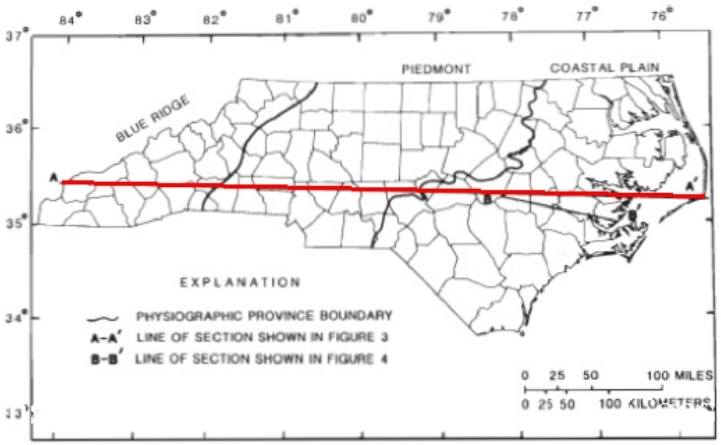
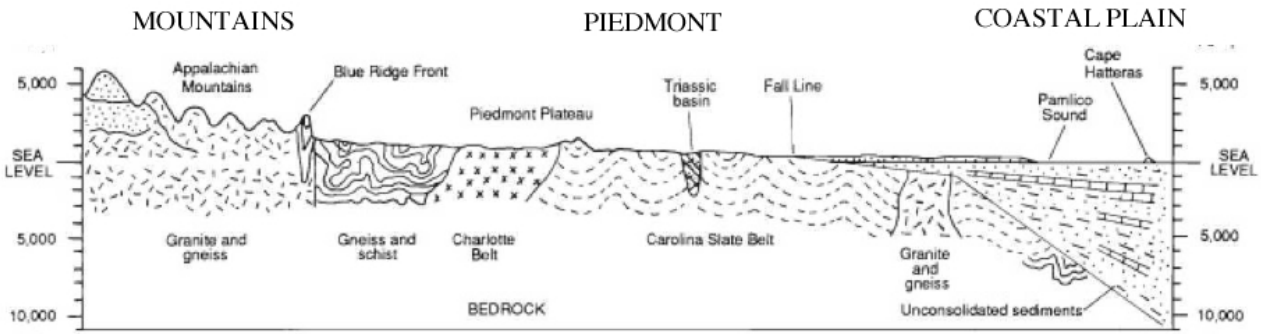
Ground Water Resources in NC

Jeff Lautier
Ground Water Management Section
NC Division of Water Resources

March 5, 2008

Geology





Mountains and Piedmont:

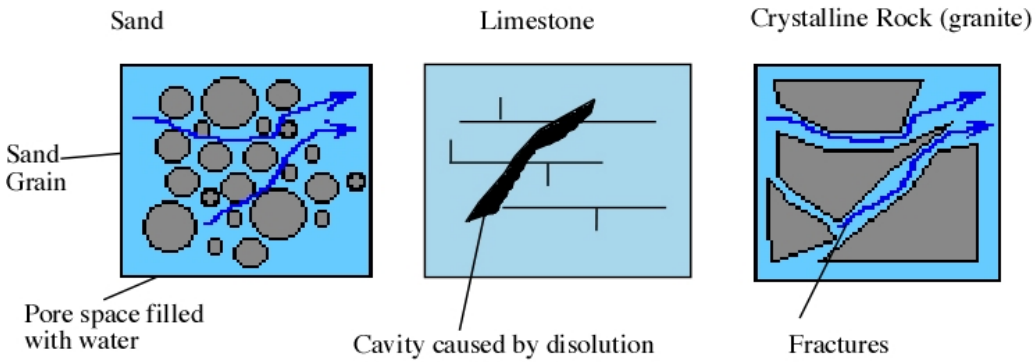
-Underlain by a complex assortment of very old crystalline rock (granite, gneiss, schist, slate etc.)
-Complexly folded, faulted and fractured
-Overlying crystalline basement rock: Regolith: made up of weathered crystalline rock/Saprolite, alluvial materials, soils

Coastal Plain:

-Underlain by wedge shaped body of sedimentary rock consisting of alternating layers of sand, limestone, silt, clay and combinations
-ranges from feather edge at fall line to 10,000 feet at Cape Hatteras.

Ground water system contained within these materials

Ground water: Water held below ground surface in openings or void spaces in rock or unconsolidated material such as sand.

