



# Haw River Assembly

Defending the river since 1982.



Elaine Chiosso  
Haw Riverkeeper

[www.hawriver.org](http://www.hawriver.org)

*Working to protect the Haw River  
and Jordan Lake*

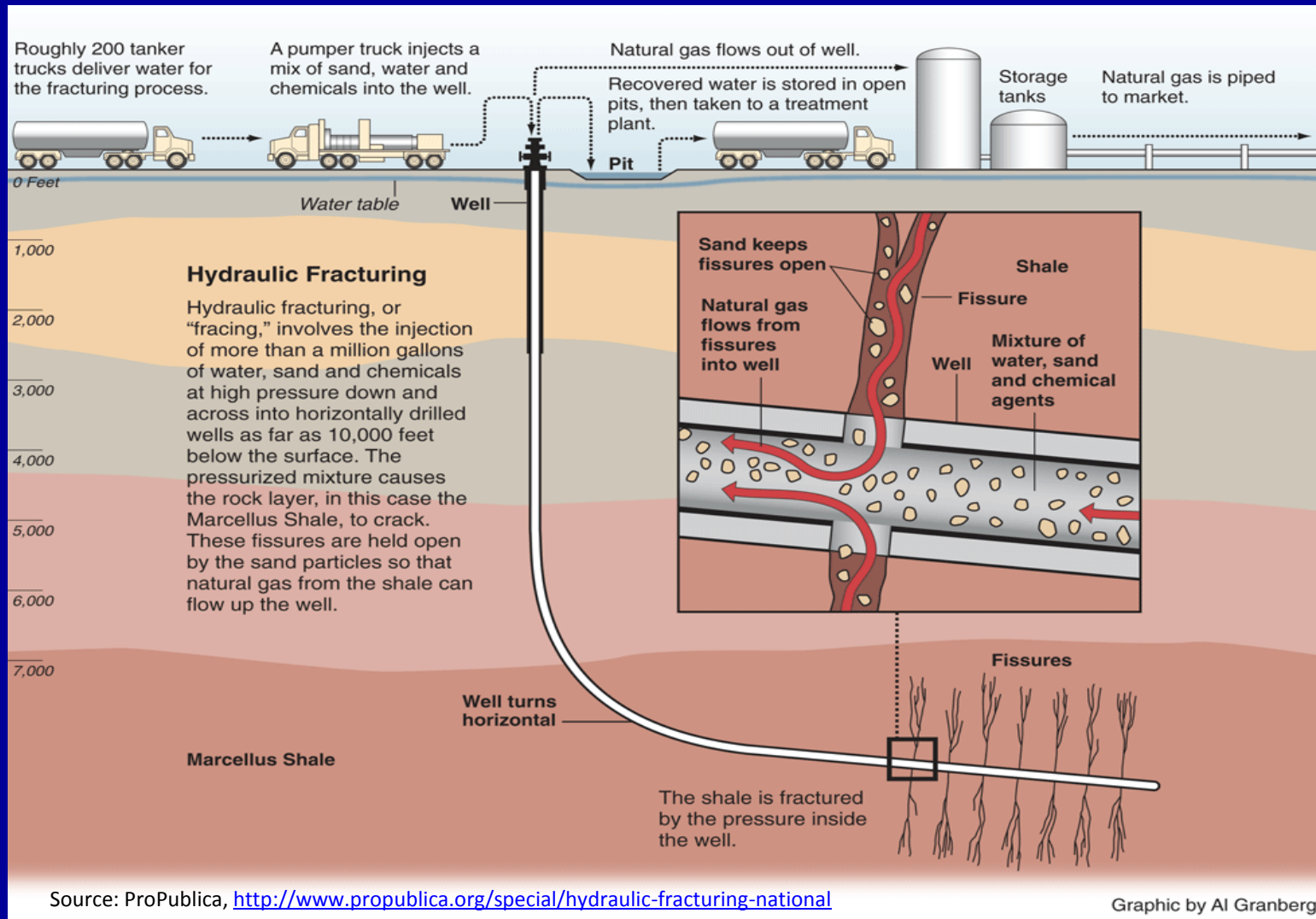


# Hydraulic Fracturing For Gas—What Could Fracking Mean For NC?



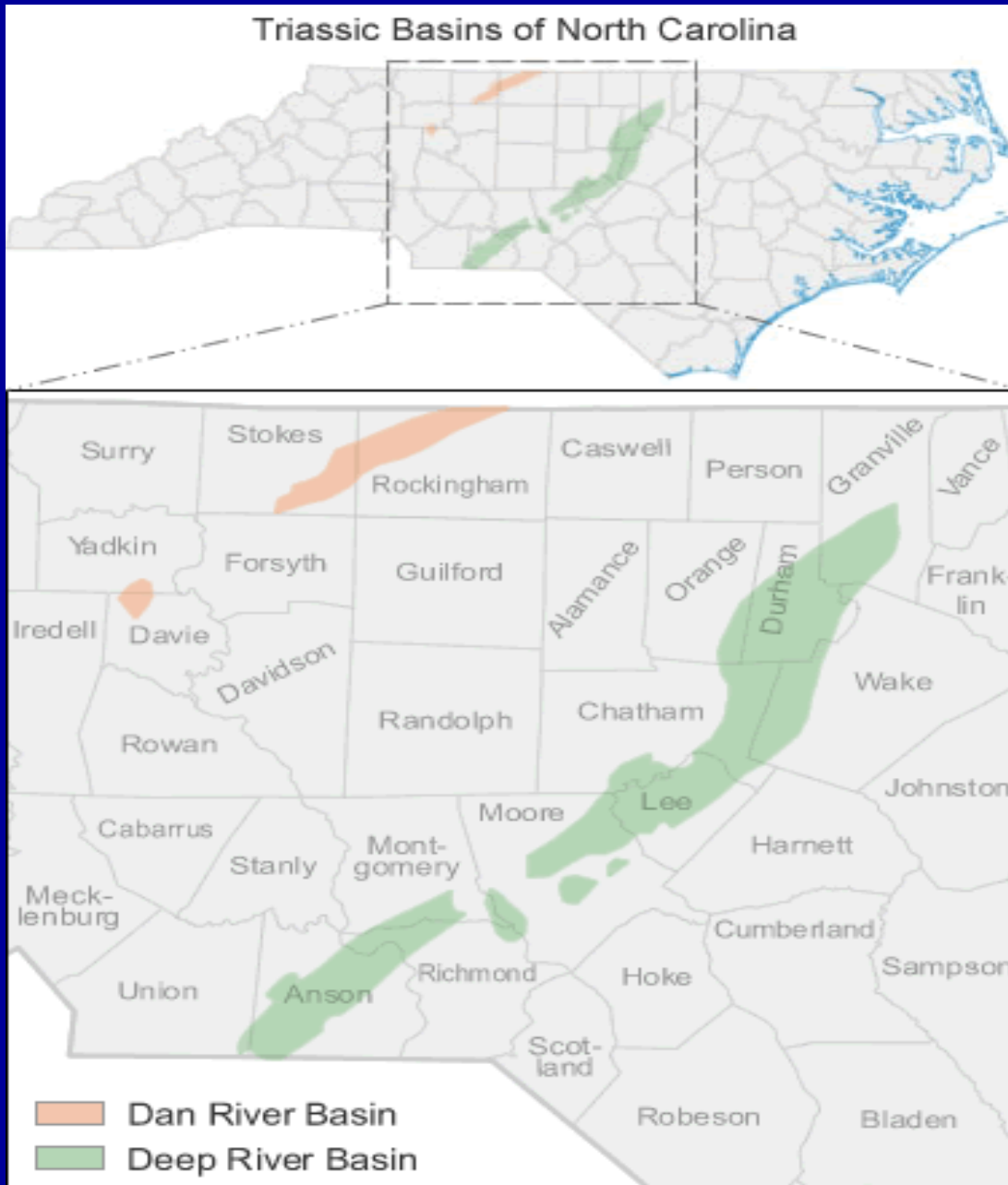
Marcellus shale gas fracking operation in Pennsylvania

# What is Fracking? Extracting natural gas from shale rock by injecting water, sand and chemicals at high pressure down a gas well using "directional" drilling





# Where could fracking happen in NC?



**Current known shale gas basins in NC include land in these counties:**

Anson  
Richmond  
Montgomery  
Moore  
Lee  
Chatham  
Orange  
Wake  
Durham  
Granville  
Davie  
Yadkin  
Stokes  
Rockingham

USGS National Assessment of Oil and Gas Assessment of Undiscovered Oil and Gas Resources of the East Coast Mesozoic Basins of the Piedmont, 2011

"Unassessed" Basins In NC include the Cumberland -Marlboro Basin with land in these counties:

