



Introduction to Soil and Nitrogen

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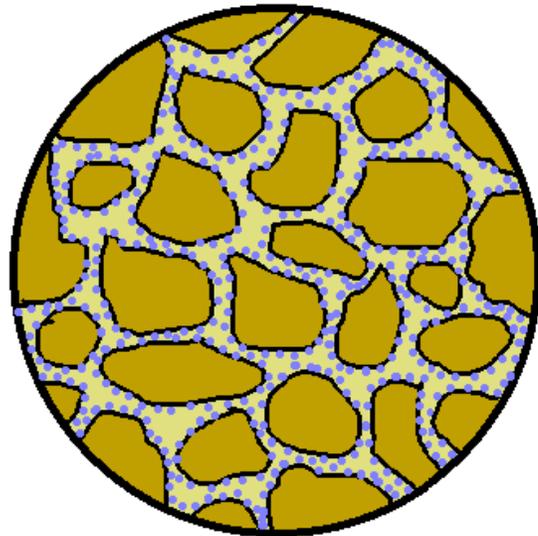
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Outline

- Soil Composition
- Southeast Minnesota soil characteristics
- Basic soil fertility
 - Nitrogen
 - Phosphorus
 - Potassium
- Environmental implications

Soil composition

Soil is composed of solids, water, and air



50% Solids

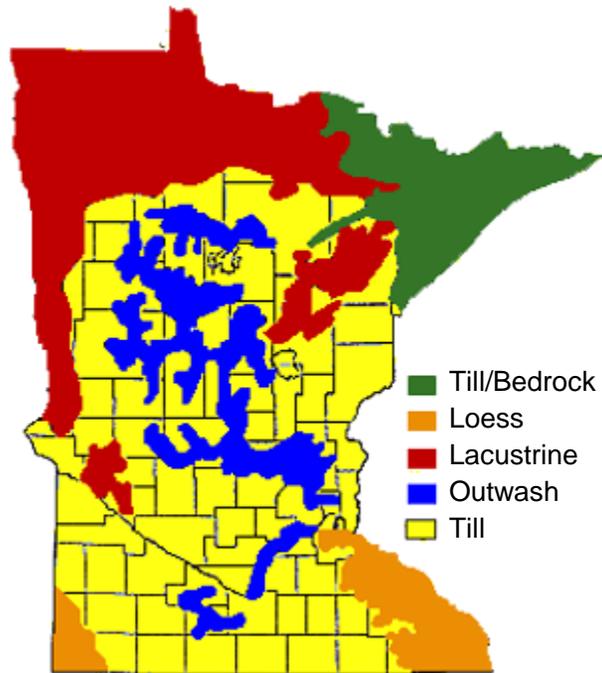
25% Moisture Films

25% Soil Air

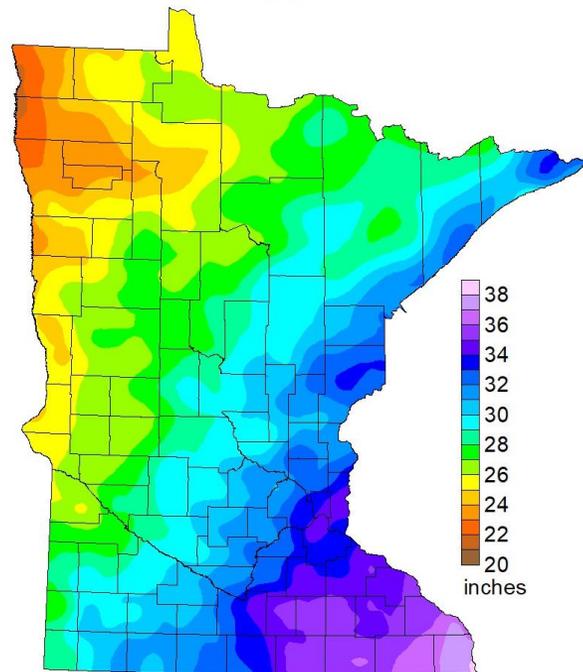
- Solids (50%)
 - Sand, silt, clay (90-99%)
 - Organic matter (1-10%)
- Water (25%)
 - H₂O
 - 100-1000 ppm soluble salts (nutrients)
- Air (25%)
 - High CO₂ (10-20 times as high as the atmosphere)

