MINI - GROUNDWATER MODEL
from "OKLAHOMA 4-H LIFESTYLES OF THE WET 'N WILD"
courtesy of Oklahoma Cooperative Extension Service

(Students will actually help build the model, and will easily identify an aquifer, water table, saturated and unsaturated zones, recharge and discharge, and the effect of well pumping and pollution)

MATERIALS NEEDED:
- 1/4" to 1/2" gravel (available at local concrete company)
- 2 L. soda bottles, one per group
- Scissors
- Light or clear plastic soda straws, one per bottle
- Bucket or large can
- Clear packaging tape
- Soap pumps (from beauty supply stores -do **not** use plant sprayer nozzles)
- Cut up pieces of nylon panty hose
- Rubber bands
- Diluted food color - red

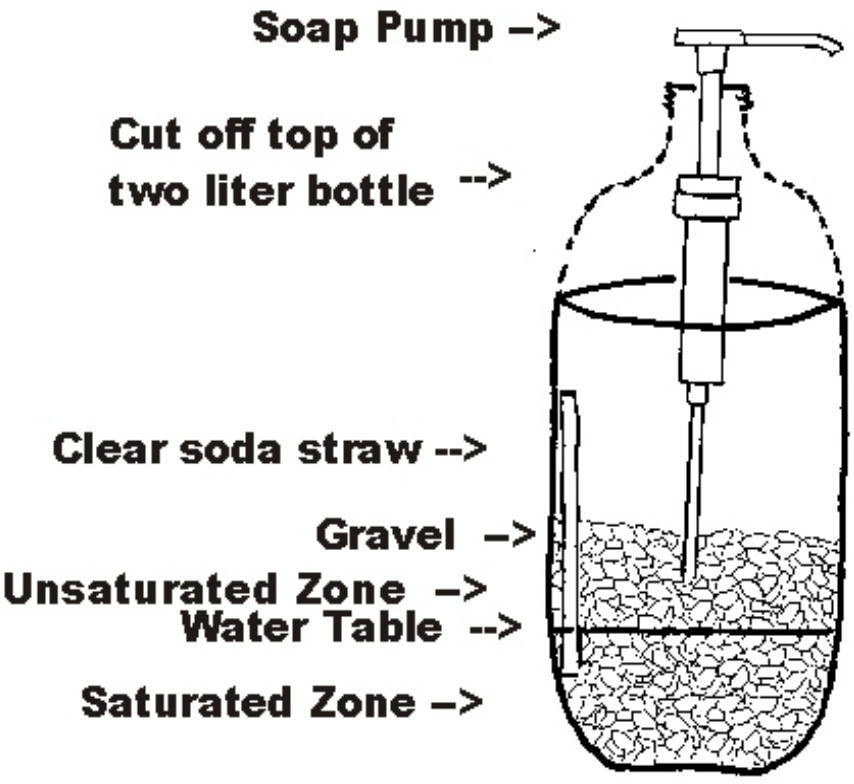
TIME FRAME: one-half hour

BACKGROUND:
Note: Extensive background information and instructions are included with the sand-tank Groundwater Flow Models. Also very useful is the publication, Groundwater in the Great Plains, included in the resource trunk.
Nationwide, over half the population depends on water from underground for household water supply. Water held between soil particles and in pore spaces and fractures in rock underground is called groundwater. The boundary between a completely saturated ground layer and the unsaturated layer above it is called the water table. If a water-saturated zone below the water table yields enough water to pump out, it is known as an aquifer.
As a well is pumped, a discharge is created. Other kinds of discharges are springs, or ground water flowing to streams and lakes (normal stream flow during the dry season is almost all from ground water). The water table near a discharge will drop as water flows or is pumped out. If there is an extensive aquifer in the surrounding area, and if the discharge slows or stops, water will flow through the ground to replace the discharged water, and the water table will rise toward its previous level.
Groundwater is constantly being replenished by recharge. This can be from rainfall percolating directly into the ground, or from slow seepage from flooded wetlands, lakes, and streams.
Thus, groundwater tends to be moving a lot, and it moves from recharge areas to discharge areas. Polluted groundwater does the same. Pollutants in the air or on the land surface can be dissolved and carried by rainfall and surface water as it recharges the groundwater. That is how pollution which occurs at the surface can end up in our well water. And since groundwater can discharge into our lakes and streams, pollution that gets to groundwater can also affect those water bodies.

STEPS IN ACTIVITY:
1. Students can work in small groups or individually, according to materials available.
2. Cut top quarter off soda bottles, as shown on diagram, following page.
3. Tape soda straw vertically on inside of bottle.

4. Attach small piece of panty hose as a filter over bottom of soap pump with rubber band.
5. Put some gravel in bottom 1/4 of bottle, insert soap pump, and fill to about 3/4 full with gravel.
6. Add water - a sprinkler is best. Note that this is "recharge". Students should be able to see water table, zone of saturation below it, and zone of aeration above it.
7. The soap pump represents a well and pump. Now, pump some water out into a bucket or can (discharge). Do we have an aquifer? What happens to the water table as we pump?
8. "Spill" some pollutant (food color) on the "ground surface". "Rain" on the model. Pump it. What is the evidence that pollution can reach the groundwater? Is the color just as dark as the original spill? Why not? (Because of dilution)
9. Further discussion: Can we always know there is pollution in groundwater from its color? Some chemicals are clear, like water; others can be so dilute that we cannot see them in water, but they can still be quite dangerous, even at concentrations as low as one part chemical in a million parts of water - or even lower! Chemists can analyze the water, but this is expensive and complicated. The best approach is to avoid the risk of pollution, by disposing of wastes and handling hazardous materials properly, not exposing them to rainfall or surface water that may percolate into the ground.

MINI-GROUNDWATER MODEL



Kids can see the water table between the big rock particles. They will also see that water level in the straw is the same as the water table. You can drip in some red food color solution on top of the gravel. Soon, youll be pumping out pink water. Also, kids can see the water table drop when you pump. It wont go back up unless you recharge it, by raining some more water on the gravel.