A One Health Perspective: Impacts of Unconventional Deep Horizontal Fracking on Human and Animal Health

Peter L. Nara, M.Sc., D.V.M., Ph.D., F.A.A.A.S.

Overview

* What is "One Health" and the role it can play
* Current Evidence for Impacts to health
  * National Health picture-is it telling us something and are we not listening?
* Ohio's Health Picture
* New Considerations for Protecting health
* Miscellaneous

SPRING BOOKS ROBERT COSTANZA ON NICHOLAS STERN'S 'BLUEPRINT'
009 | www.nature.com/nature | £10
THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

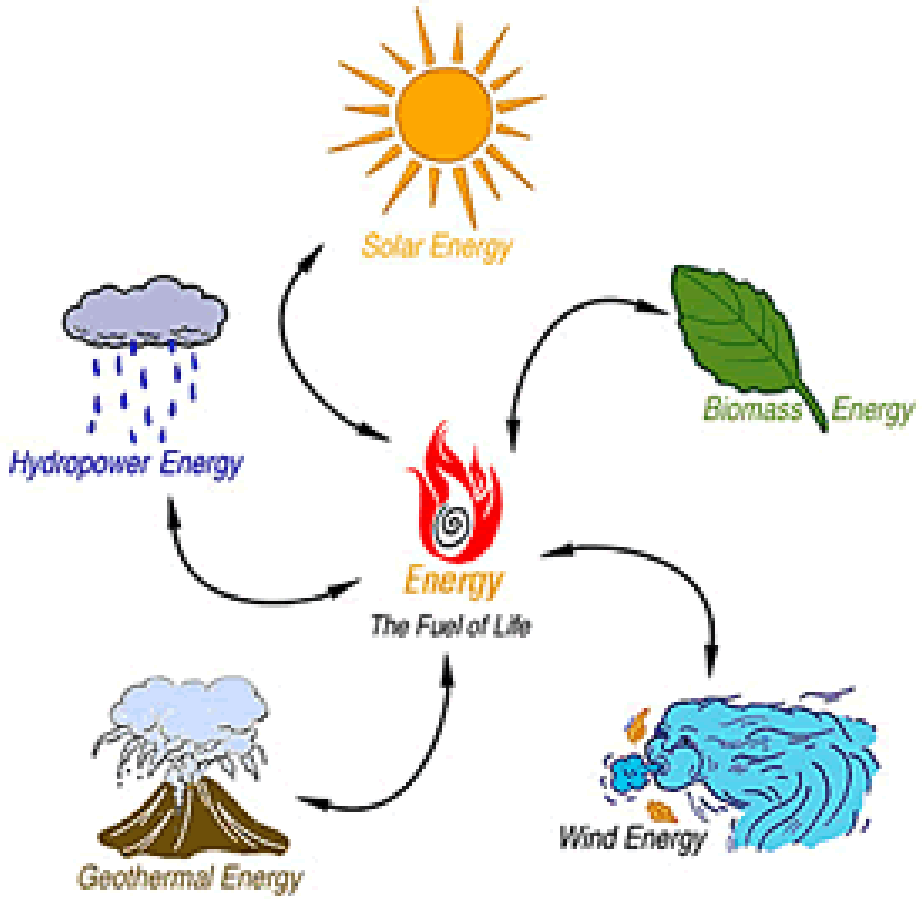
nature

THE COMING CLIMATE CRUNCH

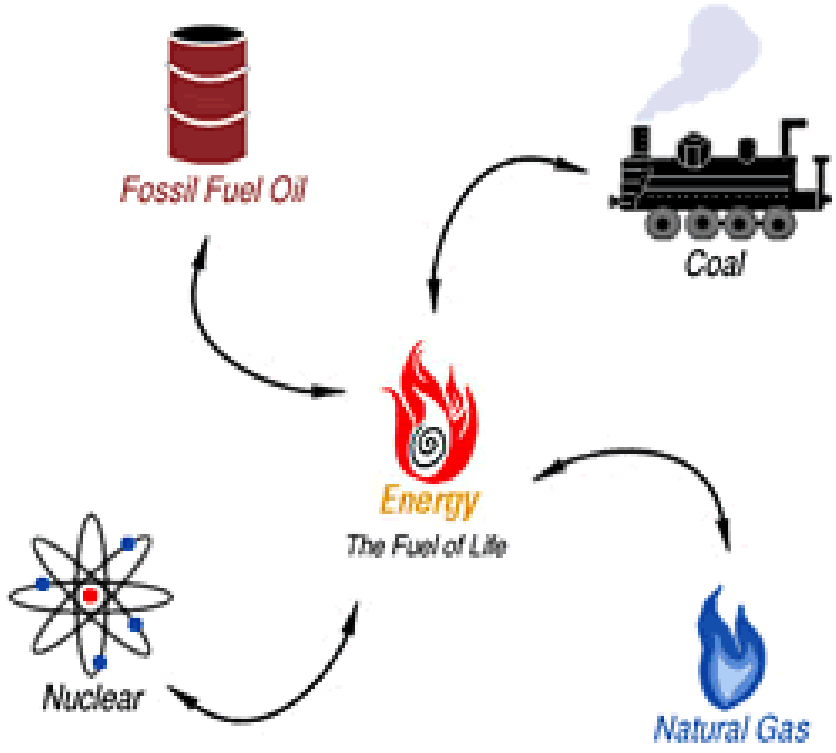
- The trillionth tonne of carbon
- How disastrous can it get?
- Engineering alternatives