Factors affecting the soils in southeast Minnesota

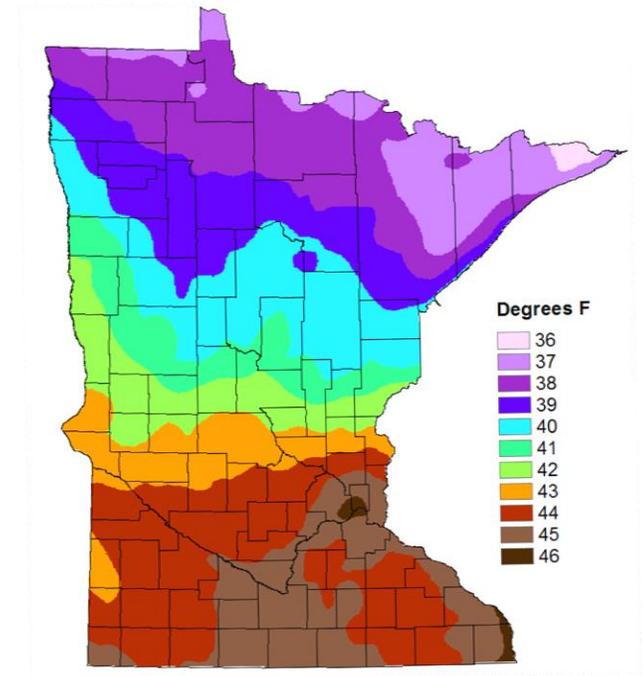
Parent material



Rainfall



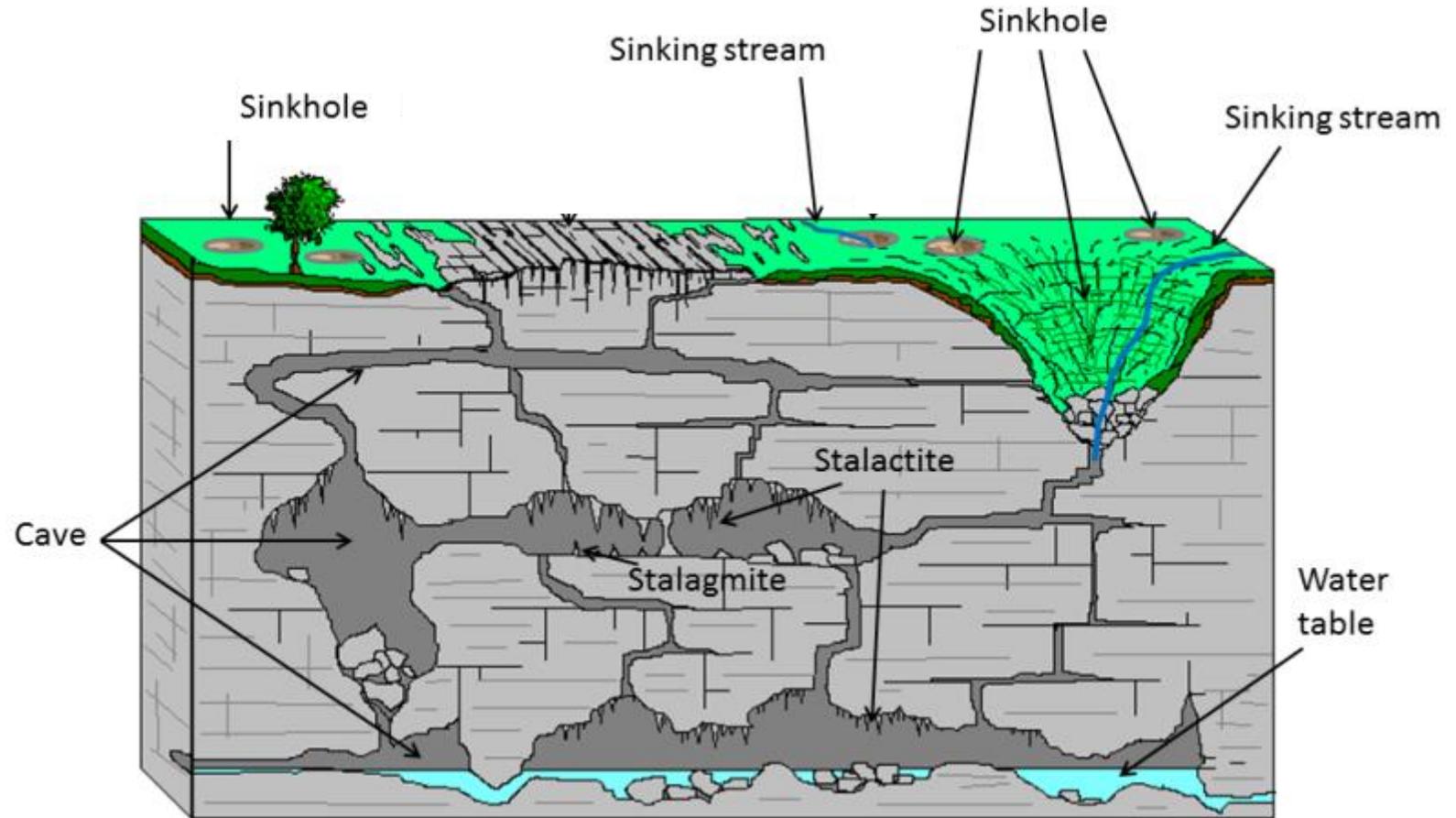
Temperature



Factors affecting the soils in southeast Minnesota

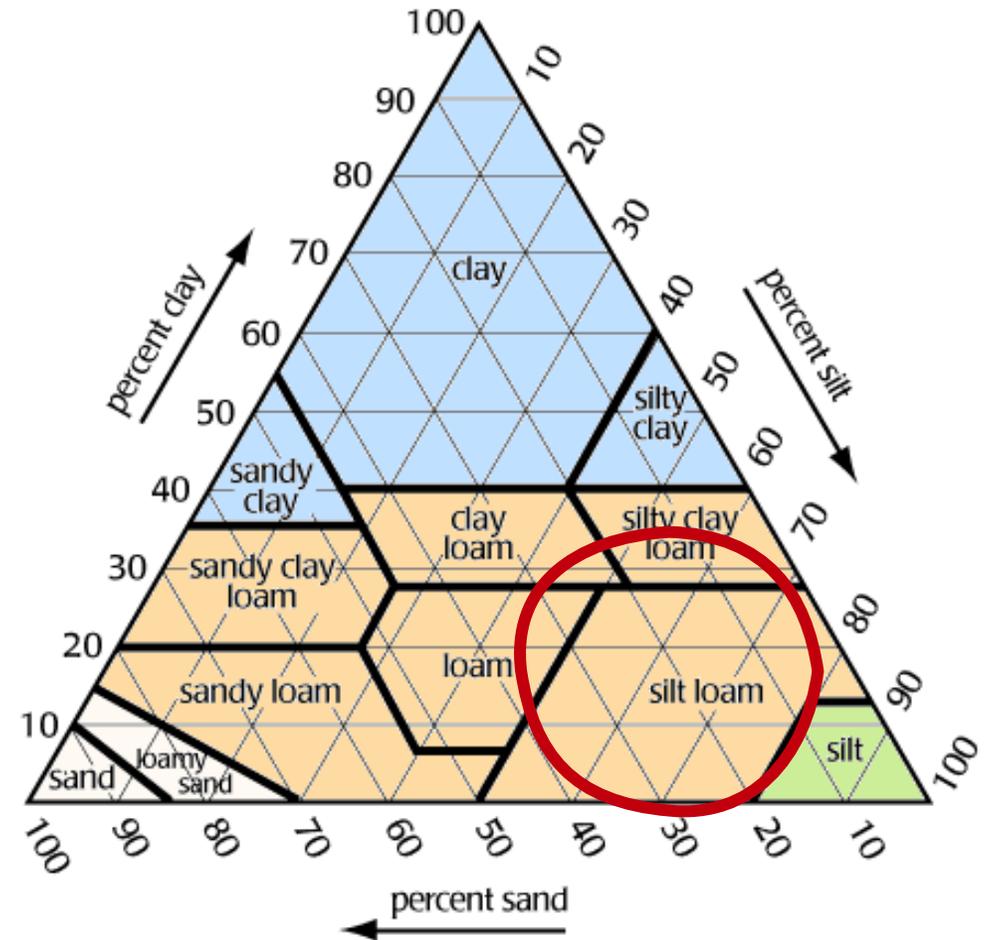
Karst Topography

Karst is a type of landscape where the dissolving of the bedrock has created sinkholes, sinking streams, caves and other characteristic features. Limestone is the dominant soluble rock type in southeast Minnesota.



