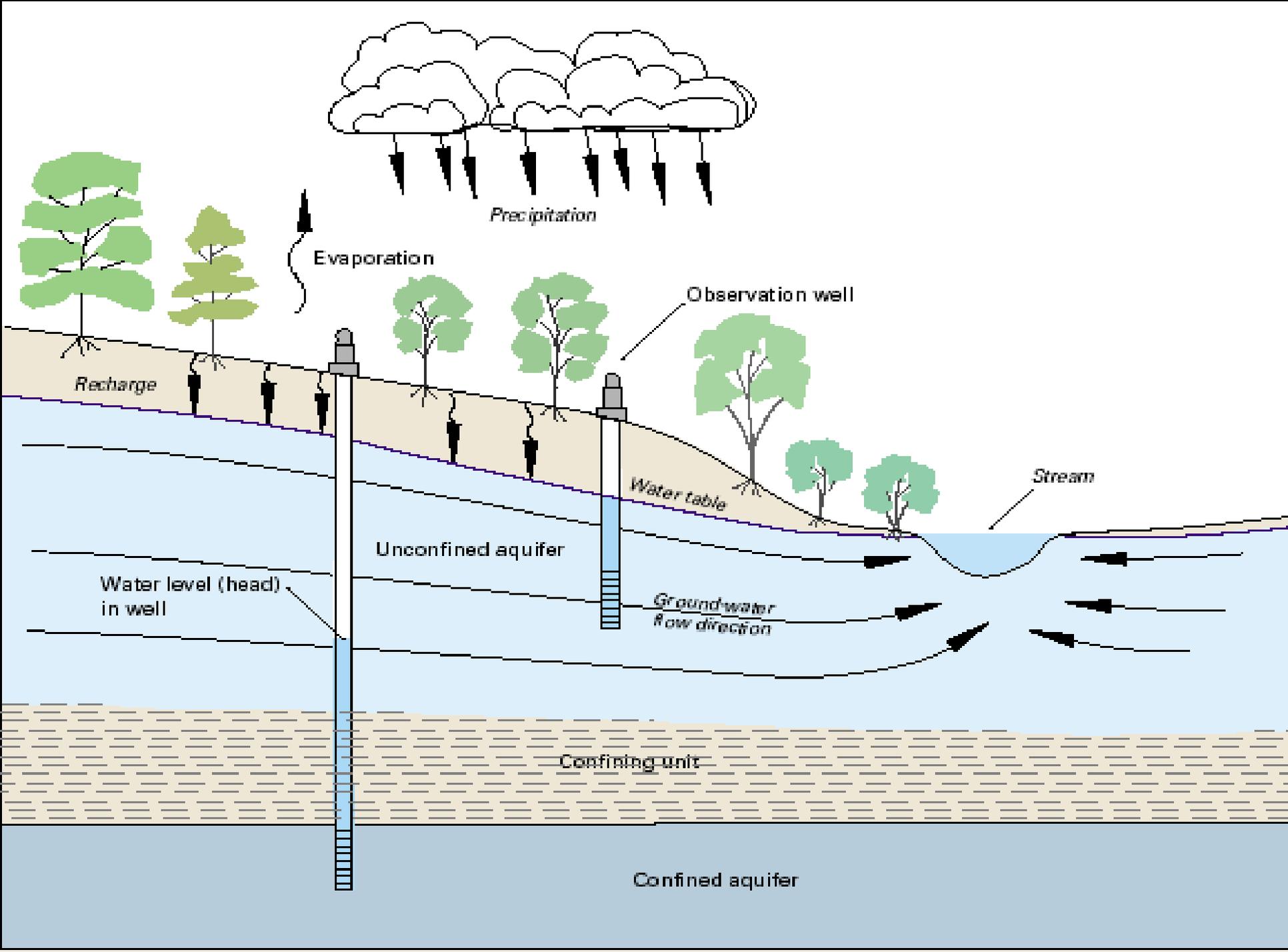


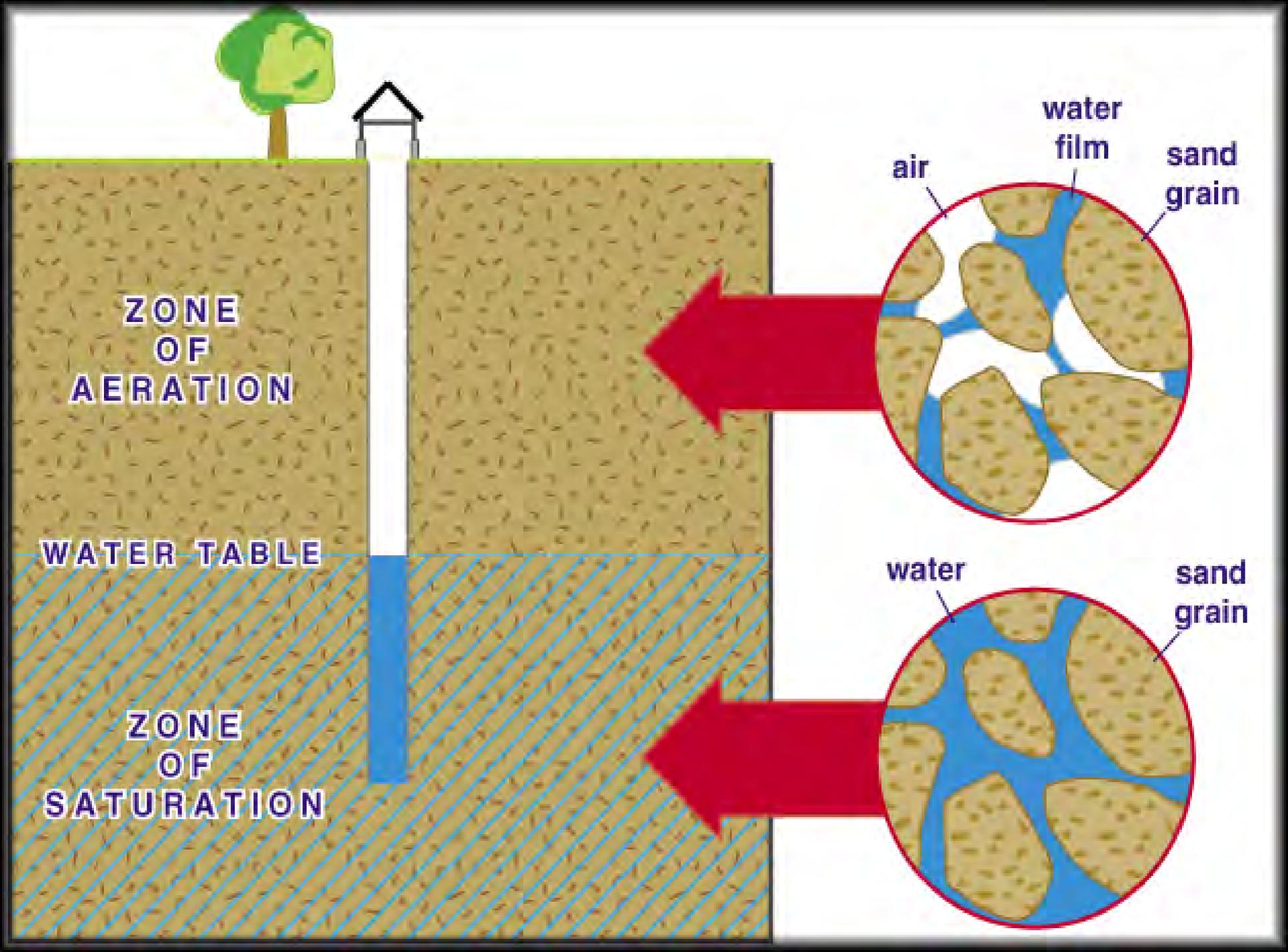
Basic Hydrogeologic Concepts

The background of the slide is a solid blue color. In the bottom right corner, there are several overlapping, wavy, light blue lines that create a sense of movement or depth, resembling stylized water ripples or geological strata.



