

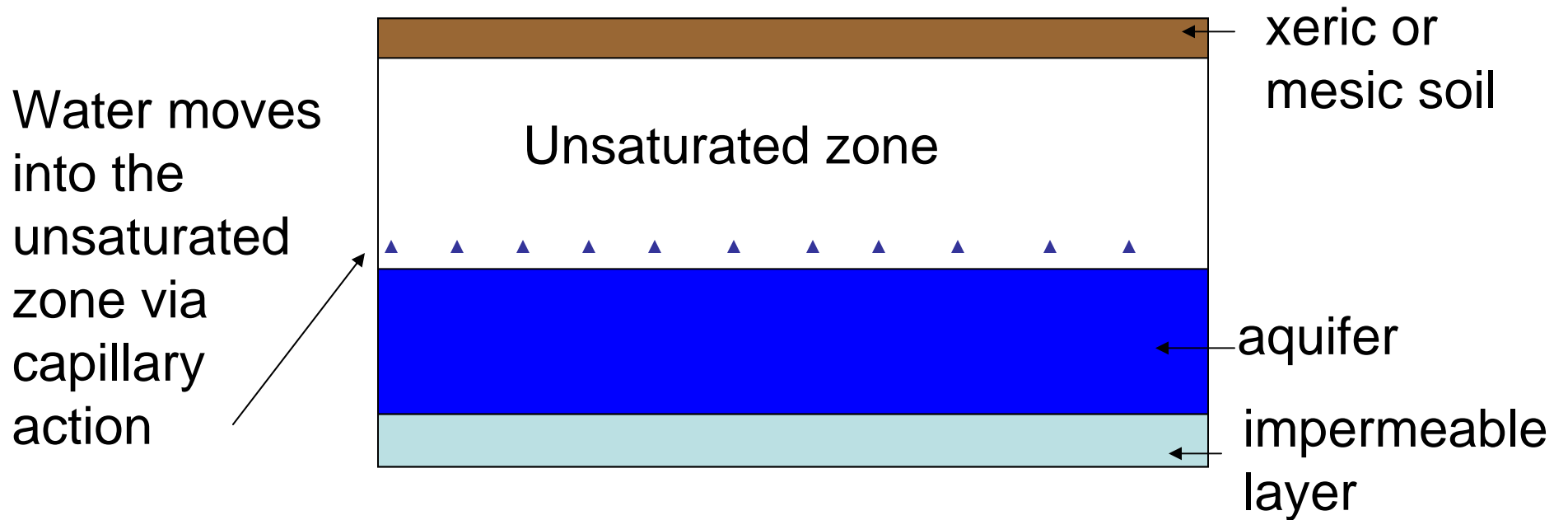
# Water and soil

- Water moves into the ground via infiltration
- If water hits impermeable layer (e.g., non-porous bed rock), will pool there ...  
AQUIFER (mix of gravel, sand, etc. that is *saturated* with water)

# Aquifers

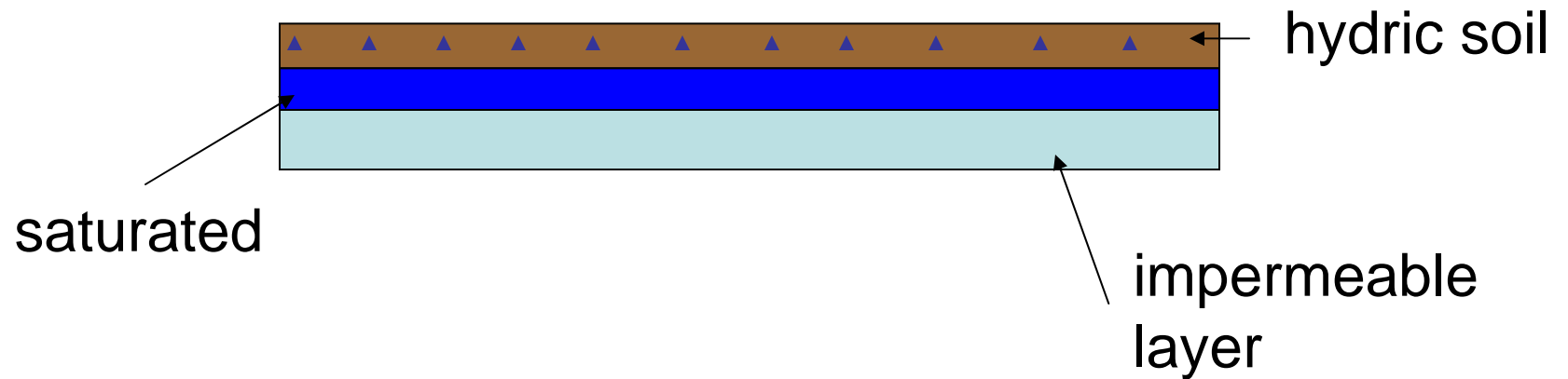
- Inputs (infiltration rate)
  - Rate and amount of water percolating from surface (rainfall, human activity)
  - Soil characteristics
- Outputs
  - Rate of capillary action and use by plants (roots...cottonwoods, willows)
  - Discharge into rivers and oceans
  - Use by humans (water wells)

