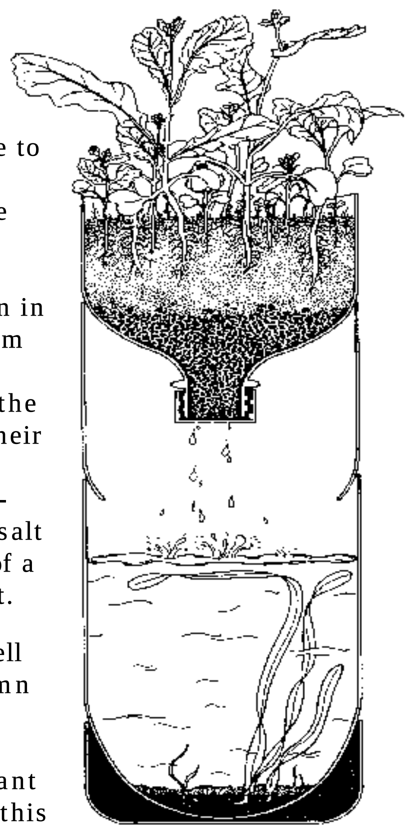
From Above or Below:

The Effect of Salt on Fast Plants

Salt (mainly sodium chloride, NaCl) is introduced into the environment in many different ways and can cause a wide variety of problems. In the northern United States, salt is frequently used to melt ice on *roads*. Most of this salt ends up in roadside soils.

Overhead *irrigation* can cause the buildup of salts on farm fields. This is due to the evaporation of the irrigation water and corresponding deposition of salt which was originally dissolved in this water.

In coastal areas, extensive well pumping of ground water aquifers can cause the *infiltration* of salts from the oceans into these aquifers and related soils.



Through the use of *TerrAqua columns* and Fast Plants, it is possible to model some of the effects of salt on the environment. Fast Plants are a good choice for vegetation in the terrestrial system because they will respond quickly to the presence of salt. Their rapid life cycle also makes it easy to observe the effects of salt at different stages of a plant's development.

Fast Plants grow well in a TerrAqua column when planted in a "field" of 20 to 30 plants. You may want to plant more than this number and then thin three or four days after sowing. Also, don't forget to fertilize your Fast Plants: 50 ml of a one tablespoon/gallon of 20-20-20 Peters solution at four, seven, and 14 days works well for a two-liter TerrAqua bottle.

Algae are a good addition to the aquatic component of a column because they are also very sensitive to salt. A film can's worth of pond water added to the water reservoir at the beginning of an experiment will serve as an inoculum of a diverse collection of algae. Don't worry if you cannot see anything at first. Algae grow quickly, especially if there is a source of nutrients such as "runoff" from the terrestrial component of the TerrAqua column.

If you know ahead of time that you will be needing algae in the winter, and you live in a cold winter-freezing environment, collect pond water in the fall and put it in an aquarium with some sort of water movement system. However, beware of tropical fish bubblers: they can add too much oxygen to the water and kill your aquatic plants.

You may also want to occasionally add fertilizer, perhaps one-half cup of 1X 20-20-20 Peters or equivalent, once a month. When building your aquarium, you may want to add an inch or so of pond bottom to act as an additional source of nutrients, especially micronutrients, and as an additional source of algae.

To model contamination, use a one percent (weight/volume) salt solution as a starting concentration. It is important to use pure salt. Regular table salt contains both iodine and 'flowing agents' which might effect your results. Lab grade NaCl works well, and you can also use pickling or kosher salt.

Because the size of salt crystals can vary considerably, it is best to weigh out the salt you will be using. Dissolving 20 grams of salt in 2.0 liters of water in a two-liter soda bottle works well. A simple hand-hanging postal scale works well for weighing the salt; a film can clipped to the scale can hold the salt while weighing. You may want to use distilled water for your solution to avoid any potential effects of treated tap water.

To simulate salt contamination from above, use a watering bottle made from a soda bottle. "Rain" onto the Fast Plants and soil around 100 ml of

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the salt solution on days three, six, and nine. Adding salt to the soil before or at planting will significantly reduce germination rates. Direct application of salt onto the leaves of Fast Plants has a damaging effect.

Salt infiltration can be modeled in a TerrAqua column by adding salt to the aquatic system below and connecting it to the terrestrial system above with a capillary wick such as pellon. A good place to start with these experiments is to use the same one percent salt solution mentioned above as the starting aquatic solution in the column. It may take time for the salt to move into the soil above, so have some patience and keep your eye out for initially subtle changes in the growth of plants in the terrestrial system.

In any experiment, it is important to keep a control. In this case this is easily accomplished by running a parallel column which is treated with pure water every time salt solutions are added to the experimental columns. If you are running parallel salt columns, such as one with salt from above and the other with salt from below, add equal volumes of salt or water to each column for each treatment.

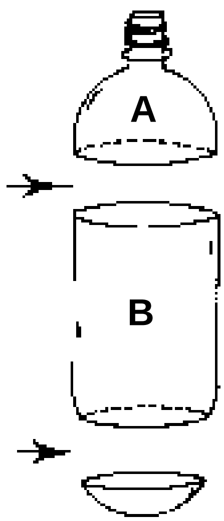
Keep close observations on as many aspects of the columns as possible. All sorts of surprises can pop up. One which you may find interesting is the differential loss of water from the aquatic system of the column under different salt treatments. This is most likely caused by salt related physiological stress and the resulting reduced transpiration rates.

Cut Bottles

1st bottle

Cut to leave 1-2" of the cylinder on the shoulder.

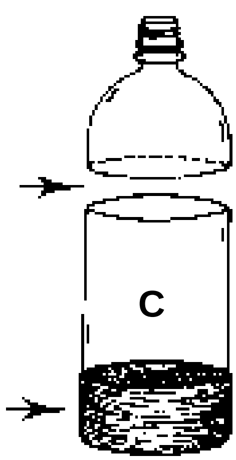
Cut to leave 3/4" of the hip on the cylinder.



2nd bottle

Cut across top of cylinder leaving straight sides.

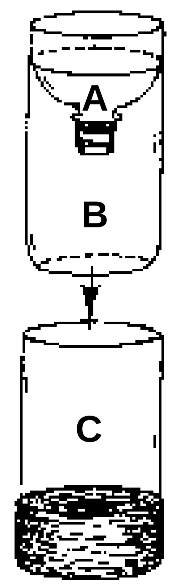
Leave base attached.



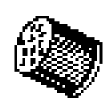
Combine Bottles

Invert Part A and insert into part B.

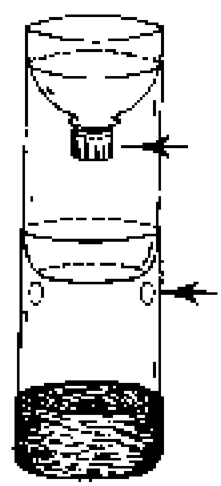
Slide the A/B unit into part C.



Add Finishing Touches



Punch small holes in cap.



Screw cap onto bottle.

Cut or melt into the top sides of the lower bottle.