

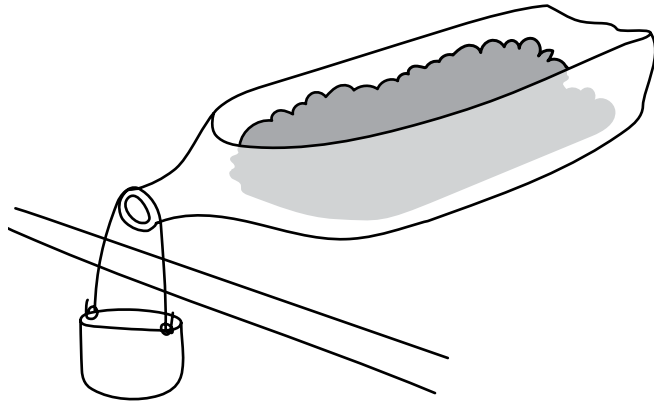
Keeping nutrients in their place

How can surface water runoff impact nutrient placement in our lawns and fields?

Runoff and erosion are problems in both rural and urban areas. Nutrient usage in lawns is typically done according to the fertilizer bag instructions and with a ground driven broadcast dispenser. Nutrient usage in agricultural fields changes according to soil testing results, soil type, crop type, and farm implement tool. Farmers take soil samples to help determine what types of fertilizers and amendments are necessary for their fields for optimum crop yield.* The main fertilizers and amendments added to fields are nitrogen, phosphorus, potassium, and lime for pH. These amendments can be placed in the field at different stages of plant growth with various farm implements in varying amounts. Planters place fertilizer near the seed when planted, coulter injectors place nutrients into the soil near a growing crop, and airflows blow dry fertilizer on the soil from a boom. Currently, farmers use the smallest amounts of amendments possible to maintain their bottom line and grow a high yielding crop. Excess use of nutrients does not benefit crop yield.

Materials

- 3 two-liter bottles
- 3 water bottles
- Garden soil
- Grass, corn & soybean seeds
- Osmocote slow release fertilizer
- String
- Small watering can
- Heavy scissors or utility knife
- Phosphorus, nitrogen, pH tests



Instructions

1. Use heavy duty scissors or a utility knife to cut out the two-liter bottles and water bottles according to the diagram above.
2. Add slow release fertilizer to garden soil according to directions.
3. Fill your two-liter bottles with garden soil until it is 1 inch from the cut line on the bottle. Plant your soil with one type of seed (grass, corn, soybean) about 1 inch apart, cover with $\frac{1}{2}$ inch soil, press soil down gently over the seeds.
4. Place the two-liter bottles on a counter so that the water bottles can hang over the edge. Elevate the bottom of the bottles slightly ($\frac{1}{2}$ –1 inch or less).
5. Slowly saturate the soil with water until it is evenly moist and water pools slightly on top to create runoff.
6. Collect water runoff and test for phosphorus, nitrogen, and pH. Record data below.
7. Repeat watering procedure and data collection twice a week as the crop grows.

Extension: Prepare a nutrient solution according to the directions on the label. Slowly saturate the soil until it is evenly moist and water pools slightly on top to create runoff. This will add additional fertilizer to a growing crop. Collect water runoff and test for phosphorus, nitrogen, and pH. Record data below.

* Refer to the Nutrient content, pH and soil testing lesson for procedure of how to test soil.

Crop type	Date	Appearance	Phosphorous	Nitrogen	pH
Grass					
Corn					
Soybean					

Freshwater standards	Appearance	Phosphorus	Nitrogen	pH
	Clear, colorless, odorless	< 0.03 ppm (clean) > 0.1 ppm (unsafe)	< 4.4 ppm (clean) > 44 ppm (unsafe)	6.0–8.2

Reflection

1. How do homeowners and farmers determine fertilizer needs for their lawns and fields?
2. How do your results compare to the freshwater standards given in the chart below the data table?
3. Compare this simulation to what happens in a farmer's field. (If you don't know what happens, ask a farmer). How is it the same. How is it different?
4. Compare this simulation to what happens in a homeowner's lawn. How could broadcast fertilizer impact nutrient loss compared to fertilizer placed within the soil?
5. What actions might a farmer or homeowner take to keep the nutrients they apply in their place?