# Water and soil



Non-wetland scenario

# Water and soil



Wetland scenario

*The groundwater is close to the soil and it is saturated by capillary action and/or inundation*

# Wetlands

- Difficult to define
- Hydric soils = soils saturated with water
  - typically anaerobic activity (low oxygen)

# Wetlands

- Some are continually inundated
- Others (e.g., river floodplains) are only seasonally inundated
  - Any area can temporarily become a wetland if the input of water to soil exceeds the output

# Wetlands

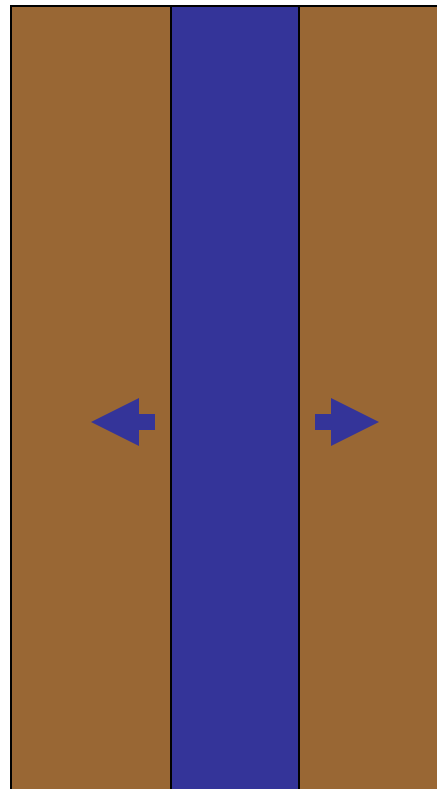
- Why are they important?
  - Support hydrophytes (plants that are adapted to living in wet, saturated, low-oxygen soils)
  - Nutrient uptake from watershed
    - Carbon sequestered into plants
    - Nitrogen compounds converted to N gas (more later)
  - Waterbirds, fish, and invertebrates

# Wetlands

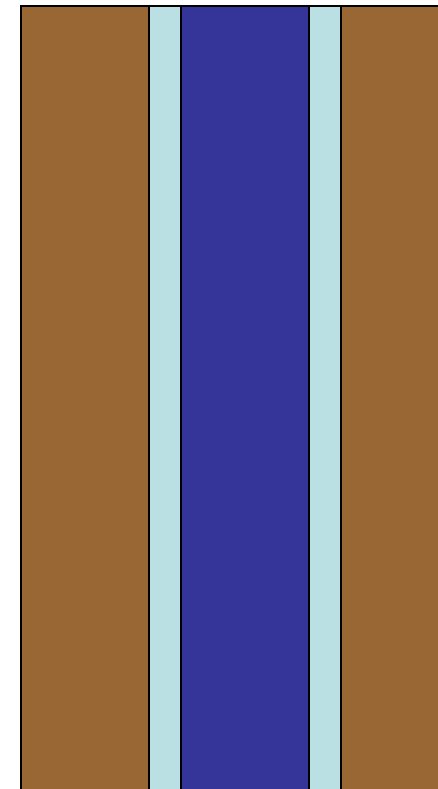
- Why are they threatened?
  - Wet soil is not *perceived* as readily useful to humans
  - Drained for agriculture
  - Fluvial wetlands (river floodplains) leveed for agriculture and flood control
  - Sedimentation (river floodplains)
  - Drained for urban development (part of Boston was a wetland area; Netherlands was diked; New York City as well)

