Name _____

Model Ecosystem

Introduction

Can you build an ecosystem that is self-sustaining? To answer this question, you must explore some of the relationships that living organisms have with each other and with their environment. We call a community of organisms living in and using their environment an *ecosystem*, and ecosystems work by some basic rules. You can discover those rules by building and observing a model ecosystem.

You will be recording all information regarding this project on a blog. Even though you will be working with other students to construct the ecosystem, **each student is responsible for keeping daily records and observations on his or her own blog**. The record keeping starts today! Throughout the assignment, there will be specific instructions on what needs to be recorded.

Problem: Can an enclosed, self-sustaining ecosystem using two clear, two-liter plastic soda bottles be built?

Teacher Notes: These materials are suggestions. Some organisms may not be available in your area.

Materials:

Suggested supplies	Water snail(s)	Required supplies
Organic potting soil	*Daphnia*	2 two-liter bottles
Sand	*Elodea*	Clear packing tape
Clay	Hornwort	Gravel
Bean seeds	Duckweed	Cotton string
Grass seeds	Rotala	
Corn seeds	Spring water	
Radish seeds	Aquarium water	
Freshwater shrimp	Pond water	

*** Go through the list of materials.** Determine the role in the ecosystem for each of the organisms your group has chosen and record this on your blog.

*** Make a goal for this project.** What do you want to accomplish? This will be the answer to your experimental problem. Justify your goal with reasons, and describe the abiotic (nonliving) and biotic (living) factors that will be necessary for the success of the project. Include a food web or food chain illustrating the interactions expected in your ecosystem. Where will the energy come from for your ecosystem? Include this on your blog.

Goal (make sure you have justifications and mention the abiotic and biotic factors):

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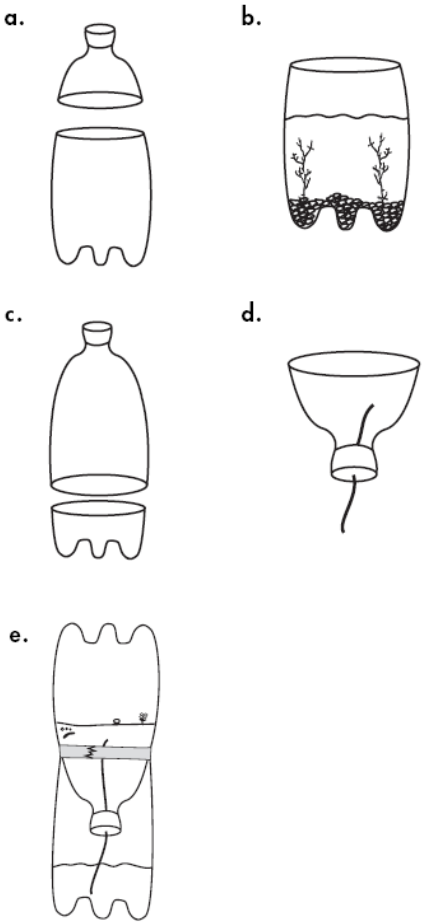
Food web (chain):

Energy source:

*** You will keep a journal of observations for this project on your blog.** Today is your first day of recording. You will make observations and collect data each day you are in class. Make observations on the health and behavior of your organisms. Record measurements such as population sizes, changes in the environment, and growth of the plants. If you are absent, you will need to get observations from someone else in your lab group. Don't forget to keep good daily notes. Good notes are essential for your lab.

Teacher preparation: Rinse out the bottles and caps well. Cut the bottles at shoulder. Save the top portion and the bottom portion of one two-liter bottle, including the cap, and only the bottom portion of the other bottle. Use the diagram as a guide. Be careful when cutting the bottles.

Next, make a hole in the cap by using a hammer and nail. This will provide drainage for the terrestrial portion of the ecosystem. Replace the cap on the bottle.



Safety: You will need to wear gloves and goggles to set up your ecosystem. At the end of class, make sure to wipe down your lab area and wash your hands.

*** Procedure:**

1. Obtain two already-cut, two-liter bottles from your teacher. You should have the bottom on one two-liter bottle and the bottom and top of another two-liter bottle (a and b in the diagram).

2. Add a layer of gravel to the bottom of the bottle (b). That will be your aquatic section .

3. Add your choice of water to the two-liter bottle, filling to about halfway (b). DO NOT USE TAP WATER. Measure how much water you added and record the type and amount on your blog.

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Type of water:

Water: _____mL

4. Measure in cm the length of the water plant you chose. Anchor the plant in the gravel or allow the plant to float. Record the length of the plant and its overall health. Make sure the entire plant is submerged in the water.

Plant: _____cm

Health:

5. Place the invertebrates in the water. Count and record how many and what kind are added.

What type of invertebrates?

How many of each invertebrate was added?

7. Run a cotton string through the cap. The string connects the aquatic and terrestrial sections of the ecosystem by hanging into the water.

8. Make sure the lid of the terrestrial section does not touch the water in the aquatic section. Only the string in between connects the two sections.

9. Fill the inverted bottle top ½ to ¾ full with your choice of soil. Record the type of soil and amount of soil that you used on your blog.

Type of soil:

Amount of soil: _____g

10. Plant two to three seeds in the soil. Water your seeds a little. Record how many and what type of seed you planted on your blog.

Number of seeds: _____

Type of seeds: _____

11. Attach the bottom of the second bottle so that the terrestrial biome is sealed (e).

12. Place finished bottle in the location provided by the teacher.

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You will record observations until it is time to take your bottle down.

Teacher notes: You can keep the ecosystems going for as long as you like. Typically, you want to have the ecosystems going for two to three months. On take-down day, set up labeled tubs where students can put all parts of their ecosystem. Remind students that all invertebrates will be placed in the aquarium and not released into the environment.

Safety: You will need to wear gloves and goggles to take down your ecosystem. At the end of class, make sure to wipe down your lab area and wash your hands.

*** Take down your biome bottle.** Record your data and clean up all the parts of your biome bottle. Place all the parts of your ecosystem in the properly labeled tub on your lab table. The invertebrates will be put in the aquarium at the end of class. Never release lab animals into the environment. If you want to transplant your plant, there are pots and soil available and you can place your plant by the window.

Procedures on the last day

1. Measure the plants in the terrestrial part of your bottle and record their health. Keep all data on your blog.

Plants: _____ cm tall (list each plant)

Health:

2. Measure the plants in the aquatic part of your bottle and record their health on your blog.

Aquatic plant is: _____

Health:

3. Record the number and health of your invertebrates on your blog.
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There are _____ animals alive in the aquatic section (list the types and number alive).

4. Measure the amount of water in the aquatic section and record on your blog.

Water: _____mL

5. Measure the amount of soil in your terrestrial section and record on your blog.

Soil: _____g

*** Conclusions. Answer these on your blog. Make sure you answer completely each question and support your answers with data from your ecosystem.**

1. Did your ecosystem meet your group's goals?

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2. Did you see any evidence of the water cycle happening in your ecosystem? Explain using evidence from your observations.
3. What evidence did you observe of the process of photosynthesis in your ecosystem?
4. Was your ecosystem successful? Explain why or why or why not.
5. What would you change about your setup of the ecosystem if you were doing this lab again?
6. What other experiments would you like to do with your ecosystem?
7. Was there an ecosystem in your class that was more successful than the others? Why do you think if was more successful?
8. Did anything happen in your ecosystem that you did not expect?
9. What have you learned from this lab?

Teacher notes: Grade the blog entries for completeness along with the questions in the conclusion. It's important that students give complete answers with supporting evidence.