

TerrAqua Column Lab

The land-water connection

Introduction:

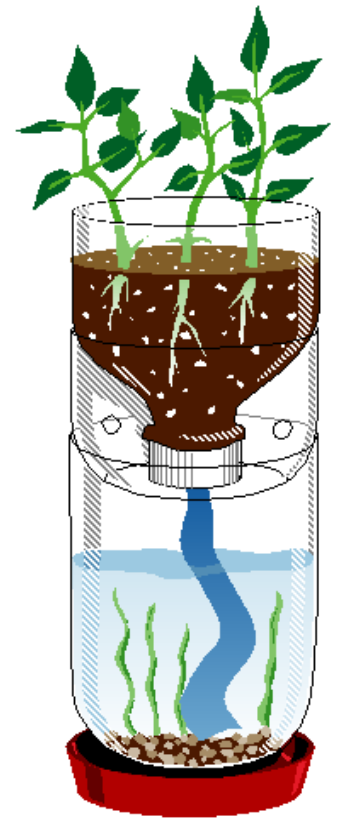
TerrAqua Column (TAC) is a perfect vehicle to make science dynamic, relevant, and fun. The TAC provides a compact, inexpensive, eco-friendly model to explore the link between land and water and allows you to focus on specific aspects of a complex world. Constructed from two 2-liter soda bottles, the TAC has three basic biotic components: soil, water, and plants.

Objectives:

- Build a TerrAqua column
- Observe developing seedlings
- Observe interactions between terrestrial and aquatic environment

Materials:

2x 2-Liter soda bottles	distilled water	hole punch
1 bottle cap	utility knife	scissors
2 paperclips	pebbles	clear and masking tape
1 snail	seeds	pen/sharpie
1 aquatic plant	soil	ruler
wicking material-fabric	ice pick / awl	lab report (e.g. camera)



Procedure:

Construct a column using the instruction sheet at your lab station. You will observe (over a period of 2 full weeks) the developing seedlings and the interactions between terrestrial and aquatic environment. Observe the change in variables e.g. water, light, pH of water/soil, dissolves oxygen in water, temperature etc.

Keep the following questions in mind:

- What questions do you have regarding to this experiment?
- What variables will you observe in your experiment?
- What is your experimental procedure?
- What items will you need?

Data Recording and Analysis:

Keep a log of everything you do to your columns in a lab report. Remember to date all entries.

- Make a **graph** of your TAC conveying plant growth, relationships between terrestrial and aquatic components of your TAC and other changes in variables of your choice.
- Use your measurements and observations to describe how your TAC was affected. Explain how and why you came to the conclusions you have.

Each day you make observations, record the following things in your lab report:

- The date,
- Measure each of the variables you chose at the beginning of the experiment
- Draw and/or take pictures of the changes you observe
- Note anything else unusual or notable

Questions:

1. What is an indicator species?
2. What type of soil is used in your TAC? (Potting soil, soil from outside, etc)
3. What type of water was used in your TAC? (Fresh, tap, purified, etc.)
4. What kind of changes did you observe in your TAC? Explain in detail.
5. How did the changes affect the growth of any plants and the snail in your TAC?
6. How does temperature affect your TAC? Explain in detail.
7. How does lighting affect your TAC? Explain in detail.
8. What would you do differently if you were to do this experiment again?

Going Further-Application to Real Life:

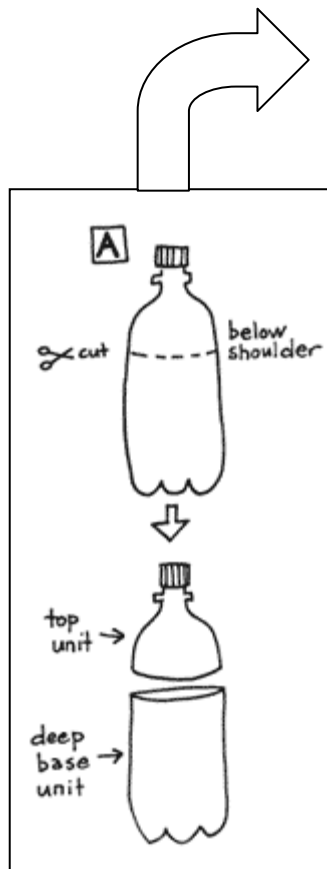
9. How do land and water interact in your area?
10. Does runoff from fertilized lawns or agriculture threaten the quality of our streams or groundwater?
11. Is salt pollution a problem, from either road salt, irrigation, or saltwater intrusion?
12. Are landfills affecting local groundwater?
13. What do you think is the land-water connection? Explain in your own words.

Procedure for Constructing TerrAqua Column

Each column is composed of two units. The upper unit is terrestrial and the lower unit is aquatic. Follow the instructions below for making the column.

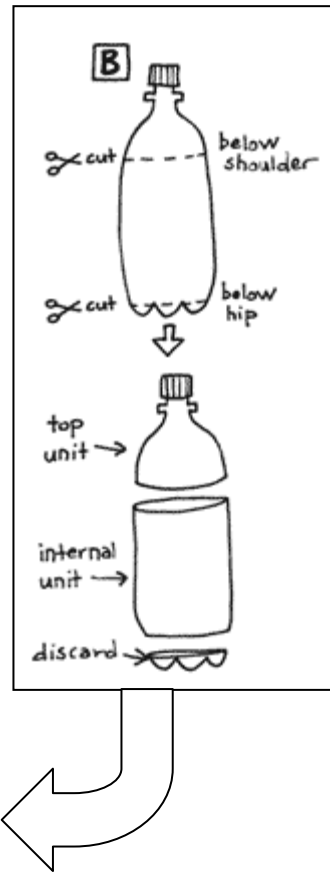
Step 1: Cutting bottle A and B

- Make sure that the labels from the bottles are removed before you begin cutting.
- The easiest way to cut a bottle is to cut along a marked line with scissors. So, draw all of your cutting lines first.
- Place it on its side with the bottle cap on, for pressure.
- Don't worry about ragged edges; they are easy to snip away with scissors once the bottle has been cut.