# What is a levee?

Earthen levees  
or dikes



Stream (or lake or ocean)  
accesses floodplain via surface  
& groundwater



Denied access  
via surface



**Vrouwenpolder**

Land protected by flood defenses

All historical wetland

BY NATHANIEL VAUGHN KELSO — THE WASHINGTON POST

# Wetlands

- Loss varies by region
  - Iraq (Tigris and Euphrates Rivers) – drained in 1990s as punishment to indigenous people
  - US
    - (drained “Black Swamp” – coastal wetlands of Great Lakes of Indiana and Ohio....1800s)
    - Illinois - 85% of wetlands drained
    - Indiana – 87% lost
    - Ohio – 90% lost

# Wetland designation

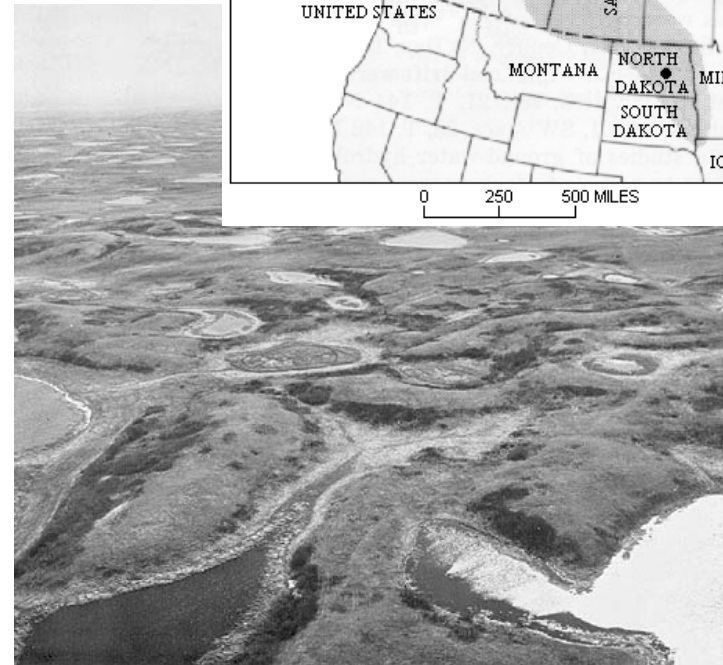
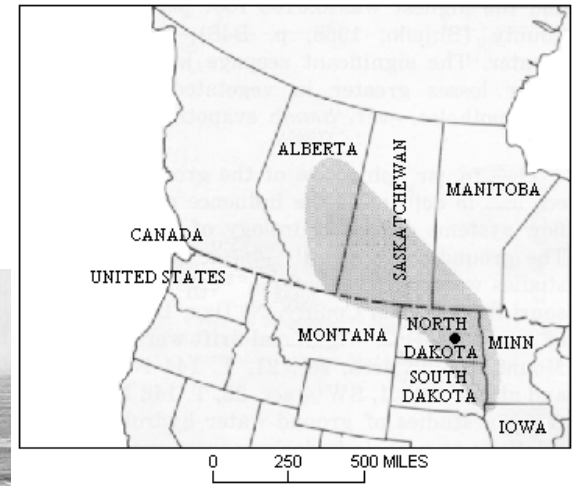
- Both scientific and legal definitions vary greatly
  - Of concern because of high value of drained wetlands to agriculture and urban development (\$)
  - Still unclear...
    - Fen, peatland, bog, bottomland, swamp, vernal pool, wetland, marsh, moor, slough, wet meadow, paddy...lots of names

# Major freshwater wetland types

- Tidal freshwater marsh – coastal influence of ocean but far enough to be freshwater ...at least some of the time (can vary in salinity)
- Freshwater marsh – prairie potholes, playas, Everglades...shallow and often seasonally filled by water and dries occasionally



Playa in Texas



Prairie Potholes

# Major freshwater wetland types

- Northern wetlands
  - Bogs and peatlands (organic-filled kettle lakes)....permanent
- Deepwater swamp
  - Continually filled
  - (SE United States)
- Riparian
  - Adjacent to rivers (floodplain areas)...high water table...seasonal

# Engineered wetlands

- Natural
  - Beavers (major factor altering geomorphology on continental scale)
  - Alligators build pools in Everglades
- Humans
  - Mitigation for wetland loss
  - Mixed results.....