

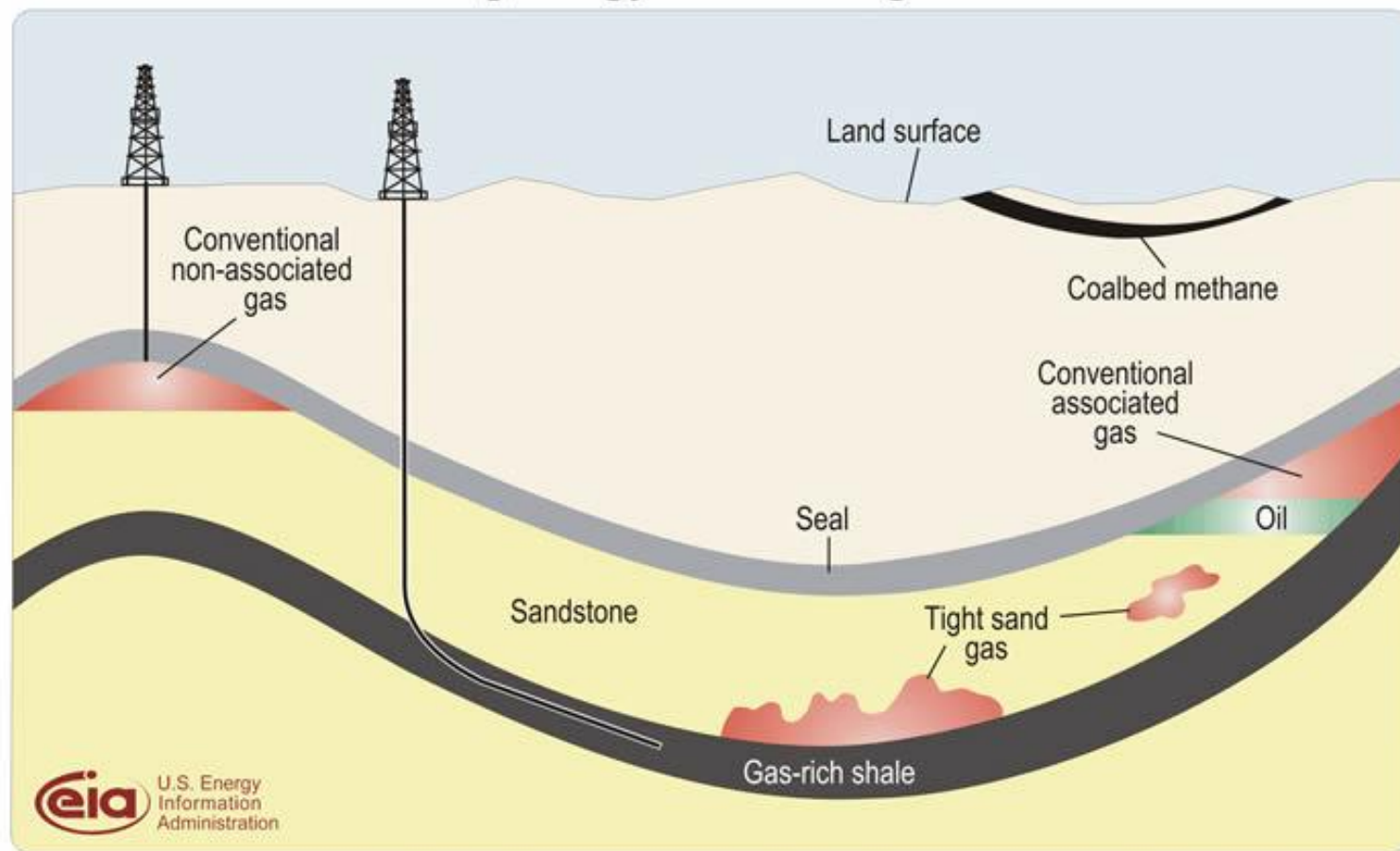
The Public Health Implications of Marcellus Shale Activities