Unconfined Aquifers

- Also called Water Table Aquifers
- Unconfined aquifers have no confining layer (e.g., clay or silt) on top
- **Wells that are open or “screened”** in unconfined aquifers will have water levels that sit at the level of the water table

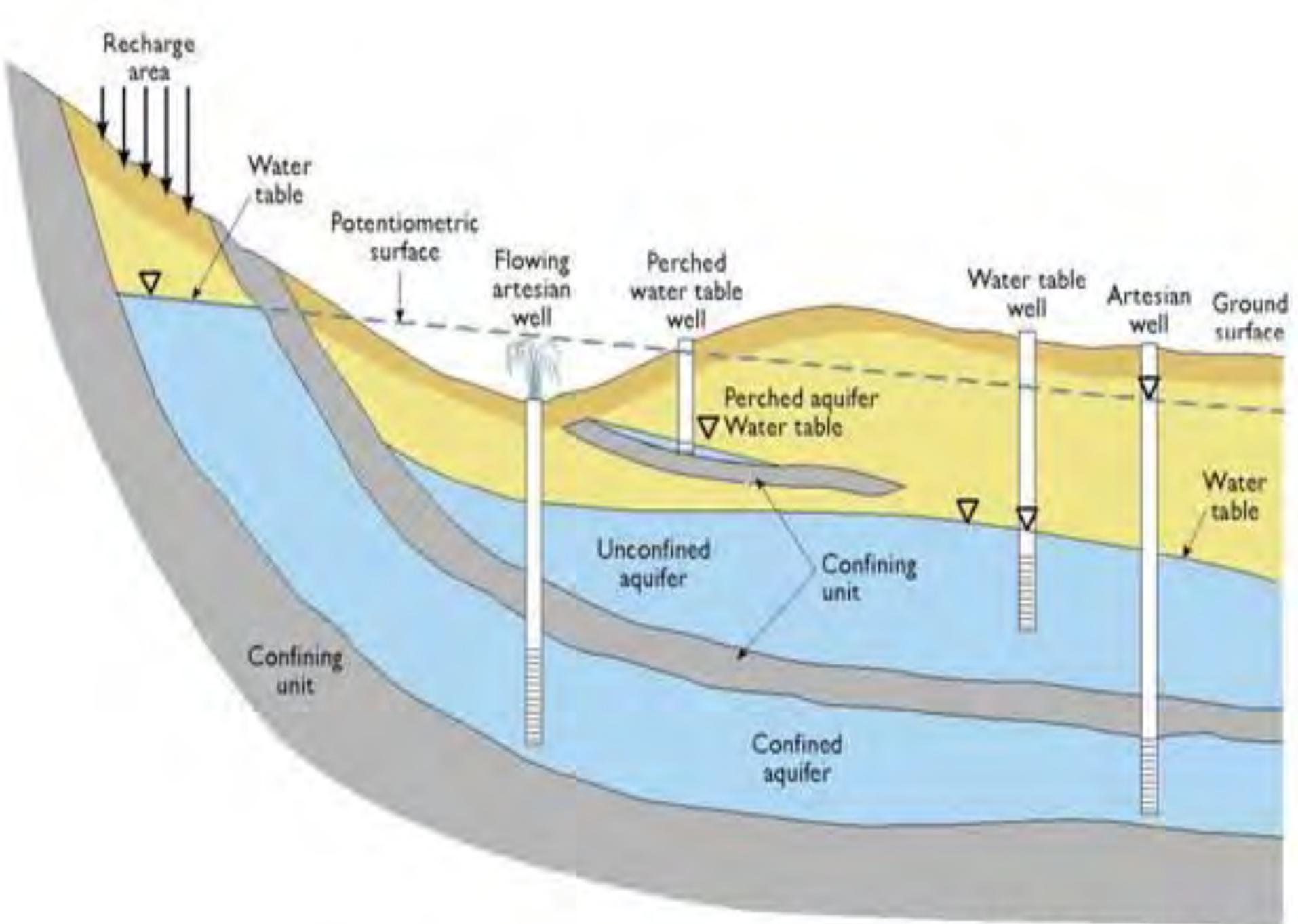


Confining Layers

- Aquitard = confining layer; a geologic unit that does not transmit very much water
- Confining layers are part of what keeps water in certain aquifers under a lot of pressure
- Confining layers also protect some aquifers from being easily contaminated