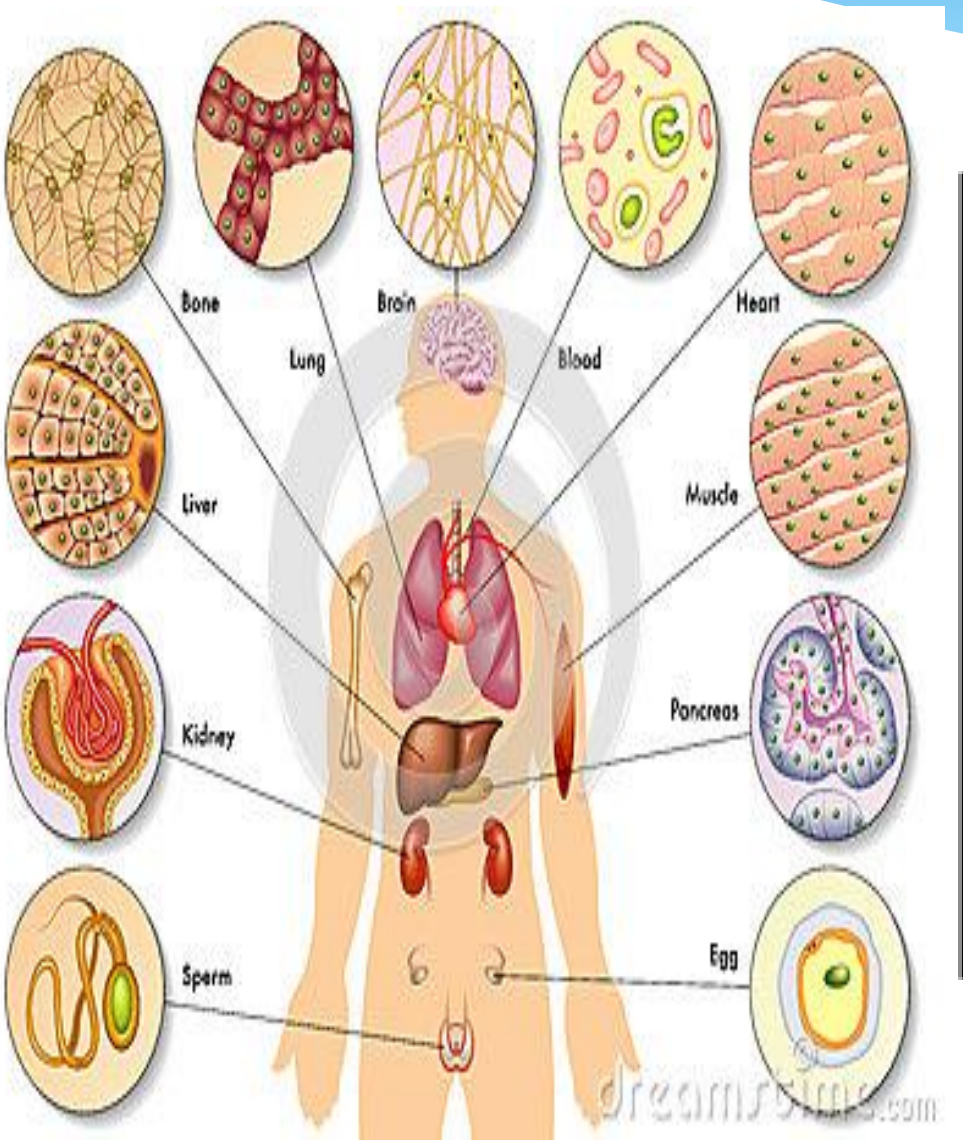
NATUREJOBS
Immunology

Renewable Energy

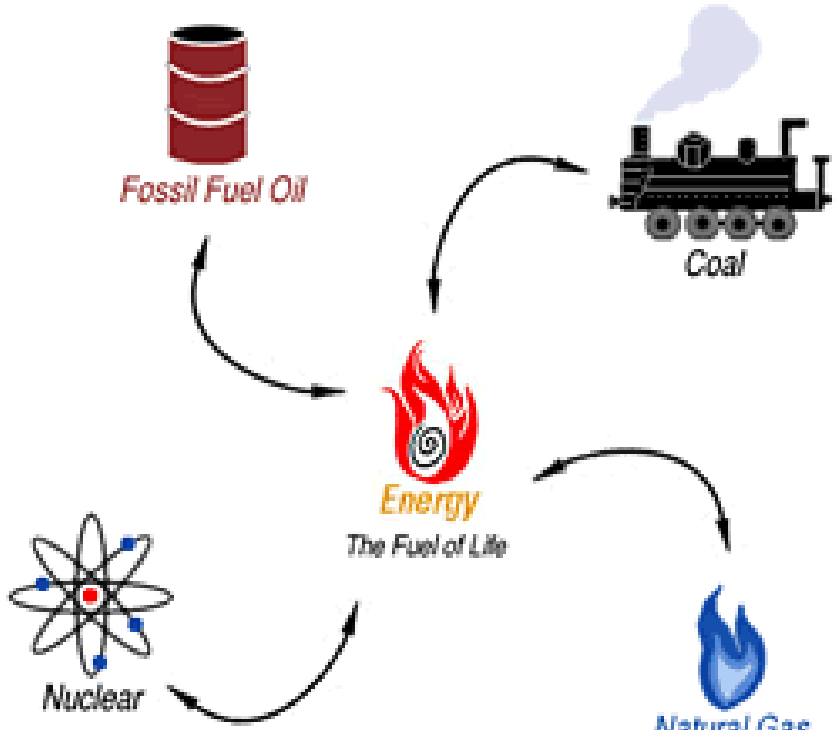


Non-Renewable Energy

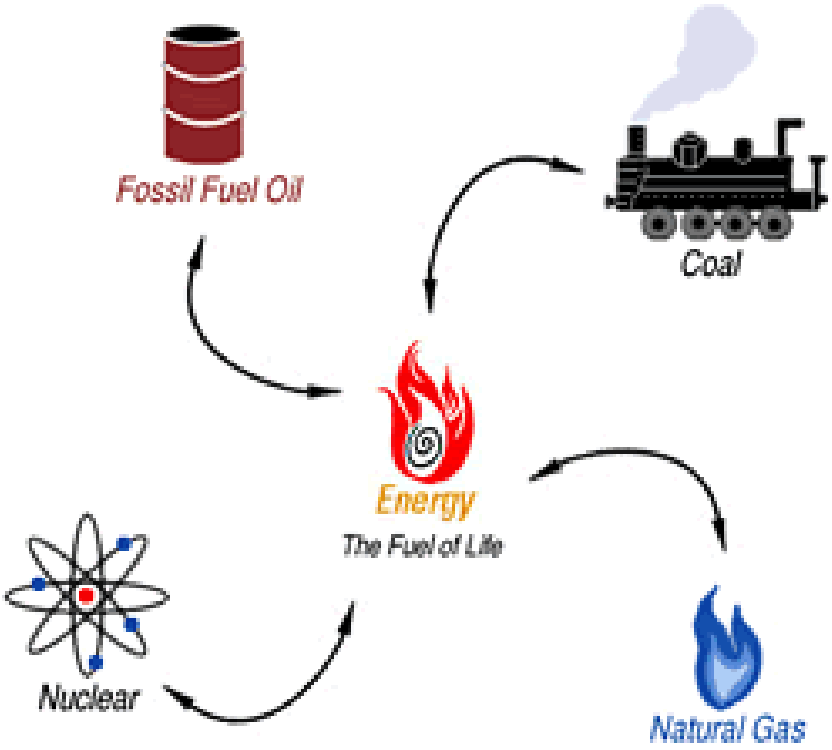


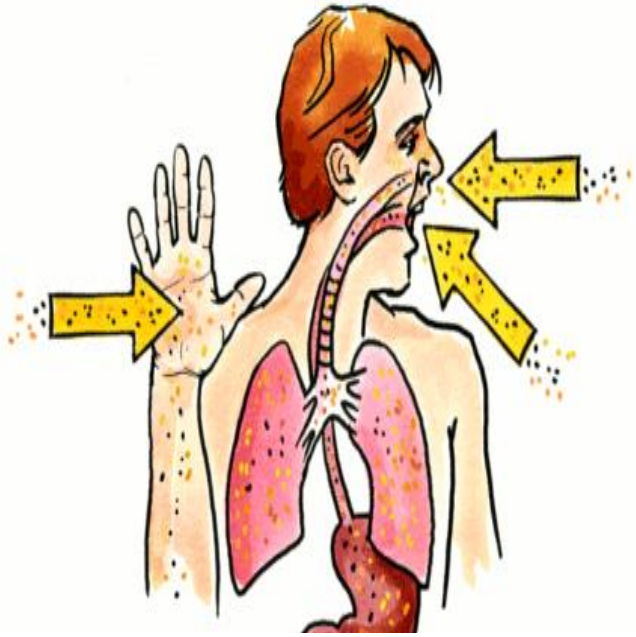


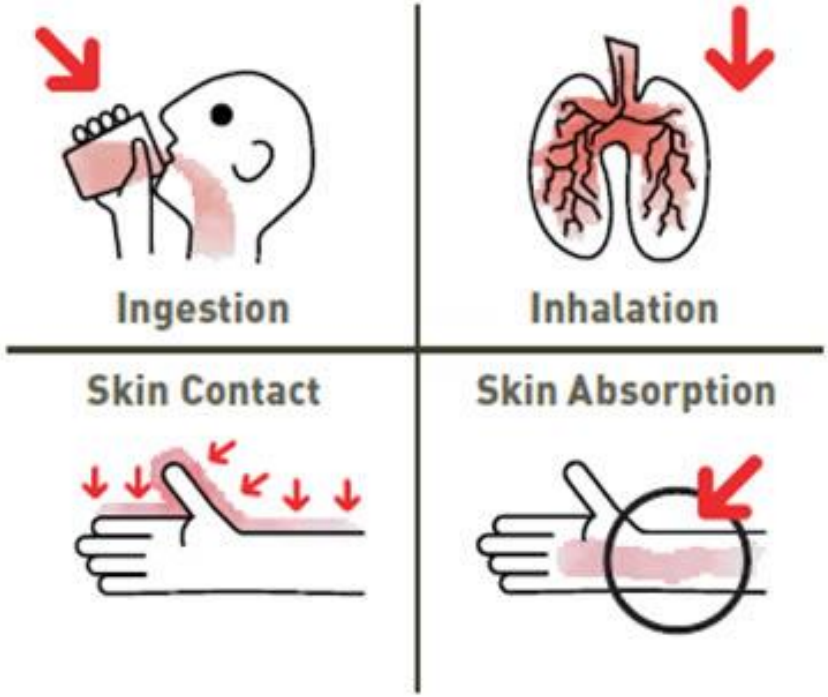
Non-Renewable Energy

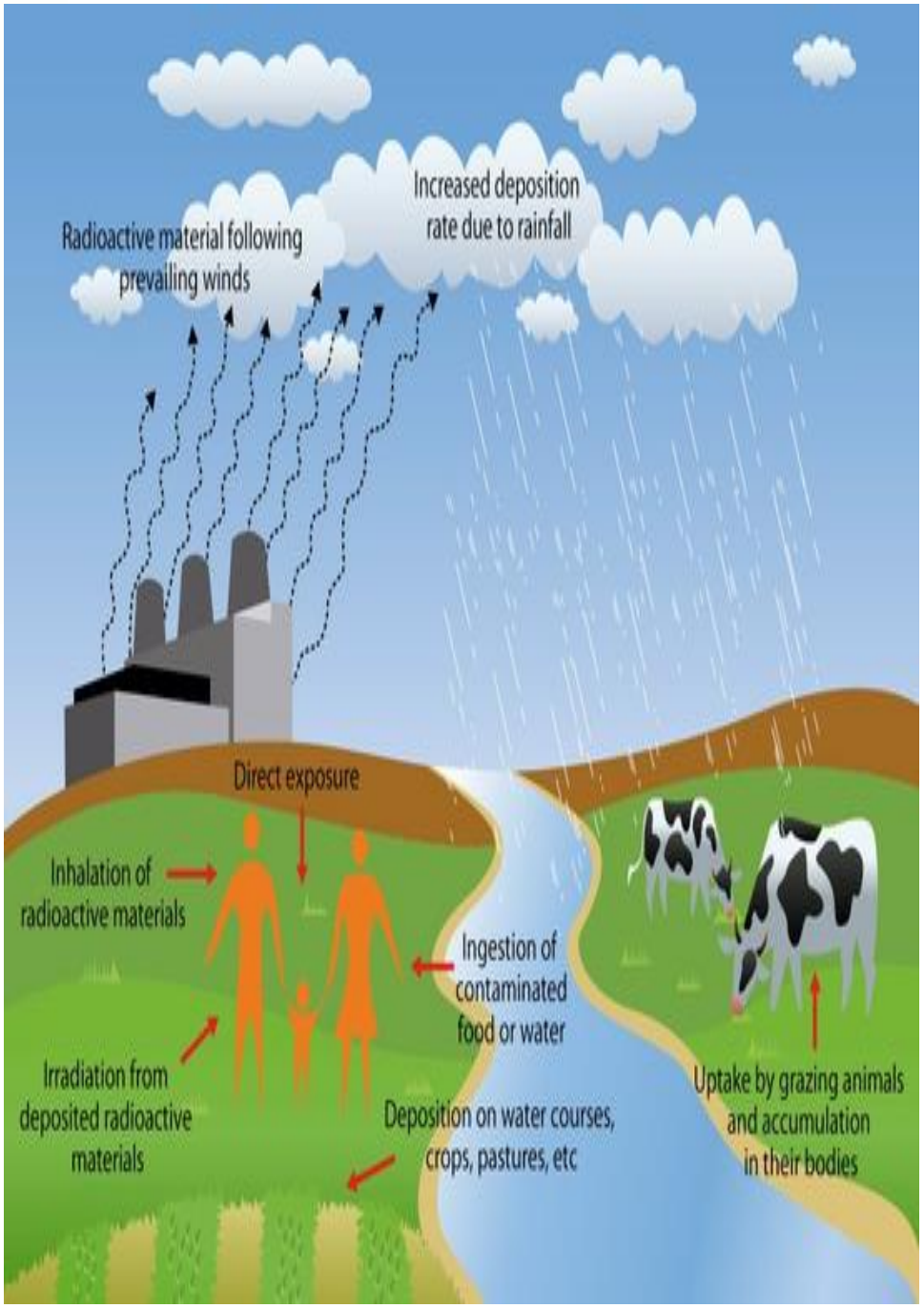


Non-Renewable Energy

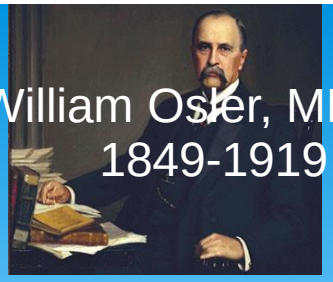





Ingestion
Inhalation
Skin Contact
Skin Absorption


Radioactive material following prevailing winds
Increased deposition rate due to rainfall
Direct exposure
Inhalation of radioactive materials
Ingestion of contaminated food or water
Irradiation from deposited radioactive materials
Deposition on water courses, crops, pastures, etc
Uptake by grazing animals and accumulation in their bodies

One Health



* The concept of **One Health, One Medicine** originates as far back as to the time of Aristotle in 500 BC and Hippocrates of Cos in 340 BC. Aristotle wrote the "Historia Animalium" to elaborate on the natural zoonotic history of animals whereby Hippocrates provided insight on other possible causations for disease in the human body, not just from "humor" imbalances.
* The collaborative effort of multiple disciplines to attain optimal health for people, animals and our environment -University of California at Davis's, Calvin Schwabe's Veterinary Medicine and Human Health book publication in 1984

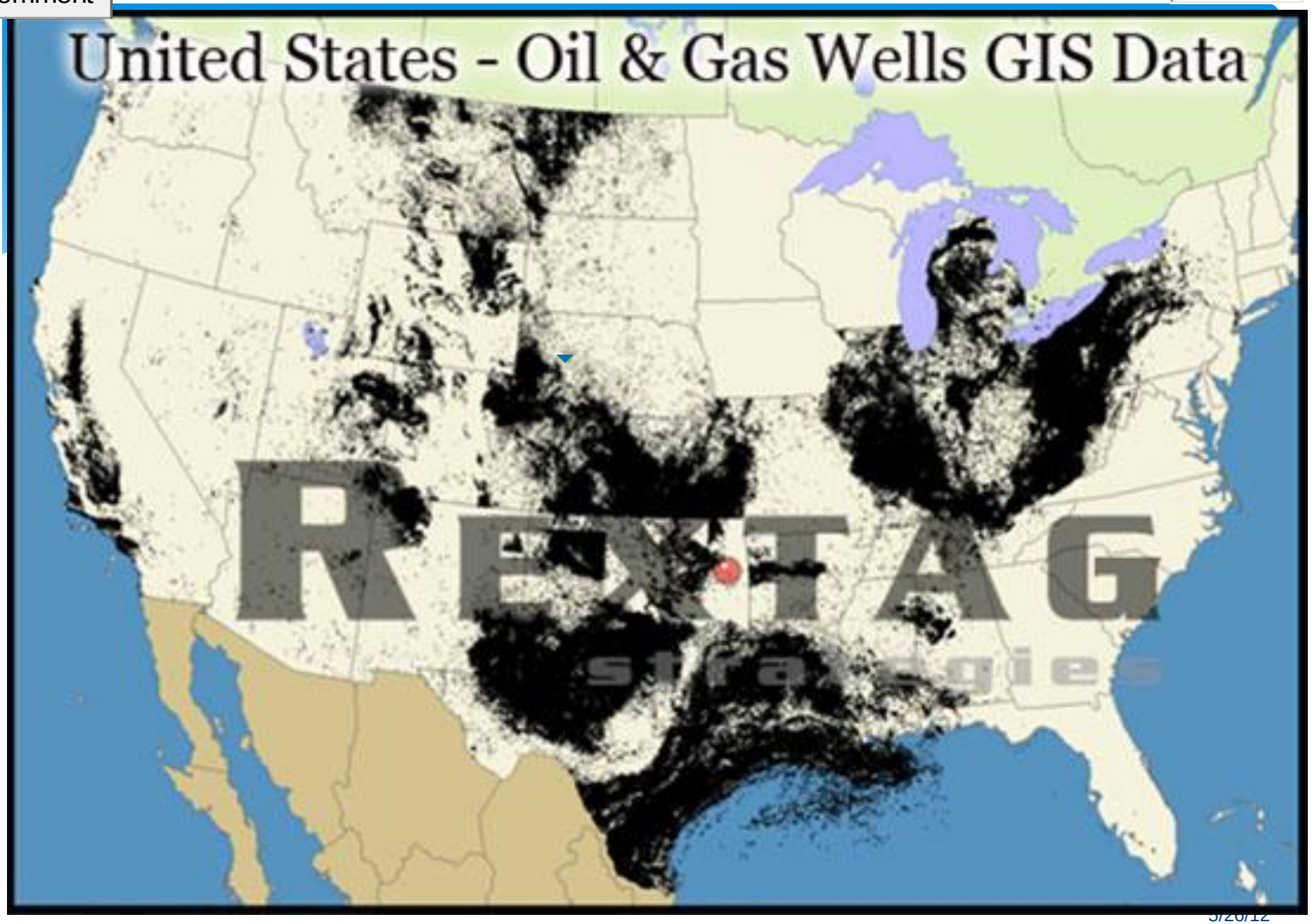
One Health Commission-July 2009

Ohio is a leader
and well positioned to utilize this new and important network of physicians, veterinarians, public health officers, nurses, ecologists, epidemiologists, agronomist, geologists, hydrologists, systems biologists, environmental engineers etc.

- American Medical Association (AMA)
- American Public Health Association (APHA)
- American Veterinary Medical Association (AVMA)
- Association of Academic Health Centers
- Association of American Medical Colleges
- Association of American Veterinary Medical Colleges
- Association of Fish and Wildlife Agencies
  - Liaisons with governmental agencies and support organizations (e.g. ASTHO)

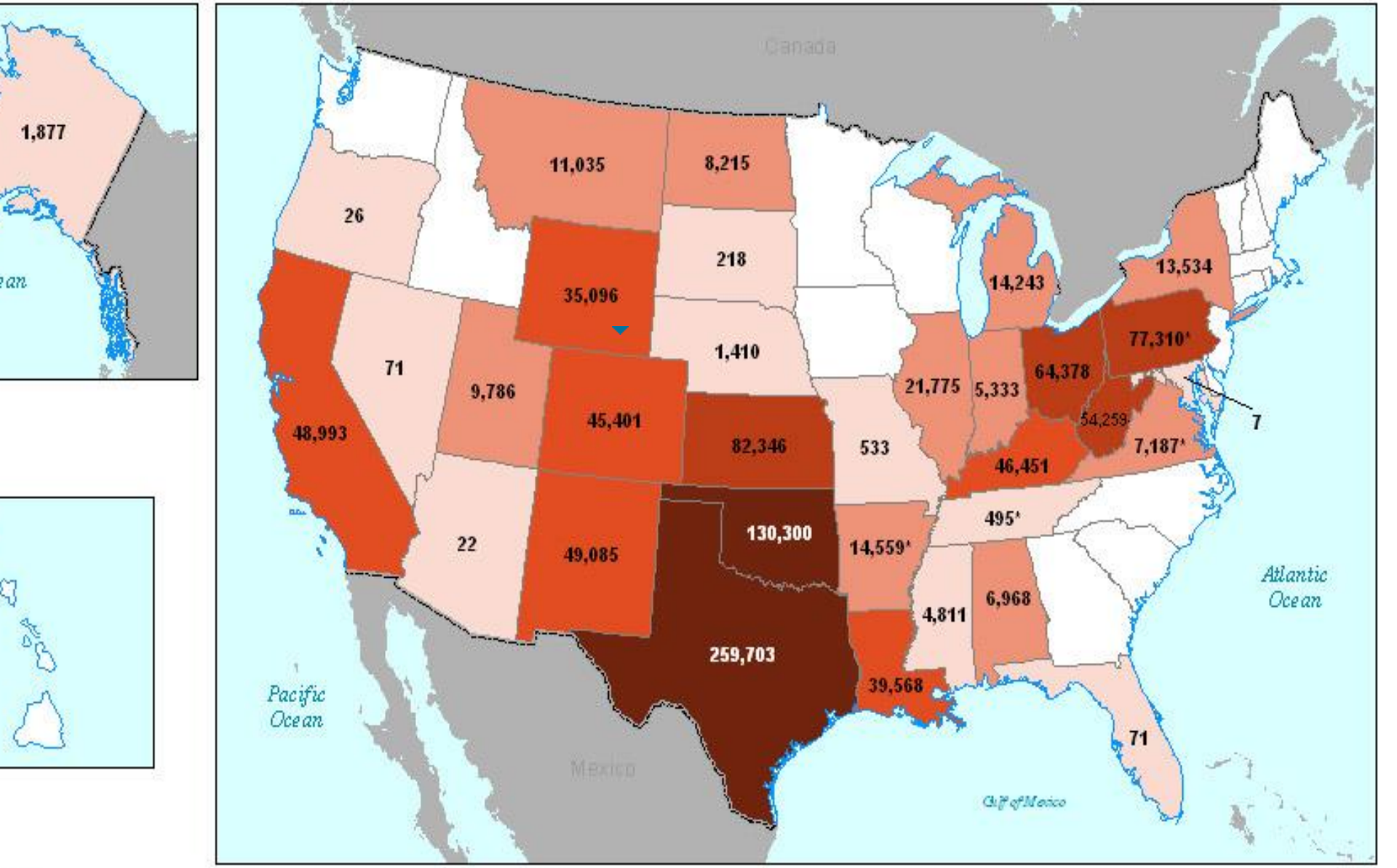
What do we see in the United States?

