

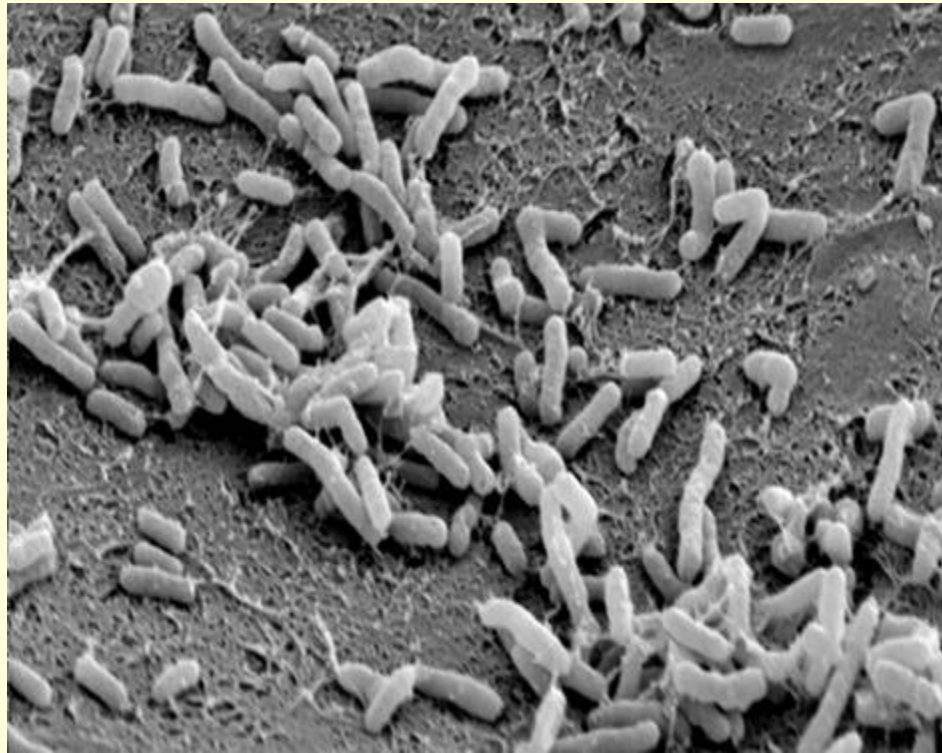


**2005 Wisconsin Fertilizer, Agrilime and Pest Management Conference  
Alliant Energy Center, January 18-20, 2005**

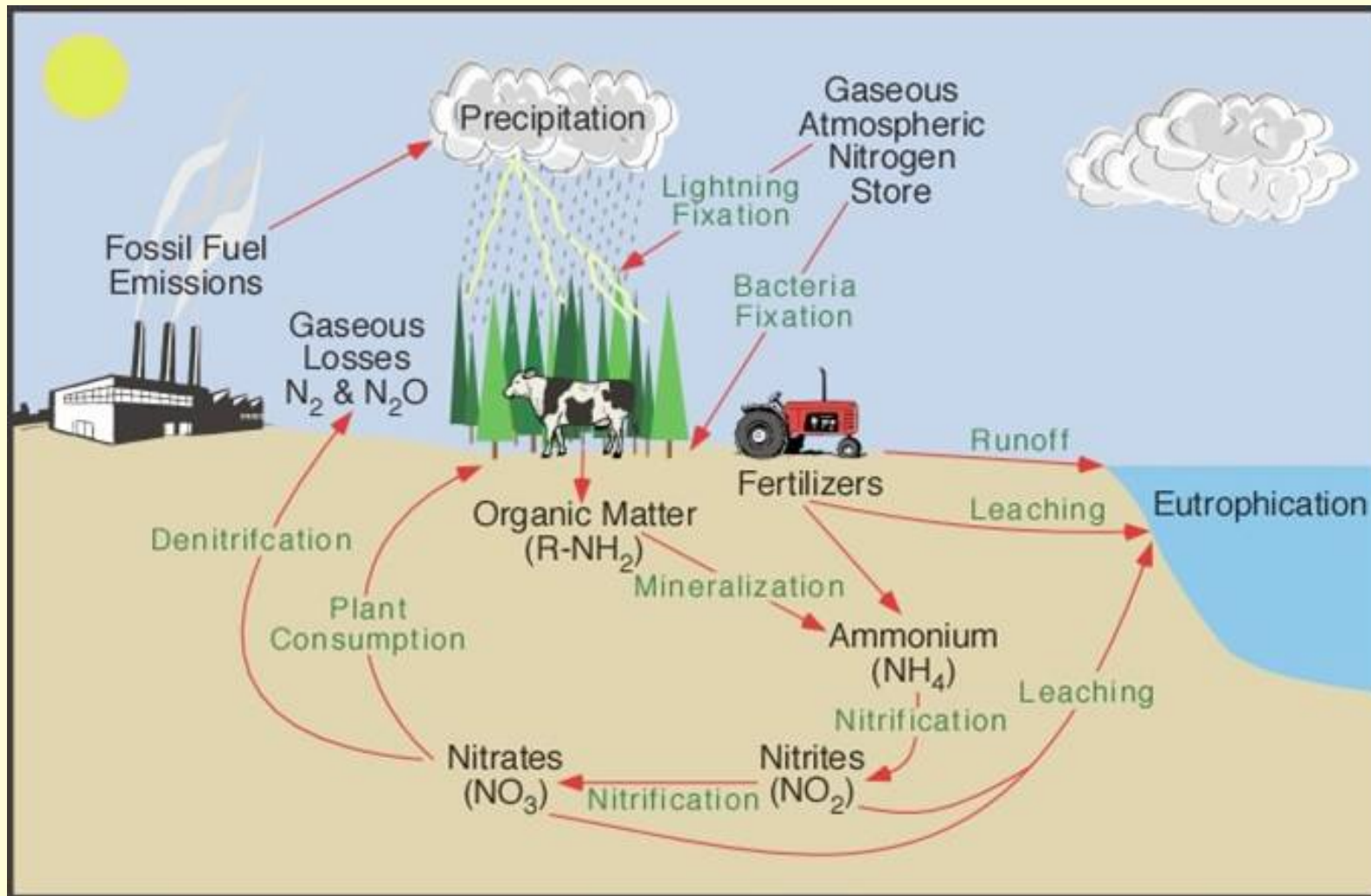
## **The Ecology of Soil Nitrogen Cycling**