- Scotland
- Robeson
- Hoke
- Cumberland
- Sampson
- Wayne
- Johnston

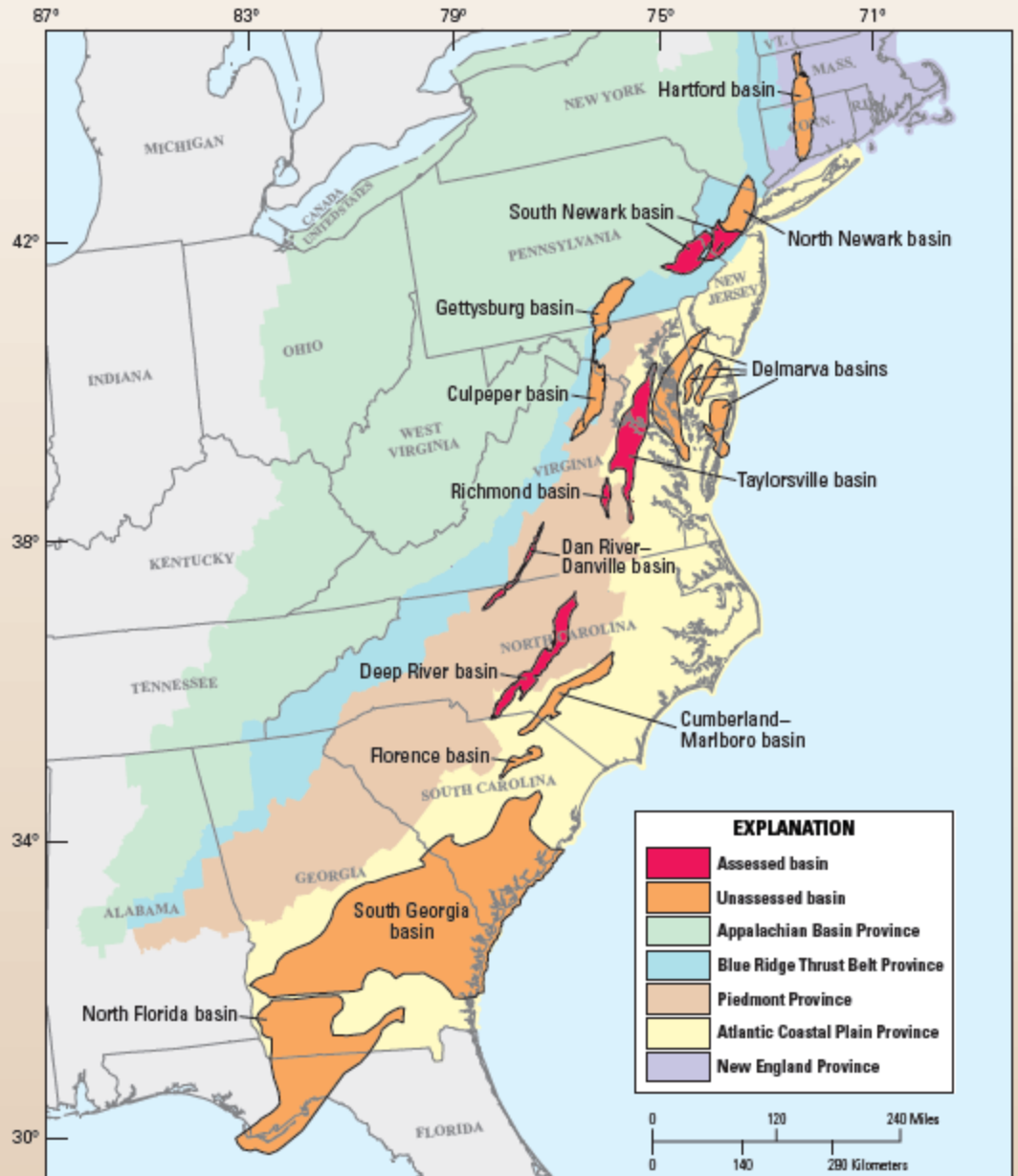
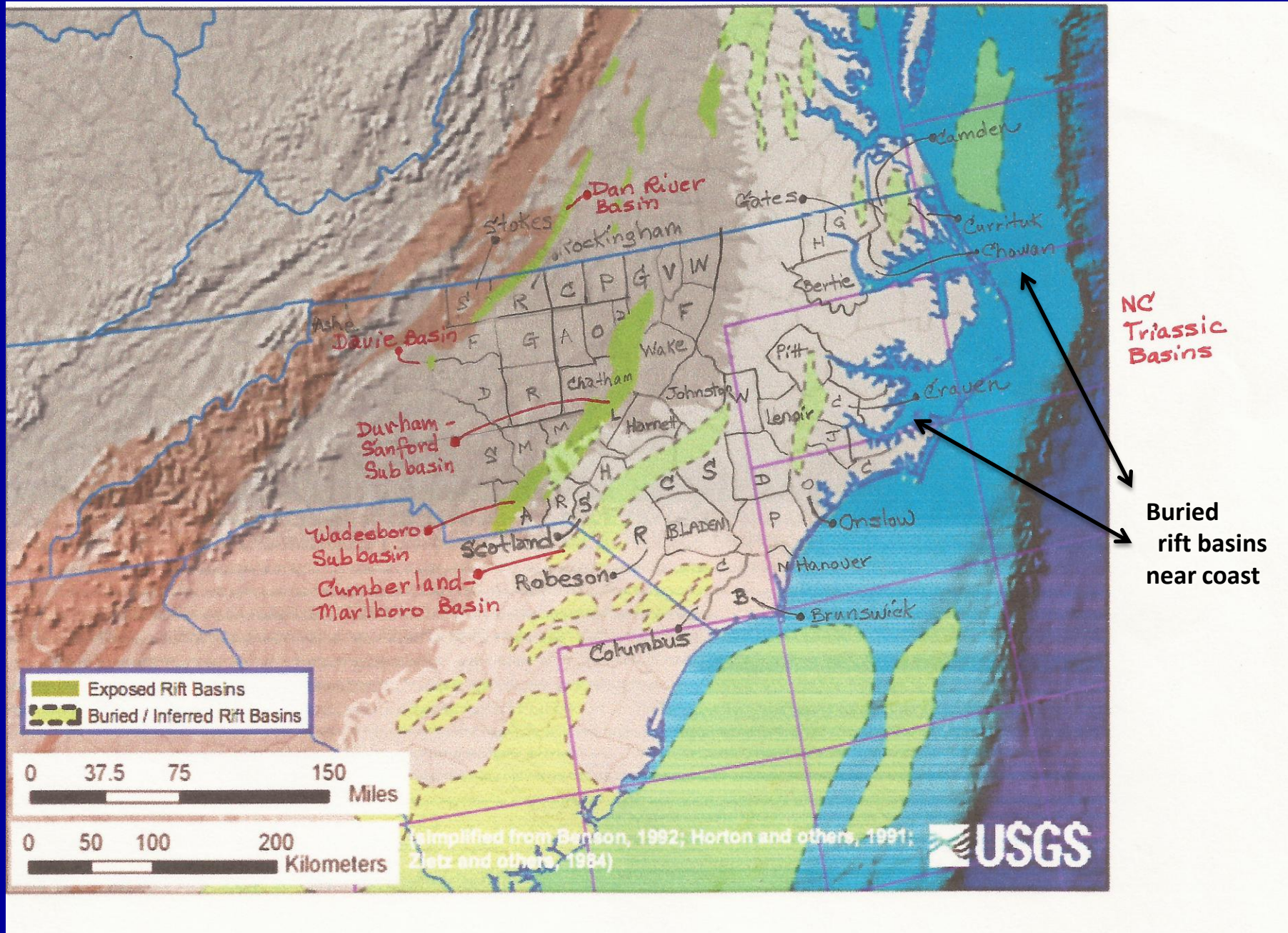


Figure 1. Map of the Eastern United States showing the locations of the five quantitatively (volumetrically) assessed East Coast Mesozoic basins, the nine basins that were not volumetrically assessed, and the U.S. Geological Survey province boundaries. Each basin includes one continuous gas assessment unit (tables 1, 2).



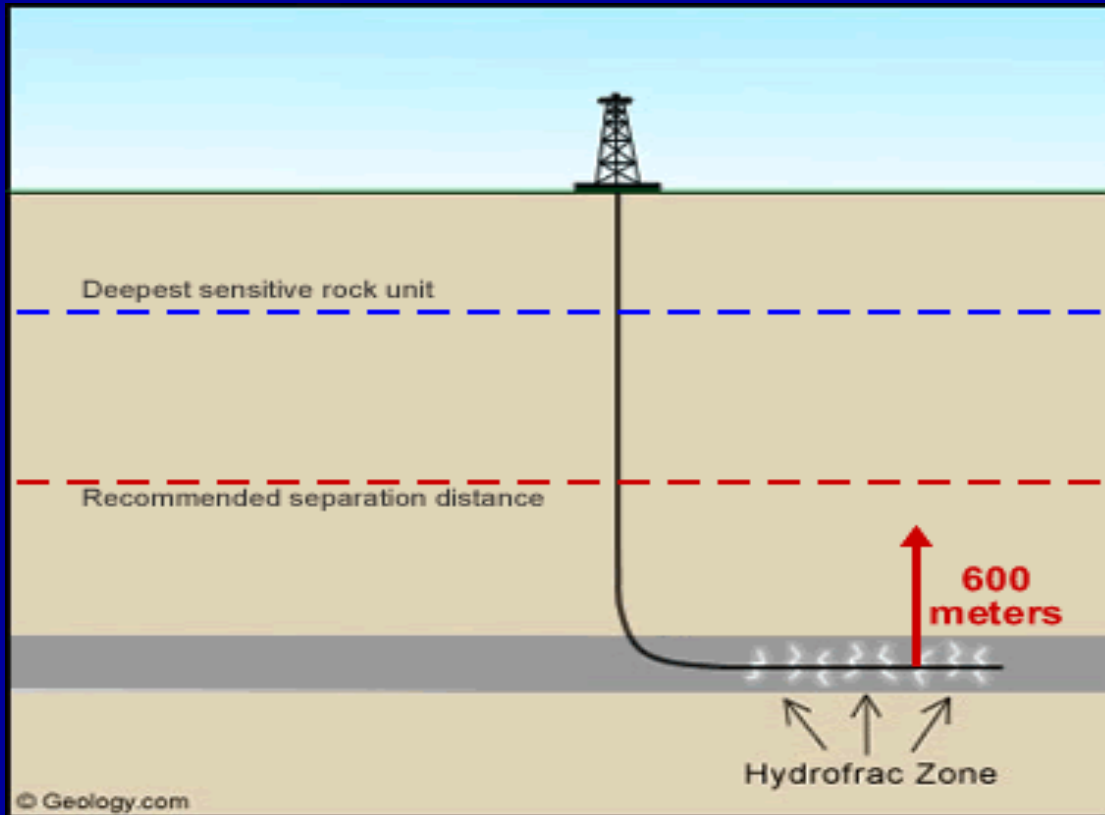


USGS says there may also be "buried rift basins" with shale gas closer to the coast

