



Down the Drain and into the Yard

Goal: To demonstrate how a private septic system works, ways it can be damaged and how it should be maintained.

Indiana Proficiencies and Competencies:

Middle/Junior High School 1.1, 1.2, 2.5, 3.2, 3.3, 4.1, 5.5, and 9.2;

First year Earth and Space Science 1.1, 1.2, 2.2, 4.4, 6.2, and 9.2;

Environmental Science, Advanced 1.1, 1.4, 1.5, 2.1, 2.2 and 6.1.

Background: It has been estimated that approximately 70% of the septic systems in Indiana are not operating effectively. In many instances, the poor operation of a septic system will go undetected for many years. If a system is operating poorly it can be discharging under-treated waste into ditches and streams or into the ground water. Because many systems are not pumped out and inspected regularly, the only time poor operation is noticed is when the system fails completely, and wastewater backs up into the residence.

In this activity we build a model of a private septic system, complete with tank and leaching field. To simulate “waste” we used pony beads (can be purchased at any store that sells crafts), smaller beads, glitter, and food coloring. (You may wish to try other things, too.)

Materials:

a large, transparent, water-proof, container - we used a plastic “sweater storage” box

- some “play sand” - enough to cover the bottom of the container to a depth of an inch or two
- a small, clear plastic storage container, to simulate the septic tank
- modeling clay, the kind that never dries out and is not affected by water
- four, flexible drinking straws
- a small funnel
- water
- some pony beads, smaller beads, and glitter of other materials that can be used to simulate “waste”
- food coloring

Procedures:

Getting started:

Before you begin to build the model you need to prepare some of the materials. (This will be an important safety issue if you are using the model in a classroom situation.)

1. Take three of the straws and using an awl (or an ice pick) poke holes along the length of the straws.
2. Drill or punch a hole into the food storage container in the center of one side near the top. This hole should be just big enough for a soda straw to fit into.
3. Drill or punch a hole into the lid of the food storage container that the small end of the funnel will fit into. This hole should be positioned such that the funnel can be held in place on a long side of the large sweater box, and still fit into the hole.

Now that you have finished using the sharp tools to prepare the materials, you are ready to begin the actual construction itself.

4. Fill the sweater box with one to two inches of play sand. This is the “earth” that will hold the tank and the leaching field for the septic system.
5. Use a small section of straw to connect from the septic tank to where the leach field will be. Seal the joint with modeling clay.
6. Place the septic tank into the sweater box, so that the outlet pipe is lying just on the surface of the sand.
7. Connect the three perforated straws using modeling clay as shown in the illustration, trying to keep the field as level as possible. (It should slope at about a 1% gradient. Water needs a slope to flow, but you don’t want to design the system with such a steep gradient so that all the water rushes to the ends of the pipes. You can have your students calculate what a 1% gradient would be over a given distance for a regular system.
8. Seal the ends of the straws with a little modeling clay.

9. Put a little clay into the bottom of the tank to simulate the sludge that is normally found coating the bottom of the tank. Place some beads into the tank. (The clay will also allow you to keep some of the beads from floating.)
10. Place the funnel over the hole in the tank and seal the connection with modeling clay.

Now the model is built, you are ready to do the simulations.

11. First, slowly add water to the system.
What happens if you add too much water?
12. Add some glitter.
Describe what happens. What do you think the glitter might simulate?
13. Add some food coloring and wash it into the system with a little water.
Describe what happens. What do you notice with the food coloring? What might it simulate?
Discuss how the following substances would act in a home septic system:
 - solvents
 - oils
 - hazardous materials
 - bleach
 - anti-bacterial soaps and detergents

Enhance the activity:

Research your county regulations on septic systems.

For More Discussion:

- *List some common contaminants in ground water and describe how they could have gotten there.*
- *You may want to try different slopes on the leaching bed, like 0%, 1%, and 2%. What will happen if the slope is too great?*
- *List common hazardous materials that could be found around the home.*
- *Brainstorm about where these would be stored or used in the home (or farm)*

- *Ask how you should properly dispose of any hazardous material "leftovers"?*
- *What effect do different types of soils have on the effectiveness of the leaching system?*
- *Visit some Web pages detailing current and innovative septic systems and discuss the pros and cons of these systems.*



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