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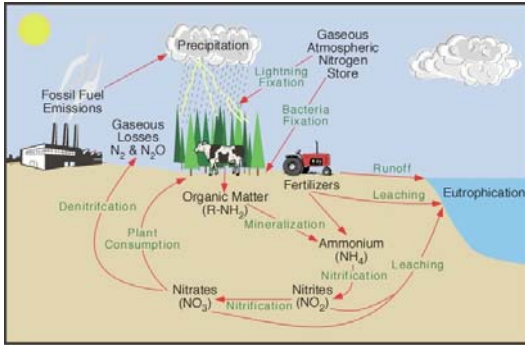
**Soil ecology: the interaction between soil organisms and their environment.**



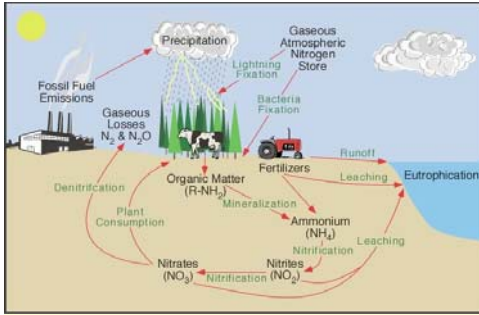
**In order to understand and predict soil functioning, we must understand soil ecology.**