# FRACKING and WATER CONCERNS:

1. Shallow shale formations in NC: danger of groundwater and drinking water well contamination
2. Surface waters could be polluted by spills, casing failures and other means
3. Huge amounts of water are needed to frack
4. No good solutions for disposal of frack wastewater
5. Infrastructure impacts on NC waters

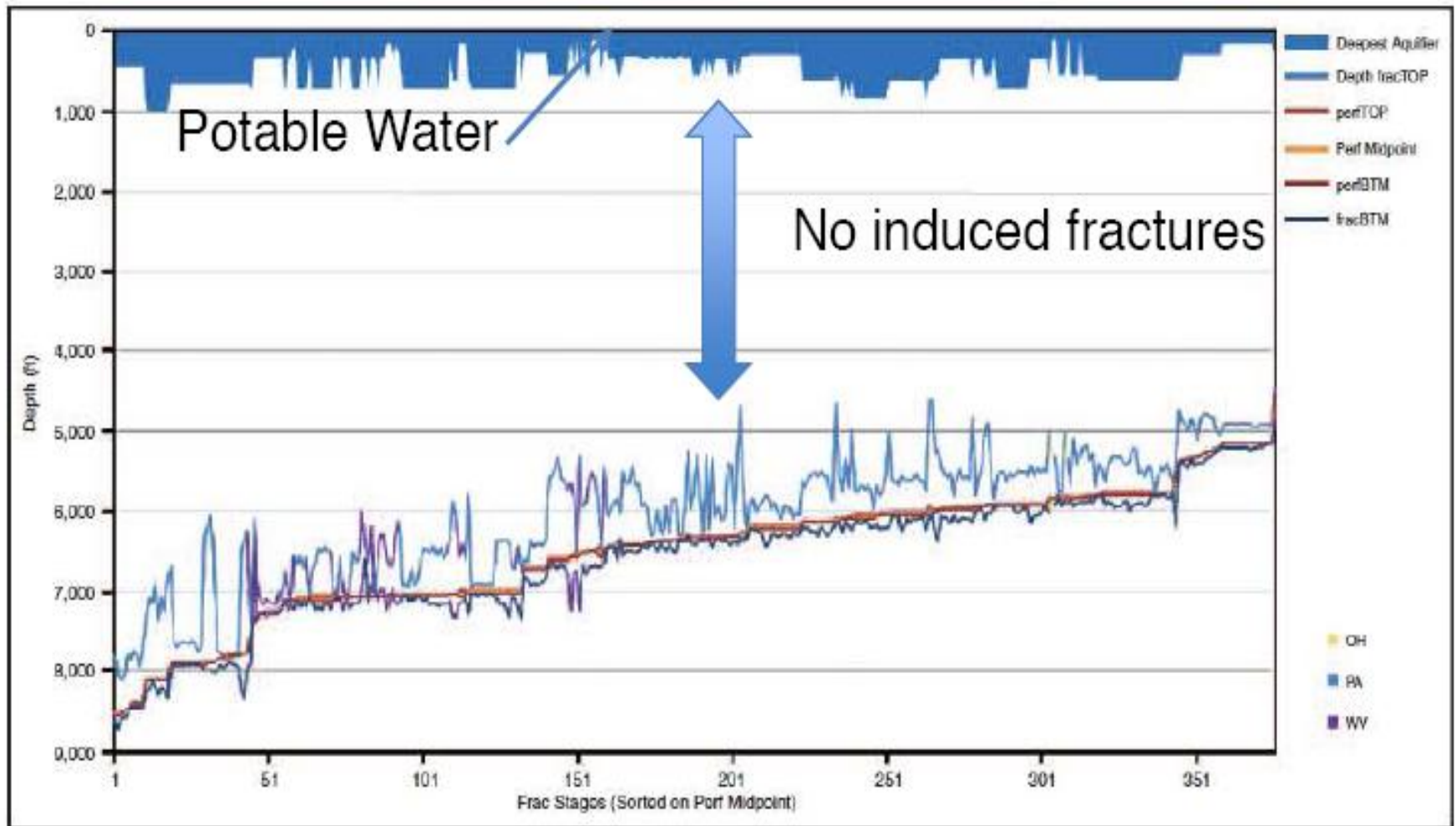
# 1. Concerns about the shallow shale deposit in NC and separation with groundwater



A study by Richard Davies, Durham University, UK, suggests that a separation of at least 600 meters (1,969 ft ) between the hydraulic fracturing level and the deepest sensitive rock will minimize the possibility of ground water contamination caused by the generation of rogue fractures. Deep River shale basins have a 1500' or less separation.



## Marcellus Shale Mapped Fracture Treatments (TVD)



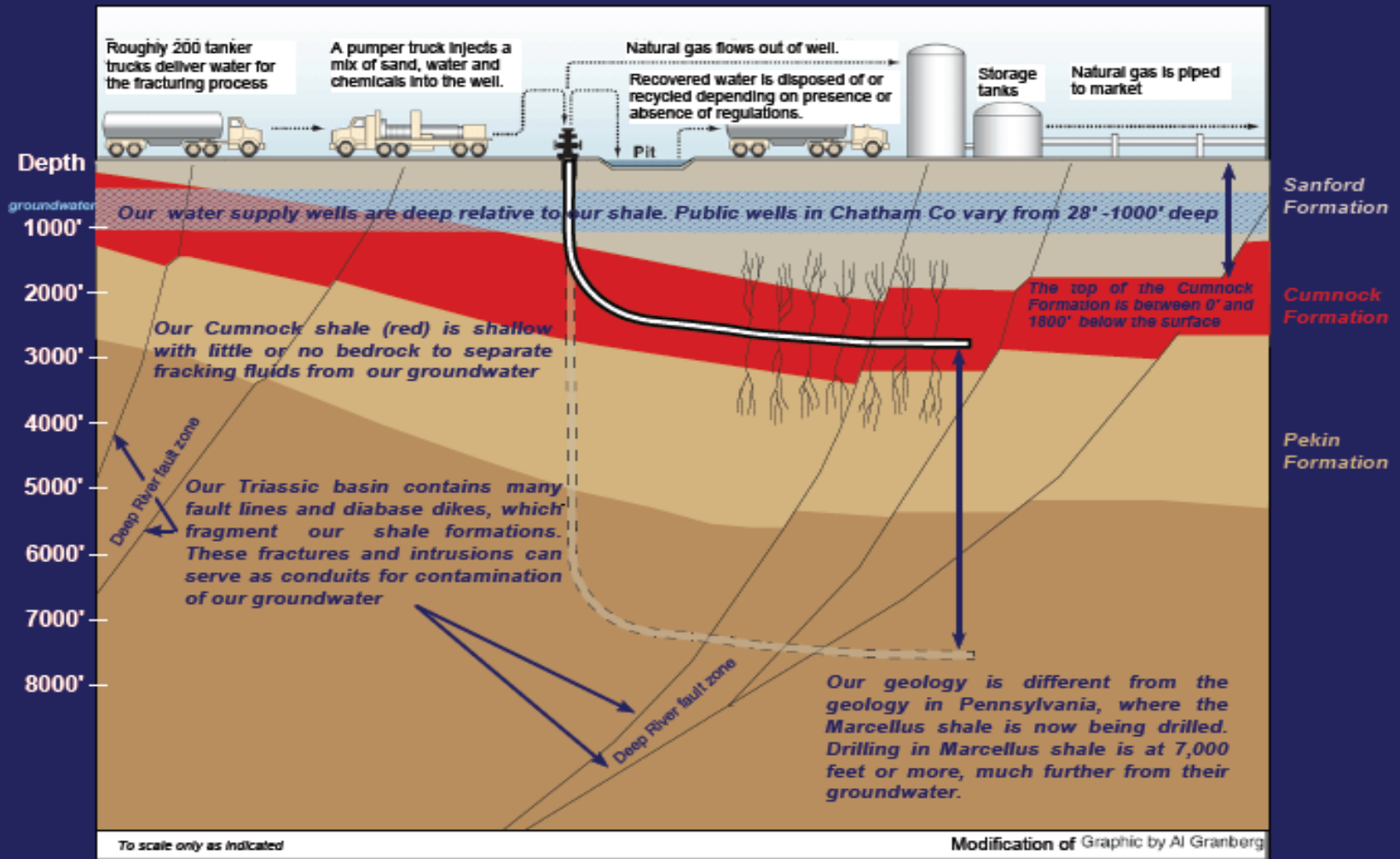
Marcellus Shale Mapped Fracture Treatments  
*Note separation of 4000 - 9000 ft. However, this large separation has not prevented contamination of drinking water wells.*

Red band = Cumnock Formation 0-1800' below surface

Blue band = Drinking Water wells 28- 1000' deep

The Lee County shale gas is much more shallow – little to no separation from groundwater

## North Carolina Shale Geology: Risks to Our Water Supply from Gas Extraction



# Private Drinking Water Well Use in NC

- Nearly 3 million people in NC rely on private wells for drinking water. Since 2006, new wells drilled require initial inspections and tests but **no well inspections or water quality testing is required for existing wells drilled prior to 2006.**
- *We have no good baseline data for water quality in older wells.*

Source: Clean Water for North Carolina <http://www.cwfnc.org/>





# Methane in Drinking Water Wells Linked to Fracking Operations

Osborne, Vengosh, Warner, Jackson Duke University (2011) (1.)