Bernard D. Goldstein, MD
**Department of Environmental and Occupational
Health**

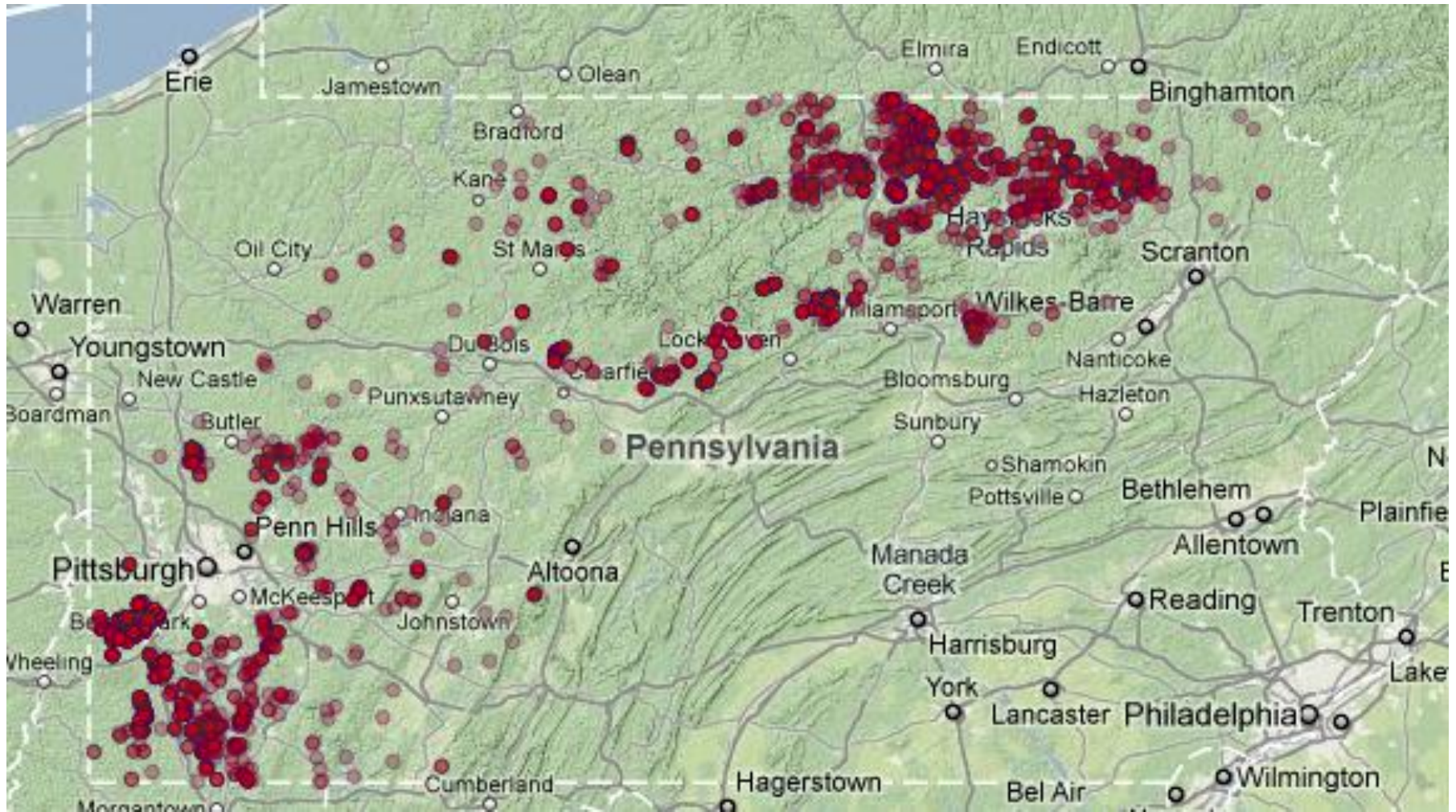
University of Pittsburgh
Graduate School of Public Health
bdgold@pitt.edu

Conventional and Non-conventional Natural Gas Extraction Methodologies

Schematic geology of natural gas resources



Marcellus drilling activity in PA to-date



Approximately 1,700 drilled Marcellus wells to-date (PA DEP, 2011). Map created using Data.FracTracker.org.

Drilling Rig in Rural Upshur County, WV



Five Unanswered Questions About the Gulf Spill

Newsweek
By Ian Yarett
August 03, 2010

Many important unknowns remain...

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Where has all the oil gone?

Does the wellbore have good integrity?

Are underwater seeps from old wells common?

Why aren't there more dead animals?

Pathways to Adverse Health Impacts of Marcellus Shale Operations

- Worker health and safety
- Air pollution
- Water pollution
- Soil pollution
- Noise pollution
- Community safety: traffic, explosions, fires;
crimes
- Psychosocial disruption
- Sustainability
- Global climate change

Questions Include

1. How is flow back and produced water disposed of?
2. Is the disposal of water affecting ground water or municipal and/or private drinking water supplies?
3. Water withdrawal and management?
4. Is there an additional burden to already compromised air quality in Southwestern, PA?
5. Movement of radionuclides?
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7. How will pipelines and heavy road traffic affect the infrastructure of communities?
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ACCIDENT