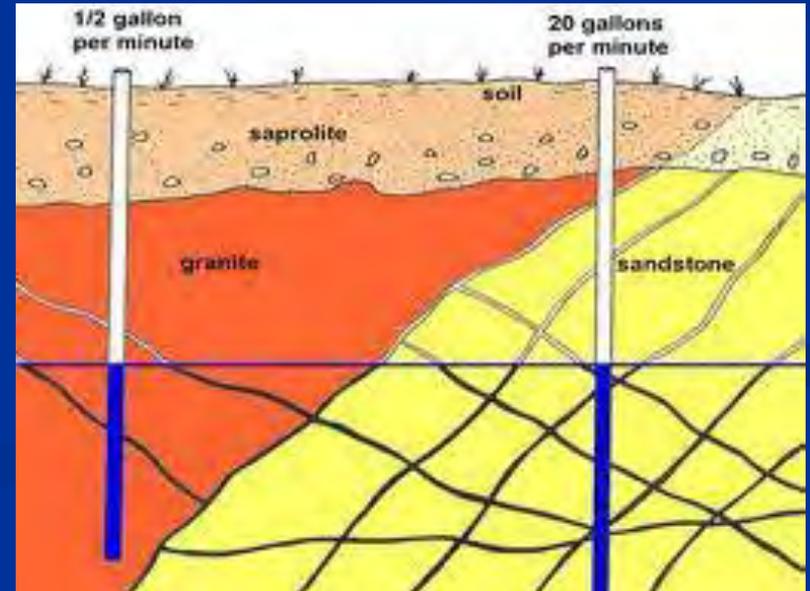
Confined Aquifers

- Confined aquifers have a confining layer above them
- The water in confined aquifers are under pressure
- **When you “screen” a well in a confined aquifer (after drilling through the confining layer), water will rise ABOVE the top of the aquifer**



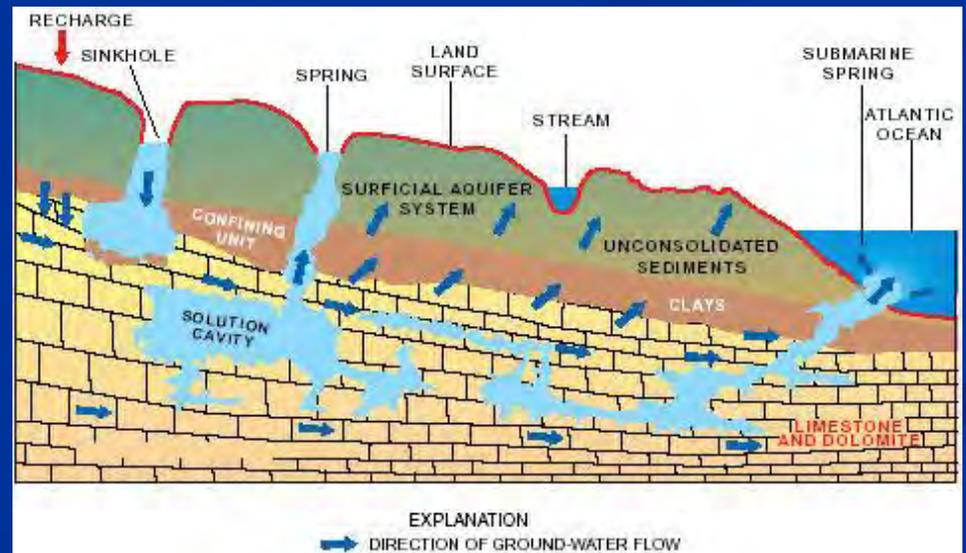
Fractured Rock Aquifers

- Most of the flow is through the fractures
 - Pores may be present
 - Pores may not be well-connected
- Very rapid flow is possible