- Methane concentrations were measured highest in drinking water samples from NY and PA water wells within 3,000 feet of active gas operations, **highest when closer**. Isotopic analysis confirmed the source of this high methane in drinking water **to be shale gas from the drilling**, rather than gas from pockets of naturally occurring methane
- Pathways for gas migration to drinking water wells could be badly cased gas wells, abandoned drilled wells or movement through connections with new or existing fractures.
- A new study in June 2013 by Jackson and Vengosh in the journal *Proceedings of the National Academy of Sciences* confirmed the **earlier findings** and found concentrations of contaminants are about 6 fold higher if a resident's water well is within one kilometer of a gas well. (2.)

(1) <http://www.cwfnc.org/documents/Osborn-et-al-2011.pdf>

(2) [http://www.eenews.net/assets/2013/06/25/document\\_ew\\_01.pdf](http://www.eenews.net/assets/2013/06/25/document_ew_01.pdf)

## Second Concern:

# Contamination of Surface Waters

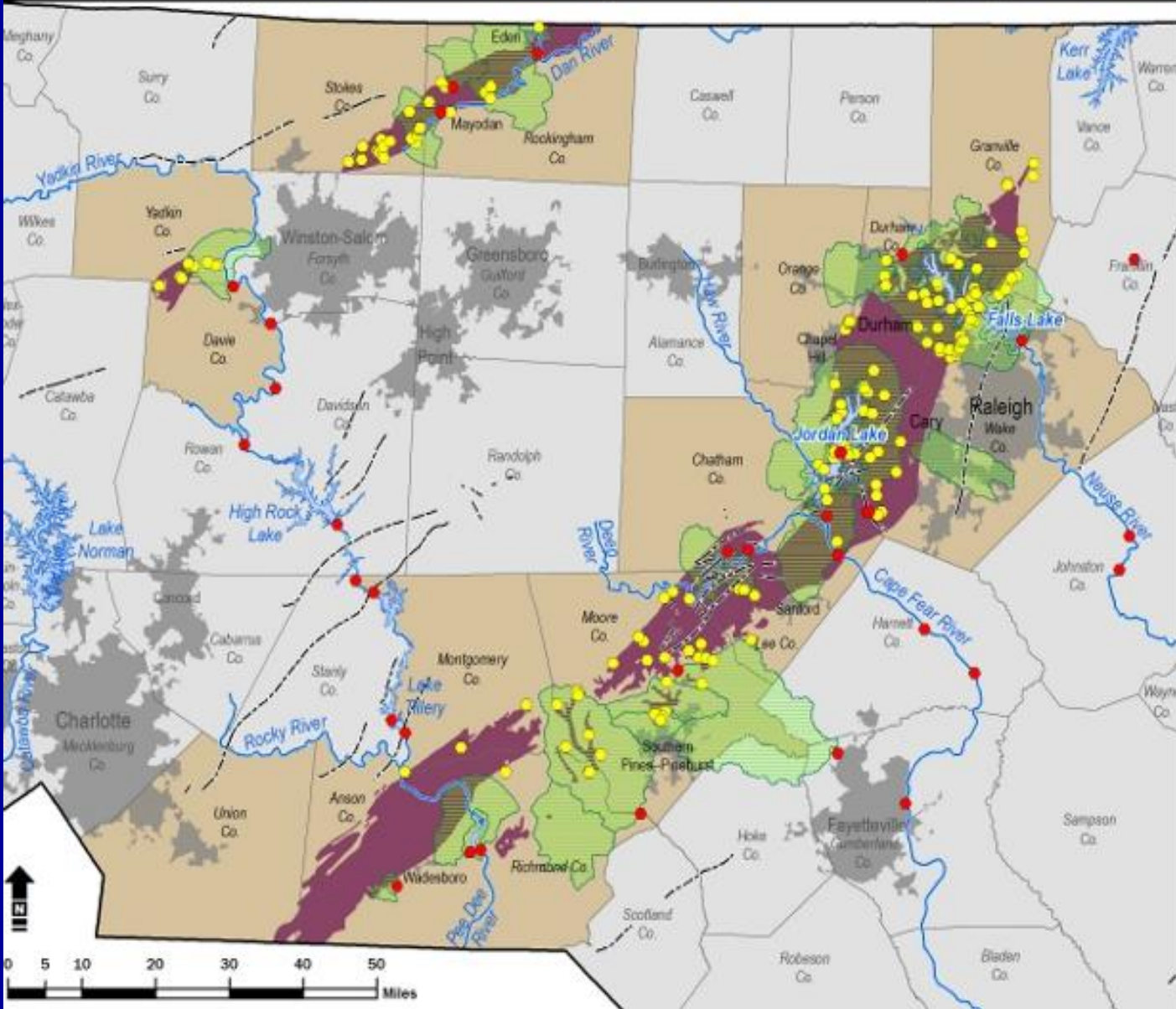
Will surface waters in NC be contaminated by spills of chemicals or fracking fluids at the drill sites, or from runoff from frack wastewater holding ponds?

Recent reports documented deliberate dumping of millions of gallons of fracking wastewater in Greene Co. PA from 2003-2009



<http://www.post-gazette.com/stories/local/state/state-charges-local-company-for-dumping-wastewater-and-sludge-287538/?print=1>

# Hydrofracking Could Impact Water Supply for 2.4 Million People



| Major Public Water Supplies |                     |
|-----------------------------|---------------------|
| <b>Triassic Basin</b>       | <b>Downstream*</b>  |
| Raleigh                     | Winston-Salem       |
| Durham                      | Fayetteville        |
| Cary                        | Wilmington          |
| Sanford                     | Lexington           |
| Apex                        | Greenville          |
| Robeson County              | Rocky Mount         |
| Davie County                | Wilson              |
| <i>Plus 35 more</i>         | <i>Plus 15 more</i> |

- Legend**
- Public Water Supply (Groundwater)
  - Public Water Supply (Surface Water)
  - Public Water Supply Watershed
  - Fault Line
  - Triassic Basins
  - County with Triassic Basin

Created: July 21, 2011  
 Data Sources: NCGS; USGS; NC DEH; NC DWQ  
 \*—Not all downstream sources shown on map





# Third Concern – Amount of Water Used

3.5 million gallons (avg.) of water are used per frack.

Where will it come from?

## Regional Water Supplies?

- Falls Lake supplies water to 450,000 people and Jordan Lake supplies water to over 300,000 people in the Triangle region.
- Water supply, recreational use and wildlife conservation needs are carefully allocated –there is no extra water for fracking.

## From our Creeks and Rivers?

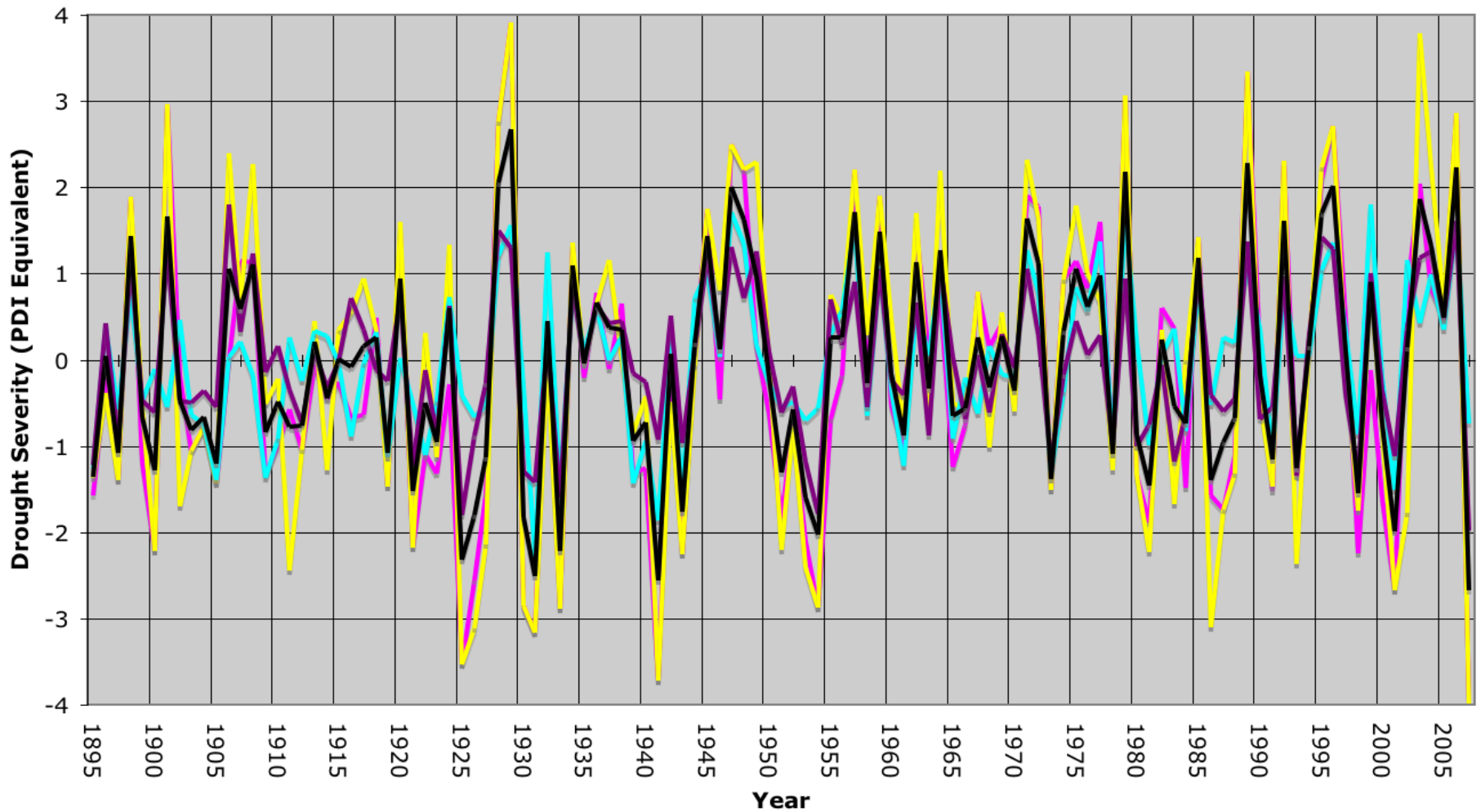
- NC's inadequate laws allow water to be sucked out of streams and rivers by tanker trucks or pipes- with no real oversight.