Comment



Comment

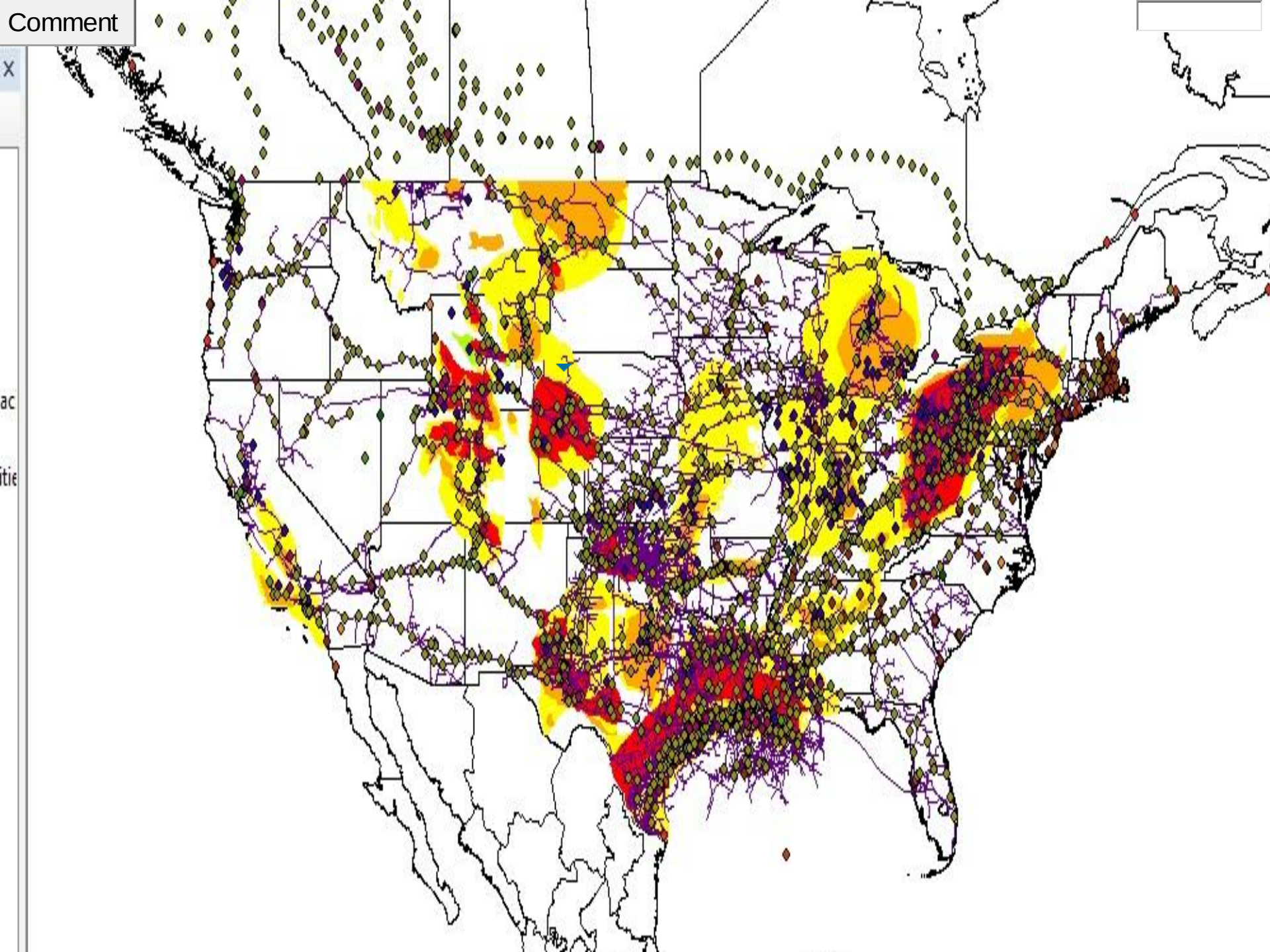
ucing Oil and Gas Wells in the United States, Including Offshore



*World Oil End of 2010 Estimated Figure

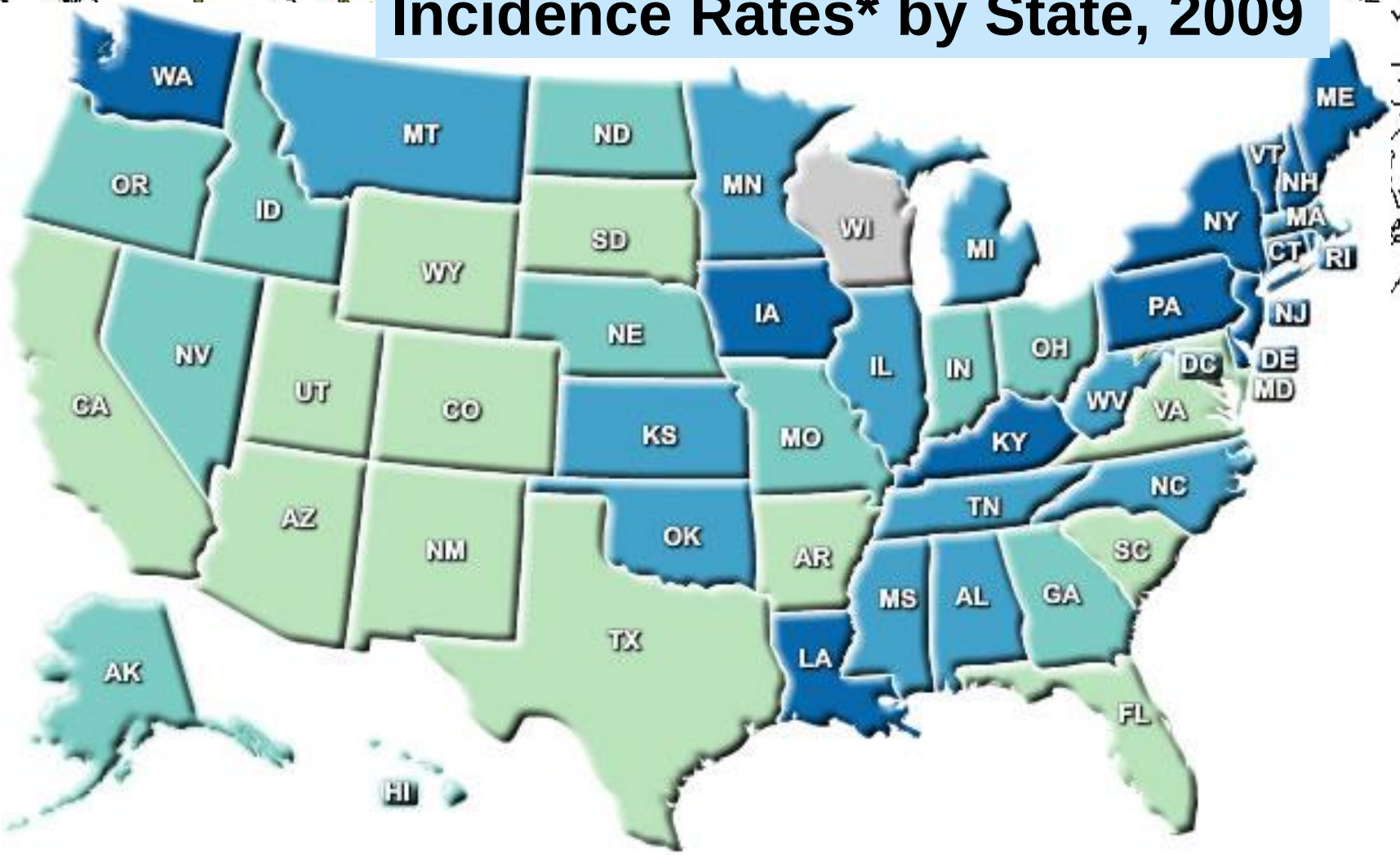
Prepared by the Natural Resources Defense Council
September 13, 2011

Wells
,000
00-25,000
000-50,000



Comment

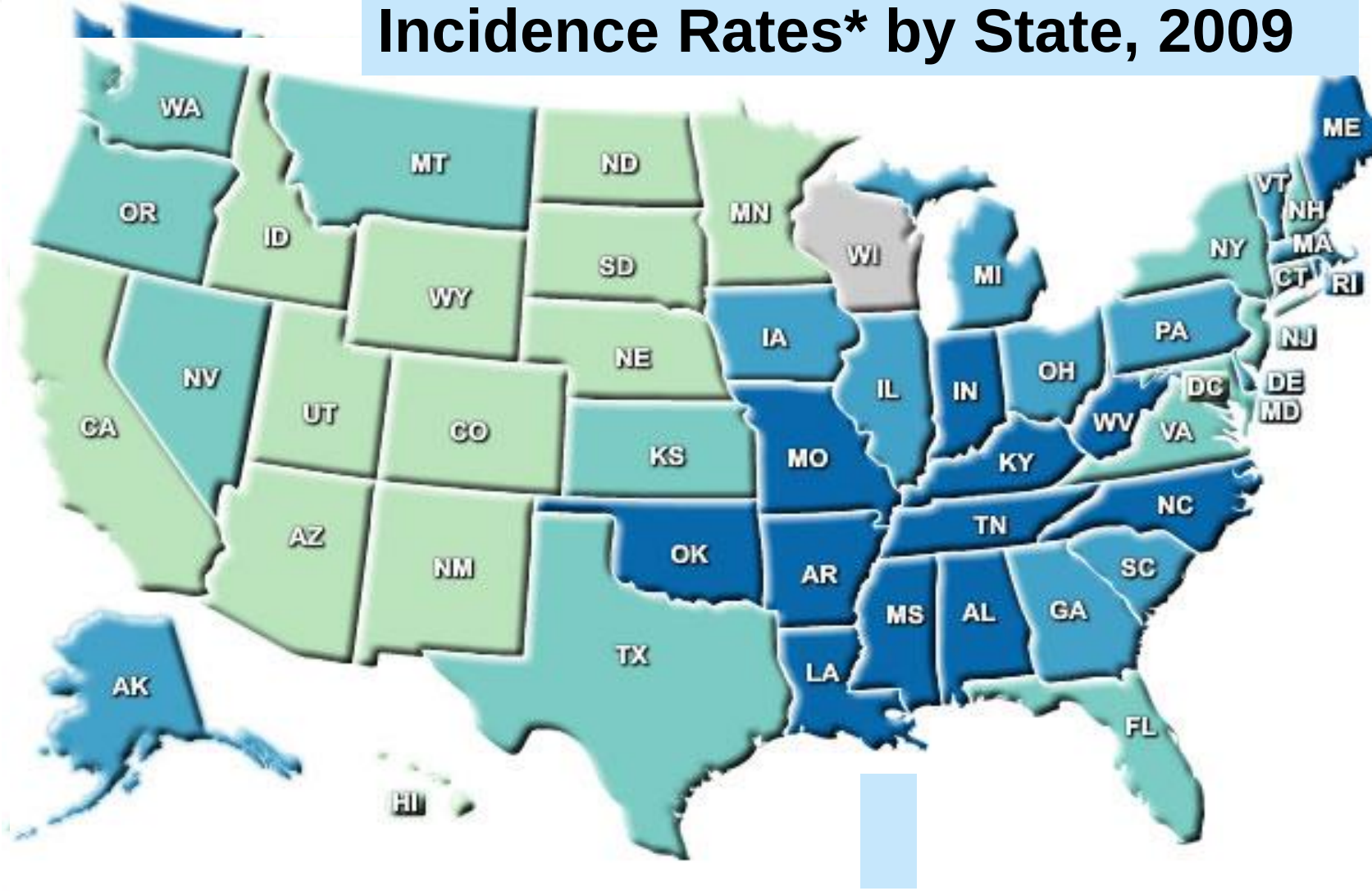
All Cancers Combined Incidence Rates* by State, 2009



