Ecosystem Lab: Creating a sealed ecosystem

BACKGROUND:

Establishing balanced ecosystems appears to be difficult initially, but biological systems tend to self organize. For example, as animals in an aquatic ecosystem feed, they reduce the abundance of the algae and the food shortage causes reduced animal reproduction and survival. As animal feeding is reduced, the algal population can increase. Evidence of this relationship can be seen in any nearby lake if one were to look closely. If the system was closed and the animals ate all of the algae, they would also eliminate their oxygen source, however this has not been observed to occur.

The planet earth can be considered a giant space vessel with a functional ecosystem where processes occur on a vast scale in volume, time, and complexity to sustain its various life forms. Earth is essentially closed to mass exchange with its surroundings. Energy is input to the earth as sunlight, which drives physical and biological processes that power nutrient cycling. Life continues by the recycling of carbon, nitrogen, oxygen, phosphorus and other elements through the ecosystem in a self-sustaining manner that passes energy on until it is lost as heat.

DIRECTIONS:

You will be planning and creating your own self-sustaining ecosystem.
You will be randomly placed into groups some of whom will be doing aquatic ecosystems, and some of whom will be doing terrestrial ecosystems.
My ecosystem is: terrestrial aquatic (circle)

1) Decide on the design of your ecosystem (see samples for ideas).

2) Decide on the materials to include in your ecosystem and how much of each to include**.**

3) Once you have planned your ecosystem, **have the plan approved by Mrs. Robson or Ms. Stanley before you begin to assemble it**. Bring supplies ahead of time!!!!! We will build on Friday September 21st.

4) Some supplies will be provided…see list!.

5) After you have assembled the ecosystem, **record your predictions and observations in your lab Notebook (Lab #3) (leave several pages, because, hopefully y**ou will record observations throughout the rest of the year.**

6) If you disturb any other ecosystem, you will automatically receive a zero on this lab.

Provided Supplies:

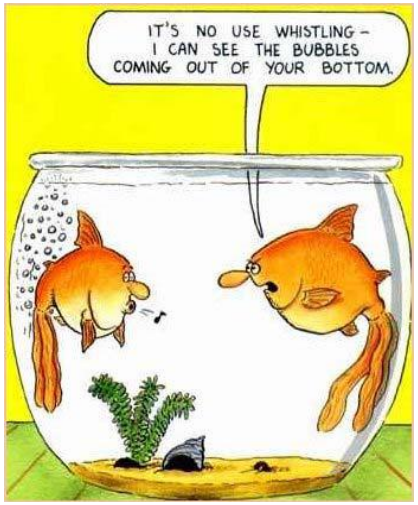
1. large rubber bands
2. Scissors
3. saran wrap
4. Masking tape
5. Sand & Soil
6. Saran Wrap
7. Pond water with bacteria

Supplies Your Group Will Need to Bring in for Terrestrial System:

1. CLEAR, large glass or plastic jar.
2. Aquarium Rock /Stone pebbles
3. 2-3 rocks (with moss if possible)
4. Forest moss if possible
5. 1 to 2 4" potted plant(s)
6. Rotting branch, piece of cholla etc.
7. Insects, worms, beetles etc.

Supplies Your Group Will Need to Bring in for Aquatic System:

1. CLEAR, large glass or plastic jar.
2. Aquarium Gravel
3. 2-3 rocks (washed without soap!)
4. Driftwood
5. 3-4 aquatic plants (elodea and anachris work great!)
6. Aquatic snail
7. Fish (guppy or goldfish) - do not get until instructed!



OUR GROUP'S PLAN - DRAFT
(will be placed in lab notebook)

Guidance: Keep It Simple! There are a lot of biotic and abiotic factors to consider, but you will NOT be able to use all of them in your ecosystem. When choosing, consider the following:

- How will each organism get food?
- How will each organism get nutrients (ex. Oxygen, carbon dioxide, sunlight, suitable moisture and temperature levels…)
- How will each organism change the environment, over time?
- Are all the needs of all the organisms being met?

