spirulina ratio to filter 158 ppb of lead 0.392 g of algae would be needed.
- This design is what could be implemented into the homes of people with running water and is a variation of the previous systems shown.



Thank You!

Questions?