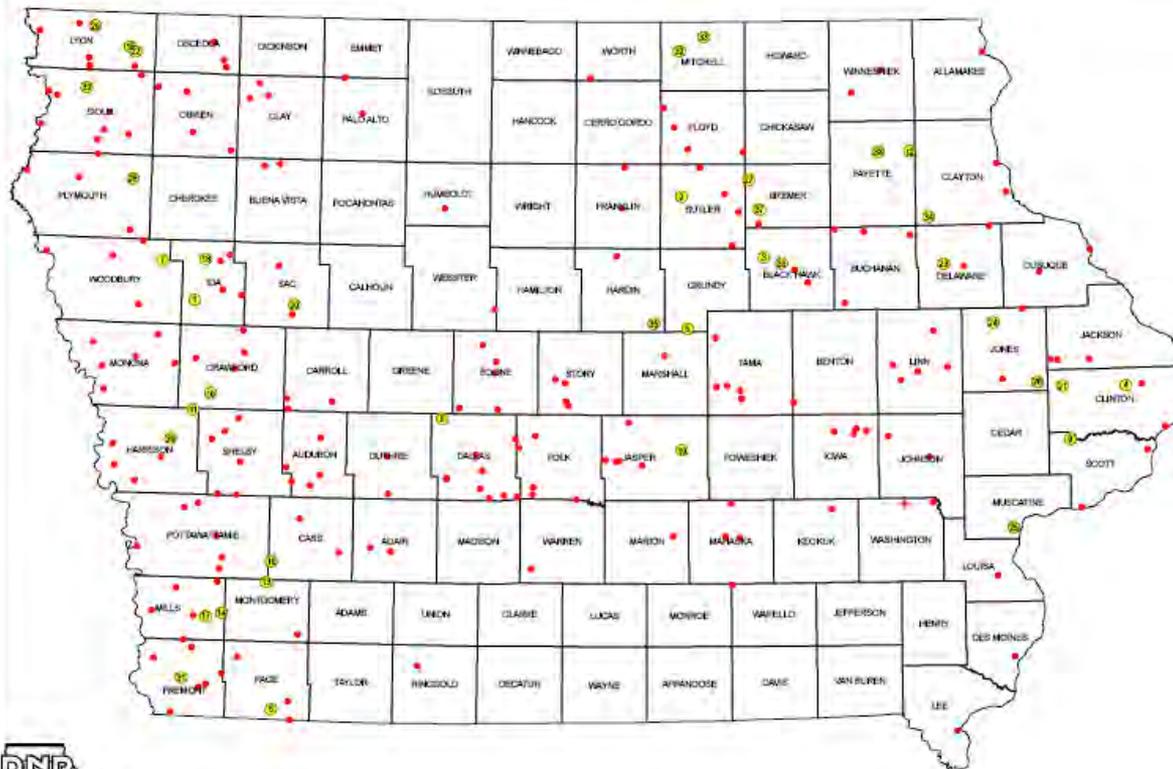
Karst Aquifers

- Limestone, dolomite
- Sinkholes, caves, underground drainage
- Very rapid flow



260 Highly Susceptible Community Water Supplies

Priority and Highly Susceptible Community Water Systems



Priority SWP Systems

● Priority SWP System

Priority systems have highly susceptible aquifers with finished water N levels above 5 mg/L.

Map # Water Supply

- 1 Battle Creek
- 2 Brislow
- 3 Cedar Falls
- 4 Charlotte
- 5 College Springs
- 6 Conrad
- 7 Correanville
- 8 Dawson
- 9 Dixon
- 10 Dow City
- 11 Dunlap
- 12 Eight
- 13 Elliot
- 14 Emerson
- 15 George
- 16 Grissold
- 17 Hastings
- 18 Hostein
- 19 Kellogg
- 20 Lake View
- 21 Lost Nation
- 22 Lyon-Sioux RWIS - Sojard
- 23 Manchester
- 24 Montcelo
- 25 Muscatine
- 26 Oxford Junction
- 27 Plainfield
- 28 Remsen
- 29 Rock Rapids
- 30 Rock Valley
- 31 Sidney
- 32 St. Amarg
- 33 Stacyville
- 34 Stubbins Point
- 35 Union
- 36 Waterloo
- 37 Waverly
- 38 West Union
- 39 Woodbine