<http://www.physicalgeography.net/fundamentals/9s.html>



**Why** does nitrogen cycle?  
**How** does nitrogen cycle?



## Nitrogen cycles when:

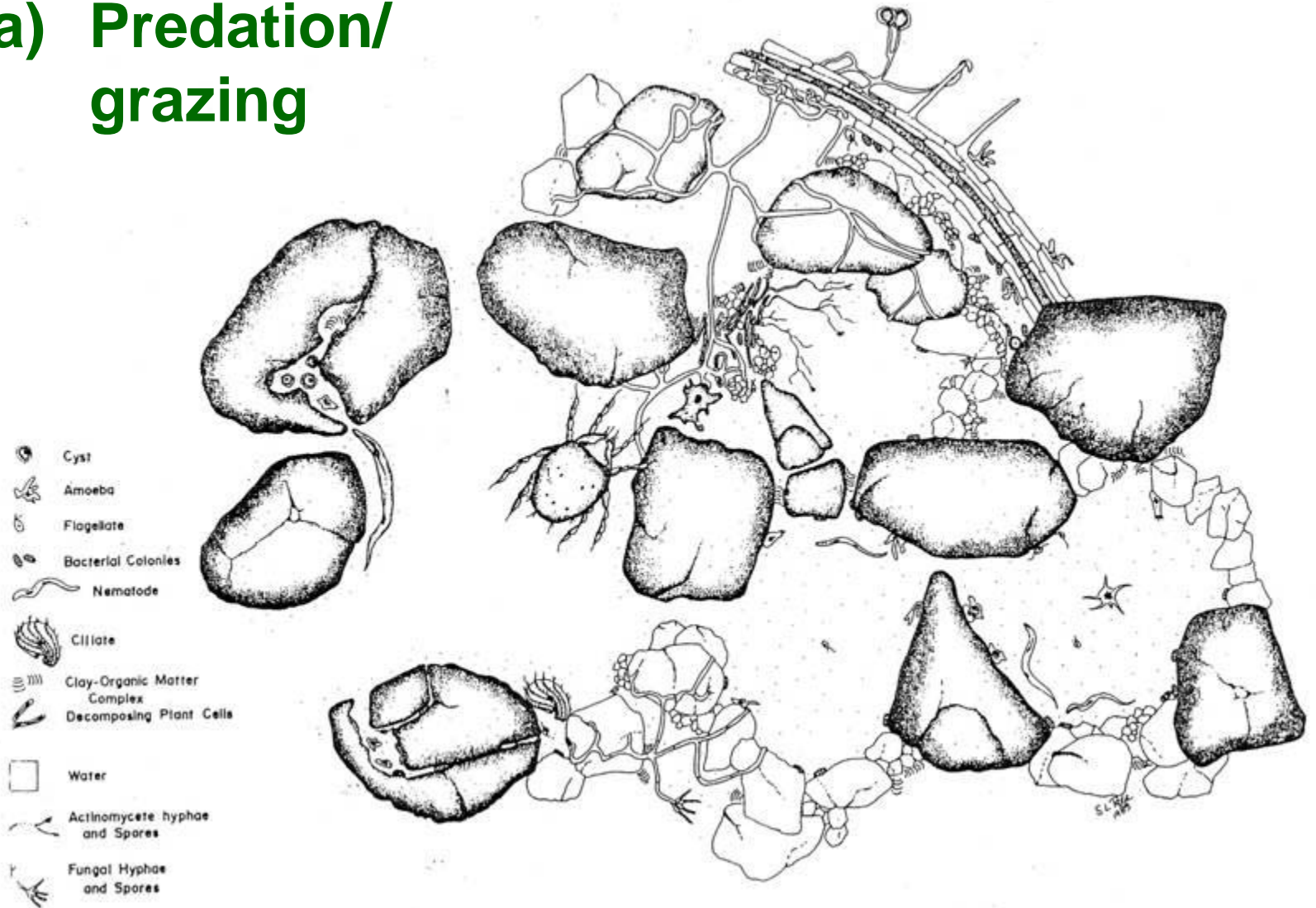
### 1) Bacteria and fungi die. (Mineralization)

- Nearly 100% efficient in N-use
- Must be forced to give up N (mineralize)