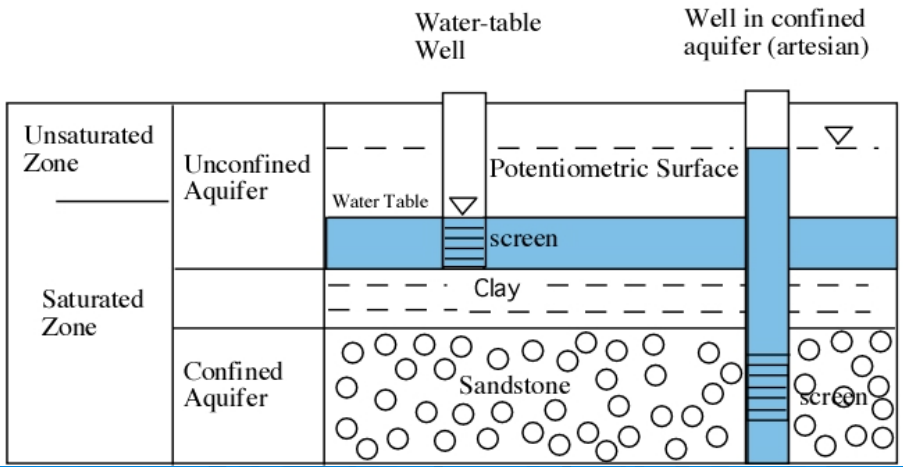


Aquifer defined: A layer of rock or sediment that is capable of yielding usable quantities of water to a well or spring.

Two kinds of aquifers:

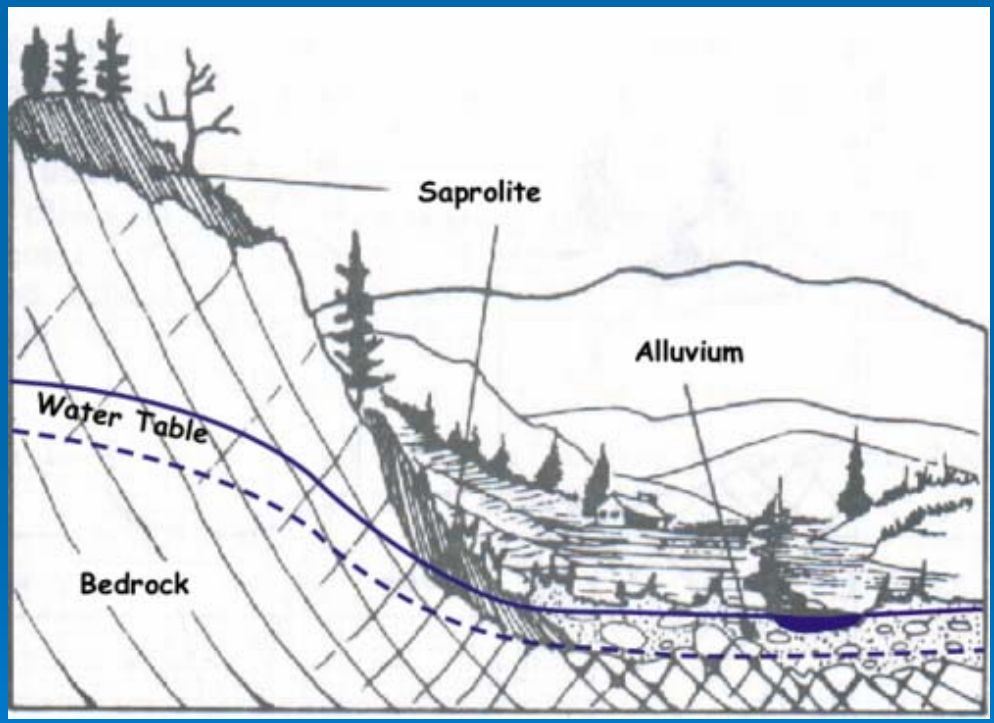
Unconfined: Uppermost aquifer, including soil layer, containing the water table.

Confined aquifer: Overlain by a layer of clay, silt or or lower permeability material under artesian pressure