Susceptible Systems

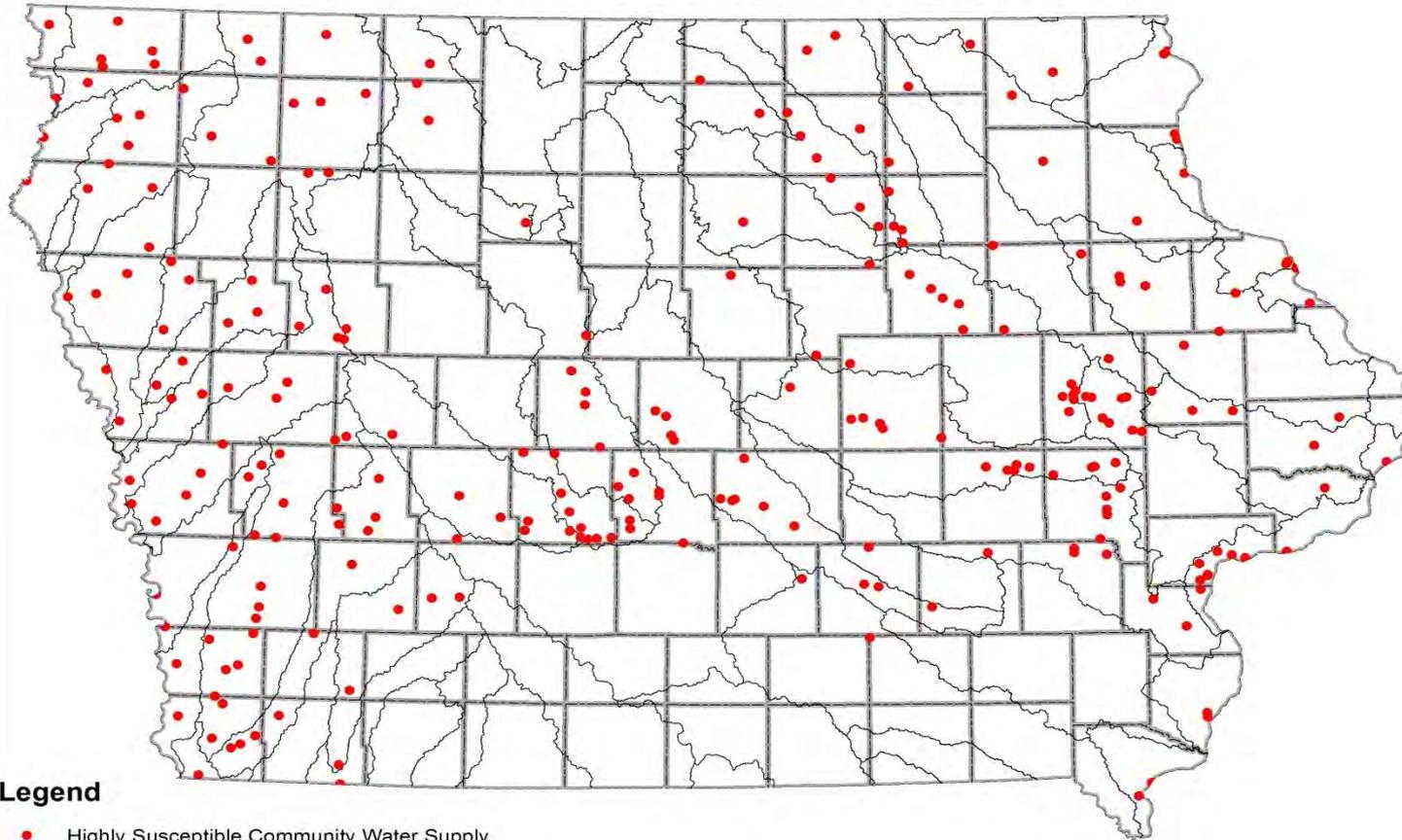
● Highly Susceptible Systems

Susceptibility is based on the geologic characteristics of the aquifer and is independent of well vulnerability. Aquifer susceptibility is determined by examining the geologic logs for the public wells being modeled and/or other nearby wells for the thickness of any impermeable material, referred to as confining beds, above the aquifer.



