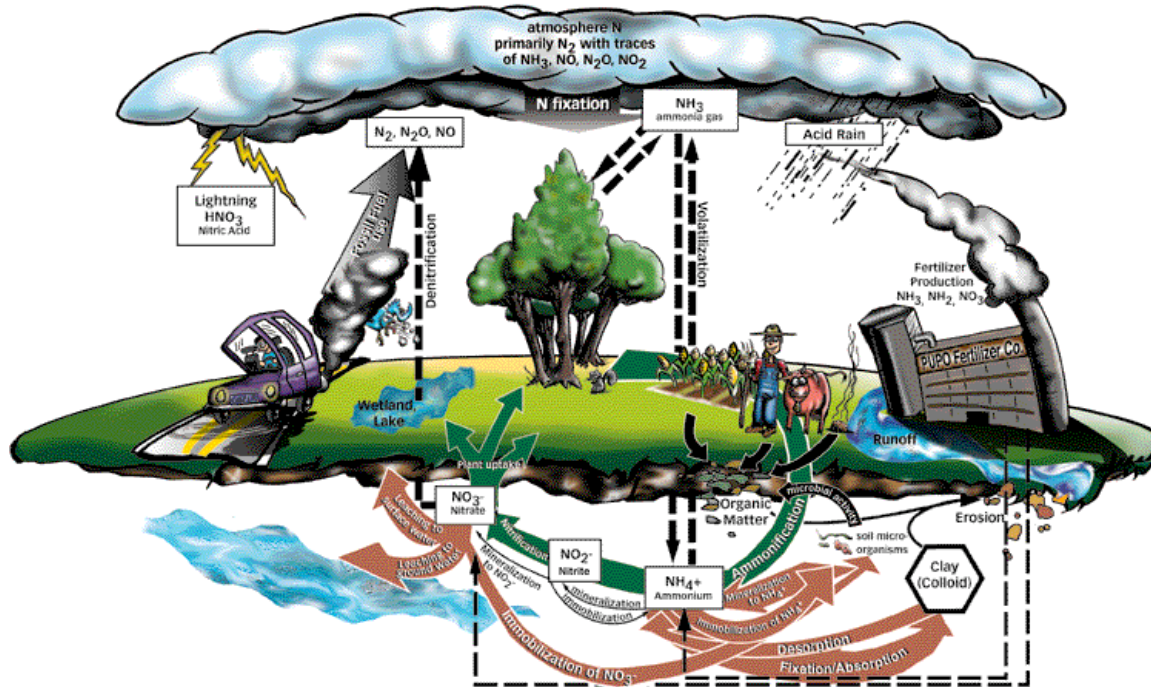


## Lesson Two

### NITRATES



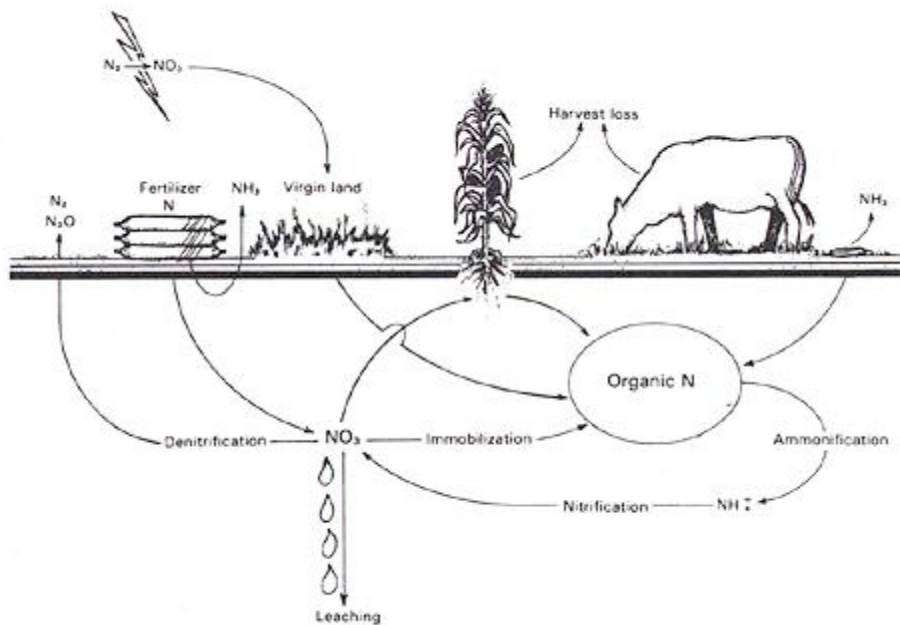
Nitrates are an essential nutrient for plant life. It is a limiting factor in the soil for plant growth. Nitrate has a terminal electron acceptor that allows bacteria to oxidize it and create energy through electron transfer.