387.1-440.2 | 440.3-462.5 | 462.6-480.6 | 480.7-509.1 | Data Suppressed

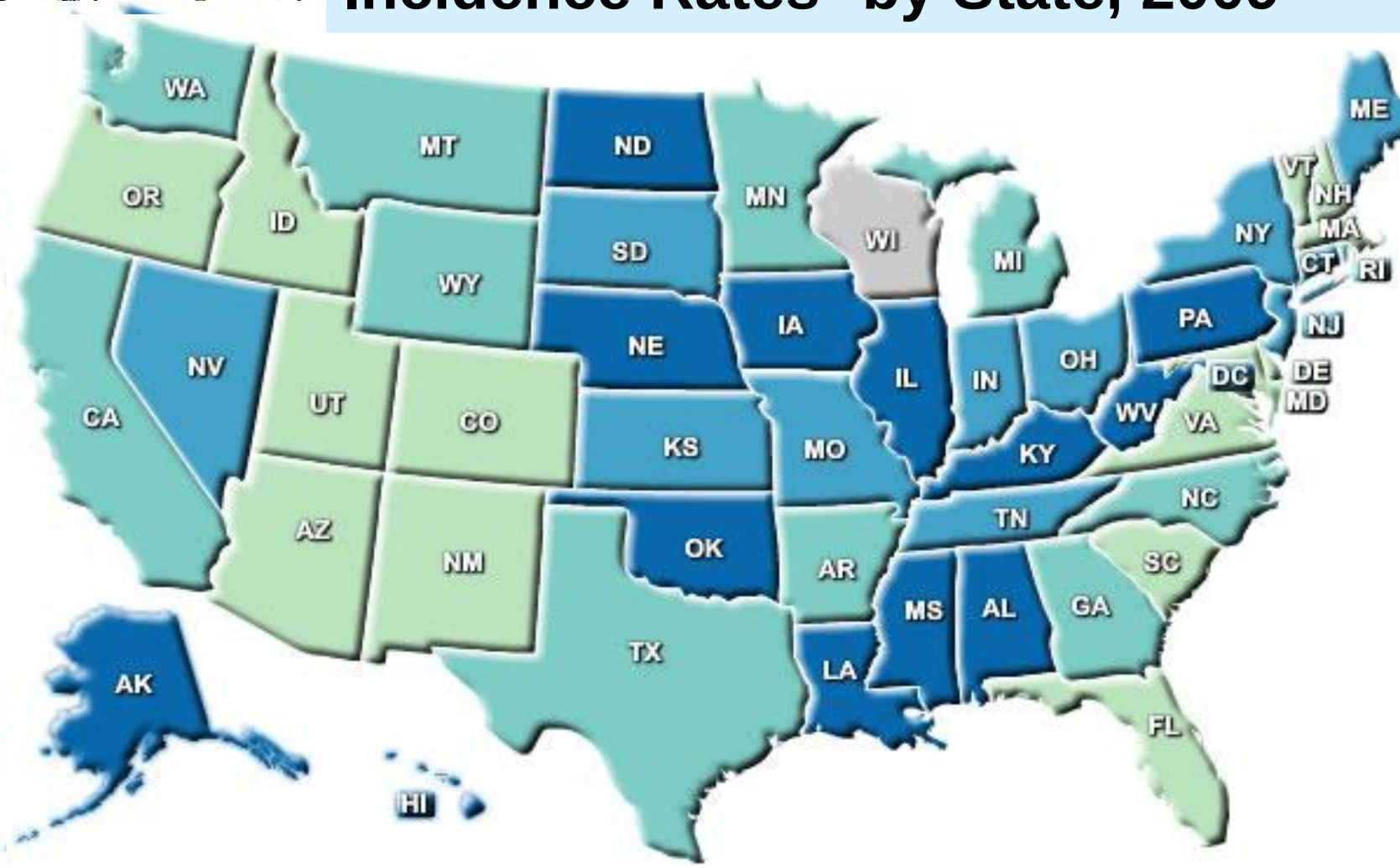
Comment

Lung and Bronchus Cancer Incidence Rates* by State, 2009



Comment

Colorectal Cancer Incidence Rates* by State, 2009



U.S. ranks 130 out of 184

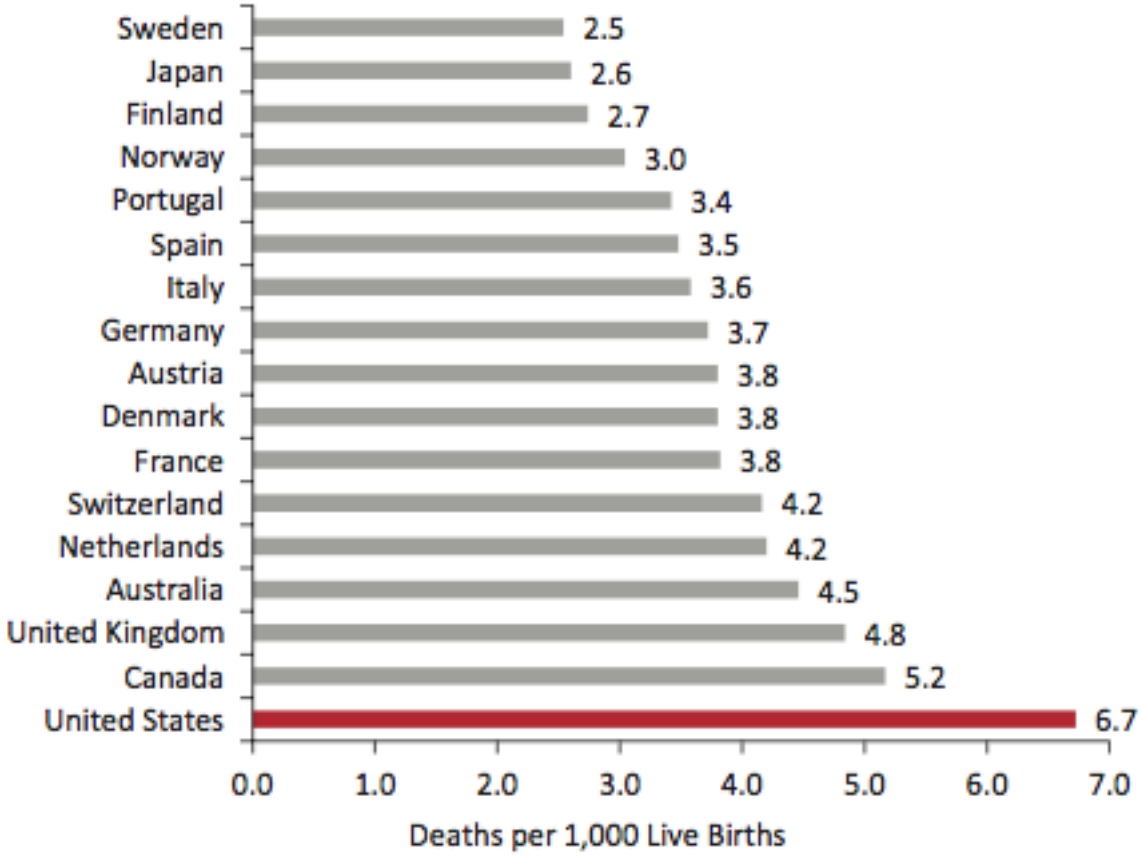
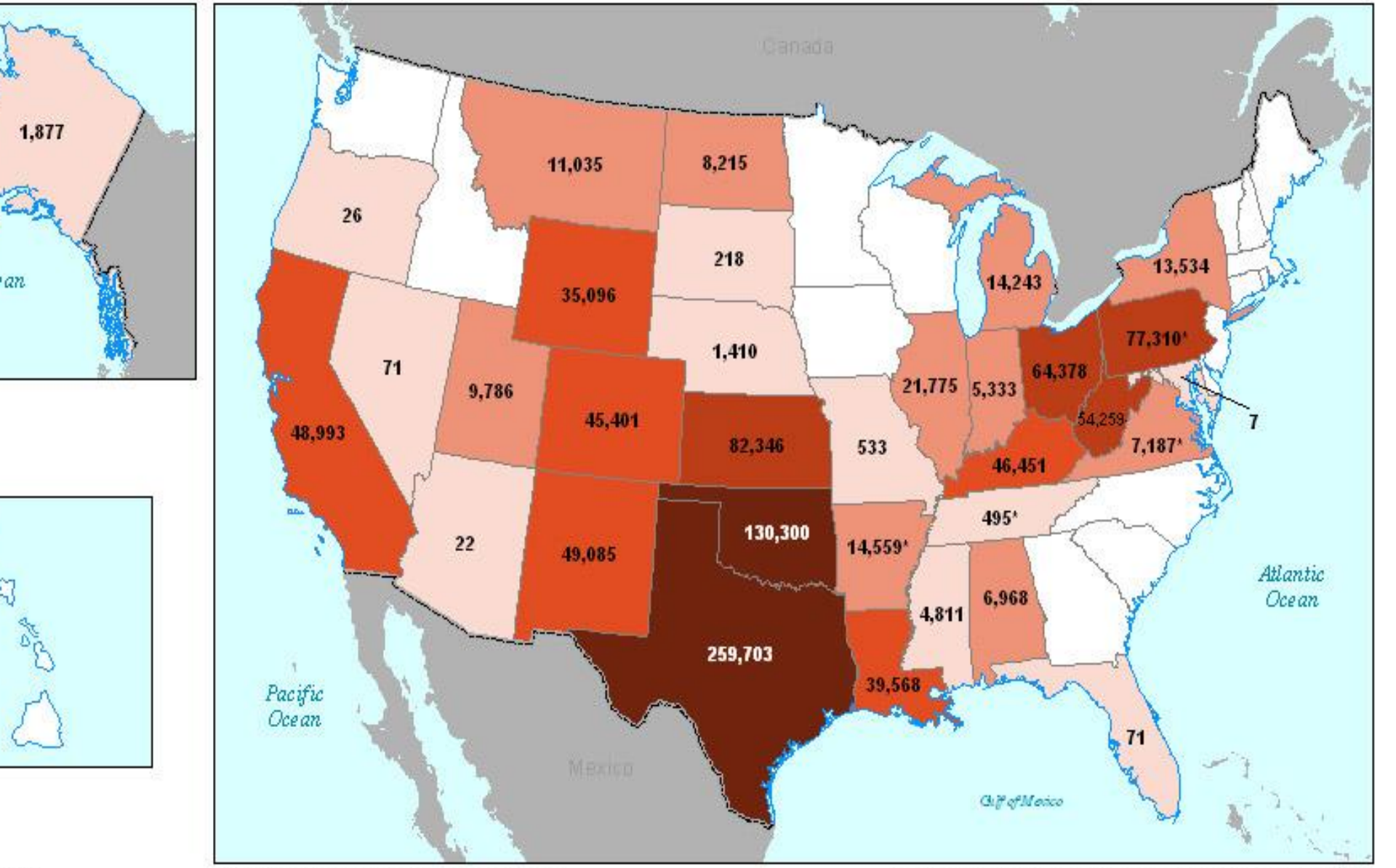


FIGURE 2-1 Infant mortality rates in 17 peer countries, 2005-2009.
NOTE: Rates averaged over 2005-2009.
SOURCE: Data from OECD (2012c).

Producing Oil and Gas Wells in the United States, Including Offshore



*World Oil End of 2010 Estimated Figure

Prepared by the Natural Resources Defense Council
September 13, 2011

Wells
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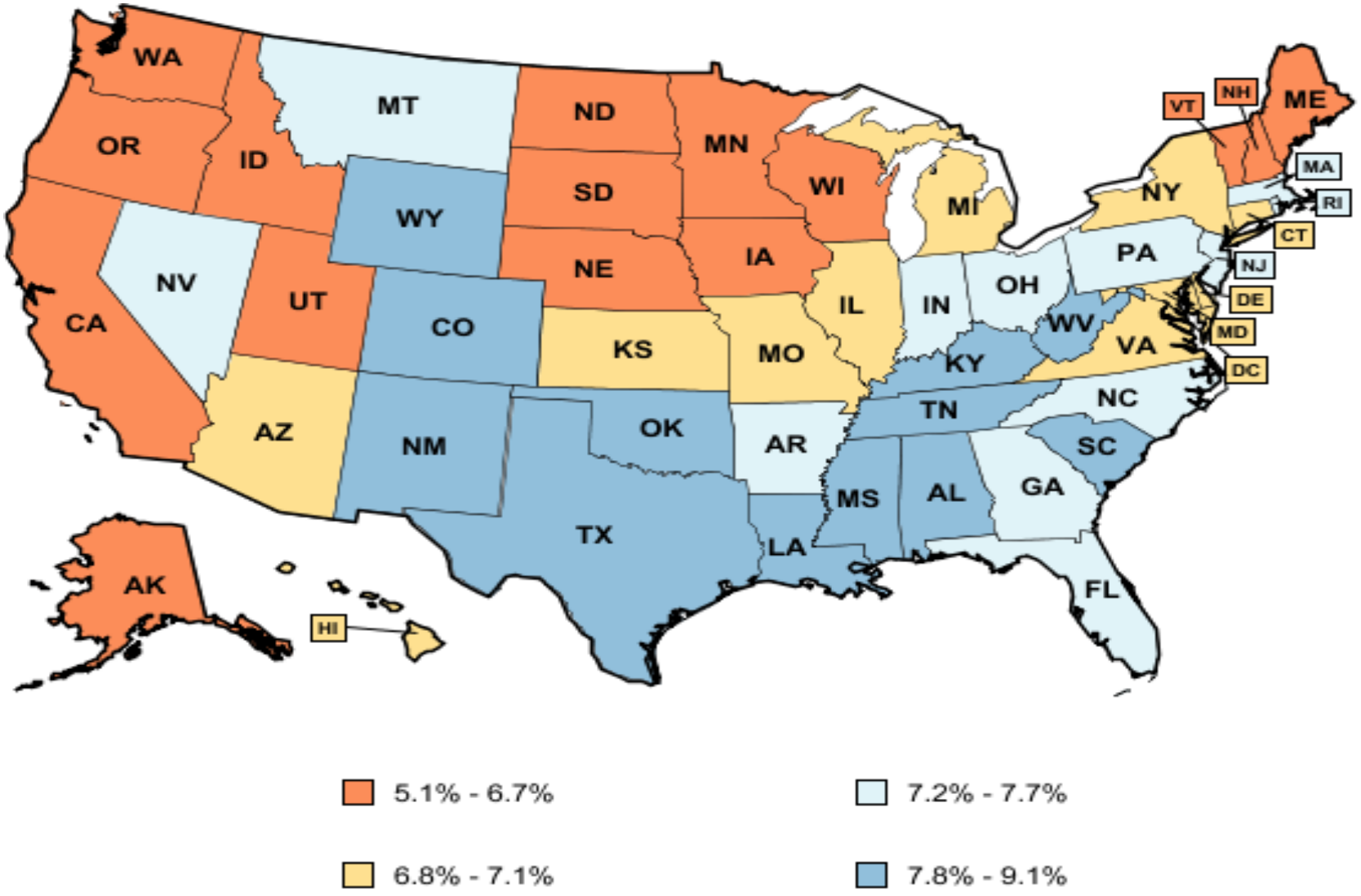
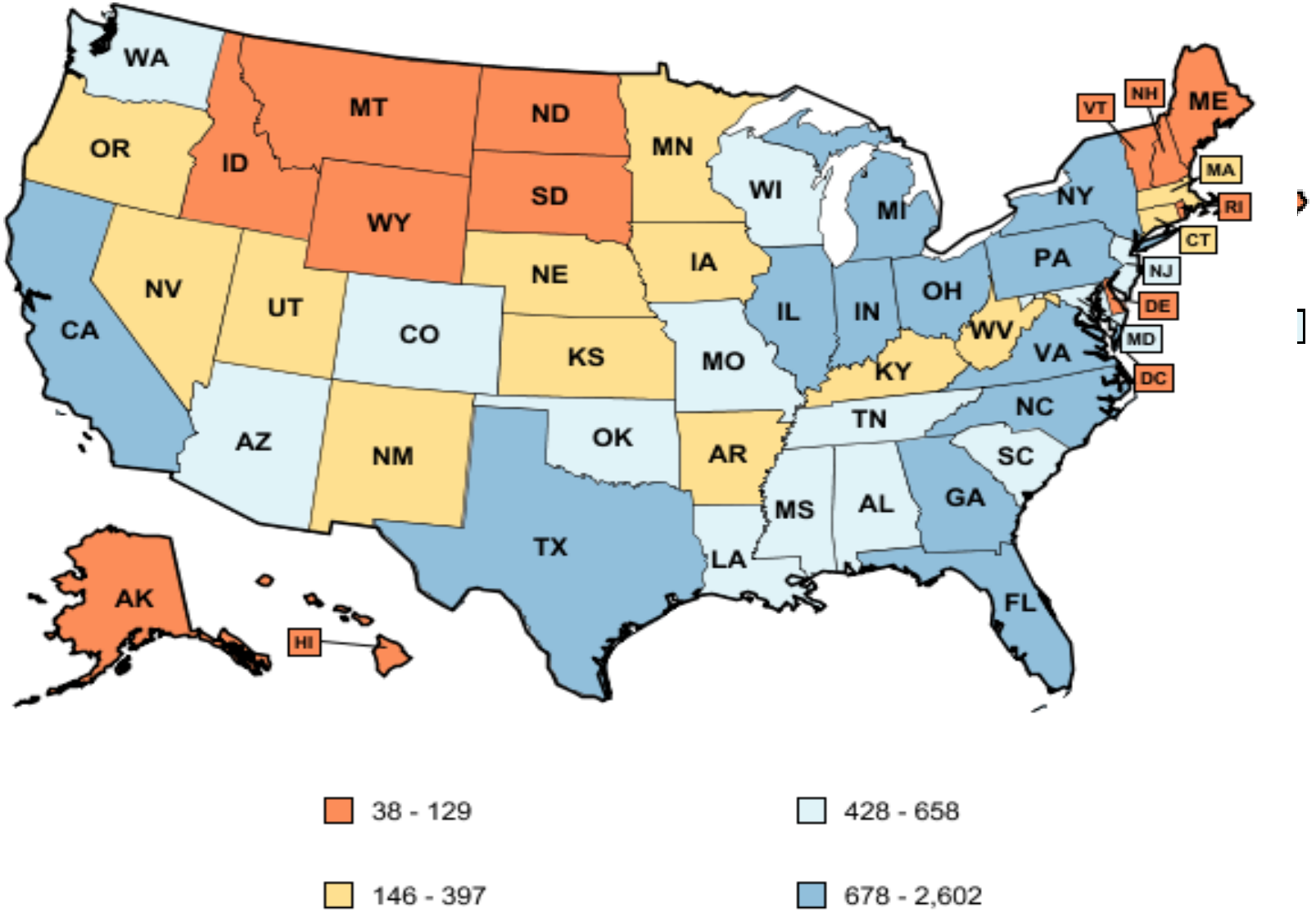
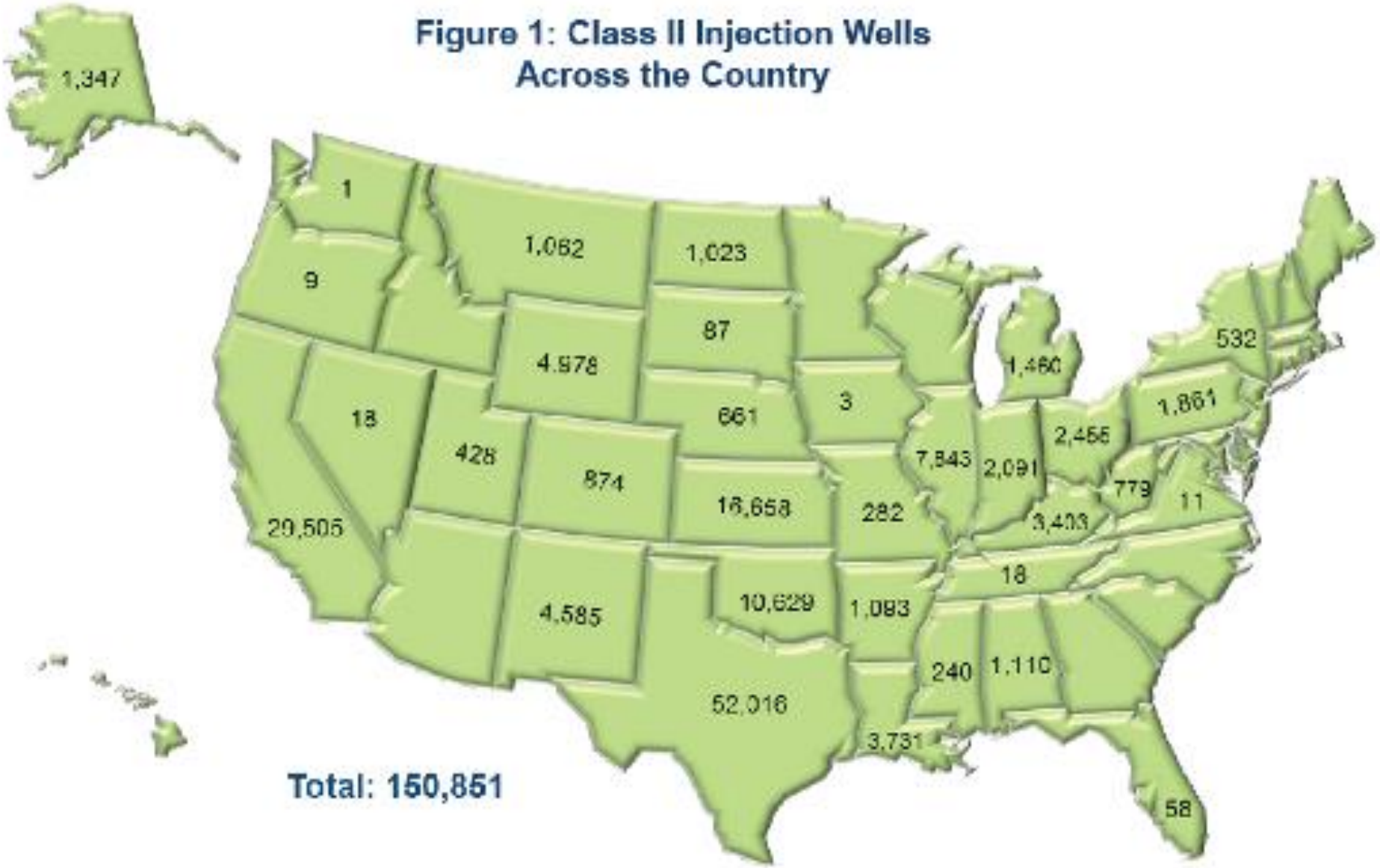