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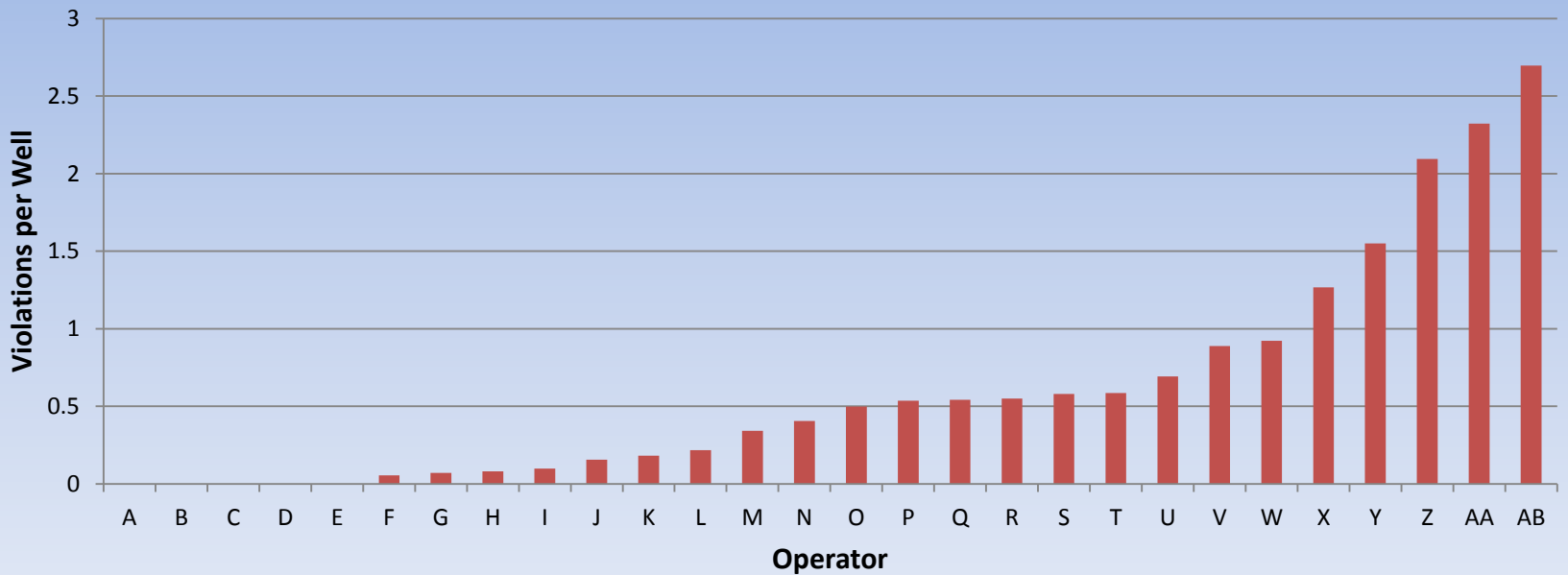
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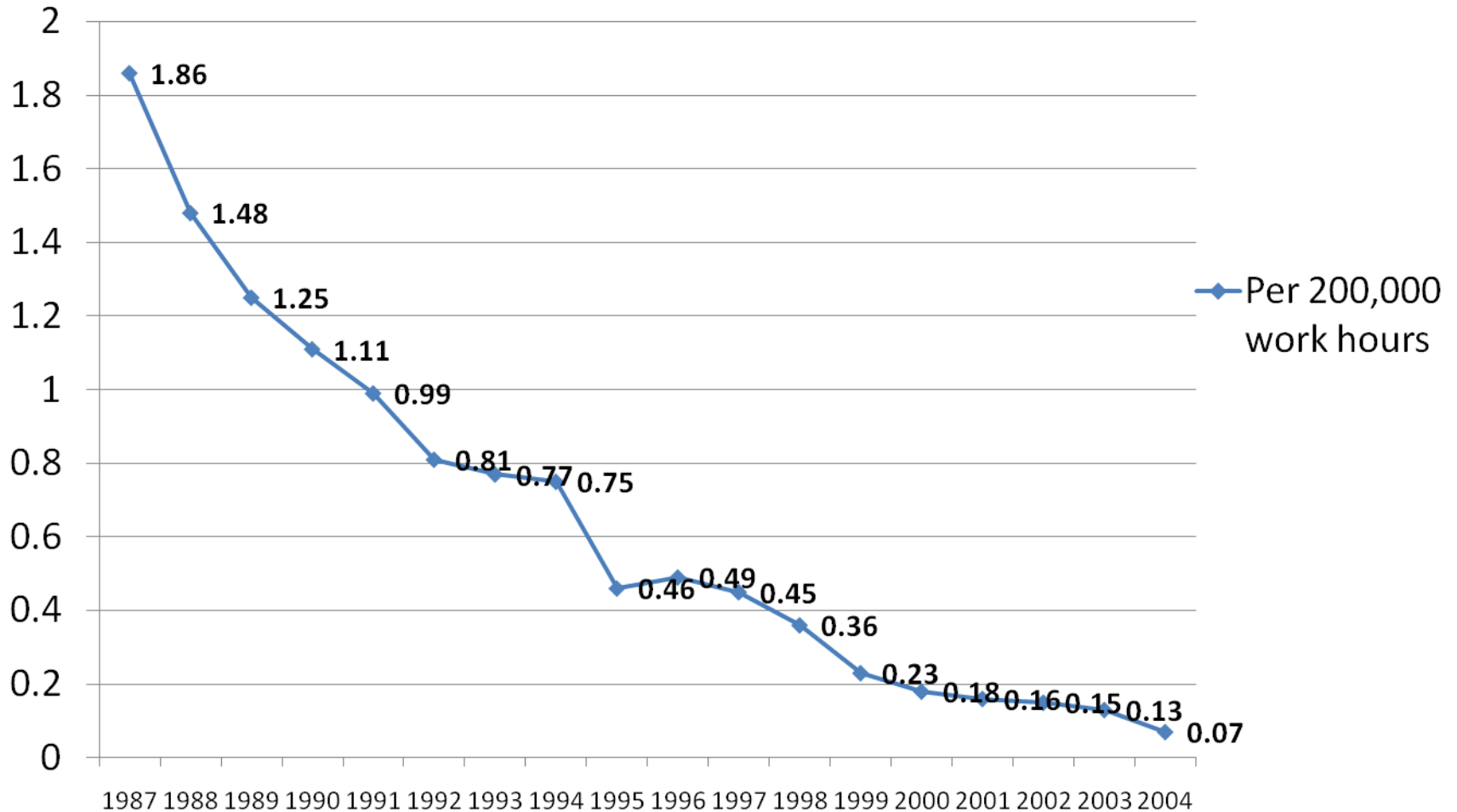
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Alcoa Lost Workday Performance 1987-2004