Susceptible CWS with Rivers

Highly Susceptible Community Water Supplies



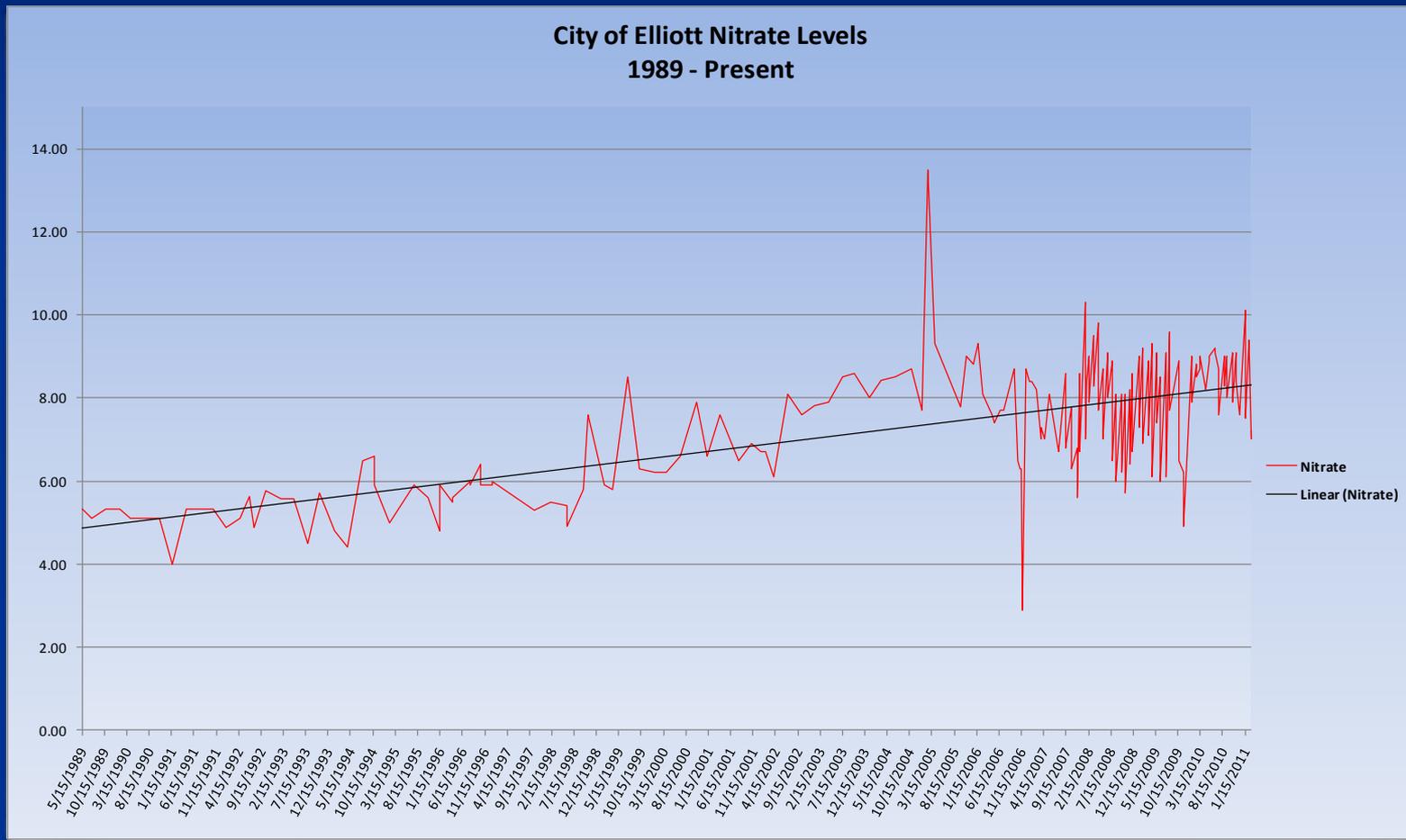
Legend

- Highly Susceptible Community Water Supply
- HUC 8 Watersheds
- County Boundary

Criteria:

1. Shallow alluvial aquifer –
no confining layer
2. Nitrates in finished water at
or above 5 mg/L

Why Are We Concerned With High Nitrates?



Health Concerns With High Nitrate Levels

- High nitrate levels can cause infants to develop a *life-threatening* condition called "*blue-baby*" syndrome.
 - This is a condition which decreases the ability of blood to get oxygen from the lungs to all parts of the body.

Maximum Contaminant Level (MCL)

- The maximum permissible level of a contaminant in water which is for delivery to any public water supply system.