# When/how do they die?

## a) Predation/ grazing





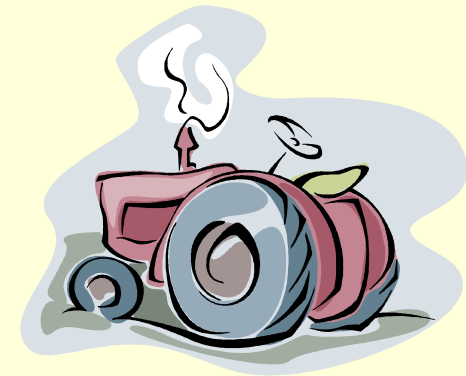
# When/how do they die?

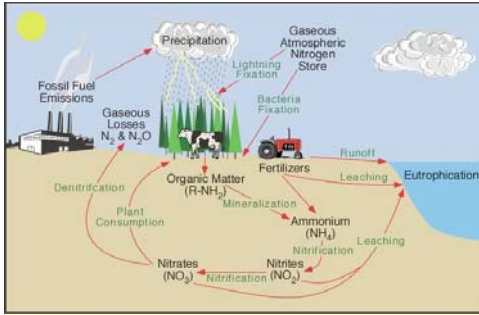
## b) Physical stresses

- Freeze/Thaw
- Wet/Dry



- Tillage

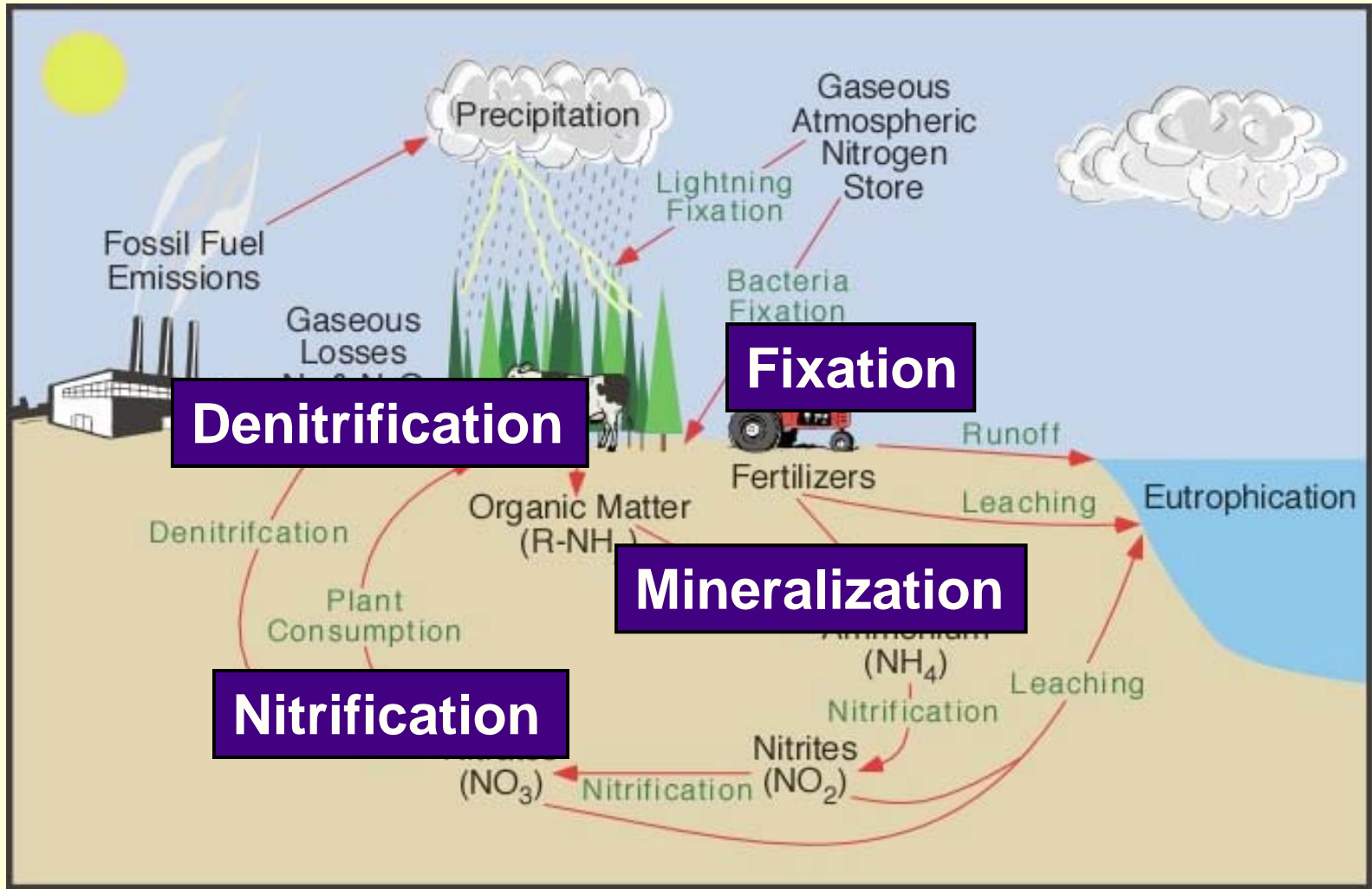




## Nitrogen cycles when:

### 2) Bacteria need it to grow (microbes are not plants)

- N-fixation