Births of Low Birthweight as a Percent of All Births by Race/Ethnicity, 2009: Non-Hispanic White



Number of Infant Deaths, 2009

Figure 1: Class II Injection Wells Across the Country

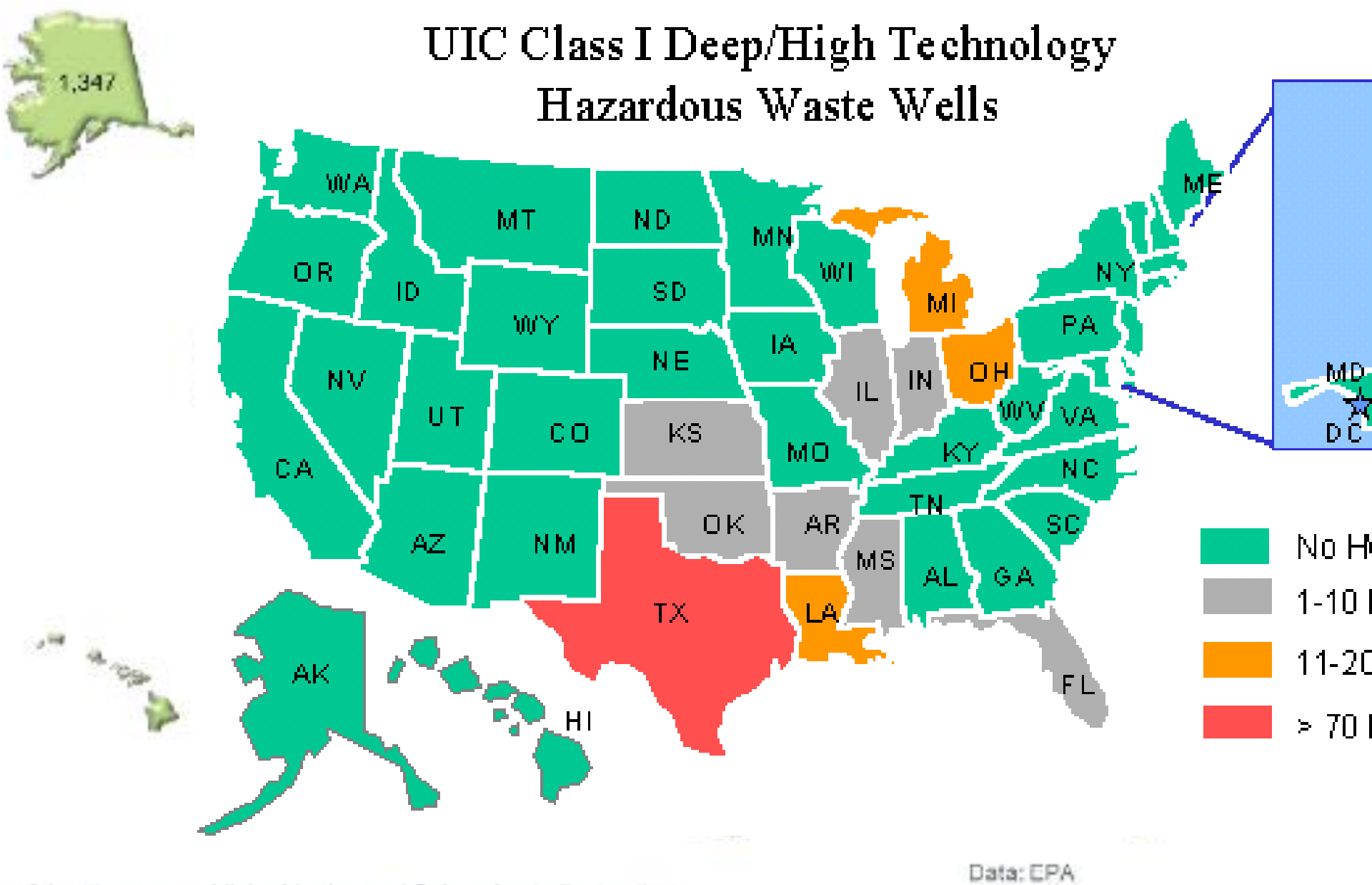


Data: EPA

of the literature published in the past 5 decades indicates that than 40 incidents of seismic activity that were felt at the surface otentially associated with Class II injection wells in the United

00-25,000
000-50,000

UIC Class I Deep/High Technology Hazardous Waste Wells



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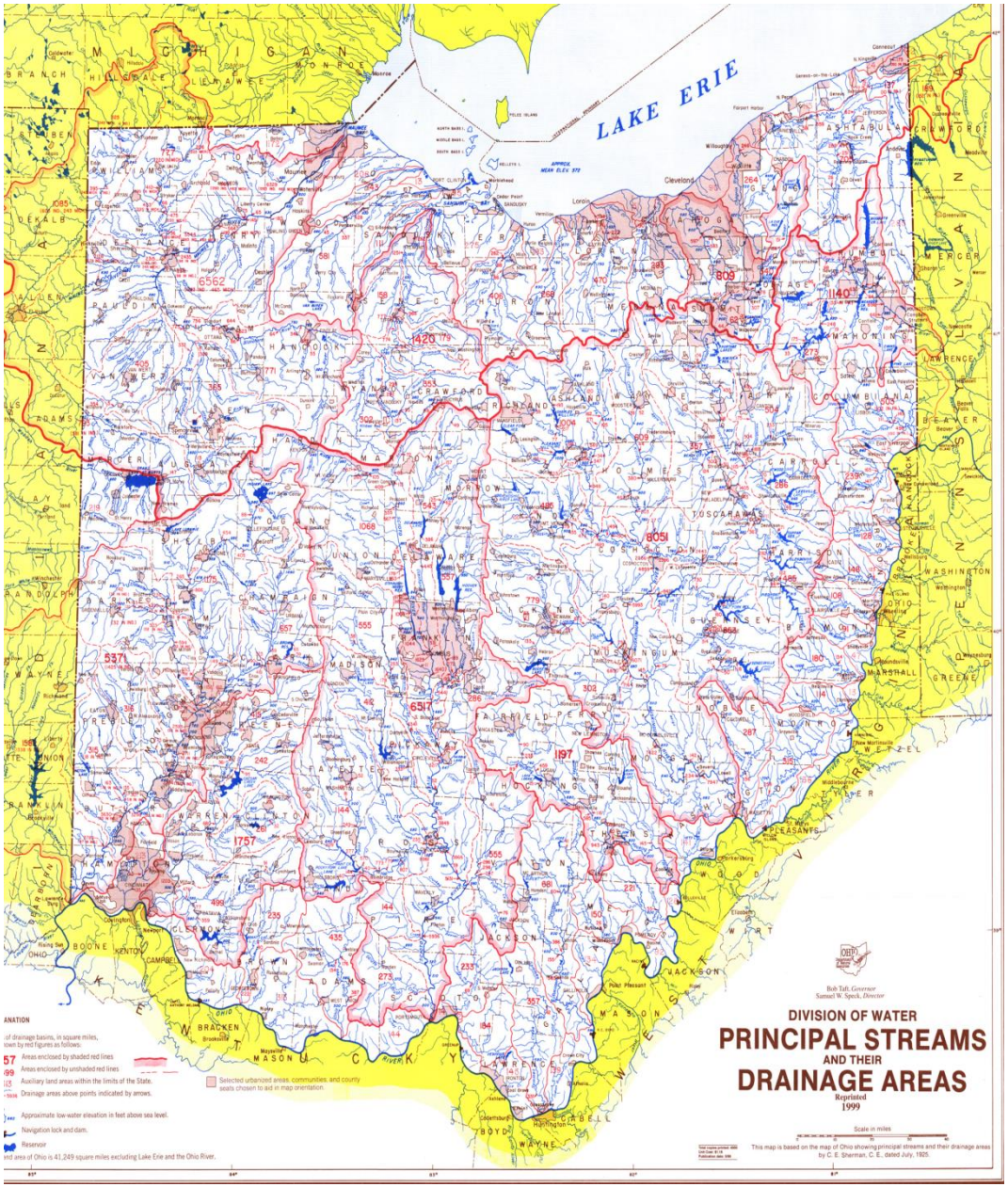
00-25,000
000-50,000

Infant mortality is an important indicator of the health of a nation, and the recent stagnation (since 2000) in the U.S. infant mortality rate has generated concern among researchers and policy makers. The percentage of preterm births in the United States has risen 36% since 1984 (1).

Its cause is unexplained in all cases of adjusted socio-economic and race demographics ------

Given that the only significant and accelerated expansion of an industry (Gas/Oil) that has geo-spatial distributions similar to these disease distributions ------it is imperative that we find a way forward to look for causal linkages from water and air contamination by oil/gas industry by-products

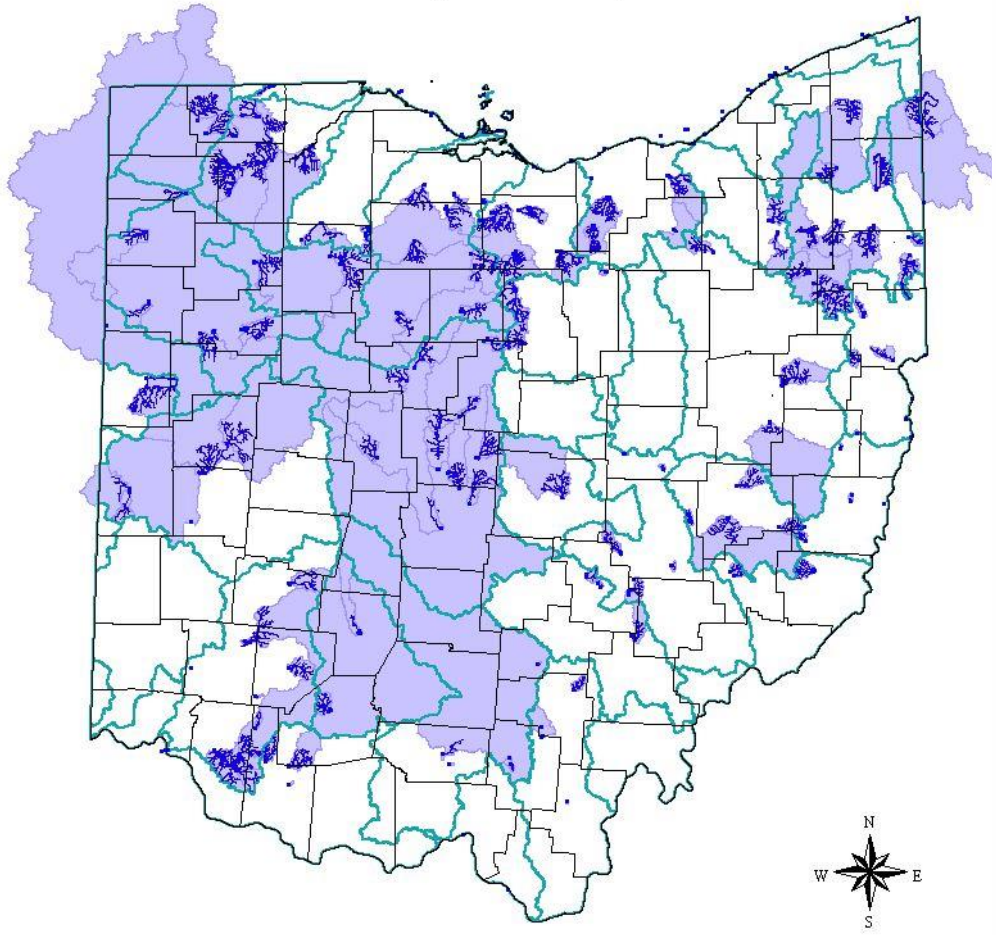
What do we see in Ohio?


