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ARTICLE

Silt Deposits in Streams

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Silt is a fine sediment that collects on the bottom of rivers, streams, and lakes. This is caused by the natural process of the decaying of organisms in the water, which produces silt at the bottom of waterbodies. Silt is a rich source of nutrients for fish and bottom dwellers like crayfish. However, this is a problem for rivers, lakes, and streams, because this is the buildup of excess fine sediment introduced by industry. Silt contains harmful chemicals that can turn a beautiful, clear lake into a brown, contaminated pond. Silt could be introduced into streams and lakes by mining, agriculture, and sewage. Silt accumulations could create navigational, and other hazards, and could also divert a river from its original channel. The sediment carried by rivers could fill in reservoirs or spawning beds, clog or damage water supply intakes and treatments on plants, and could also foreclose recreational uses. I will be experimenting by making my own filtration system, using plastic water bottles, gravel, and contaminated water. Filtration will help because it keeps things like water, chemicals, and pharmaceuticals clean, pure, and fresh from contaminates. If we did not have filtration we would not have clean and fresh water. It is important because it removes sediment, sand, carbon, and any other suspended particles.

Silt is made up of rock and mineral particles that are larger than clay but smaller than sand. Silt is found in soil, along with other types of sediments such as clay, sand, and gravel. Silt is created when rocks are eroded, worn away by water and ice. As flowing water transports tiny rock fragments, they scrape against the sides and bottoms of stream beds, which chips away more rock. The particles grind against each other, becoming smaller and smaller until they are silt-size. Glaciers can also erode rock particles to create silt. Moreover, wind can transport rock particles through a canyon or across a landscape, which forces the particles to grind against the canyon wall or one another. All of these three processes create silt. Agricultural and industrial runoff clogs ecosystems with silt and other sediments, and in areas where they use chemical fertilizers runoff makes silt toxic. Toxic silt can poison rivers, lakes, and streams. Too much silt can upset some of the ecosystems. When agricultural soil is washed away into rivers, the waterways are then clogged with silt. Animals and plants that are adapted to live in moderately silty water are then forced to find a new niche to survive in. The river habits of some organisms that live in the Amazon River like the pink amazon river dolphin are threatened. River dolphins are not able to locate prey in the silty water. Silt can also be made toxic by chemicals from ships, making the silt at the bottom of the ports and harbors a risk. In 2008, the city of Melbourne, Australia decided to deepen its harbor, and a lot of people worried that this would threaten the waterway's ecosystem because of the chemicals and silt being produced.

PURPOSE

The main objective of this project is to make my own water filtration system to turn silt-contaminated water into clean water. Making my own water filtration system to clean out contaminated water will help me learn why it is important to have clean water with no silt for many of the organisms that live in rivers, oceans, or ponds. Making my own sediment filter will remove visible matter, particles of dirt, sand, dust, and debris that could be caught by its micron-rated capacity. Sediment filters will also remove turbidity from water. Turbidity is the cloudiness in the water, caused by the heavy presence of suspended solids.

HYPOTHESIS

My hypothesis is that creating a water filtration system will clean out all of the contaminants including silt, so it is clean water that will help organisms that cannot exist in silty rivers or lakes. I predict that my water filtration system will also remove suspended matter like silt, clay, or any other sediments. I also hypothesize that the trial with the most gravel will do the best job in cleaning the water because it will have a better chance of stopping the silt.

MATERIALS AND METHODS

The materials that I will be using to create my water filtration system are: 2 empty plastic water bottles, scissors, paper towels, gauze to cover the mouth of the bottle, rubber bands, soil with silt, gravel, and cotton balls. In trial one, I used: 1.5 handfuls of gravel, 2 spoons of soil, 1 gauze, and 2 paper towels. In trial two, I used: 1 handful of gravel, 2 gauzes, 2 spoons of soil, and 3 paper towels.

To make my water filtration system, I first must create a dirty water sample by mixing soil and dirt with tap water. The dirty water will symbolize wastewater. Secondly, I will have to build the filter cartridge. I cut the water bottle in half, across the width of the water bottle. Then, I removed the cap from the water bottle, and put a gauze over the opening, and secured it with a rubber band. Then, I turned the top half of the bottle upside down, and placed it into the bottom half of the bottle. Using clear containers will help see the filtration better. Afterward, I designed the filter by layering my materials using paper towels. Lastly, I evaluated my results. I will be conducting two trials, and see which trial is more effective.

VARIABLES

The independent variable in this experiment would be the materials (sediments, soil, gravel, etc.) that are used in the water filtration system. The dependent variable is how much of the contaminants is left in the filtration system. The controlled variable would be the amount of water that is being added into the water bottles for both of my trials.

OBSERVATIONS/RESULTS

In trial one, I saw that there were not that many contaminants in the filtered water, and since there were more rocks in this trial it blocked the silt from the soil entering the clean water. The paper towels were also useful in blocking the silt and soil. In trial 2, I observed that the result from the filtered water is dirtier than the result from trial 1. I think this is because there were fewer rocks used than trial 1, so the rocks could not block the silt from the soil entering the filtered water. The water filter that I have constructed was successful in trapping all of the sediments and contaminants from the wastewater. My water filter was not 100% effective, but it did filter out most of the contaminants from the wastewater. In trial 1, the water was a little gray and yellow but was mostly transparent and more effective than trial 2. Therefore, the results from conducting two trials are that trial 1 had the cleaner filtered water than trial 2.

CONCLUSION

The conclusion I can draw from conducting my experiment is that trial one filtered more of the sediment and silt from the water compared to trial two. Silt is mostly deposited in wetlands, lakes, and harbors. Floods deposit silt along river banks and on flood plains. About 60% of the Mississippi River Delta is made up of silt. After conducting my experiment, I have learned how much silt is found in lakes, and rivers. I also learned that if water is not filtered it can swarm with dangerous microorganisms, such as Giardia lamblia, Cryptosporidium, and Vibrio cholerae. This can lead to hazardous health issues, such as diarrhea, sepsis, cholera, and potentially death. Sediment filters can help clean out the dirt, and debris found in lakes. While I was investigating and researching about silt deposits, I also learned that sensitive marine life and freshwater fish can be affected by the suspended silt in their native waters. Benthic organisms like coral, oysters, shrimps, and mussels are especially affected by the silt. Silt deposits can also cause water pollution, and the soils can clog the gills of fish and other macro-invertebrates like crayfish, insects, and snails that live in the stream, causing them to suffocate and die. The soils suspended in the water impact how much sunlight can penetrate the water. To reduce silt deposits in lakes, I think we need more sediment filters that can remove the suspended matter like silt, sand, and clay from lakes, rivers, and oceans. We can also reduce silts in ponds by planting thick vegetation along an area where the surface water can enter a pond which will help prevent both debris and silt from entering the pond.

FUTURE STEPS

If I had to do this science experiment again, what I would do differently next time would be to probably use different materials. I can also use bigger water bottles, or any clear, and bigger containers. I can challenge myself next time by trying to filter out vinegar or food colouring into clean, and filtered water. To improve my project, I can use more materials like grains or cereals and layer them with paper towels. I can also use different materials, like replacing paper towels with something that can absorb the silt better.

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ABOUT THE AUTHOR - JASNEET BAINS

Hi, I'm Jasneet Bains, and I am 14 years old and attending London Central S.S. I love studying all the different topics surrounding biology, and environmental science. I love learning about science, and how it can show us the path to many of our problems. Science helps us to encourage creativity, develops a love for learning, and broadens our perspective and way of thinking. I love participating in extracurricular activities, and my favorite sports are basketball and soccer. I also love being involved with the community and being there for the people.