

## Collaborative Groundwater Studies by the NC Division of Water Quality

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## DWQ's Mission

"Preserve, protect and enhance North Carolina's water and groundwater resources through quality monitoring programs, efficient permitting, responsible management, fair and effective enforcement and excellence in public service."

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## Resource Evaluation program

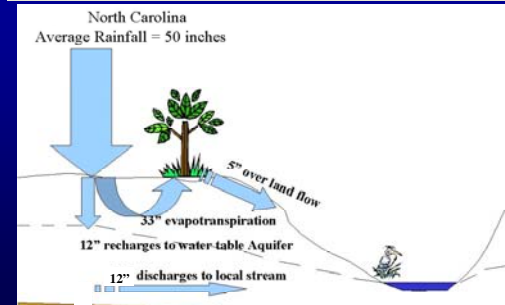
- Part of a program of hydrogeologic investigations to answer:
  - What is the ambient groundwater quality?
  - What threats are there to groundwater users, and how can they protect themselves?
  - How do permitted activities affect groundwater quality?
  - What impact does groundwater have on surface water quality?

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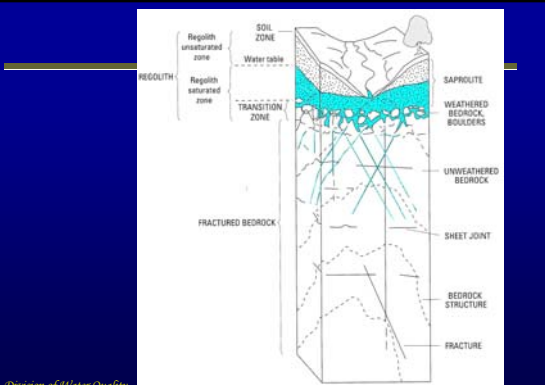


## Hydrogeology 101 (Piedmont-Mtns Edition)



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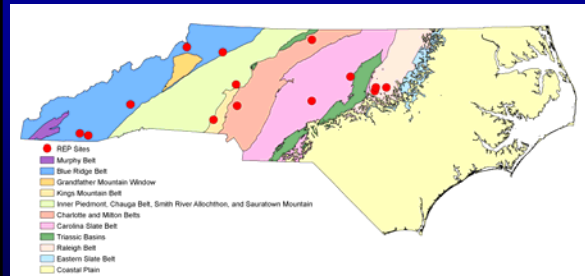


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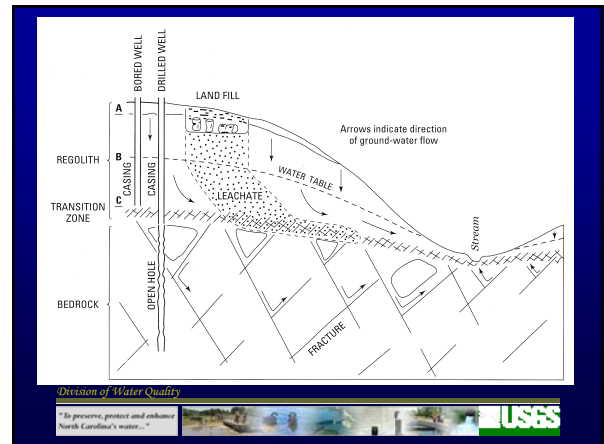
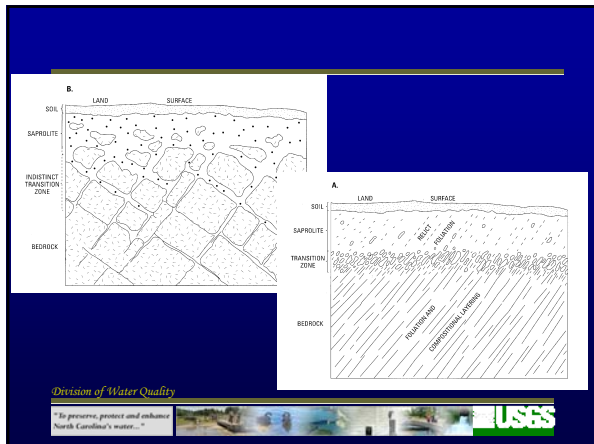
## NC Geology