Issues in Toxicological Testing of Fracking Compounds

- Fate and transport
- Hazard
 - To individual species; including humans
 - To ecosystem
- Dose
- Persistence
- Bioconcentration and biomagnification
- Degradation products
 - Of chemical
 - Of natural gas components following interaction with chemical
- Interactions with existing chemistry and geology of air, soil and water; and in waste streams

COREXIT 9500 MSDS: NALCO

(edited)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous:

<u>Hazardous Substance(s)</u>	<u>(w/w)</u>
- Distillates, petroleum, hydrotreated light	10.0 - 30.0%
- Propylene Glycol	1.0 - 5.0%
- Organic sulfonic acid salt (Proprietary)	10.0 - 30.0%

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- 1) If you own the risk you own the harm
(It is not just the fault of the subcontractor)
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(Regulate groups of chemicals)



Image: Chris Wilkins/AFP/ Getty Images



Image: Exxon Valdez Oil Spill Trustee Council



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(see Satcher, D. *Public Health Reports* 125:6-7, 2010)

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Contradictory Statements

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THE ONLY THREE CERTAINTIES

1) Surprises

Unforeseen threats to human health will be detected.

2) Disease Clusters

Clusters of adverse health effects will occur in communities in which Marcellus shale activity has occurred, whether causally related or not

3) Less Pollution Over Time

Industry will find ways to recycle fracking chemicals (which they buy); and emit less of their product (which they sell)

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2) Disease Clusters and Law Suits

It is certain that in a community with Marcellus Shale activity there will be a highly publicized statistically significant increase in a disease. This will result in worried community members, loss of property values and law suits. The concern will spread to other Marcellus Shale communities

When this occurs Health Department or university epidemiologists will be asked to help determine whether the observed increase in disease incidence is a result of Marcellus Shale activity. This will require retrospective reconstruction of exposure to various chemicals. At best there will be a high degree of uncertainty in the exposure assessment that will complicate determination of cause and effect relationships

What's the Rush?

- Over time it is virtually certain that all the nation's oil and gas sources, including the Marcellus Shale, will be tapped.
 - So what's the rush?

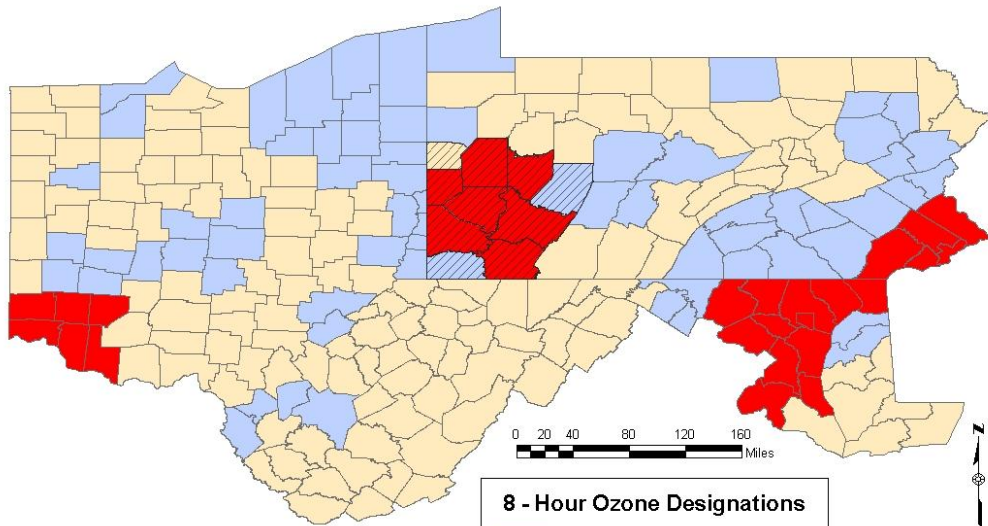
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Point Sources as Non-Point Sources