Soil characteristics for southeast Minnesota soils

- Mainly silt loams
- Water permeates easily
- Water retains well
- Depth of soil varies
- Desirable soil for crop production



Soil fertility and fertilizers

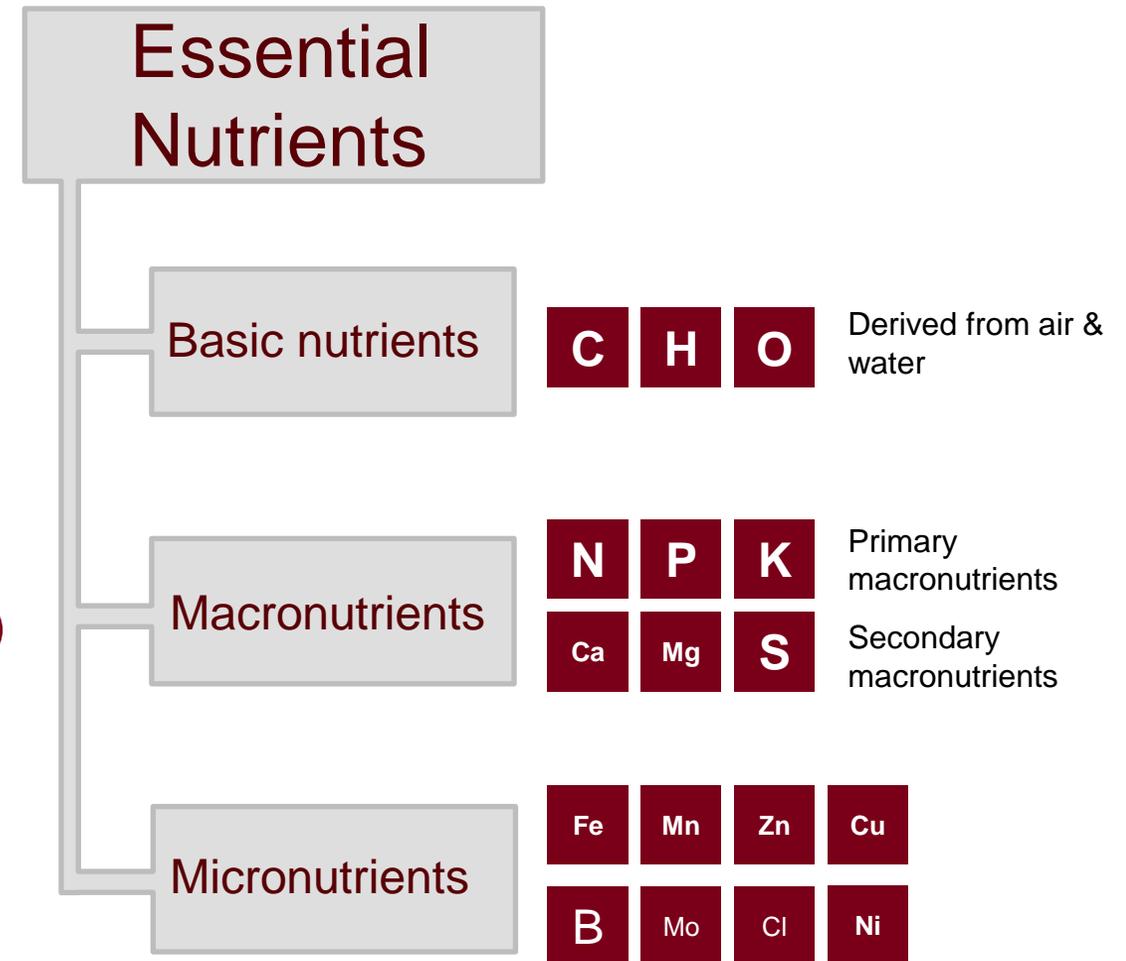
Soil fertility is the ability of the soil to provide **essential plant nutrients** and water to the plants in adequate amounts for proper growth and reproduction.