Aquifers

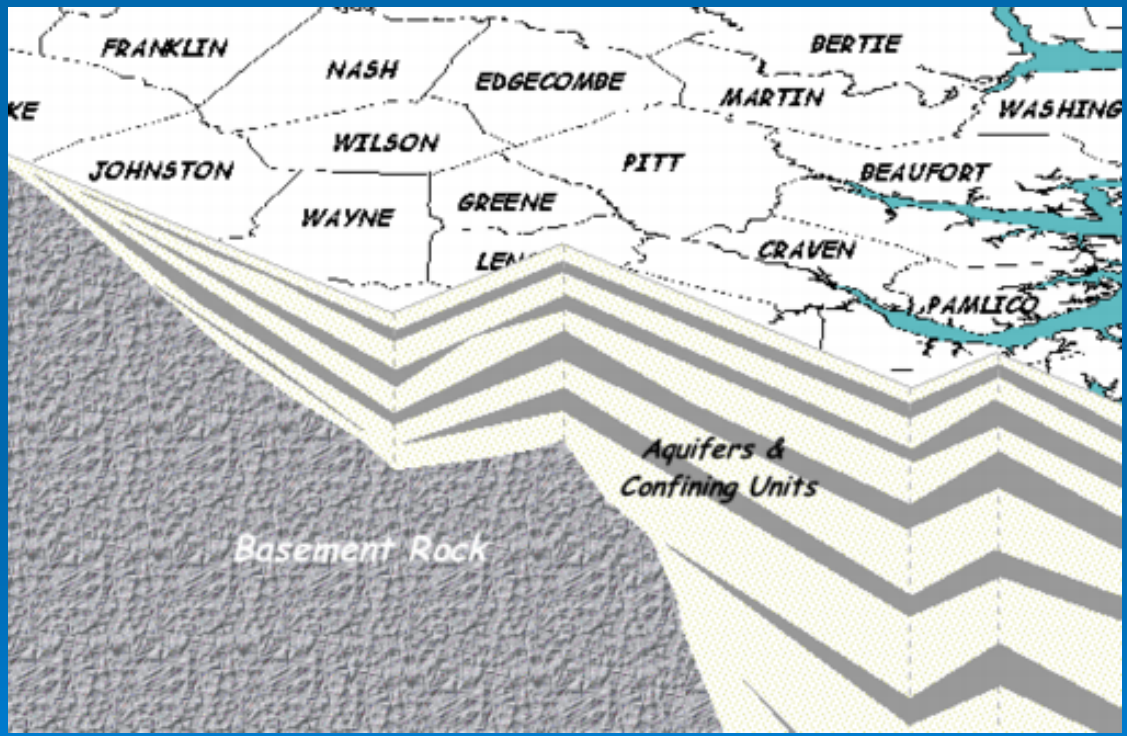
Mountains & Piedmont



- Two-layered aquifer system:
- 1:Underlying bedrock stores and transports water through fractures
- 2:Overlying regolith
- 3: Interconnected
- 4: Both are unconfined aquifers in which the water table is free to fluctuate in elevation.
- 5: Generally not as prolific as coastal plain aquifers

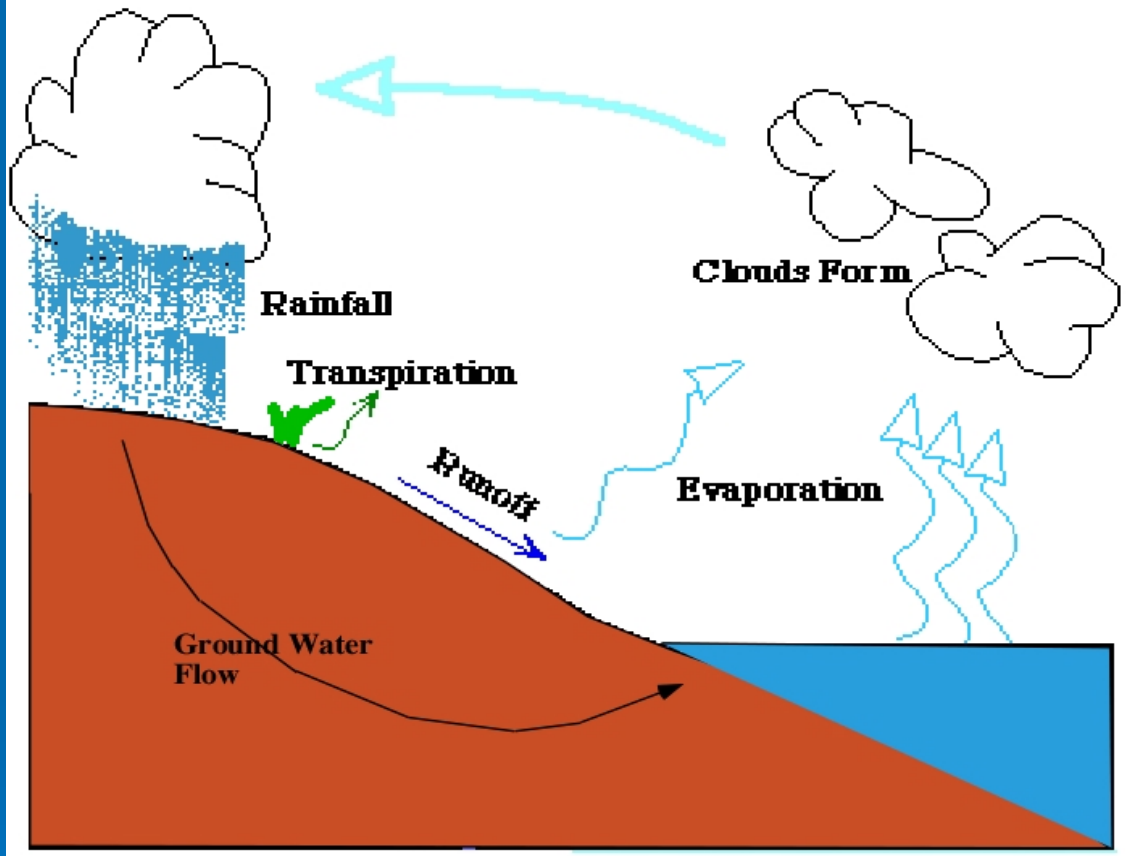
Aquifers

Coastal Plain



- Multiple-layered aquifer system
- Alternating layers of sand, shell materials, limestone, silt and clay
- Uppermost= unconfined or water table aquifer
- Beneath: multiple confined aquifers some of which can yield large volumes of water.