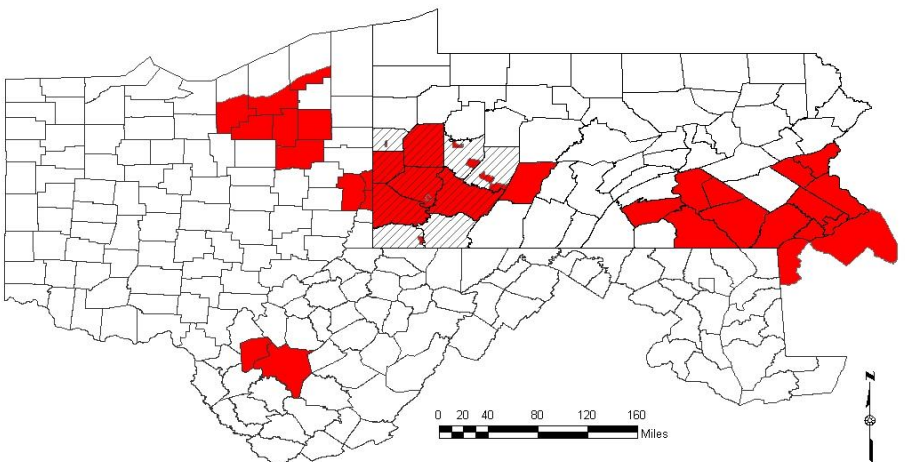
- Allowable emissions from the thousands or tens of thousands of Marcellus Shale sources easily exceed that of a major new point source (e.g., an oil refinery)
- Classically, non-point sources do not pose immediate risks in their neighborhood (e.g., nitrogen runoff from individual farms), but do so in aggregate (e.g., the dead zones of Chesapeake Bay or Gulf of Mexico)
- Marcellus Shale activities pose both local and aggregate risk
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NAAQS designations throughout PA, OH, MD, and WV



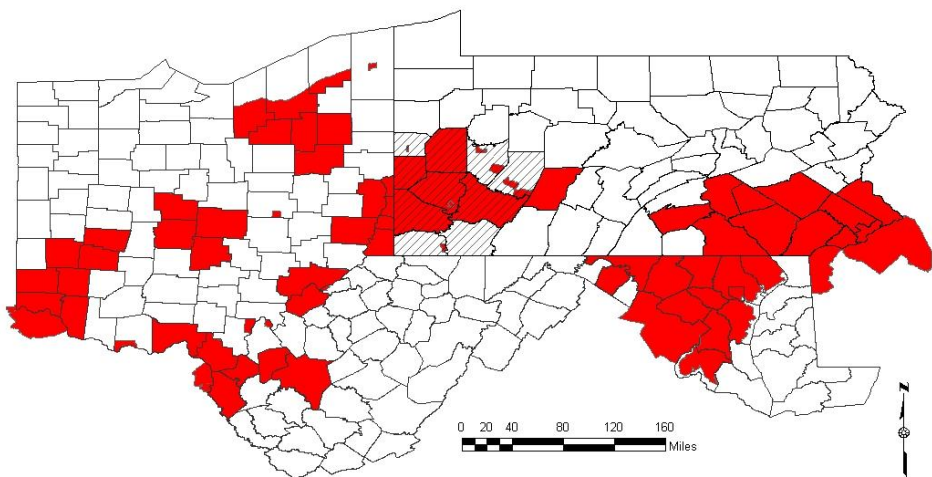
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Watch out for TE-NORM

Technologically-Enhanced Naturally Occurring Radiation

- Naturally occurring radioactivity is not infrequently associated with oil and gas deposits
- Working these deposits can lead to the unanticipated concentration or displacement of radioactivity (e.g., will there be more radioactivity in drinking water? Will more radon be off-gassed into the basements of homes near a drill site?)

Crime and Police Response – PA

- **"More and more, it seems the police reports coming out of the northern tier include arrests because of drug use and trafficking, fights involving rig workers, DUIs, and weapons being brought into the state and not registered properly," said the commissioner. "We've even encountered situations where drilling company employees who have been convicted of a sexual assault in another state come here to work and do not register with our Megan's Law website. Each of these issues is unacceptable and places an even greater burden on our law enforcement and local social programs meant to help those in need." (State Police Commissioner Frank Pawlowski)**
- State and local governments need additional resources to address the problems that have accompanied the arrival of drilling companies to Pennsylvania.