LAKE ERIE
DIVISION OF WATER
PRINCIPAL STREAMS
AND THEIR
DRAINAGE AREAS
Reprinted
1999
Bob Taft, Governor
Samuel W. Speck, Director
This map is based on the map of Ohio showing principal streams and their drainage areas by C. E. Sherman, C. E., dated July, 1925.

5/26/12

NPS Priority Drinking Water Protection Areas

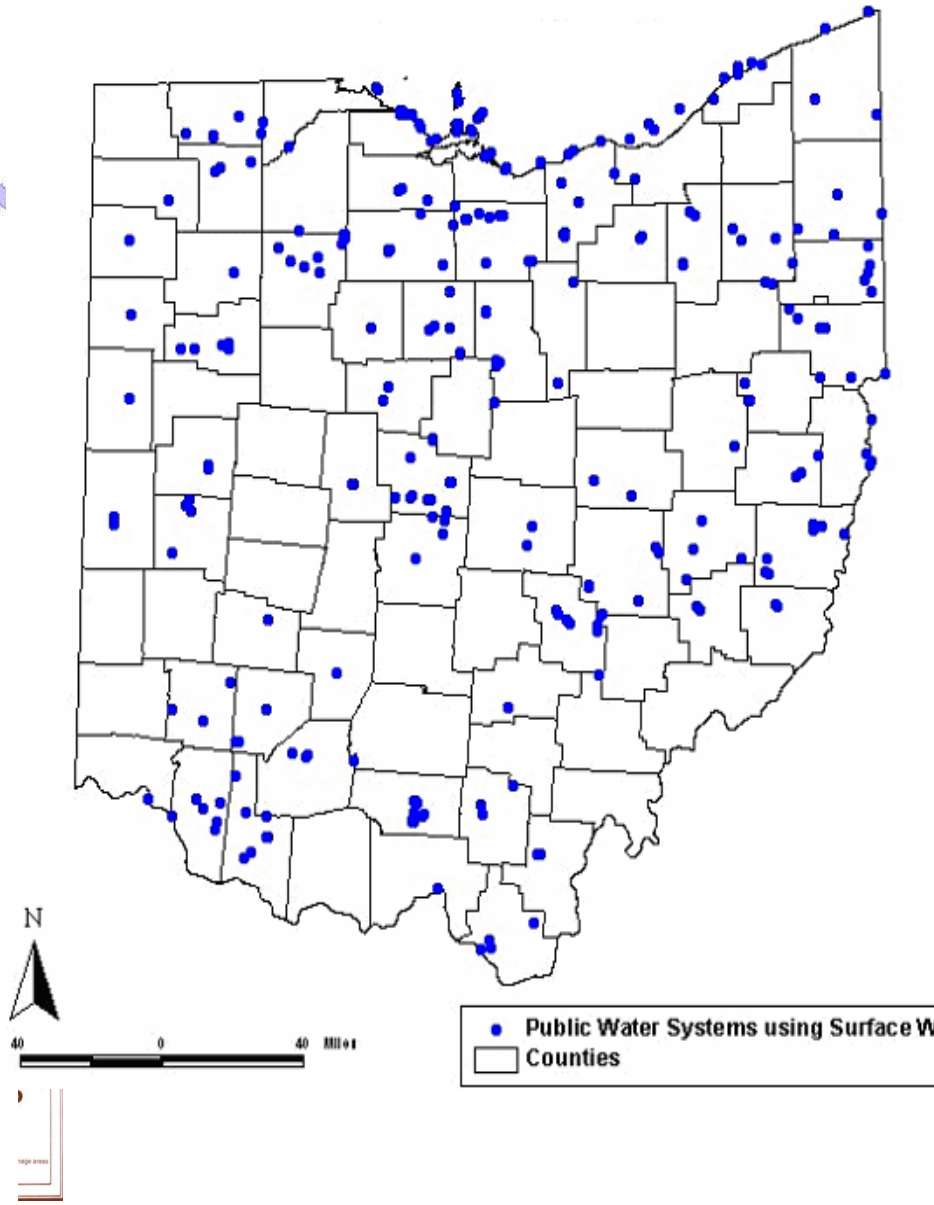
Public Water Systems Using Surface Water



LEGEND

- Corridor Management Zones
- Surface Water Intakes
- HUC 08 Watershed Boundaries
- Drinking Water Protection Areas (surface water)

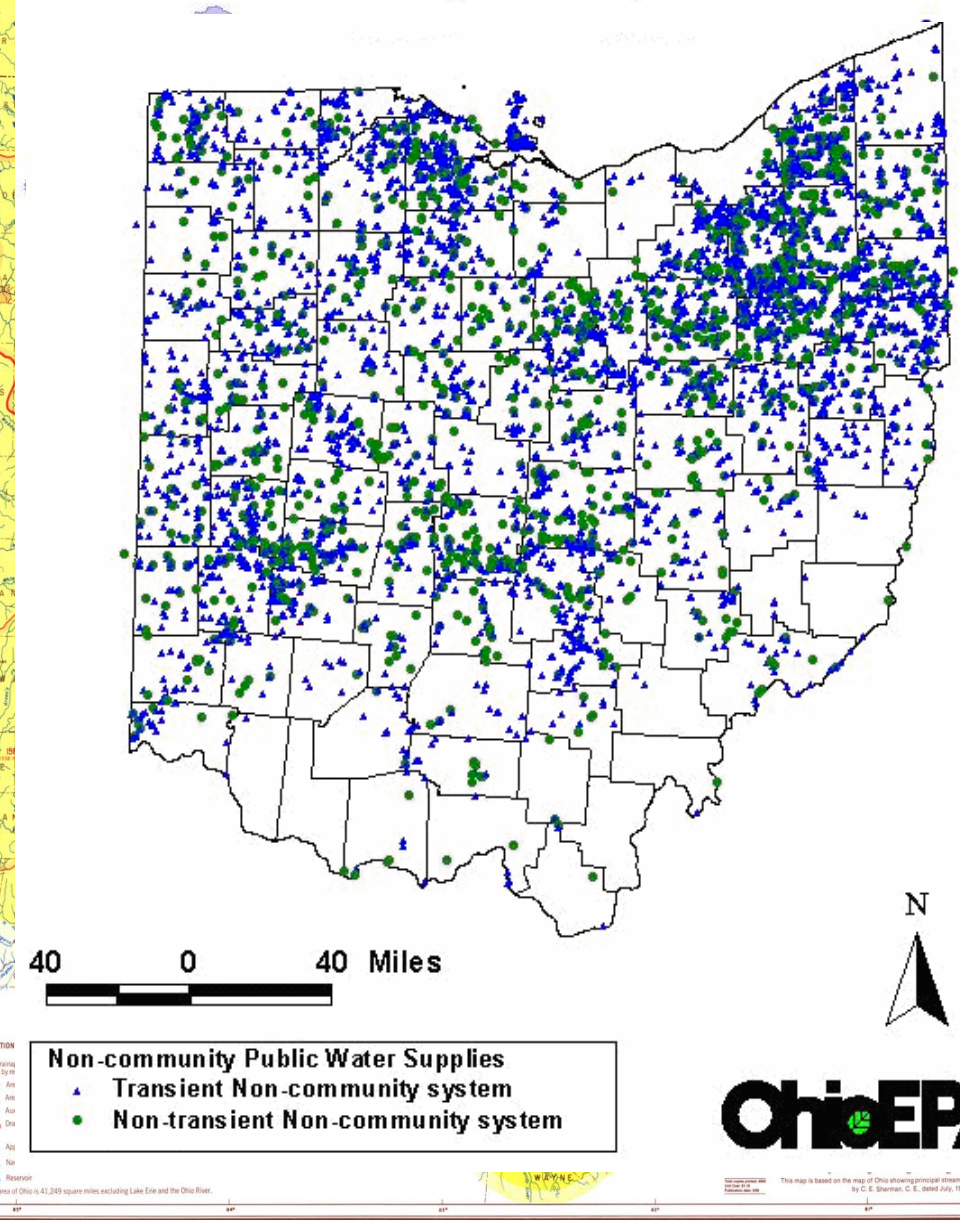
OhioEPA



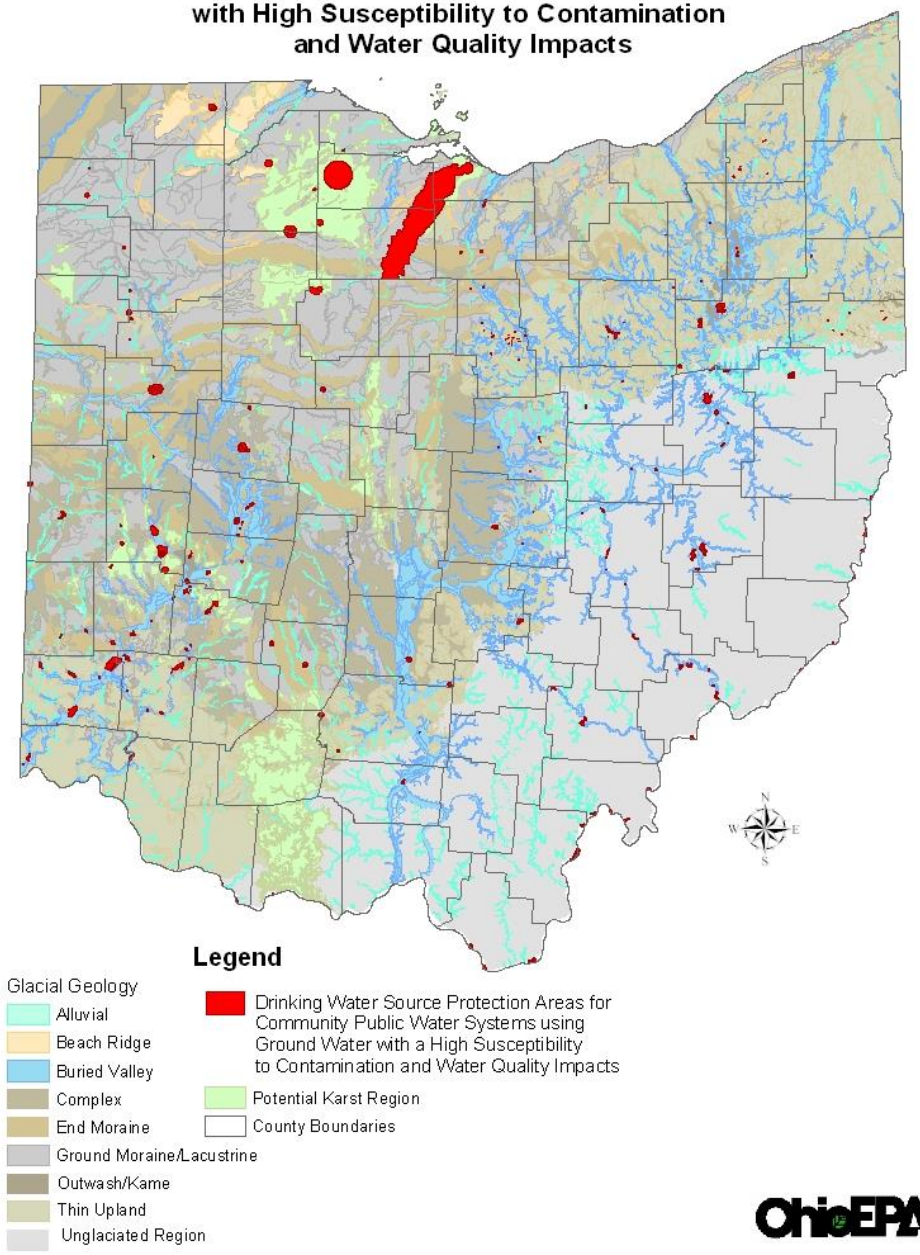
5/26/12

NPS Priority Drinking Water Protection Areas

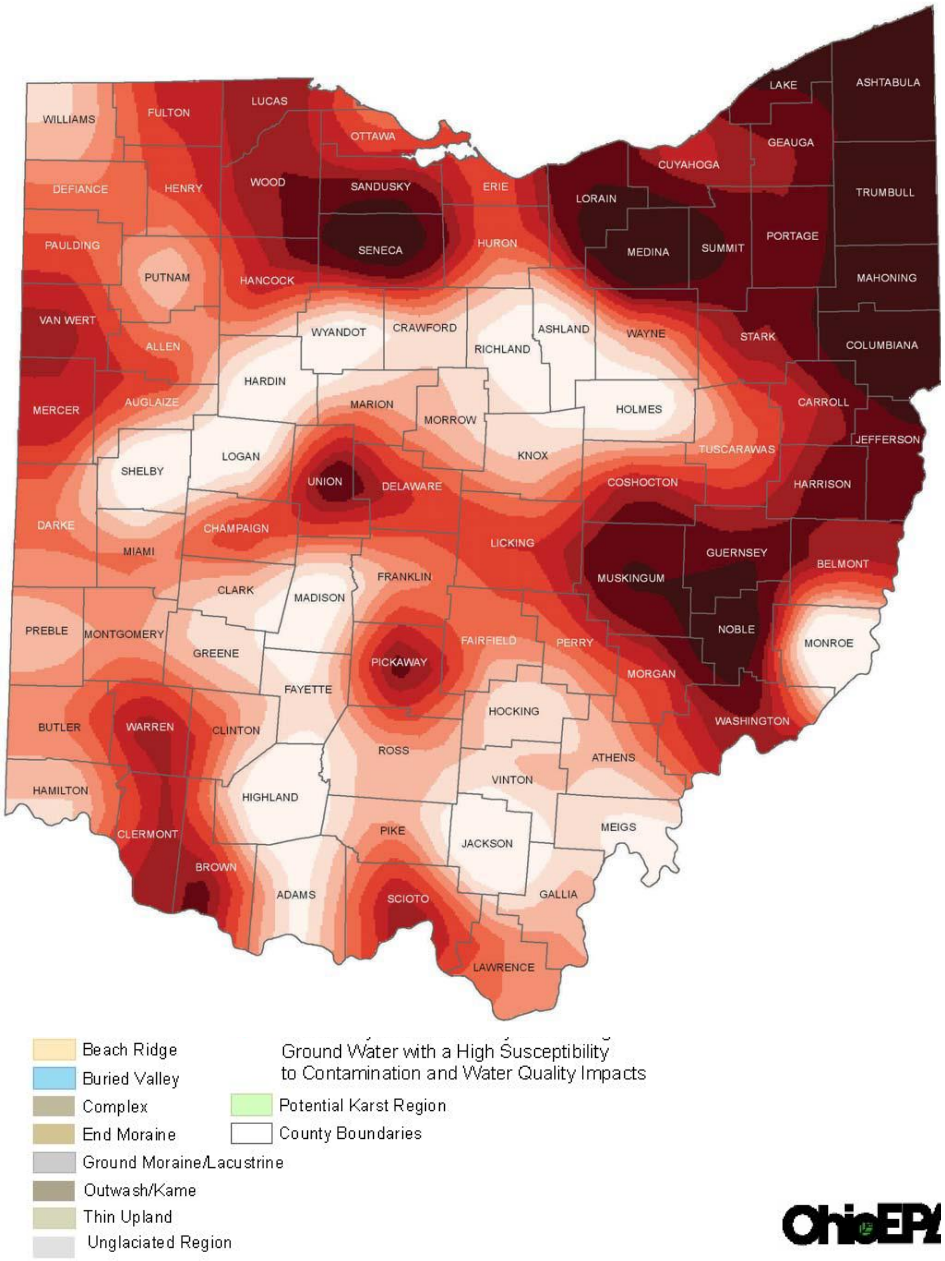
Public Water Systems Using Surface Water