Generalized Annual Water Budget Model For North Carolina



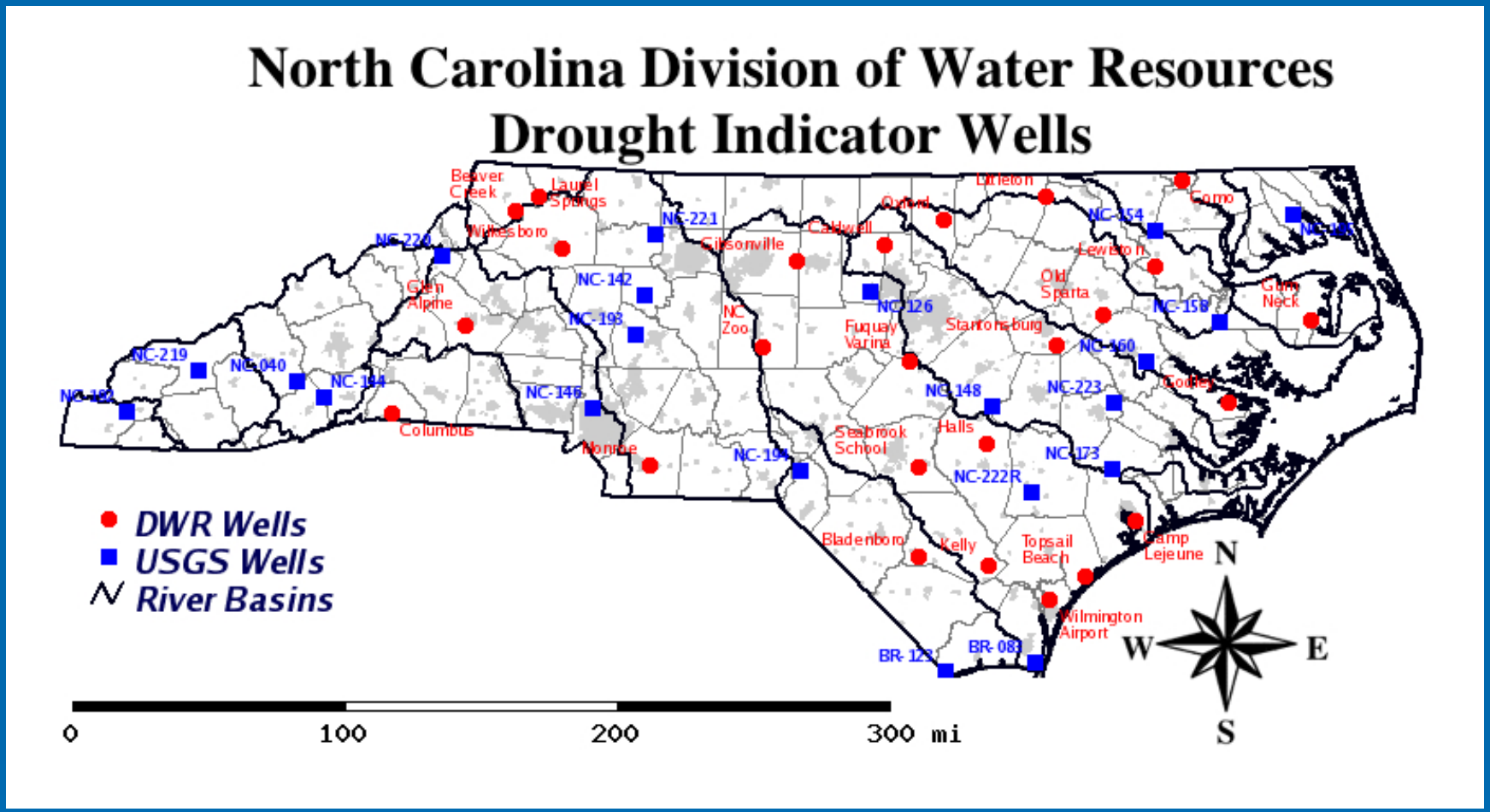
Rainfall: Average 50 inches per year across State of North Carolina

Evaporation and transpiration loss: average **60 per cent** or 30 inches per year