- Nitrification
- Denitrification



<http://www.physicalgeography.net/fundamentals/9s.html>

## Denitrification

Sensitive to  $O_2$   
Requires  $NO_3^-$   
Requires carbon

## Fixation

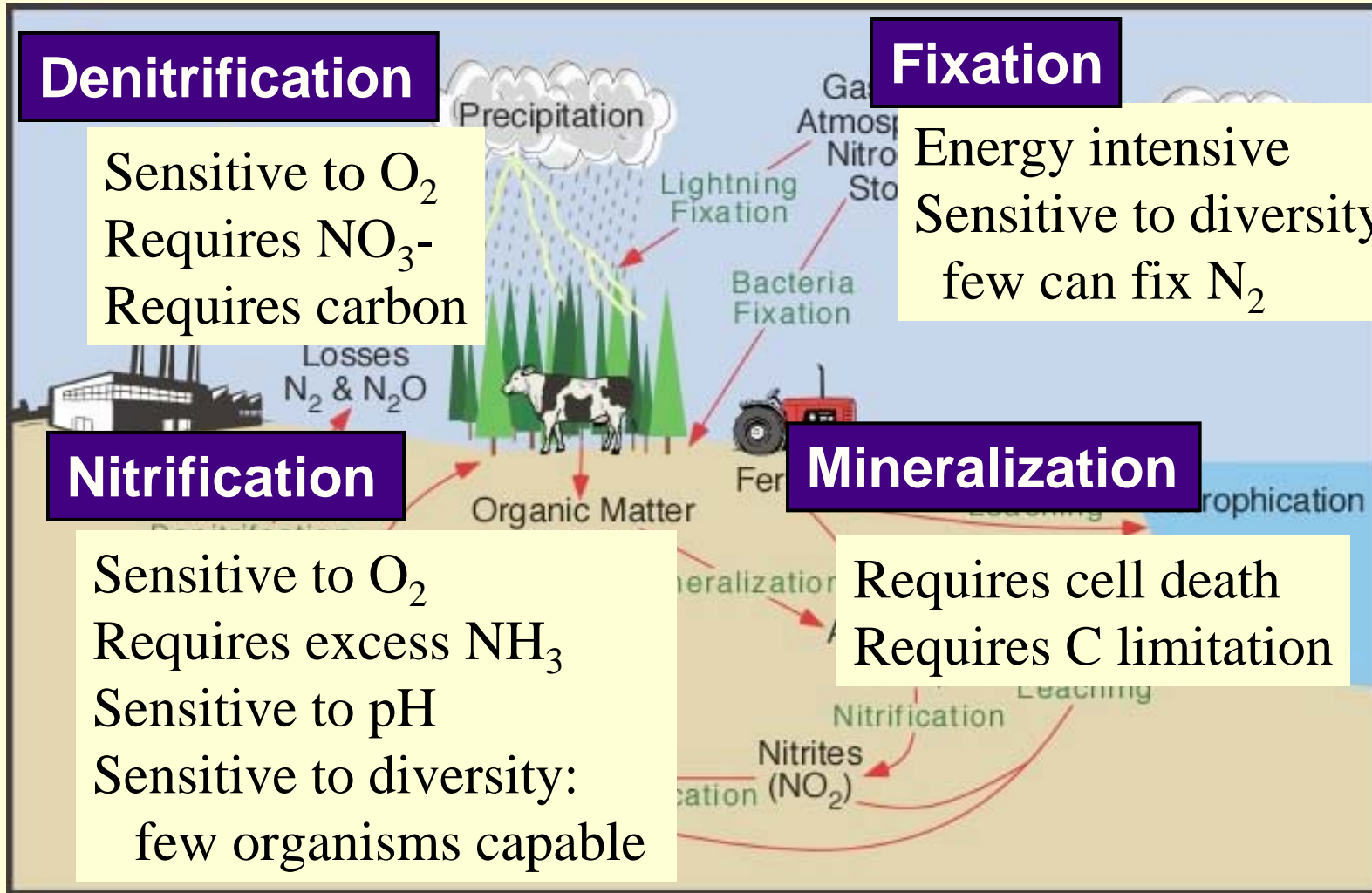
Energy intensive  
Sensitive to diversity:  
few can fix  $N_2$