*Photo of Jordan Lake, HRA*

## NC Statewide Average Drought Indicators

PDSI PHDI SPI3 SPI6 AVG of Indicators



**NEGATIVE VALUES Below Mid-line INDICATE DROUGHTS in NC from 1895 - 2005**

**The Palmer Drought Severity Index (PDSI) Palmer Hydrological Drought Index (PHDI)  
Standardized Precipitation Index (SPI3) (SPI6) and the Average of Indicators— Black line**

*State Climate Office of North Carolina*

# Jordan Lake during 2007 drought





# TEXAS TRAGEDY

## Drought + Fracking leaves people, cattle and ranches without water this summer

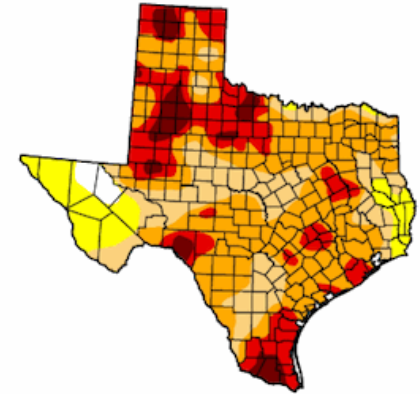
### U.S. Drought Monitor

August 6, 2013  
Valid 7 a.m. EST

#### Texas

Drought Conditions (Percent Area)

|   | None  | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4    |
|---|-------|-------|-------|-------|-------|-------|
| Current                                       | 1.72  | 98.28 | 88.38 | 67.69 | 25.80 | 6.24  |
| Last Week<br>(07/30/2013 map)                 | 2.83  | 97.17 | 87.69 | 65.36 | 25.97 | 5.65  |
| 3 Months Ago<br>(05/07/2013 map)              | 1.45  | 98.55 | 92.13 | 72.82 | 40.58 | 12.88 |
| Start of<br>Calendar Year<br>(01/01/2013 map) | 3.04  | 96.96 | 87.00 | 65.39 | 35.03 | 11.96 |
| Start of<br>Water Year<br>(09/25/2012 map)    | 9.13  | 90.87 | 78.73 | 57.41 | 24.91 | 5.18  |
| One Year Ago<br>(07/31/2012 map)              | 11.39 | 88.61 | 71.64 | 34.32 | 10.47 | 0.75  |



#### Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu>



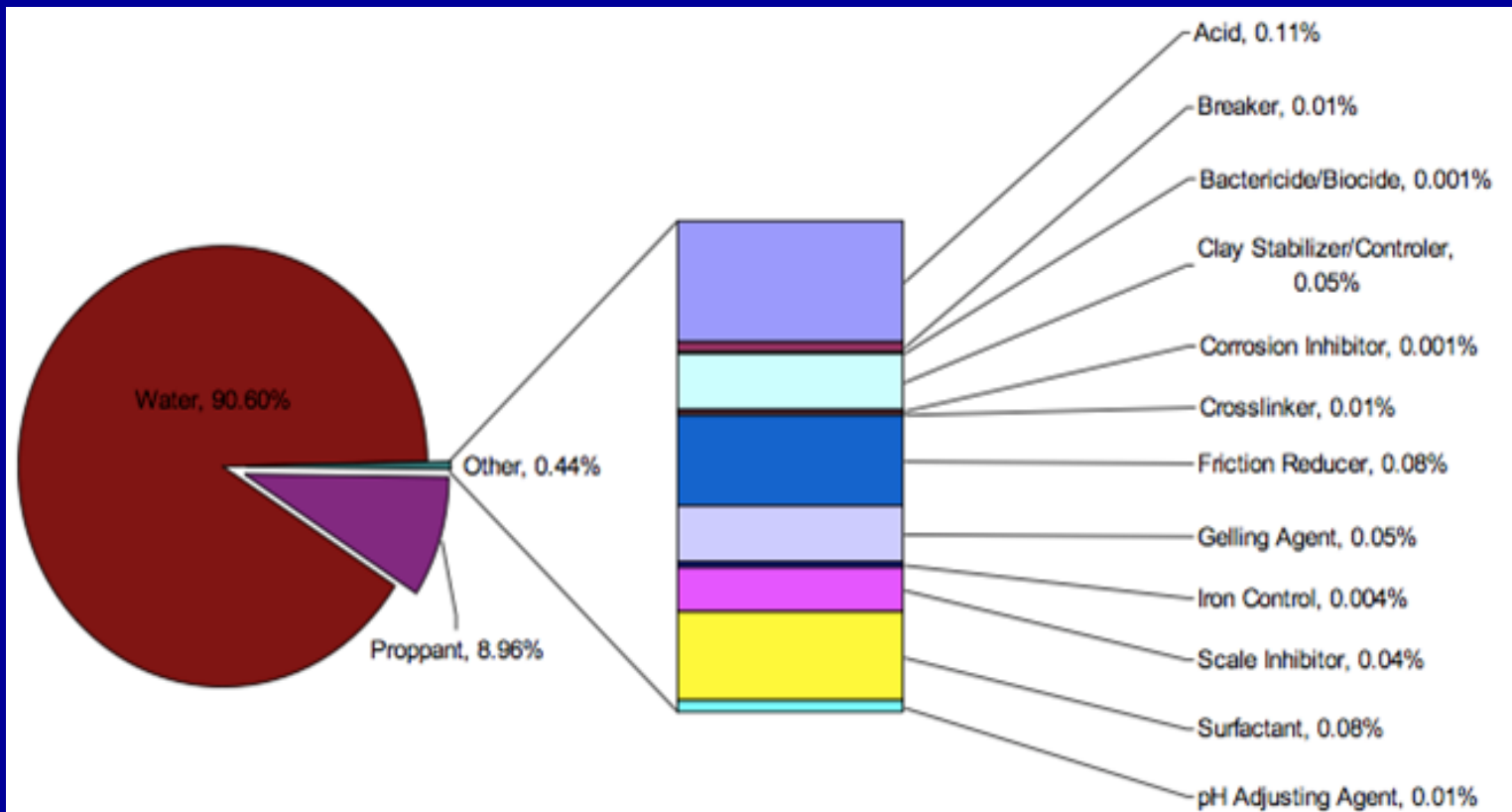
Released Thursday, August 8, 2013  
National Drought Mitigation Center,

It was reported on August 11 that the town well for Barnhart TX has run dry due to extraction of water for fracking, in the midst of a 3 year drought. In Texas alone, about 30 communities could run out of water by the end of the year, according to the Texas Commission on Environmental Quality.

# Fourth Concern:

## Disposal of Contaminated Frack Wastewater

- 20 tons of chemicals, many toxic (and undisclosed) are added to make up the .5% that is not water
- Hydrocarbons, heavy metals, and radioactive isotopes from underground are also in the fracking wastewater



NC has no wastewater treatment facility to deal with "produced water". Using municipal plants in other states for frack water has resulted in toxic effluent releases downstream.\*

**DISPOSAL OF FRAC WATER -  
BY MUNICIPAL WASTEWATER TREATMENT PLANTS  
AND DISCHARGE TO SURFACE WATER**



Courtesy Bill Kappel, USGS

\***Pittsburgh Ban on Frack water:** <http://pittsburgh.cbslocal.com/2011/04/19/drilling-companies-ordered-to-stop-sending-water-to-treatment-plants/> and **NY Times article on this issue:** [http://www.nytimes.com/2012/05/04/nyregion/wastewater-is-an-issue-in-hydrofracking.html?\\_r=0](http://www.nytimes.com/2012/05/04/nyregion/wastewater-is-an-issue-in-hydrofracking.html?_r=0)



# Frack Waste Water Impoundments

Evaporation of chemical compounds from  
frack wastewater = air pollution





Spills?  
Runoff during  
storms?