Runoff to surface water bodies: 8 inches per year or **16 per cent**

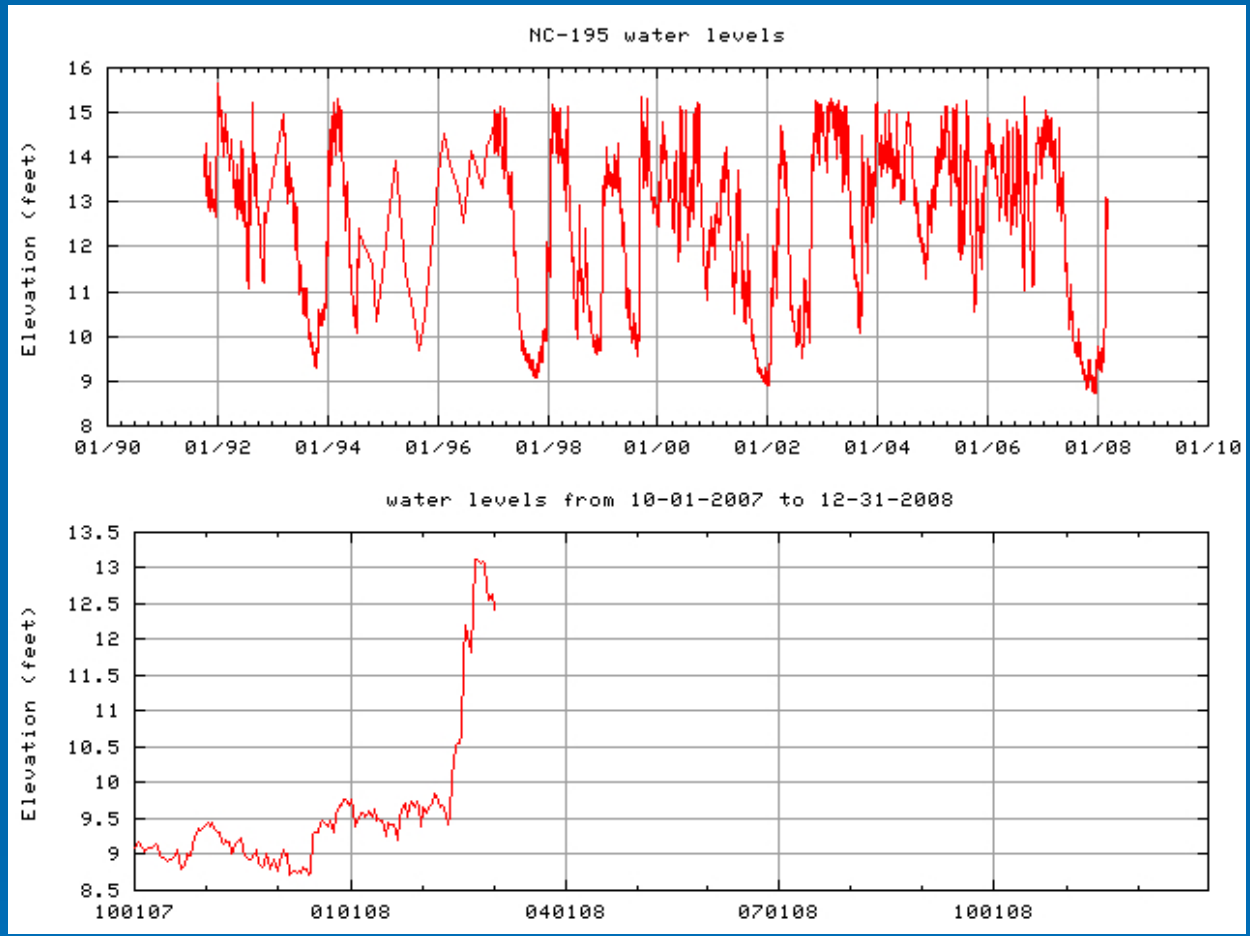
Ground Water Recharge to surficial aquifer or water table: 12 inches per year or **24 per cent**

Coastal Plain confined aquifers: Only 1 inch or less is available for recharge to deeper confined aquifers

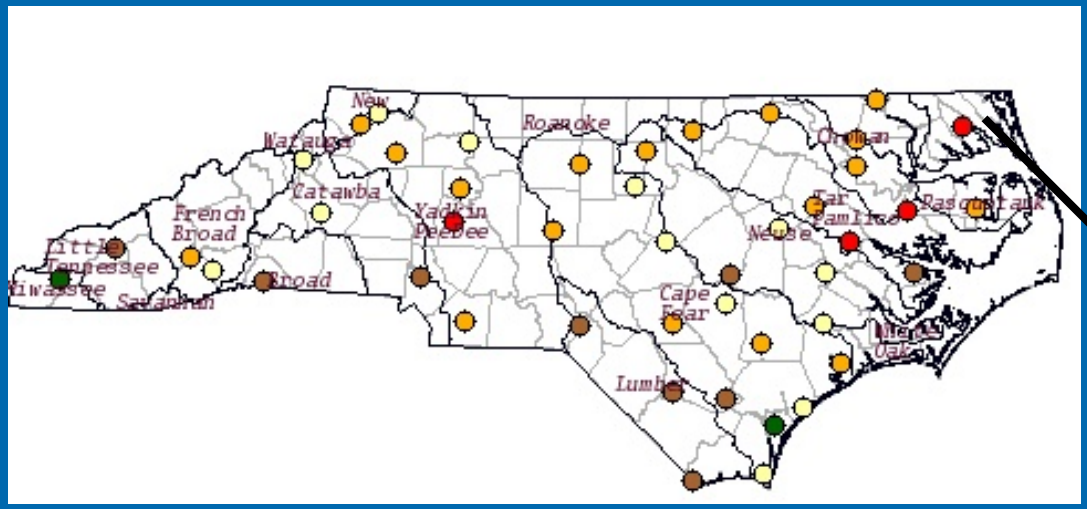


-DWR/USGS 46 well drought monitoring network
-unconfined aquifer (confined aquifers unaffected)
-periodic water level measurements
-effects of changes in rainfall/recharge on ground water levels across the State

Hydrograph



Drought network well NC-195 Elizabeth City, NC (below minimum for 1-2008)



Drought network well NC-195 Elizabeth City, NC (below minimum for 1-2008)