### The Nitrogen Cycle

<http://soil.gsfc.nasa.gov/NFTG/nitrocyc.htm>

If found in groundwater, nitrates tell us that fertilizers or septic systems have leached into the drinking water beneath the surface where they were applied. Concentrations as low as 1-10 ppm may indicate human impacts on the groundwater. In an area where there is less oxygen, nitrate can become nitrite, a carcinogen. Nitrites have also been considered responsible for blue baby syndrome. This will decrease the oxygen uptake in the blood of human beings. It binds to the oxygen receptor sites on hemoglobin. Nitrates can also support algal growth in surface water.



## The Nitrate Cycle

<http://www.nsac.ns.ca/envscils...dents/snelson/nitratecycle.jpg>

Groundwater with nitrate feeding streams can feed the algae in surface waters. Algae can decrease: the amount of sunlight, rooted plant growth, and oxygen in the water. This effects all the animals that breathe the oxygen in the water and can harm a habitat.

## VOCABULARY

**Limiting Factor-** an environmental variable that, because it occurs in small amounts, limits or slows the growth or activities of an organism; also, any environmental variable whose presence, absence, or abundance restricts the distribution, numbers, or condition of an organism

**Aerobic-** Living or occurring only in the presence of oxygen: *aerobic bacteria*.

**Anaerobic-** Living without oxygen

**Biota-** The combined flora and fauna of a region

**ppm (parts per million)-** how many parts/particles are measured out of a million parts/particles

**Porosity- a:** the quality or state of being porous **b:** the ratio of the volume of open spaces in a material to the volume of the whole

**Organic material-** Of, relating to, or derived from living organisms

**Habitat-** The area or environment where an organism or ecological community normally lives or occurs

**Leaching-** To be dissolved or passed out by a percolating liquid

## ACTIVITY

1 liter soda bottles (one for each type of soil)	small stones
different types of soil	piece of screen
beaker	nitrogen test strips
store bought fertilizer	saran wrap

Cut out the bottom of a soda bottle. Turn it upside down and place a screen across the wide area before the mouth funnel area. Fill the area above the screen with about 2 inches of stone. Fill the next 5 inches with soil. Place 0.5 inches of fertilizer on top of soil. Place the bottle into a large empty beaker so the funnel shaped mouth will allow the water to run into the beaker. Pour 500 mL of water on top of the layers. Allow the water to filter through into the beaker.

At this point you can:

1. Use a nitrogen test kit to measure the amounts of nitrogen that flushes through each soil type. The more organic material in the soil the less nitrogen should be found in the water. Different soils will also pass different amounts of water through it. This is based on the porosity of the soil. Or how much water remains in the soil and how much is allowed to pass through.
2. Cover the beakers and put them in the sunlight to allow algal growth. Growth can be measured by microscope. Using a mm ruler, etch a square cm into a slide. There should be 100.0 little squares in the full square a size of  $1.0 \text{ cm}^2$ . Count algae per square mm in each soil type. After a week, repeat the microscope process and see which soils allowed more nitrogen to pass through it. Keep the beakers away from a heat source and covered to decrease evaporation.

## HOMEWORK

1. Take a walk through your neighborhood and identify algae in surface waters.
2. Define a 1 foot square area using string. Count how many algal communities per square foot you find. Repeat three to five times in the same body of water to determine an average algal count for that area.