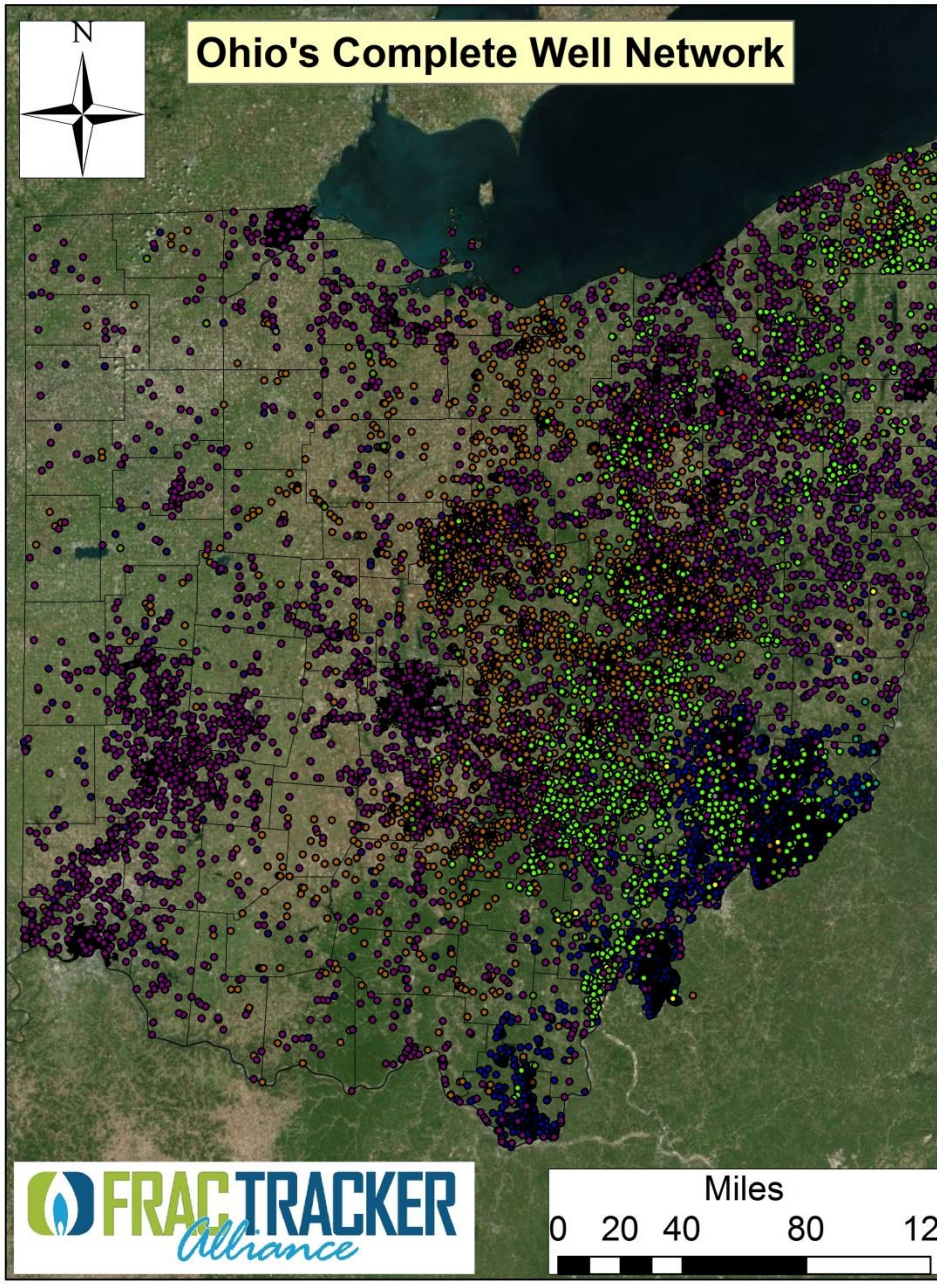


Community PWS using Ground Water with High Susceptibility to Contamination and Water Quality Impacts

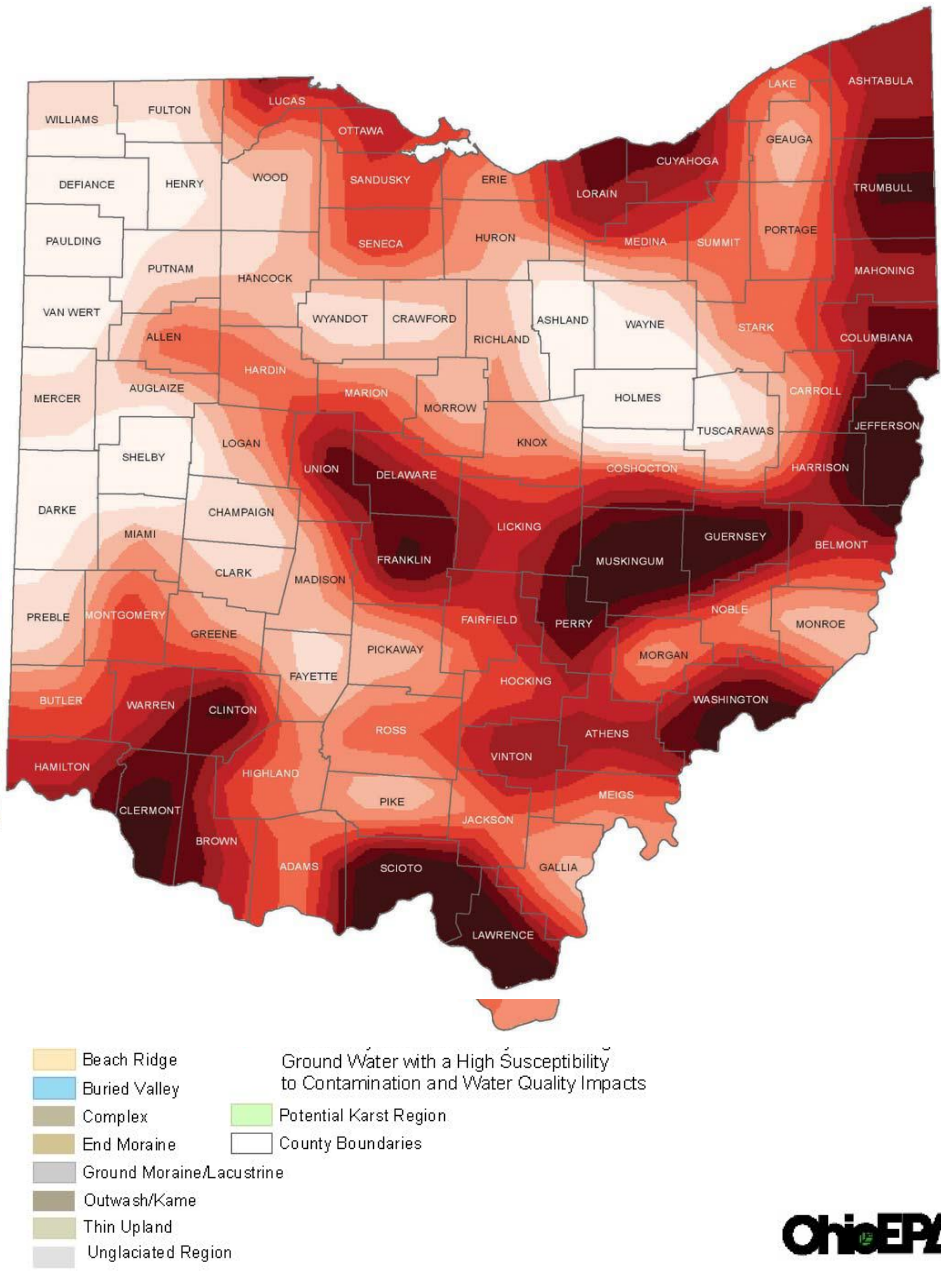


NPS Priority Drinking Water Protection Areas

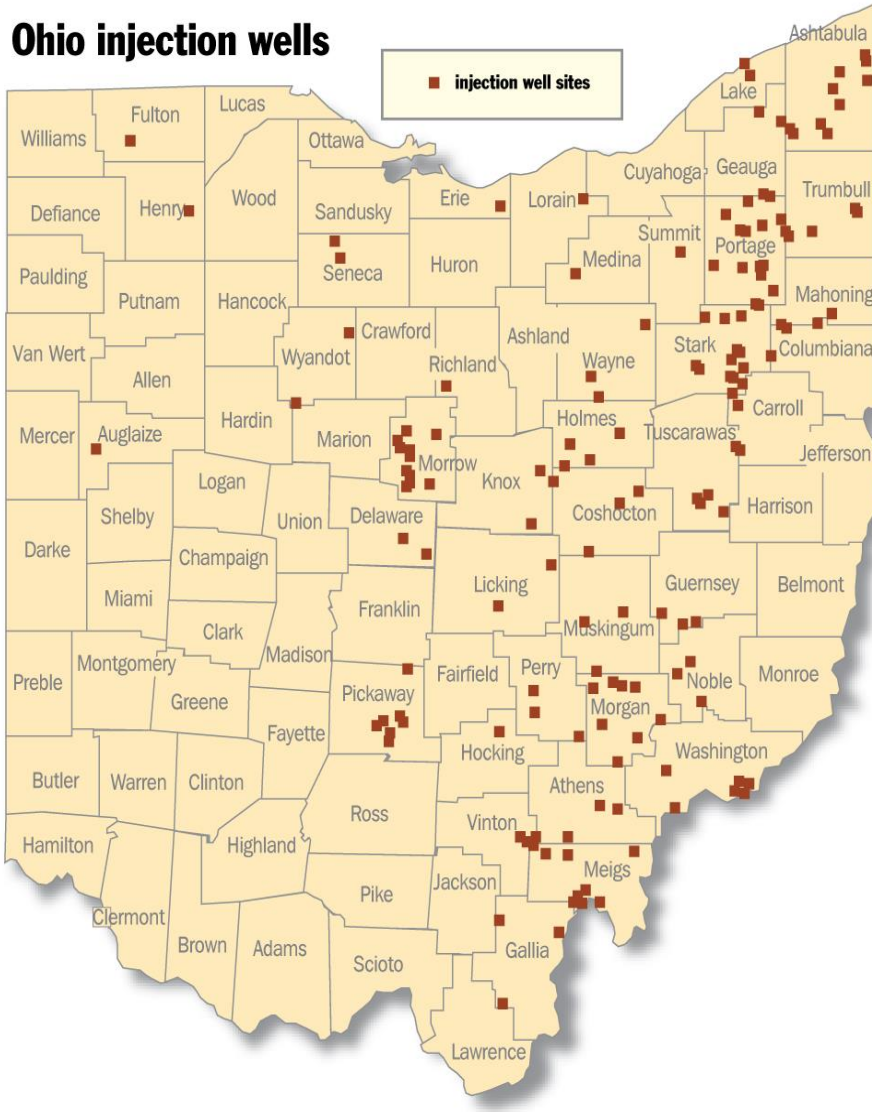




NPS Priority Drinking Water Protection Areas



Ohio injection wells



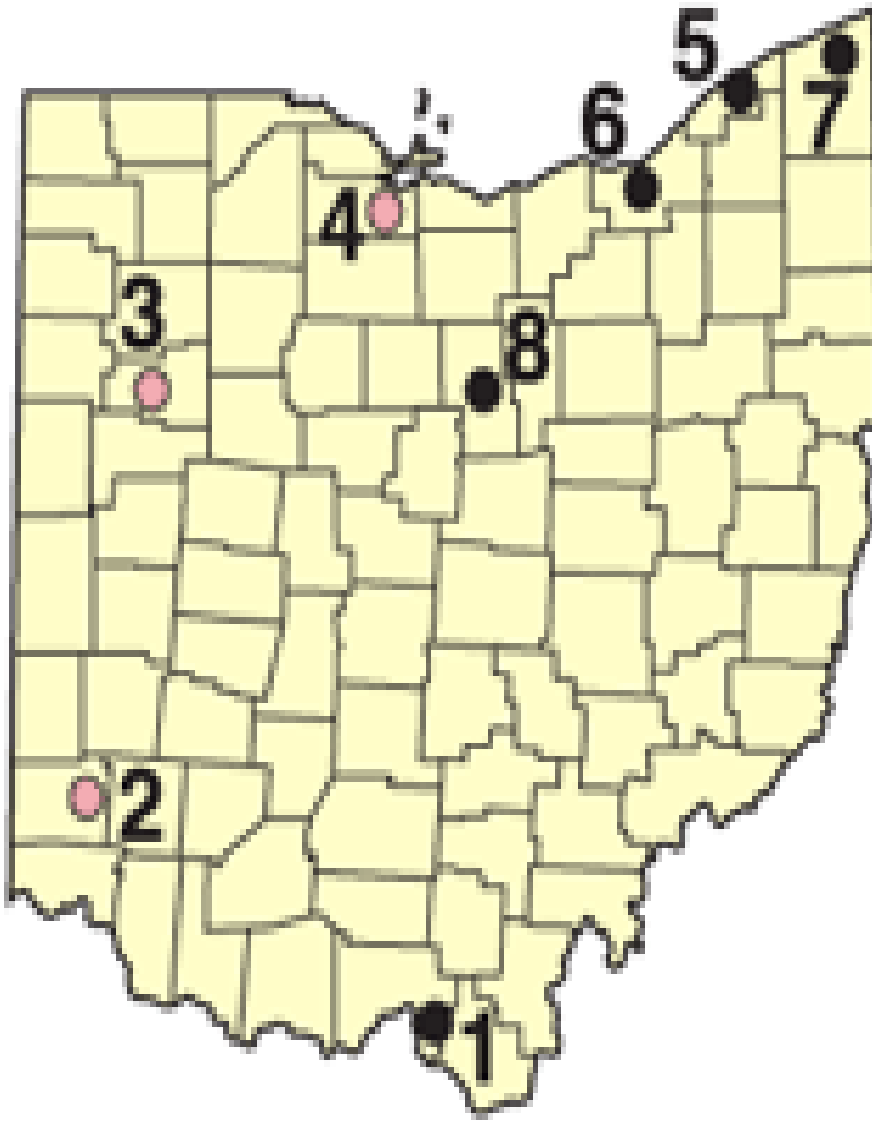
NPS Priority Drinking Water Protection Areas

Ohio has hundreds of miles of compromised Streams and rivers. Ohio EPA - study found elevated and/or unsafe levels of metals and organic compounds in Muskingum River surface water and sediments, including lead, copper, tetrachloroethene, trichloroethene, and dichloroethene .

