



ACTIVITY 3

Nature's Answer to the Sewage Treatment Plant

Background Information:



In many places on earth, it is illegal to dump household wastewater directly into rivers lakes or the sea (if you don't know why, think of what you flush away from your toilet!). Instead, the wastewater is usually sent through a series of pipes to a sewage treatment plant. There, the wastewater is cleaned up using filters, chemicals, and even living microorganisms such as bacteria until it is clean enough to send back into nature. Making this treated wastewater clean enough for you to safely swim in or drink is left to nature. If you ever get a chance to visit a sewage treatment plant, do it! It is fascinating and many of them do actually give tours.

Nature has been doing the same thing long before the first sewage treatment plant was ever built. The process is called 'biological filtration'. Plants, seaweeds, and a wide array of microorganisms take on the task of cleaning up water as part of their normal way of picking up nutrients. You can demonstrate this process indoors in a fish tank.

What You Need:



- Three small fish tanks. If you don't have access to them, any large containers will do, so long as they are at least 1 gallon in size.
- Some water plants (elodea is the cheapest, easiest to find in a pet store, and hardest to kill).
- Some liquid fertilizer or plant food (to make the waste water). Organic is better!
- An aquarium water test kit (one that tests for ammonia, nitrates, and phosphates as these can be found in urban runoff). You can find these in most pet stores and certainly in aquarium shops.

Make A Prediction:



It's that time in science for the all-important prediction! What do you think will be the relationship between the abundance of water plants and the cleanliness of the water?

What To Do:



Preparation:

1. Set up both tanks side-by-side in a location that gets at least a few hours of sunlight every day.

Preparation Continued:

2. Place tap water in each tank to about $\frac{3}{4}$ full. Let this water sit undisturbed for several days to permit the chlorine to leave.
3. Place equal amounts of liquid plant food in each tank (alternatively, you can prepare a large batch in a large container and pour equal amounts in both tanks). Do not use more than a teaspoon in a gallon of water.
4. Test both tanks with the water test kit and record your results for ammonia, nitrates, and phosphates.
5. Place a few water plants in one of the tanks and many water plants in another. Do not place any water plants in the third tank.

Experimentation:

1. Every two or three days, take water samples from each tank and test them with the water test kit. Record all your results.
2. Note any changes you see in each tank, particularly changes in the water plants. You may want to include a measurement of plant stalk length or leaf number as an indication of plant growth rate.

Review Your Results:



How well does your prediction stand up against your data? Do you need to rethink the role of water plants as biological filters? How could you change your experiment to provide a better test of your prediction?

Depending on the type of water test kit you are using, you may be able to graph your results (what should your axes be?). Graphs are a great way to show your data.

Take It A Bit Further:



Idea One:

If you have a fish tank at home or at school lacking any living water plants, you may want to add some, like elodea. Use the water test kit to monitor changes in the water quality over time. Remember that the water plant need several hours of indirect sunlight every day, or at least a grow bulb over the fish tank. Don't add any fertilizer to your fish tank! Your fish become the source of fertilizer.



Idea Two:

If you have a local pond, creek, or lake near your home or school, take a sample in a clean container and test it back at your home or classroom 'environmental testing lab'. See if you note any changes in the quality of the water from one month to the next. You may even consider a career as an environmental scientist. You would get to work in a cool lab, and may even get to do some traveling!