Community Health Concerns and the Marcellus Shale

- Even if it were true that Marcellus Shale activities present no health risk it is unreasonable to expect that communities will be reassured by statements from industry asserting that their activities are safe.
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- Public health surveillance is the continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice.
- Such surveillance can:
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- **Requires transdisciplinary approaches to complex environmental issues.**
- **Approaches must include a comprehensive evaluation of environmental, economic and social/health issues.** (e.g., in considering preventing on-site problems by trucking waste elsewhere, the diesel emissions of the trucks, impact on roads and dust generation, auto and pedestrian fatalities, etc need to be considered)
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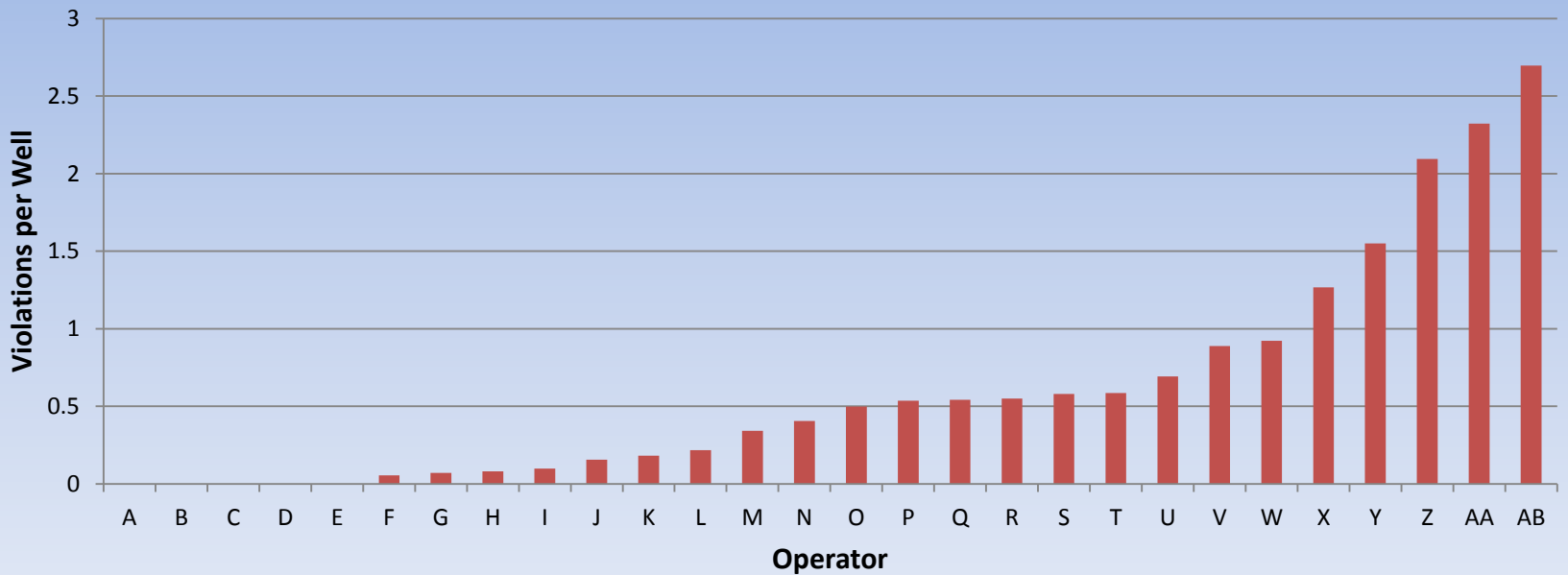
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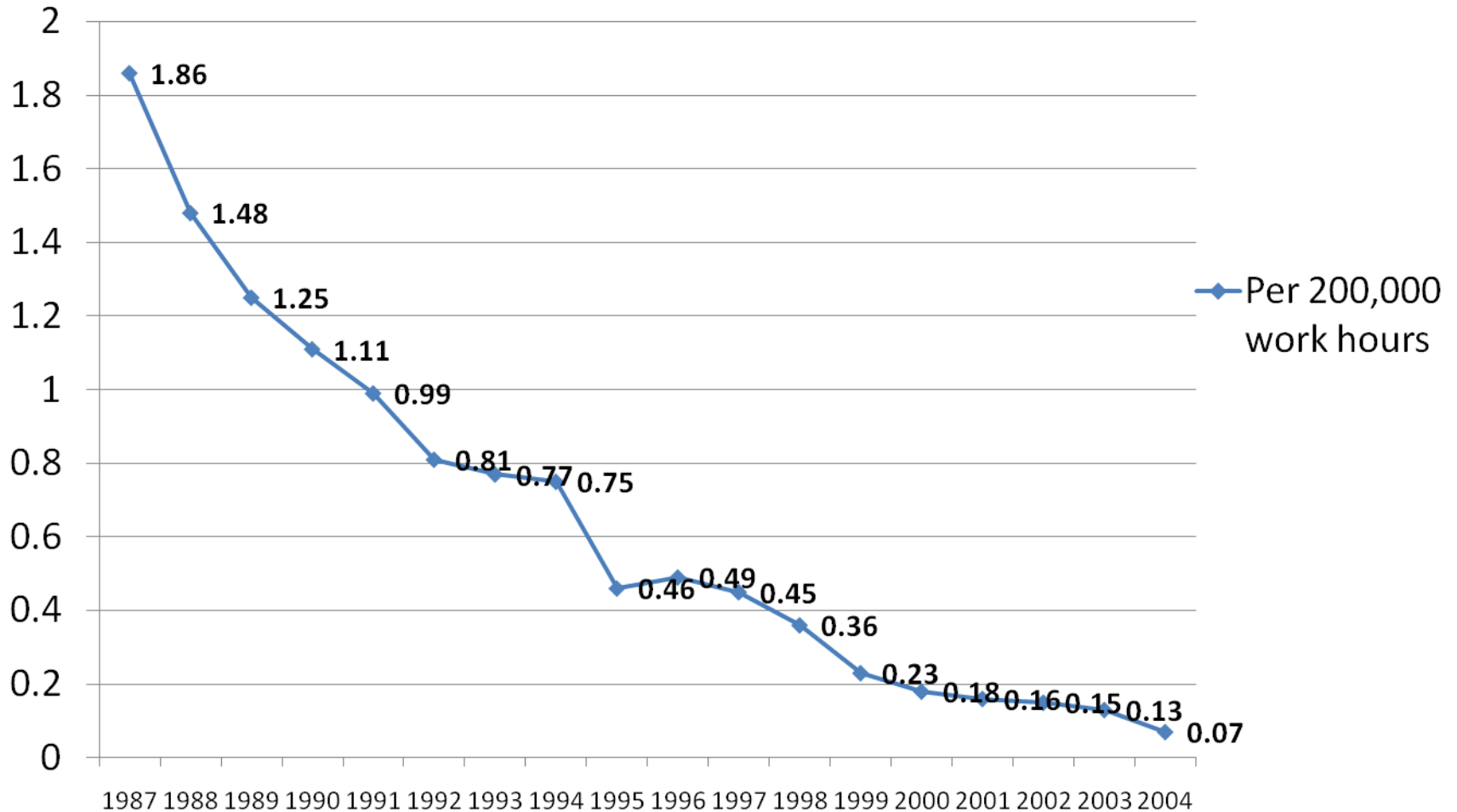
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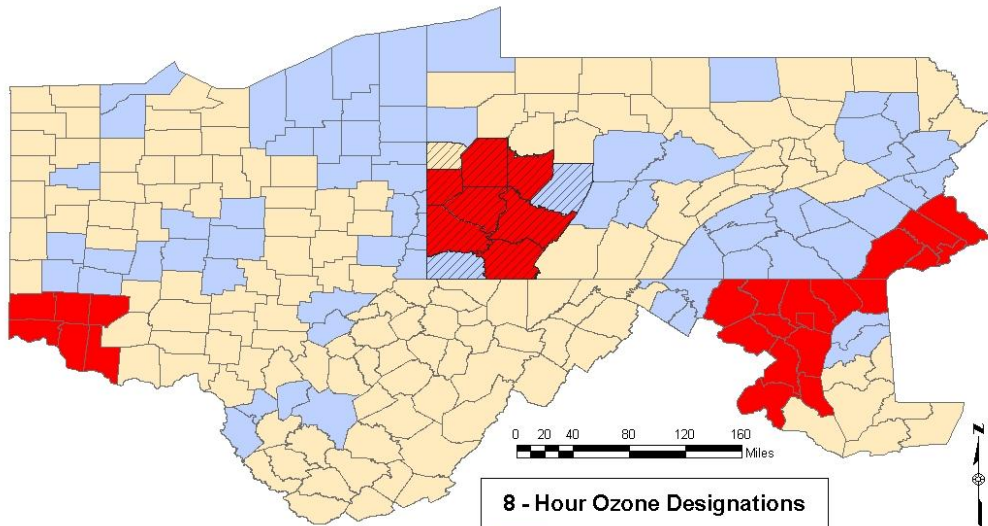
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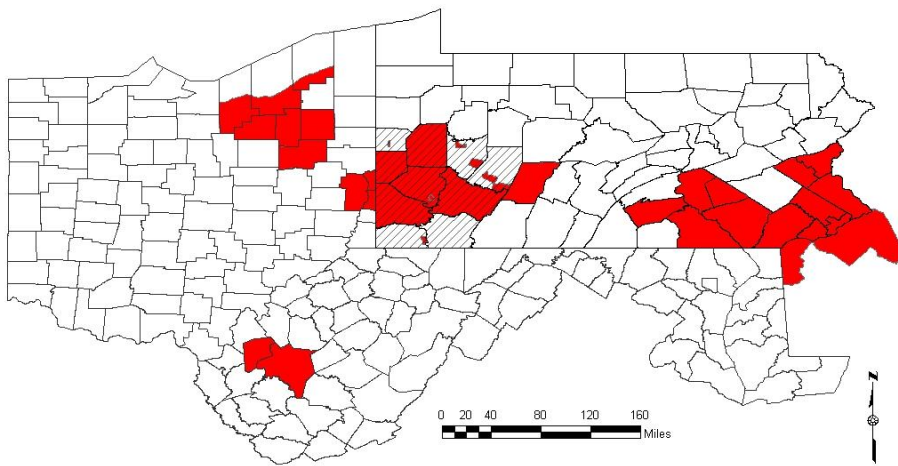
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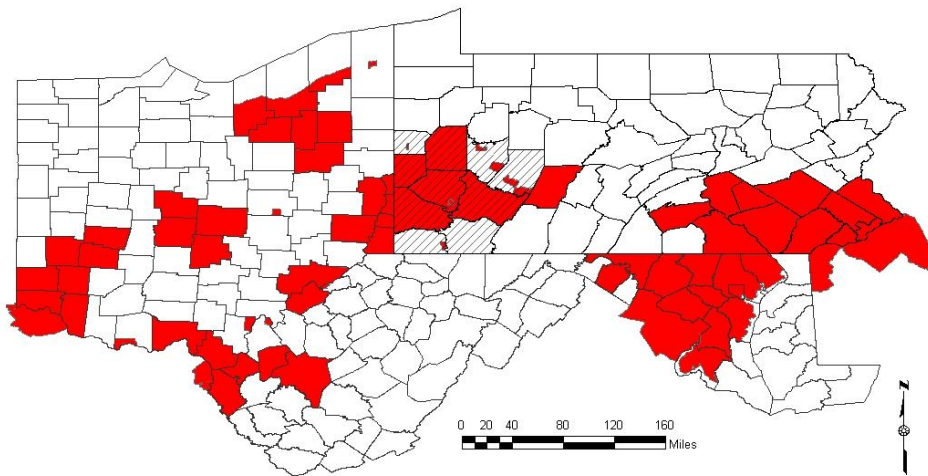
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Reasons given by those not in favor of Marcellus Shale drilling