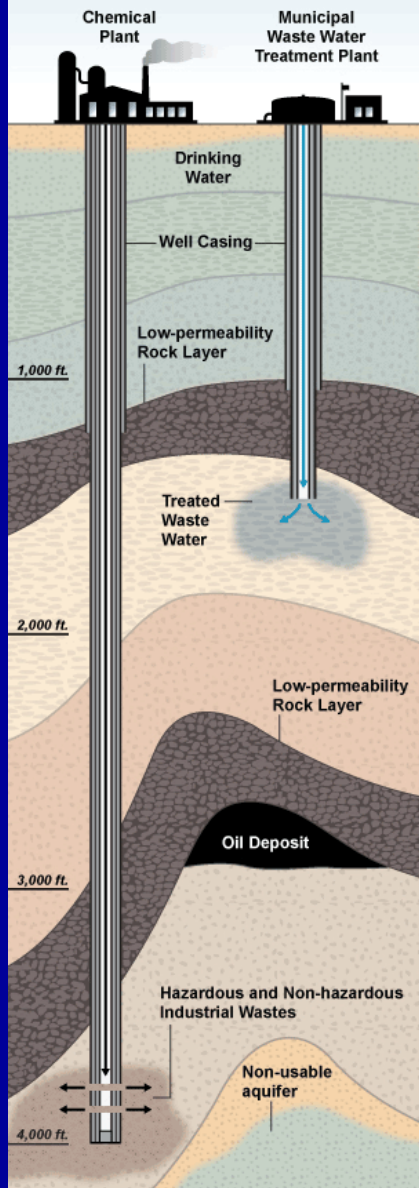
Will frack wastewater  
ponds follow the tragic  
pattern of NC hog  
waste lagoons and  
their pollution of NC's  
rivers?





## Class I Wells

Class I wells inject industrial and municipal wastes thousands of feet below sources of drinking water.



Sources: R. Laurence Davis, Ph.D., University of New Haven; E.P.A. Graphic by Al Granberg

# Deep Underground Injection Wells for Fracking Waste Water *Concerns:*

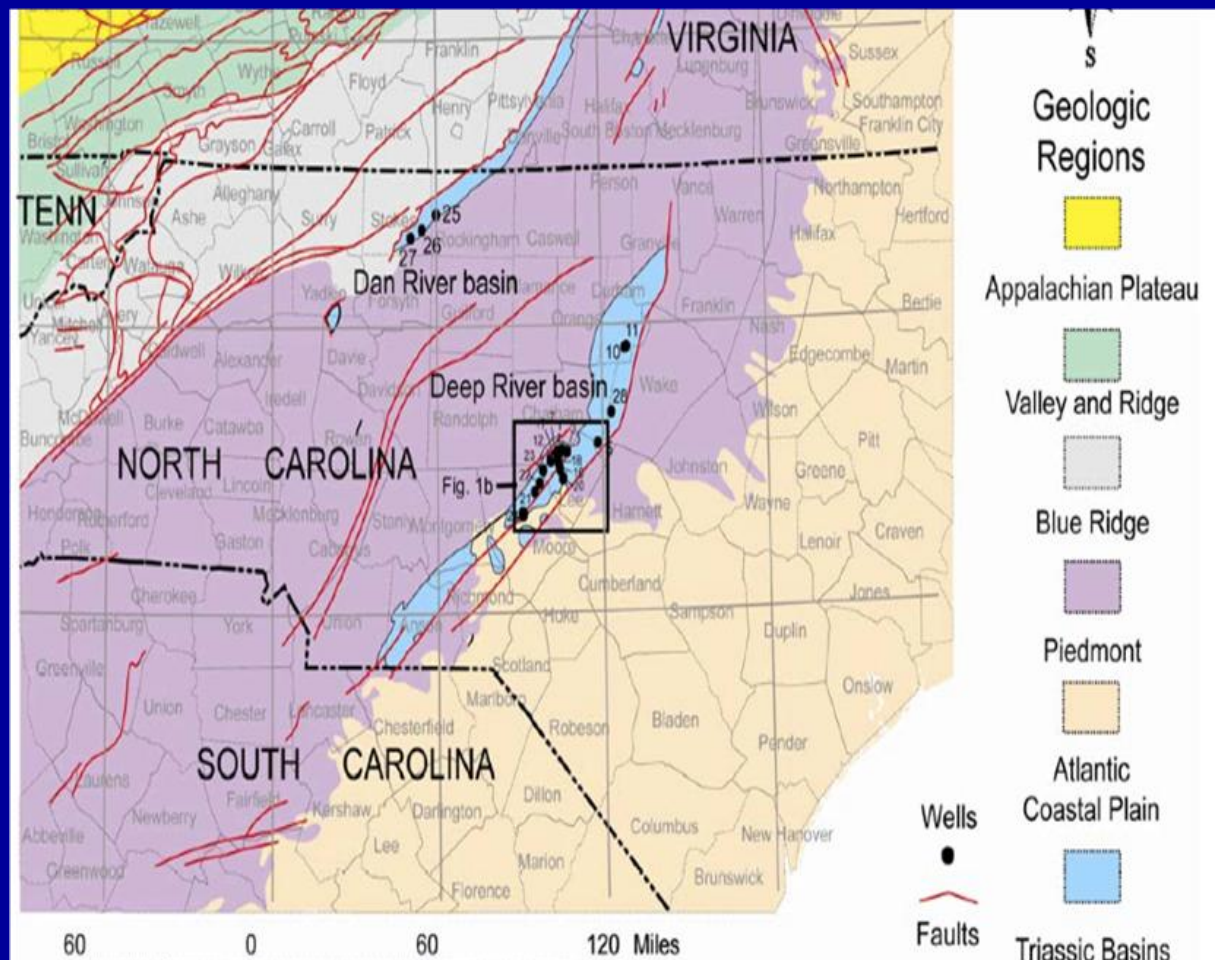
- Structural Failures (casings, etc.)
- Frequent operating violations
- Migration of fluids to surface or to adjacent fractures
- Inadequate testing and data
- Cause of increased seismic activity

*See "Injection Wells – The Poisons Beneath Us" in ProPublica*

<http://www.propublica.org/article/injection-wells-the-poison-beneath-us>



The Piedmont geology is considered too fractured to support deep underground injection of waste fluids – the state is looking at the layered aquifers of the Coastal Plain instead.



# Danger to eastern NC from Deep Injection Wells

## **It was tried before and failed:**

From 1968 to 1972, Hercules industry pumped hundreds of thousands of gallons a day of terephthalic acid into deep injection wells they drilled near Wilmington, culminating in unsustainably high pressure underground that caused them to fail. State officials later found that the chemicals had leached into the area's upper aquifers, a discovery that led to the state's current ban on that type of deep injection wells.

## **Lifting Ban Could Mean Injection of other Hazardous Liquids**

Lifting that deep injection well ban could have far-reaching implications for eastern NC. Many industries and wastewater treatment plants would like to inject waste deep under the coastal plain. And federal commerce law might require NC to accept out of state fracking waste water.

<http://www.starnewsonline.com/article/20130317/ARTICLES/130319696?p=2&tc=pg>

# Fifth Concern –infrastructure impacts on NC land and water quality

Extensive surface disturbance in areas of intensive drilling, new pipelines, gas processing facilities and road building –

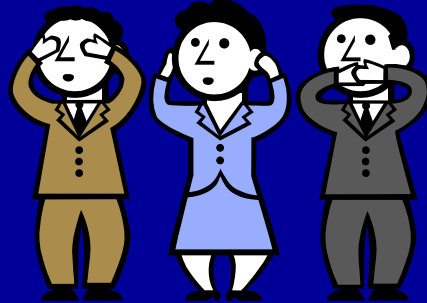






**Liquefied natural gas** or **LNG** is natural gas -predominantly methane,  $\text{CH}_4$ ) that has been converted to liquid form for storage or transport. With the current domestic glut of natural gas in US from shale boom new LNG facilities are being built. Where will new pipelines and LNG facilities be built for shale gas export? Whose land will be taken?

# Who's Watching?



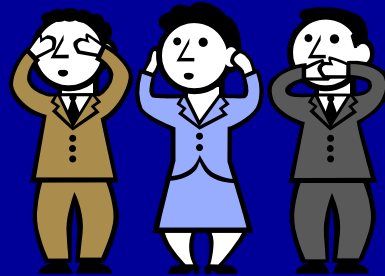
## Lack of Federal Protections: 2005 Energy Policy Act

**Exempts** oil and gas production from major parts of:

- Safe Drinking Water Act
- Clean Air Act
- Clean Water Act
- Emergency Planning and Community Right to Know Act (Toxic Releases Inventory)
- Resource Conservation and Recovery Act (“Superfund”)

***This means the states are in charge of regulation***

# Who's Watching?



## Examples of poor STATE oversight:

- From 2007-2010, Pennsylvania Dept. of Environmental Protection data: **9,370 violations at 3,661 wells.** Over 70% of these were serious violations that could impact water.
- Arkansas Public Policy Panel, Sept 2011 Report, 2006-2010 data **Companies out of compliance 54 percent of the times inspected.** Violations found in more than half of 247 routine inspections. Over 1,000 wells never inspected.