## Nitrification

Sensitive to  $O_2$   
Requires excess  $NH_3$   
Sensitive to pH  
Sensitive to diversity:  
few organisms capable

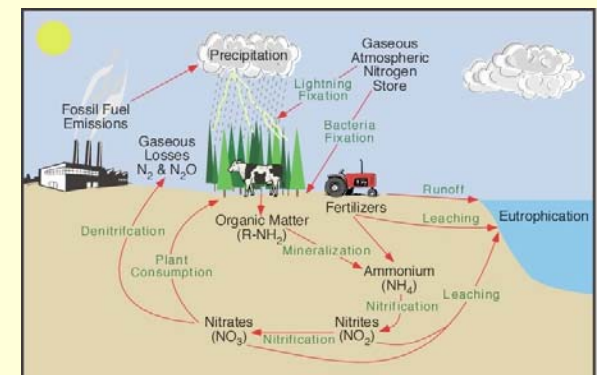
## Mineralization

Requires cell death  
Requires C limitation

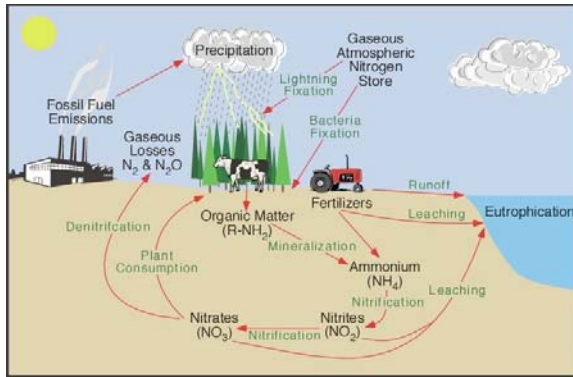


**Ultimately, nitrogen and carbon are cycled in soil because of microbial need for growth materials and energy.**

**The behavior of nitrogen fertilizer in soil is a direct result of microbial processes.**








**Soil quality may be a function of the soil community present as much as it is other factors...**

**Our ability to manage soil inputs for sustainable yield and environmental quality may depend on a greater understanding of soil ecology.**



Ecosystem Microbiology Network

**THANK YOU!**

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**Ecosystem Microbiology Laboratory, UW-Madison**  
([www.ecosystem-microbiology.wisc.edu](http://www.ecosystem-microbiology.wisc.edu))

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