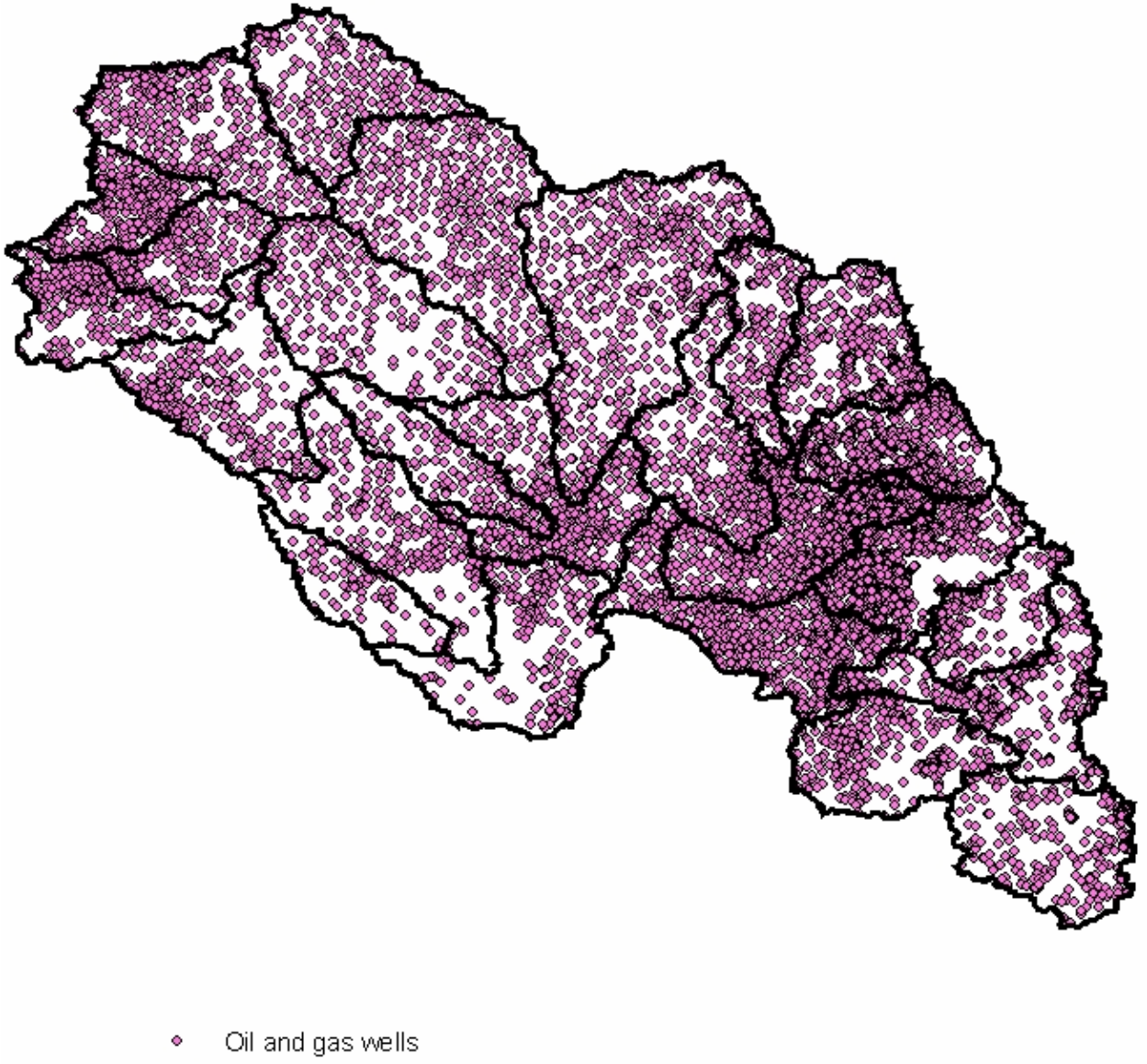
Sources-oil and gas wells were most abundant, abandoned surface and subsurface mines, strip mines, gob piles.

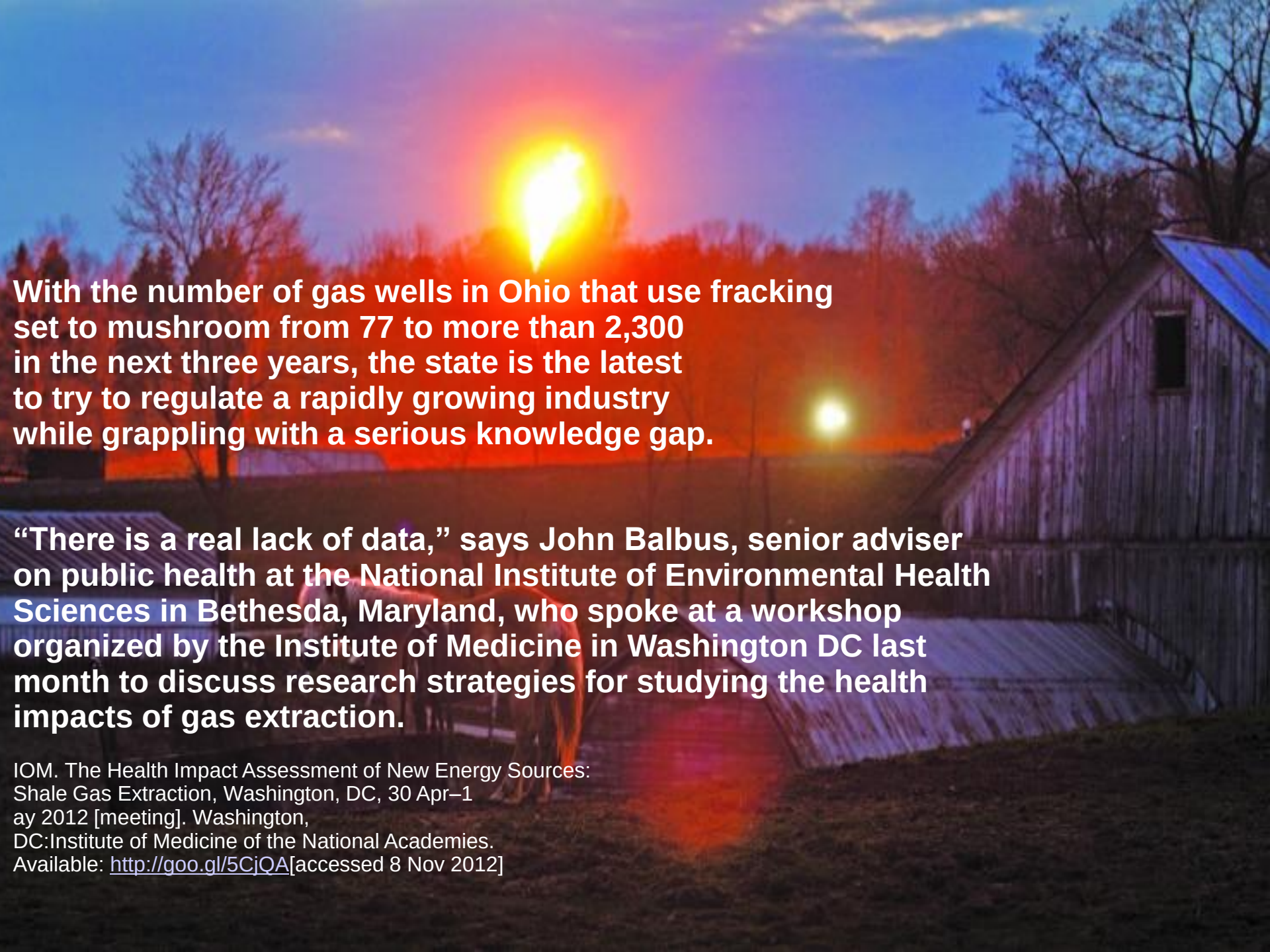
Communities in Ohio like Cambridge, Clyde and other locations exhibit extremely high incidences of leukemia, lymphoma, neurologic cancers, low birth weight, septicemia and respiratory disease clusters.

Requests by local health personnel find themselves without requested state supported studies.



Oil and gas wells are the most abundant potential sources of contamination within the Lower Muskingum watershed (Figure 11).





With the number of gas wells in Ohio that use fracking set to mushroom from 77 to more than 2,300 in the next three years, the state is the latest to try to regulate a rapidly growing industry while grappling with a serious knowledge gap.

“There is a real lack of data,” says John Balbus, senior adviser on public health at the National Institute of Environmental Health Sciences in Bethesda, Maryland, who spoke at a workshop organized by the Institute of Medicine in Washington DC last month to discuss research strategies for studying the health impacts of gas extraction.

IOM. The Health Impact Assessment of New Energy Sources: Shale Gas Extraction, Washington, DC, 30 Apr–1 ay 2012 [meeting]. Washington, DC:Institute of Medicine of the National Academies. Available: http://goo.gl/5CjQA[accessed 8 Nov 2012]

Lack of Transparency

Satterfield, John (30 June 2011). "Letter from Chesapeake Energy to EPA" (PDF).*InsideEPA* (Inside Washington Publishers). (subscription required). Retrieved 2012-05-19. "Flowback and Produced water ... Chesapeake agrees that an indepth study of toxicity, the development of new analytic methods and tracers are not practical given the budget and schedule limitations of the study ... Wastewater Treatment and Waste Disposal ... Chesapeake believes there was unjustified emphasis on the surface disposal of produced water to treatment plants in the SAB's Review ... Chesapeake disagrees with the inclusion of water distribution network corrosion and burden of analyzing for contaminants by POTW's into the study."

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

ATSDR: Problems in the Past, Potential for the Future?

Chairman Brad Miller of the Investigations and Oversight Subcommittee of the

House Committee on Science and Technology

The stated mission of the Agency for Toxic Substances and Disease Registry, ATSDR, is to serve the public by using the best science, taking responsive public health actions and providing trusted health information to prevent harmful exposures and disease-related exposures to toxic substances.

Since then, this subcommittee has heard from **many sources of other examples of jackleg science by ATSDR and a keenness to please industries and government agencies that prefer to minimize public health consequences of environmental exposures**. Our sources have included outside scientists, residents of communities exposed to various chemicals, and ATSDR's own scientists. Now, one ATSDR staff scientist told our subcommittee staff, ``**It seems like the goal is to disprove the communities' concerns rather than actually trying to prove exposures**.''

Leaked EPA Documents Expose Decades-Old Effort to Hide Dangers of Natural Gas Extraction
New York Times

Efforts by lawmakers and regulators to force the federal government to better police the natural gas drilling process known as hydraulic fracturing, or "fracking," have been thwarted for the past 25 years, according to an exposé in the *New York Times*.

Studies by scientists at the U.S. Environmental Protection Agency on fracking have been repeatedly narrowed in scope by superiors, and important findings have been removed under pressure from the industry. The news comes as the EPA is conducting a broad study of the risks of natural gas drilling with preliminary results scheduled to be delivered next year.

What is Missing?

PubMed Search:

"natural gas exploration and health effects"

3 citations

"Fracking and health"

12 citations

"Fracking"

18 citations-many were environmental related

Total Health References:

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What is Missing?

A subject search of this type, given the billions of dollars invested and decades the technology of fracking has built --- yielding such few peer reviewed references represents an unexplainable and gross shortage of federal resources not being allocated for basic and applied health/environmental science research.

Why is a technology like fracking in which it is applied to the localities of humans not under the same stringent regulatory testing and approvals mandated to other large industries such as large drug and biologics manufacturers ????

What is Missing?

Vaccines and Fracking:

Both are given to normal, healthy, humans.

Vaccines and their manufacturing process are required to undergo extensive POC, preclinical, clinical-Phase I, II and III testing prior to regulatory approval and licensing. This can take on average up to 5-8 years and $100 million dollars.

- Why does the Energy industry get a pass on this type of regulation?

Recommendation for New Energy Technologies going forward:

Adopt the **precautionary principle** which states if an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is harmful, the burden of proof that it is *not* harmful falls on those taking an act.

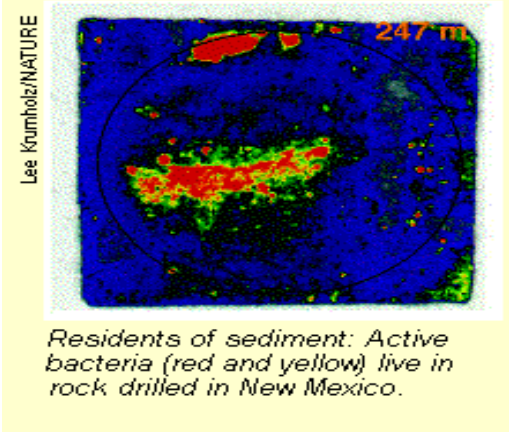
- **Require of the energy industry wanting to bring a new technology to practice for use in and around people and animals must assume a similar pre-technology regulatory approval process as used in the biologics industry**
- **This could be adopted by a new EPA or similar federal agency.**
- **In addition provide commensurate and increased funding for any and all health and ecology and environmental research**

Miscellaneous

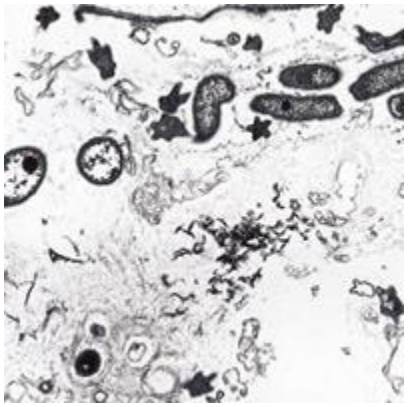
Energy conservation in the earth's crust and climate change

Mu Y, Mu X. College of Life and Environment Sciences, Shanghai Normal University, Shanghai, China.
J Air Waste Manag Assoc. 2013 Feb;63(2):150-60.

This paper argues that the **human large-scale extraction of fossil energy leads to damage of the earth's crust heat-resistant sealing, increasing terrestrial heat flow, or the heat flow as it is called, transferring the internal heat of the earth to Earth's surface excessively, and causing geo- temperature and sea temperature to rise, thus giving rise to global warming**. The reason for climate warming is not due to the expansion of greenhouse gases but to the wide exploitation of fossil energy, which destroyed the heat insulation of the earth's crust, making more heat from the interior of the earth be released to the atmosphere. **Based on the energy conservation principle, the measurement of the increase of the average global temperature that was caused by the increase of terrestrial heat flow since the Industrial Revolution is consistent with practical data.**



Residents of sediment: Active bacteria (red and yellow) live in rock drilled in New Mexico.



Luca technologies

The Earth Geo-Microbiome Project is a global project which will require processing as many as 200,000 samples from the most diverse and difficult to obtain environmental sample set ever attempted.

Bacteria perform 99% of all know inorganic and organic chemistries known to man. They have been found 1.5 miles deep in earth core, below the ocean floors and in granite. They can process hydro-carbons and produce energy with out typical oxygen and light.

THANK YOU!!

Current list of countries with a ban on fracking

France
Bulgaria
Romania
South Africa
Germany
The Czech Republic
Spain
Switzerland
Austria
Italy
Northern Ireland
Ireland
The United Kingdom
The Netherlands
Australia
Aotearoa (New Zealand)
Canada
British Columbia
Nova Scotia
Québec

Versailles, Pa., as seen in 1920.