Fertilizers are commercial (or natural) products that can supply specific plant nutrients if needed.



Fertilizers (commercial or natural) provide essential plant nutrients

- Carbon (C)
- Hydrogen (H)
- Oxygen (O)
- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Calcium (Ca)
- Magnesium (Mg)
- Sulfur (S)
- Iron (Fe)
- Manganese (Mn)
- Zinc (Zn)
- Copper (Cu)
- Boron (B)
- Molybdenum (Mo)
- Chloride (Cl)
- Nickel (Ni)



Nutrients and the environment (water quality)

Groundwater:
Nitrate-N leaching

Human health concern

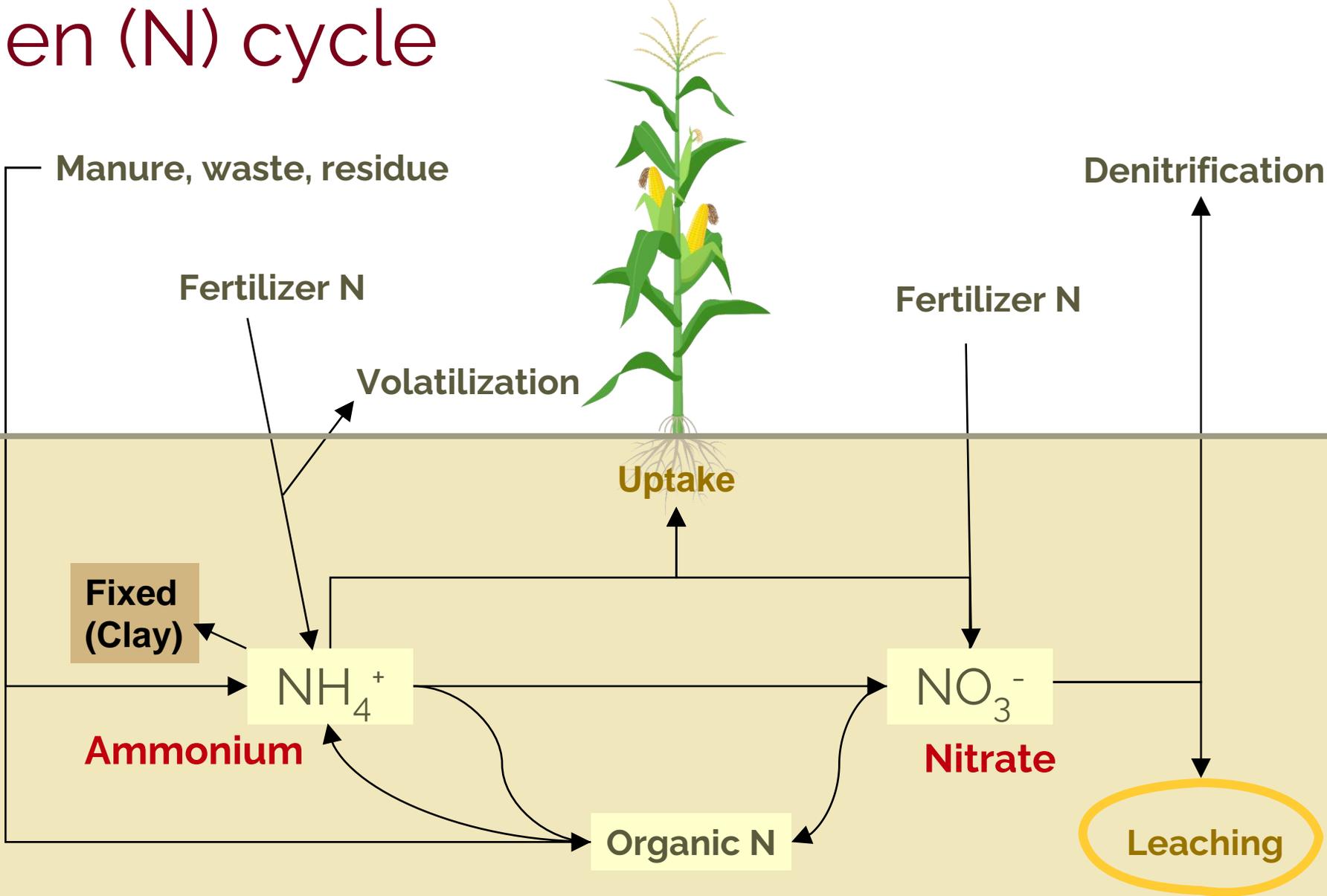
Surface waters:
Nitrate leaching/
drainage