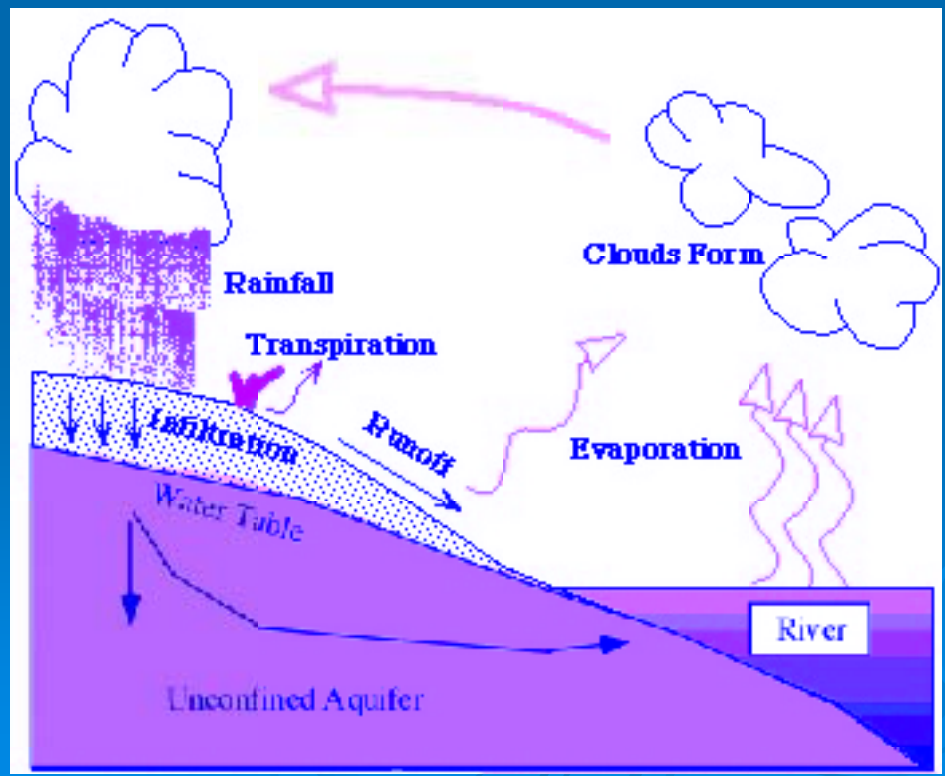
How most recent water levels in 46 well network compare to historical monthly water levels

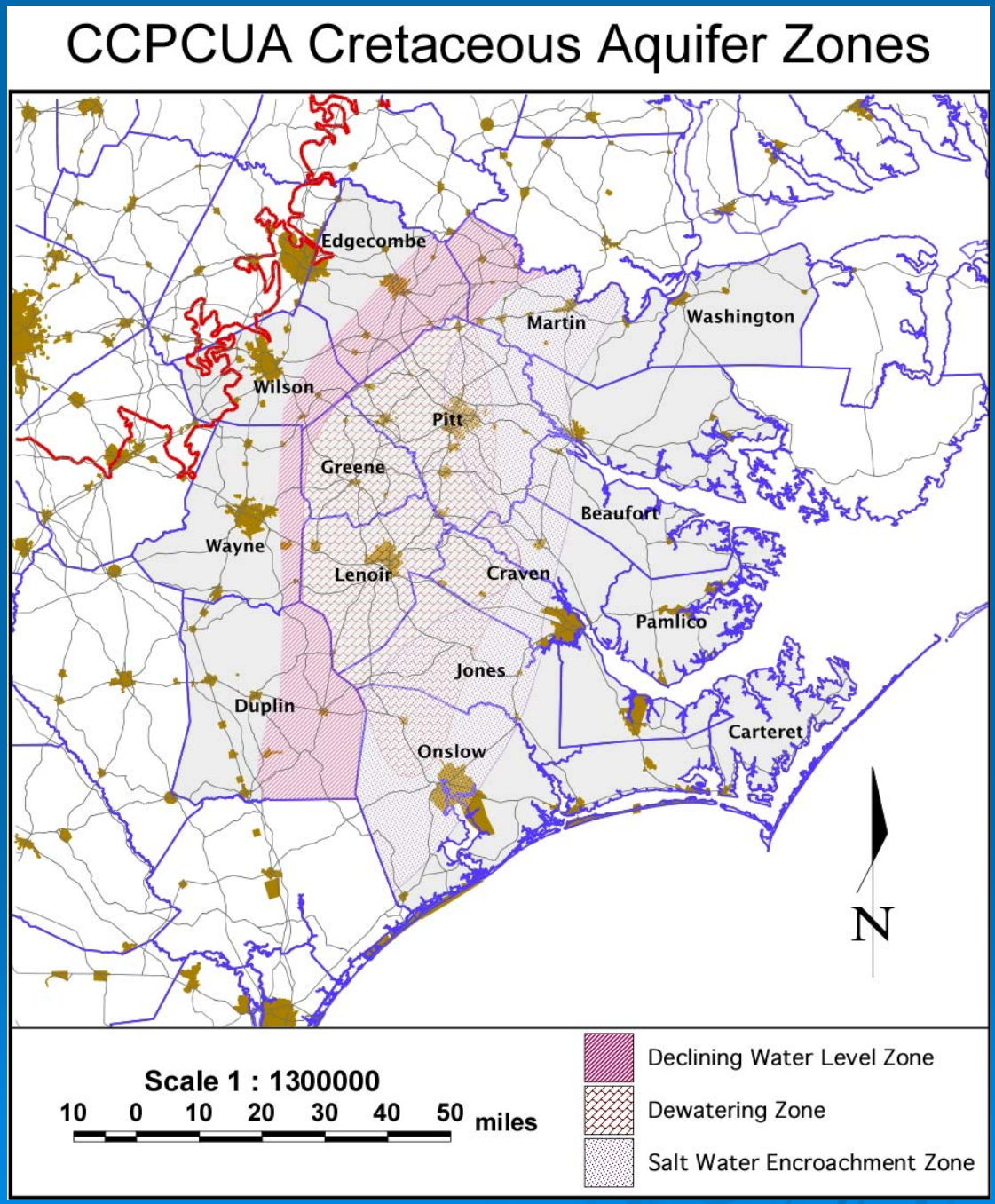
2 Above 50th percentile: Green
9 Below 50th percentile: Brown
18 Below 25th percentile: Gold
13 Below 10th percentile: Yellow
4 Below minimum: Red