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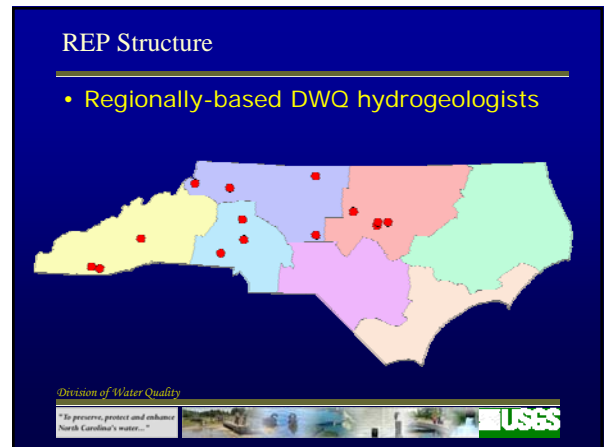




### Resource Evaluation program

- Part of a program of hydrogeologic investigations to answer:
  - What is the ambient groundwater quality?
  - What threats are there to groundwater users, and how can they protect themselves?
  - Are regulations sound and defensible?
  - What impact does groundwater have on surface water quality?

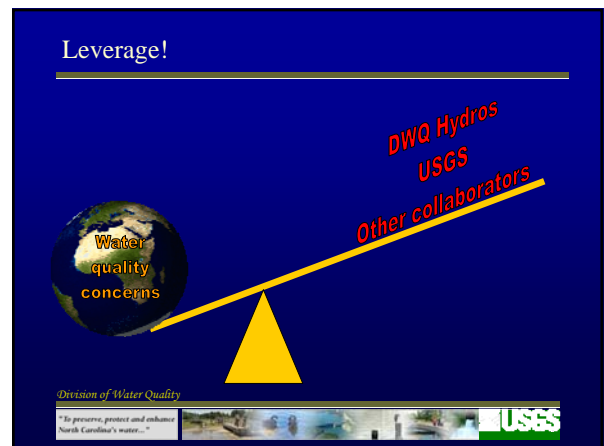
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### REP Structure

- Regionally-based DWQ hydrogeologists
- DWQ drillers - Groundwater Investigations Unit
- Collaborators:
  - USGS
  - Universities
  - NCGS
  - Local governments
  - Other agencies

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## Investigation Methods

Tachyte plot

Stereonet plots

Primary (red) and contributing (blue) fractures and geologic features (green) (fracture or minor rock types)

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## Investigation Methods

Groundwater age-dating by atmospheric tracers

Real-time water-level and water-quality monitoring

(Melinda Chapman – USGS)

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## Investigation Methods

Waterborne continuous resistivity profile suggests nitrate plumes beneath the riverbed

Riverbed piezometer sampling confirms nitrate up to ~80 mg/L at ~4 ft beneath the riverbed.

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(Melinda Chapman – USGS)

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## Investigation Methods

- NCP Sites
- Murphy Belt
- Blue Ridge Belt
- Grandfather Mountain Window
- King Mountain Belt
- Inner Piedmont, Chauga Belt, Smith River Albion, and Sawtooth Mountain
- Charlotte and Milton Belts
- Carolina Slate Belt
- Triassic Basins
- Raleigh Belt
- Eastern Slate Belt
- Coastal Plain

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## Investigation Methods

- Private Well Sampling

- Wells with radon above proposed EPA MCL of 300 pCi/L
- Wells with radon above proposed alternative EPA MCL of 4000 pCi/L
- Wells with uranium above EPA MCL of 30 ug/L

Note: All Ra-226 and Ra-228 analyses were at or below 2.8 pCi/L; all Combined Ra-226 and Ra-228 results were below 3 pCi/L.

(Ted Campbell – DWQ)

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## Investigation Methods

- Private Well Sampling

Probability of Groundwater Sample Exceeding a Concentration of 0.001 mg/L

0.2 0.4 0.6 0.8 1

(Chuck Pippin – DWQ)

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## Putting The Pieces Together

- **Arsenic Initiative:**
  - Duke Forest, NC Zoo, Union County sites
  - USGS, DHHS, Duke University, local health department collaboration
  - Arsenic probability map
  - Targeted experiments with pumping cycles, well construction, well disinfection
  - Best Practices for preventing arsenic exposure?

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## Putting The Pieces Together

- **Radionuclide Initiative**
  - Collaboration with DENR-DRP & private well owners
  - Dissolved radon probability map (2009)
  - Targeted experiments to reduce radon exposure?

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## Putting the Pieces Together

- **Shape planning, policy and regulation**
  - Contribute data and expertise to management of surface waters
  - Recommend regulation and policy improvements
- **Education and outreach**
- **Statewide scope**

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## More Information

[www.ncwaterquality.org/gwp/](http://www.ncwaterquality.org/gwp/)

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