Hypoxia (dead zone) issue
Gulf of Mexico

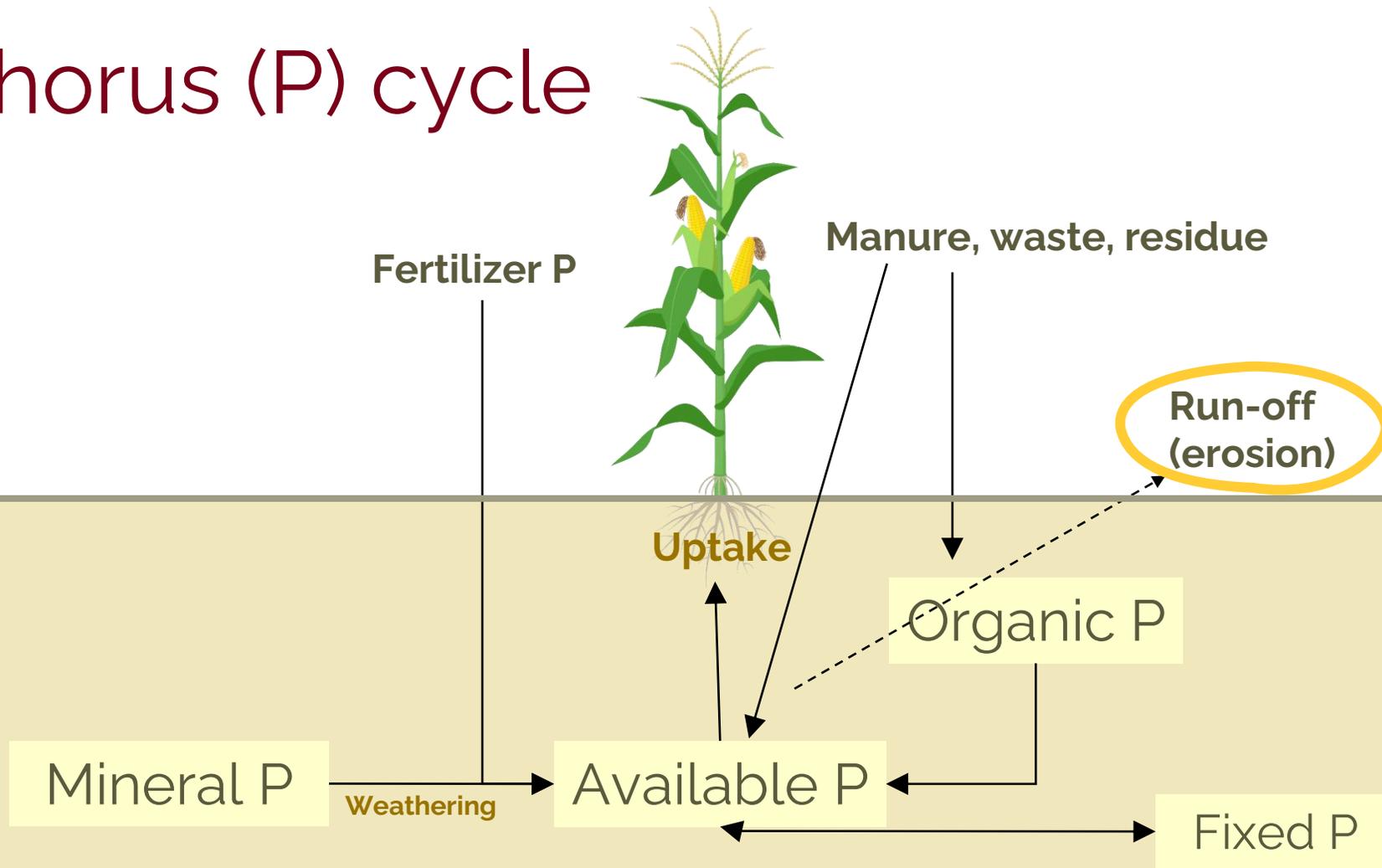
Surface waters:
Phosphorus run-off

Lake eutrophication