(preliminary data)

Washington, PA public meeting with Natural Gas Subcommittee of the Secretary of Energy Advisory Board, N=59

Reason	Percent (%)
Environmental Concerns	76.3
Negative Effects on Water	66.1
Negative Effects on Air	42.4
Chemicals in Water	30.5
General Health Concerns	61.0
Health Problem in Family member attributed to drilling	20.3
Personal legal rights have been infringed upon by companies	11.9
Concerns about safety of drilling operations	33.9
Concerns about lack of regulation of industry	42.4
Bias, conflict of interest, or lack of expertise in desired subject area by members of the committee	18.6
Export of domestic natural gas resources	10.2
Depreciation in property values	3.4

Language used in Creating Advisory Committees Related to Marcellus Shale Activities

“...task the Secretary of Energy Advisory Board (SEAB) with establishing a subcommittee...to develop, within six months, consensus recommended advice to the agencies on practices for shale extraction ***to ensure the protection of public health*** and the environment” (emphasis added)

-President Barack Obama

Blueprint for a Secure Energy Future (March 2011)

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“WHEREAS, the Commonwealth takes seriously its responsibility to ensure the development of natural gas in a manner that protects the environment and ***safeguards the health and welfare of its citizens***” (emphasis added)

Pennsylvania’s Governor Corbett Executive Order (March 2011) establishing the Governor’s Marcellus Shale Advisory Commission

Language used in Creating Advisory Committees Related to Marcellus Shale Activities

In addition the Pennsylvania Marcellus Shale Advisory commission stated,

“the following working groups were created to assist the full Commission in its deliberations: Public Health, Safety, and Environmental Protection. [Which is responsible for] consideration of additional measures necessary to ***ensure the protection of the Commonwealth’s environment and natural resources and the enhancement of public health and safety.***”

(emphasis added)

-Excerpt from *Governor’s Marcellus Shale Advisory Commission Report*

Language used in Creating Advisory Committees Related to Marcellus Shale Activities

“The Marcellus Shale Safe Drilling Initiative will assist State policymakers and regulators in determining how gas production from the Marcellus shale in Maryland can be accomplished ***without unacceptable risks of adverse impacts to public health, safety,*** the environment and natural resources” (emphasis added)

-Maryland Governor Martin O’Malley in
Executive Order 01.01.2011.11: The Marcellus Shale Safe Drilling Initiative
(June 2011)

Committee Composition

Natural Gas Subcommittee of the Secretary of Energy Advisory Board (N=7)

Government (n=0)	Academia (n=3)	Environmental Groups (n=1)	Civil Society Groups (n=0)	Industry (n=3)
	MIT, Professor of Chemistry	Environmental Defense Fund		
	Texas A&M, Head of Petroleum Engineering			
	Stanford University, Professor of Geophysics			

Committee Composition

MD Marcellus Shale Safe Drilling Initiative Advisory Commission (N=14)

Government (n=6)	Academia (n=1)	Environmental Groups (n=3)	Civil Society Groups (n=2)	Industry (n=2)
Dept. of Business and Economic Development	Towson University, Geologist	Nature Conservancy, Maryland Office		
		Savage River Watershed Association		
		Mid-Atlantic Council of Trout Unlimited		

Committee Composition

PA Governors Marcellus Shale Advisory Commission (N=31)

Government (n=10)	Academia (n=1)	Environmental Groups (n=4)	Civil Society Groups (n=5)	Industry (n=11)
Dept. of Environmental Protection	Penn State University, Professor of Geosciences	Chesapeake Bay Foundation		
Dept. of Agriculture		Nature Conservancy		
Dept. of Community & Economic Development		Western Pennsylvania Conservancy		
Dept. of Conservation and Natural Resources		PA Environmental Council		
Dept. of Transportation				
Governor's Energy Executive				
PA Public Utility Commission				
PA Emergency Management Agency				

EPA Fracking Research Agenda

“Along with the expansion of [hydraulic fracturing], there have been increasing concerns about its potential impacts on drinking water resources, **public health**, and environmental impacts...” (emphasis added)

“Future work (over the next 5-10 years) encompassing [air quality, ecosystem, seismic, occupational and economic risks and impacts] should be integrated with the results of current research to provide a **holistic view of the impacts of hydraulic fracturing on human health and the environment.**” (emphasis added)

-excerpts from the US EPA's Framework for an EPA Safe and Sustainable Research Program

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- It is our fault

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