****In your lab notebook (see note below), sketch a web showing cycling in your planned ecosystem. Include food cycling, nitrogen cycling, water cycling, and carbon cycling. Label the cycles or use different colors for each cycle's arrows. (Make a key!)**

NOTE: Do this AFTER your plan has been approved!

Item to be included	**is it biotic or abiotic?**

Day 1: PREDICTIONS

1. Do you think your ecosystem will change within **one week**?

2. If yes, how will it change? Record your predictions below.
   If no, why do you think the ecosystem will remain the same?
   Be specific (4-5 sentences).

3. Do you think your ecosystem will change over **3 weeks**?

4. If yes, how will it change? Record your predictions below.
   Be specific (4-5 sentences).
   If no, why do you think the ecosystem will remain the same?
   Be specific (4-5 sentences).

PROCEDURES TERRESTRIAL

You may add in any procedures to fit your group's plan.
This is just an outline of general procedures.

1. Make sure your jar is clear and clean (no soap residue!)
2. Add one layer of stone pebbles.
3. Add a thin layer of sand, then a thin layer of soil (which contains bacteria), and spread on top of the pebbles.
4. Add your plant, then add more soil to cover the roots.
3. Then add two or three larger rocks & wood, rotting cholla etc with moss growing on them.
5. Add small patches of different kinds of moss if possible, and nestle these on top of the soil.
7. Add real stream water, just enough to make all the pebbles on the bottom layer wet. This is your bacteria..
8. Then cover the top of the jar with a layer of air tight saran wrap. This prevents air and moisture escaping from the jar.
9. Finally, secure a rubber band around the film wrap at the neck of the jar, to keep the film wrap securely in place.
10. That's it! You're done!
11. Take your initial data - QUANT & QUAL!

NOTE: Overall, the space in the jar is divided approximately into one third rocks, soils, and organics, one third plants, and one third air. It is important to keep the eco jar completely sealed from outside influences to obtain the closed loop system effect. If the plastic wrap on top is punctured simply replace it with a new piece of wrap.

Quantitative: Measure pH, temperature, area, length, width etc. of abiotic and biotic factors in metric units. You will be graphing this data.

Qualtitative: Note, color, smell, physical changes, Identify your producers and consumers and analyze how they interact. Diagrams should be created at LEAST once a week. You may also keep a photo journal.

PROCEDURES AQUATIC

You may add in any procedures to fit your group's plan.
This is just an outline of general procedures.

1. Rinse jar thoroughly using tap water. Do not use detergent (the chemical residue is harmful to fish).
2. Once rinsed, add a layer of sand to the bottom of the jar.
3. Rinse your aquatic plant.
4. Add your aquatic plants at this time. Be sure that the plants are firmly anchored in the sand.
5. Next add a layer of gravel. Be careful to cover all exposed sand, but do not crush your plant.
6. Then add another layer of aquarium gravel. Again cover all exposed sand, but do NOT crush your plant.
7. Driftwood may also be added to the jar. Remember to rinse the driftwood before placing it in the aquarium.
8. Add 1-3 small rocks. Be sure to rinse these rocks before placing them in the tank. These rocks will provide a hiding place for the fish.
9. Fill the aquarium with tap water and allow the aquarium to set 1-3 days. This is to allow the chlorine in the tap water to dissipate and the environment to settle.
10. Fish and/or snails will be added after the aquarium has had time to settle.
11. Then cover the top of the jar with a layer of air tight saran wrap. This prevents air and moisture escaping from the jar.
12. Finally, secure a rubber band around the film wrap at the neck of the jar, to keep the film wrap securely in place.
13. That's it! You're done!
14. Take your initial data - QUANT & QUAL!

Quantitative: Measure pH, temperature, area, length, width etc. of abiotic and biotic factors in metric units. You will be graphing this data.

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