Nitrate MCL = 10 ppm or mg/L

How Does Nitrate Get Into Drinking Water?

- The source of nitrate in drinking water can come from a variety of sources.
 - These sources are called:
 - Point Sources and
 - Non-point sources

Point Sources Are Sources Associated With A Single Location

Examples of Point Sources:

- Nitrogen Spills (in-field or specific sites)
- **Municipal or Industrial Wastewater**
- Landfills or Disposal Areas
- Septic Systems

Non-point Sources Are Sources That Cannot Be Tied To A Single Location

Examples of Non-point sources:

- Commercial Nitrogen Application
- **Manure Application**
- **Field Runoff**
- **Animal Feedlots**
- **Urban Runoff**

Iowa Currently Has:

- Number of Farms in Iowa?

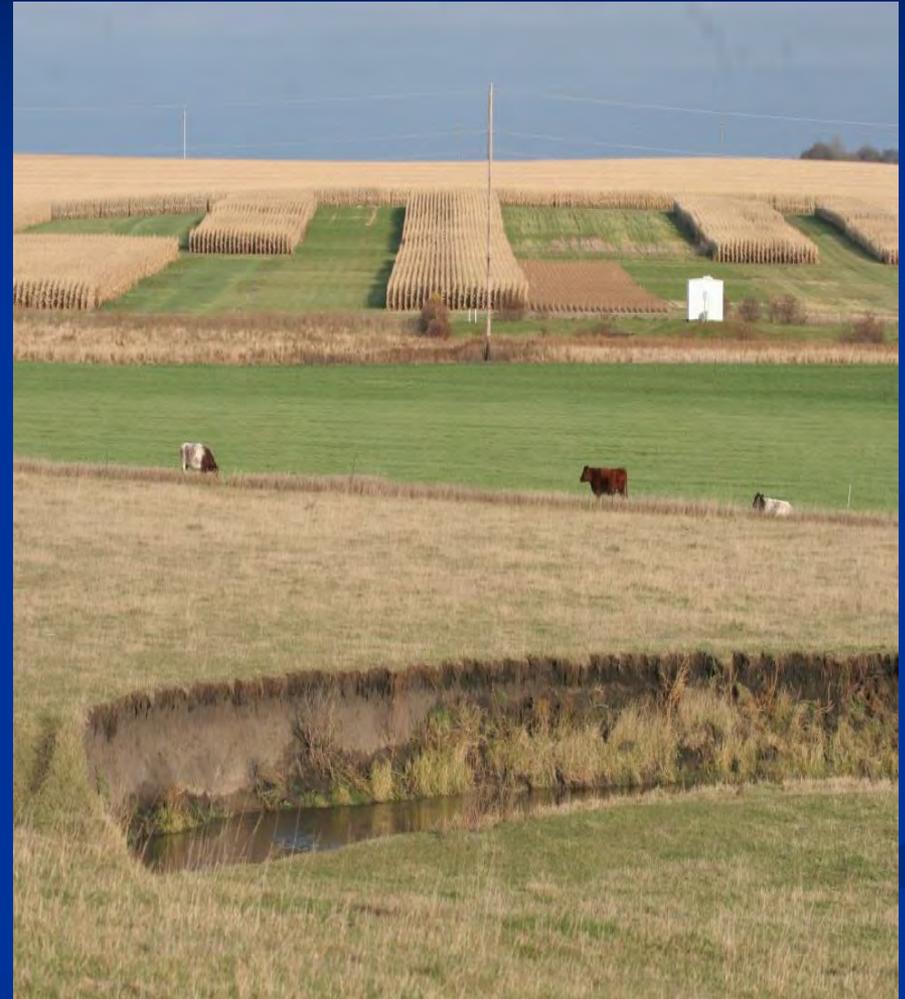
~ 90,000

- Number of Public Wells?

~ 3,300

- % of Public Wells Located in Agricultural Areas?

~ 90%



One *Voluntary* Source Water Protection Program:

- To Prevent Contaminants from Entering the Public Water Supply
- To *Ensure* Source Water Protection Today – and - for Future Generations...



Thanks !!

Rebecca.Ohrtman@dnr.iowa.gov

515-725-8332

ChiHo.Sham@cadmusgroup.com

617-673-7156