Drought Conditions:

Reduced recharge to unconfined aquifer in North Carolina, thus water levels are lower than normal. Some wells at historic lows

Reduced recharge= reduced base flow to streams, rivers and lakes.





Central Coastal Plain Capacity Use Area

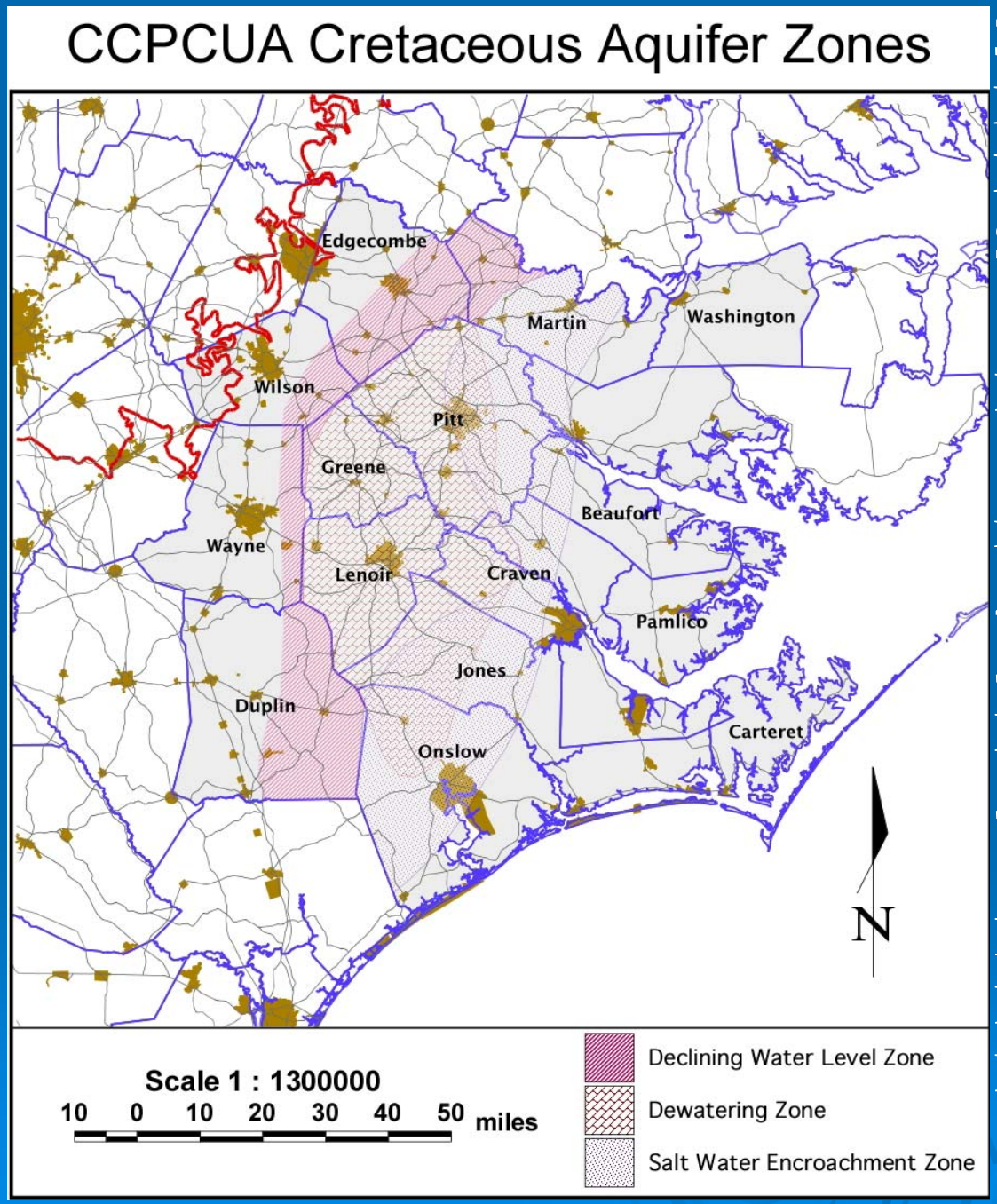
-covers 15 counties in Coastal Plain

-to protect aquifers from overpumping

-CUA permit required for pumping >100,000 gpd from any aquifer

-registration required for 10,000-100,000 gpd

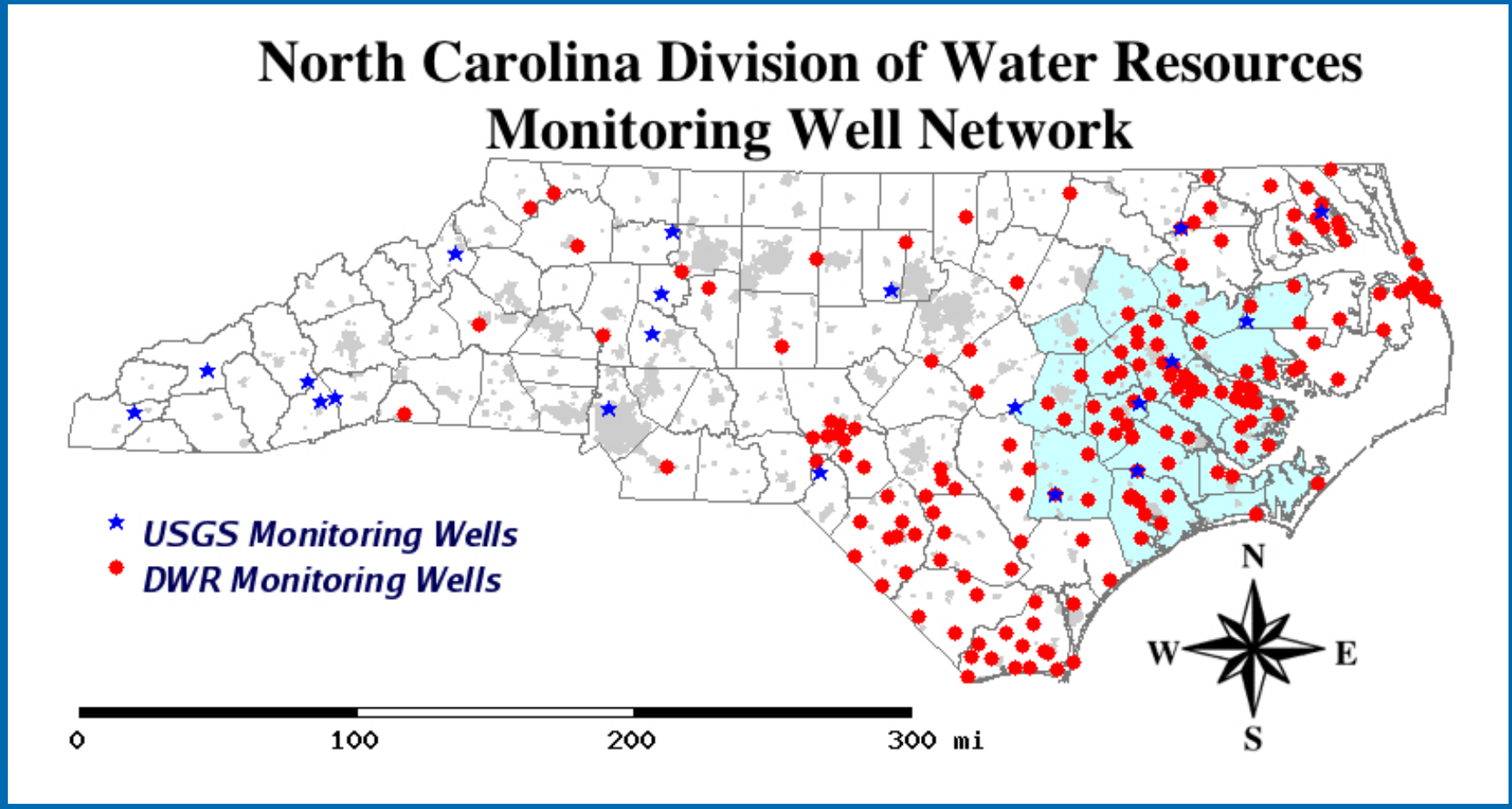
-reduction requirements for Black Creek and deeper aquifers



3 zones established:
Declining water level zone
Dewatering zone
Saltwater encroachment zone

Reductions in 3 phases
1st phase: pumping base rates established
2nd phase: 10-25% reductions
3rd phase: 20-50% reductions
End of 3rd phase:
30-75% reductions

Phase 1: 6 years from 2002
Phase 2: 2008 to 2013
Phase 3: 2013 to 2018



DWR maintains a 548 well monitoring network including the drought network

Monitor drought conditions, progress of CUA regulations in improving wl conditions in coastal plain

Study gw conditions and spot potential problem areas in the State

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Questions?