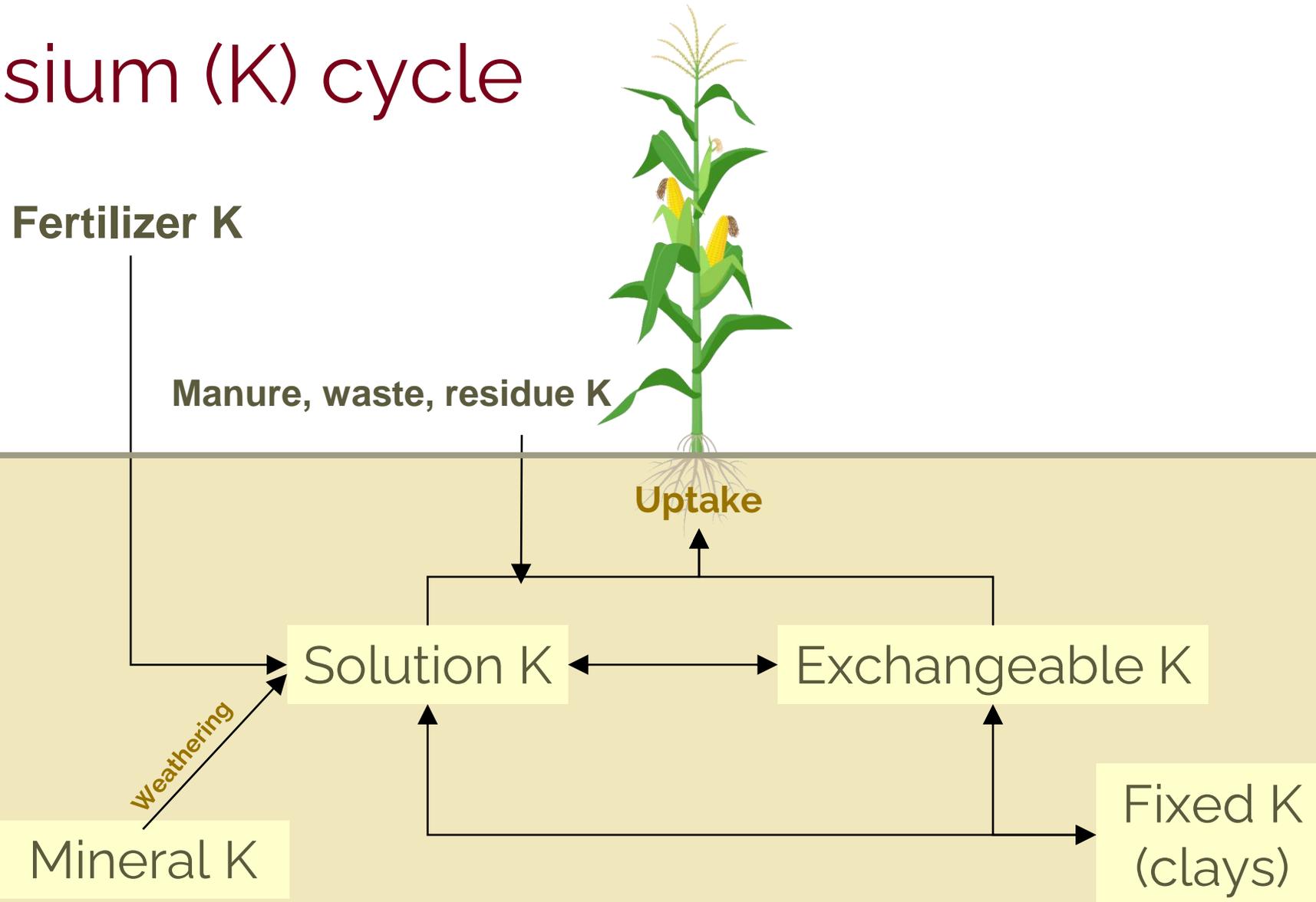
Nitrogen (N) cycle



Phosphorus (P) cycle



Potassium (K) cycle





Thank you

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