When a mineral or chemical (such as nitrate, or NO3) drains away from soil or other ground material and leaks into surrounding area.

is where certain forms of nitrogen (such as nitrate, or NO<sub>3</sub>) becomes dissolved in water and leaks out of the soil, potentially polluting waterways.

## **STAGE 1: NITROGEN FIXATION**

In this stage, nitrogen moves from the atmosphere into the soil. Earth's atmosphere contains a huge pool of nitrogen gas ( $N_2$ ). But this nitrogen is "unavailable" to plants, because the gaseous form cannot be used directly by plants without undergoing a transformation. To be used by plants, the  $N_2$  must be transformed through a process called nitrogen fixation. Fixation converts nitrogen in the atmosphere into forms that plants can absorb through their root systems.

A small amount of nitrogen can be fixed when lightning provides the energy needed for  $N_2$  to react with oxygen, producing nitrogen oxide, NO, and nitrogen dioxide, NO<sub>2</sub>. These forms of nitrogen then enter soils through rain or snow. Nitrogen can also be fixed through the industrial process that creates fertilizer. This form of fixing occurs under high reat and pressure, during which atmospheric nitrogen another logen are combined to form ammonia (NH<sub>3</sub>), which may then be processed fullier, to produce ammonium nitrate (NH<sub>4</sub>NO<sub>3</sub>), a form of hitrogen that can be added to soils and used to pants.

Most nitrogen fixation occurs naturally, in the soil, by bacteria. In Figure 3 (above), you can see nitrogen fixation and exchange of form occurring in the soil. Some bacteria attach to plant roots and have a symbiotic (beneficial for both the plant and the bacteria) relationship with the plant . The bacteria get energy through photosynthesis and, in return, they fix nitrogen into a form the plant needs. The fixed nitrogen is then carried to other parts of the plant and is used to form plant tissues, so the plant can grow. Other bacteria live freely in soils or water and can fix nitrogen without this symbiotic relationship. These bacteria can also create forms of nitrogen that can be used by organisms.