# Air Pollution, Health, Living Conditions

- **Air Pollution:** Areas of intense gas extraction and transmission: flaring of wells, “fugitive” emissions and emissions from condensate, tanks, compressor stations.
- **Industrialized Landscape:** High noise level from fracking operations, bright lights at night, 24/7 for weeks or months, heavy truck traffic.
- **Health Problems:** Due to air pollution or well water contamination, mental health issues from degraded environment. Lack of adequate health monitoring.
- **Boom and Bust cycle of fracking** operations has caused high housing prices and shortages, increases in emergency needs, and increases in crime in other parts of the country.



# Industrialization of Rural Areas

## Fracking in Pennsylvania and Northeast US

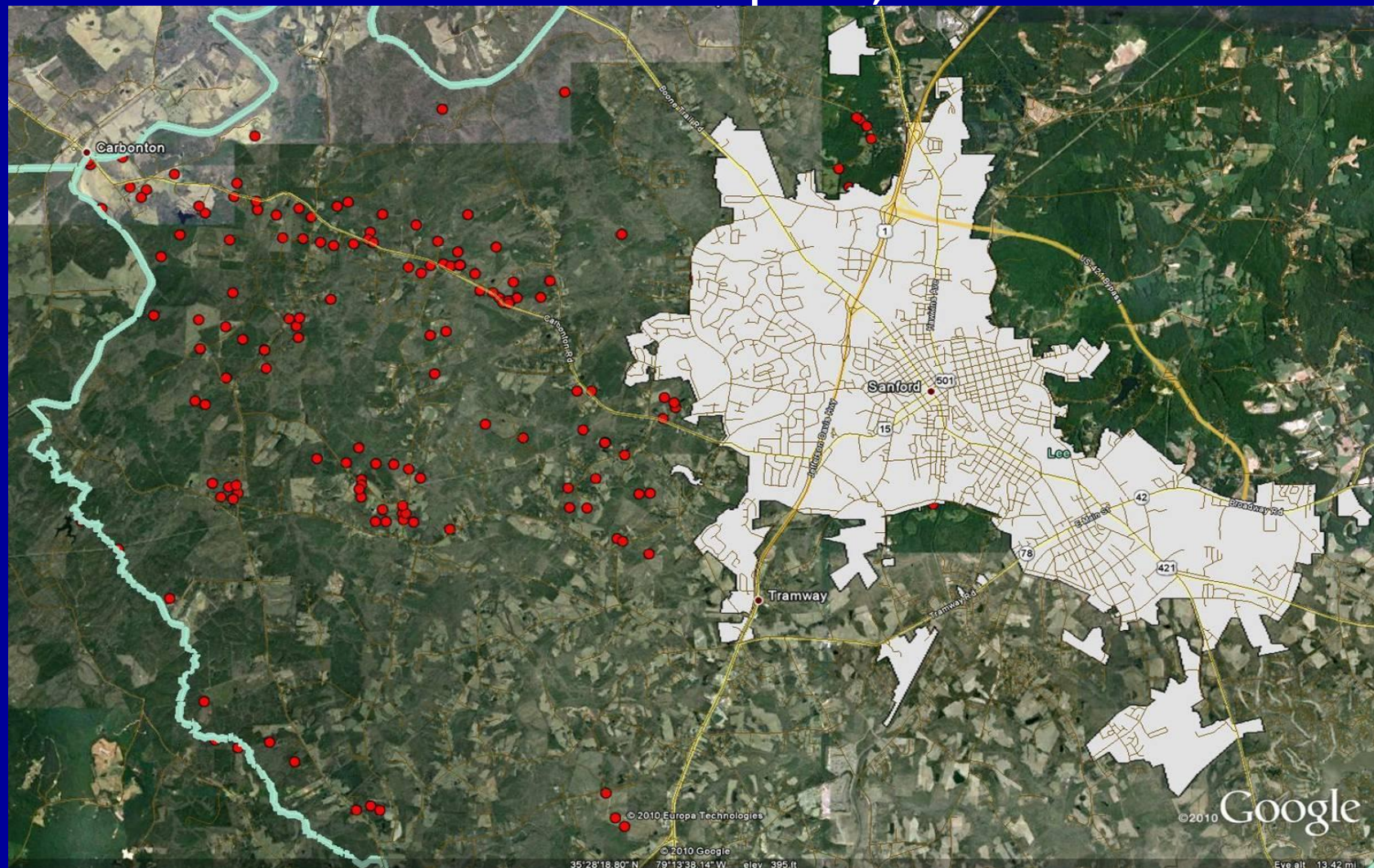
Slides courtesy of <http://www.marcellus-shale.us/>





# Environmental Justice Issues

Many low income residents on wells live near land leased for mineral rights in Lee County – **red** dots indicate new mineral rights leases, blue line is the Deep River, with Chatham on left





# Property Rights and Split Estates

If you don't own the mineral rights beneath your land, those mineral rights can be sold to and fracked by shale gas company, with no consent from you – or profits.

If you own your surface rights but not the mineral rights you have a "Split Estate"  
Some banks and lenders will no longer give mortgages to landowners of split estates, including SECU.

# Do You Own Your Mineral Rights?

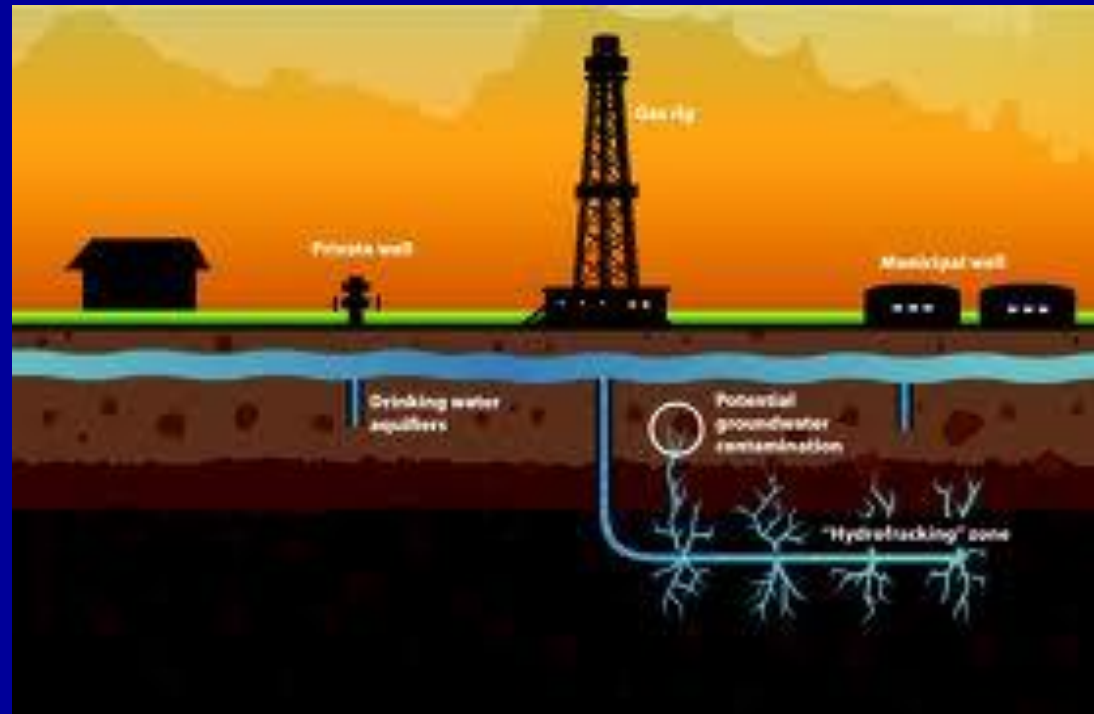


- Because we have not had much history of mining and oil/gas drilling in NC most people own their mineral rights – or assume they do. Landowners in NC were not required by law to disclose the separation of oil, gas and mineral rights to purchasers until October 2012. Lee County, with a previous history of coal mining, has now confirmed that **155** land parcels in that county are split estates.
- Some timber and pulp companies kept the mineral rights when they sold land to developers or other buyers. **Weyerhaeuser owns mineral rights below 155,000 acres in North Carolina.** The surface rights were sold off mostly in the 1970s and 1980s, and the mineral rights were kept for potential iron-ore deposits. **International Paper, also sold land sold in NC while keeping the mineral rights.** The company sold 7.3 million acres of mineral rights nationwide in 2010 to BRP, a joint venture based in Texas.

# Compulsory Pooling

Even if you own your mineral rights you can be forced to allow the gas companies to frack under your land if a percentage of the land around you is leased for fracking. Different states have different rules .

North Carolina allows forced pooling, and is creating rules to govern its use for fracking. The time to speak out on this to legislators is *now*!





# Increased greenhouse gas emissions



- **Burning natural gas produces much less climate-changing carbon dioxide than coal, *but much more methane*, a more potent greenhouse gas.**
  - Unburned methane is over 20 times more potent as a greenhouse gas than CO<sub>2</sub>, over a hundred year period. <sup>1</sup>
  - There is growing evidence that shale gas fracking releases much more methane than conventional gas drilling, and is a significant contribution to climate change <sup>2</sup>.

1. <http://www.epa.gov/methane/>

2. Robert W. Howarth & Renee Santoro & Anthony Ingraffea "Venting and leaking of Methane from Shale Gas Development" Jan. 2012 [http://www.eeb.cornell.edu/howarth/Howarthetal2012\\_Final.pdf](http://www.eeb.cornell.edu/howarth/Howarthetal2012_Final.pdf)

**What other energy  
choices do we have?**

# Energy Conservation and Efficiency

*Not wasting energy means less need for NEW energy sources  
and would put American construction workers back on the job!*



Energy savings from customer energy efficiency programs are typically achieved at 1/3 the cost of new generation resources . Efficiency programs can also reduce the need to install, upgrade or replace transmission and distribution equipment.