Cutting bottle A:
 This bottle needs 1 cut.
 Cut across the top of the cylinder, leaving straight sides (i.e. cut below the shoulder).
 *Tip: punch a hole with an ice pick/awl and then cut with scissors.

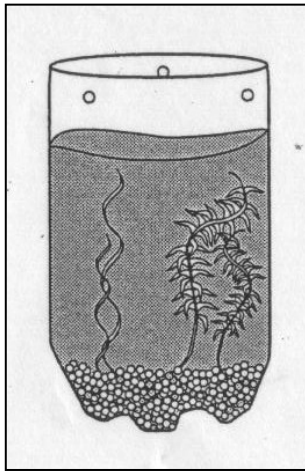
Cutting bottle B:
 This bottle needs 2 cuts.
 1. Cut across the top of the cylinder, leaving straight sides (i.e. cut below the shoulder).
 2. Cut across the bottom of the bottle, leaving 3/4 inch on the hip of the cylinder (i.e. cut below the hip).



*You will need: 1 top unit, the deep base unit, the internal unit and 1 bottle cap. Dispose the rest of the pieces into the assigned box in the classroom.

Step 2: Preparing the units

A.

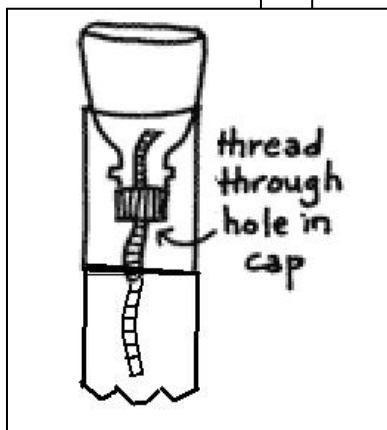
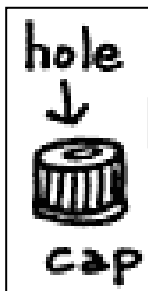


The deep base unit

Aquatic unit:

1. Use the hole punch to make 3 holes on the top for aeration. *Tip: invert the "internal unit" in the "deep base unit". Then mark with a pen/sharpie where you want to make the 3 holes (must be right beneath where the 2 layers of units come together).
2. Place *distilled* water, enough to fill it up $\frac{3}{4}$ of the way.
3. Place the pebbles, enough to fill in the bottom of the bottle. *Tip: use the cut out bottom of the bottle to measure how much pebbles to put in.
4. Place the plant. Place pebbles on the roots to hold the plant at the bottom.
5. Place a snail.

B.



Connection with the units:

Poke or drill a 1 cm hole in the bottle cap.

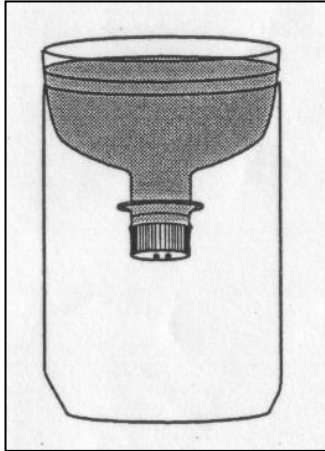
Poke: with an ice pick or an awl

Drill: done only by the teacher and/or an assigned student!

Placing the wick.

1. Cut a strip of wick (long enough).
*Tip: To be effective, the wick should run up into soil and should reach the bottom of the reservoir. It should also thread loosely through the bottle cap and not be plastered along a side of the bottle.
2. Saturate the strip of wick in *distilled* water.
3. Thread through bottle cap.
4. Insert bottle cap into the "top unit".

C.

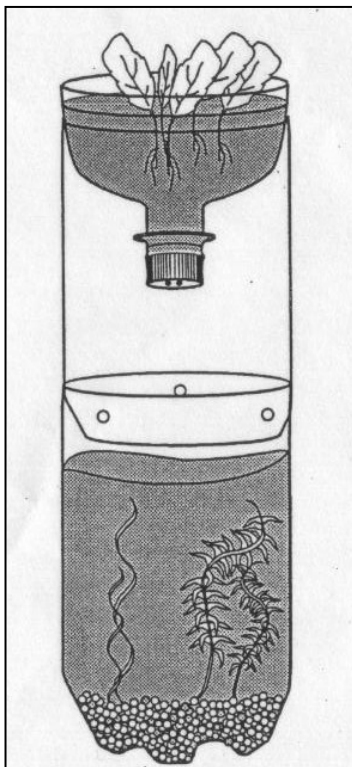


The top unit in the internal unit

Terrestrial unit:

1. Invert the "top unit" in the "internal unit".
2. With a hole puncher, punch 2 holes on each side to hold the two units together. The holes must be punched on where the 2 layers of the units come together.
3. Bind the 2 units together with 2 paperclips.
4. Fill the "top unit" with slightly moistened (with *distilled* water) soil to within 1 inch of the top.
5. Plant the seeds, lightly cover them, and water (*distilled* water).

D.



Final combination of column parts:

1. Place the completed terrestrial portion onto the aquatic portion.
2. Use some strips of transparent tape to help hold the system together in the middle.
3. Put a vertical label on the "deep base unit" (with masking tape and a pen), from bottom to the water level. Draw a ruler on the tape.
4. Label (with masking tape and marking pen) the finished TerrAqua column with your name and period.

- ☺ Good luck maintaining your TAC ☺ -