<http://aceee.org/topics/energy-efficiency-resource>

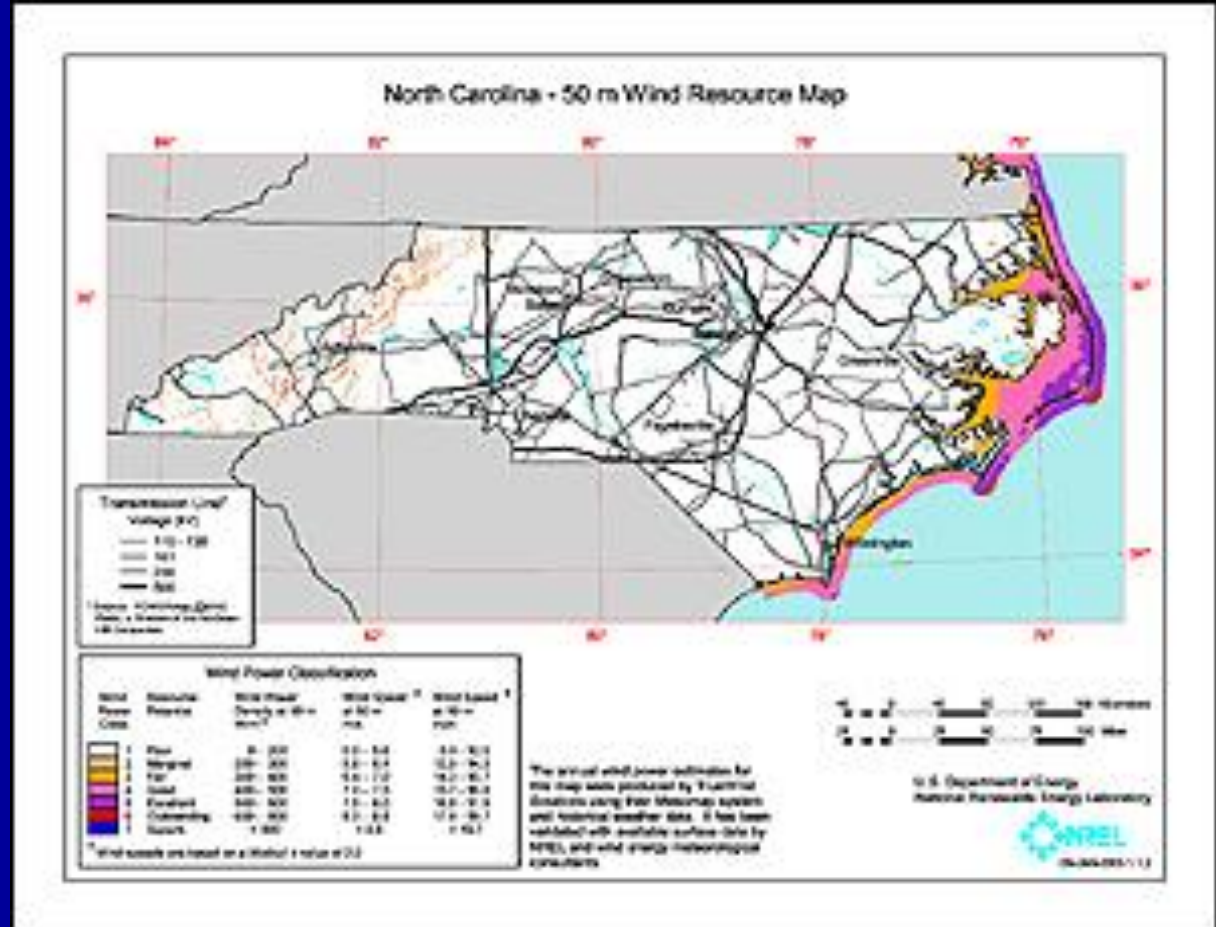


# ***SOLAR - NC is 5<sup>th</sup> in Nation***

**Since 2007, when North Carolina began requiring power companies to use renewable energy, about 100 solar farms have registered to open, according to the N.C. Sustainable Energy Association**



# NC has more potential wind power than any other state on the East Coast



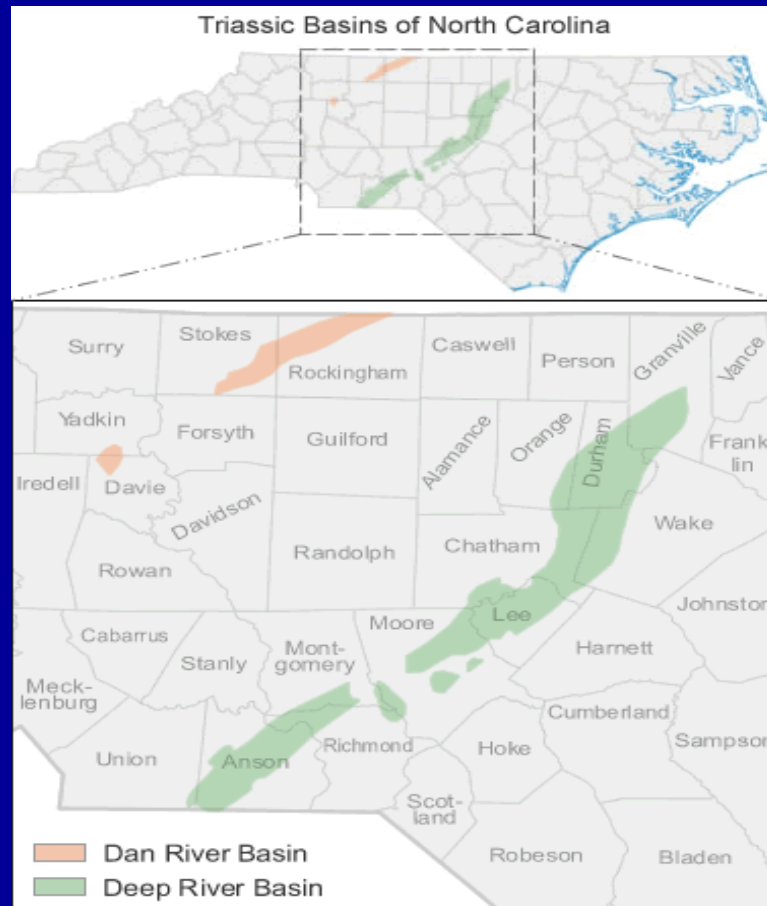
[http://www.windpoweringamerica.gov/maps\\_template.asp?stateab=nc](http://www.windpoweringamerica.gov/maps_template.asp?stateab=nc)

# What About Shale Gas Jobs and Energy Independence?

- The 2012 state report on NC shale gas used an estimate that the "recoverable" shale gas in the state could supply NC natural gas needs for 40 years but the drilling would only be a "boom-bust" period of 7 years.
- Using that number it was predicted that the industry would create an average of **387 jobs per year** during those 7 years.



# USGS June 2012 Report says there is less shale gas resource in NC than previously estimated – Even Less Jobs?



# NC had regulations in place since the 1940's to protect the state's water and people

- \* **NO** Horizontal or “Directional” Drilling
- \* **NO** Injection of materials into underground wells that can cause toxic contamination
- \* **NO** High pressure at the well head that could cause new or larger fractures underground

Despite citizen comments and protest the General Assembly overturned these rules in 2012



# 2012 Senate Bill 820

(sponsored by Sen. Rucho, R-Mecklenburg) :

1. Removed prohibitions for hydraulic fracturing, horizontal drilling higher pressure injection. Moratorium on permits until Oct. 2014
2. Set up industry dominated Mining and Energy Commission, with conflicting authority for environmental regulation
3. Allows “forced pooling” of unwilling landowners
4. Could pre-empt any local ordinances that ban or control fracking

S820 passed both the House and Senate last summer and was vetoed by Gov. Perdue. **A veto override was successful due to a voting error— so SB 820 is now law**



# Mining and Energy Commission

The MEC was appointed in 2012 to study and draft regulations for fracking in NC by fall of 2014. The

controversial issues they are tackling include:

- Sources of water for fracking, disposal of frack wastewater
- Compulsory Pooling – forcing landowners to allow fracking
- Local control over fracking
- Public disclosure by the industry of their fracking chemicals .



# 2013 Legislature Session: We held the line!

*Due to strong citizen concern, the General Assembly did not pass laws that would have further weakened NC protections*

<> **Did NOT Repeal** the requirement for another legislative vote after regulations are finalized,

<> **Did NOT Repeal** the “landmen” registry,

<> **Did NOT Allow underground injection** of oil and fracking wastewater

<> **Did NOT Take away authority of local governments to tax the industry.**

# We can also work at the local level to ban fracking or underground injection of hazardous fluids

- These can be outright bans on fracking within city or county limits, or zoning or other ordinances that would regulate the actual practice of shale gas drilling, its infrastructure or underground injection of wastes. The legislature may try to pre-empt these, but local governments need to protect themselves.
- Current moratoriums and ordinances on fracking in US include Pittsburgh, Longmont CO, Secaucus NJ, Syracuse, Buffalo NY, Vermont, NY, NJ, and Maryland and **Creedmoor and Anson Co. in NC**



***KEEP NC FRACK FREE***

***frackfreenc.org***





**Nothing is more precious than clean water.**





# Haw River Assembly

Defending the river since 1982.

Presentation produced by  
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*On behalf of Waterkeepers Carolina*

