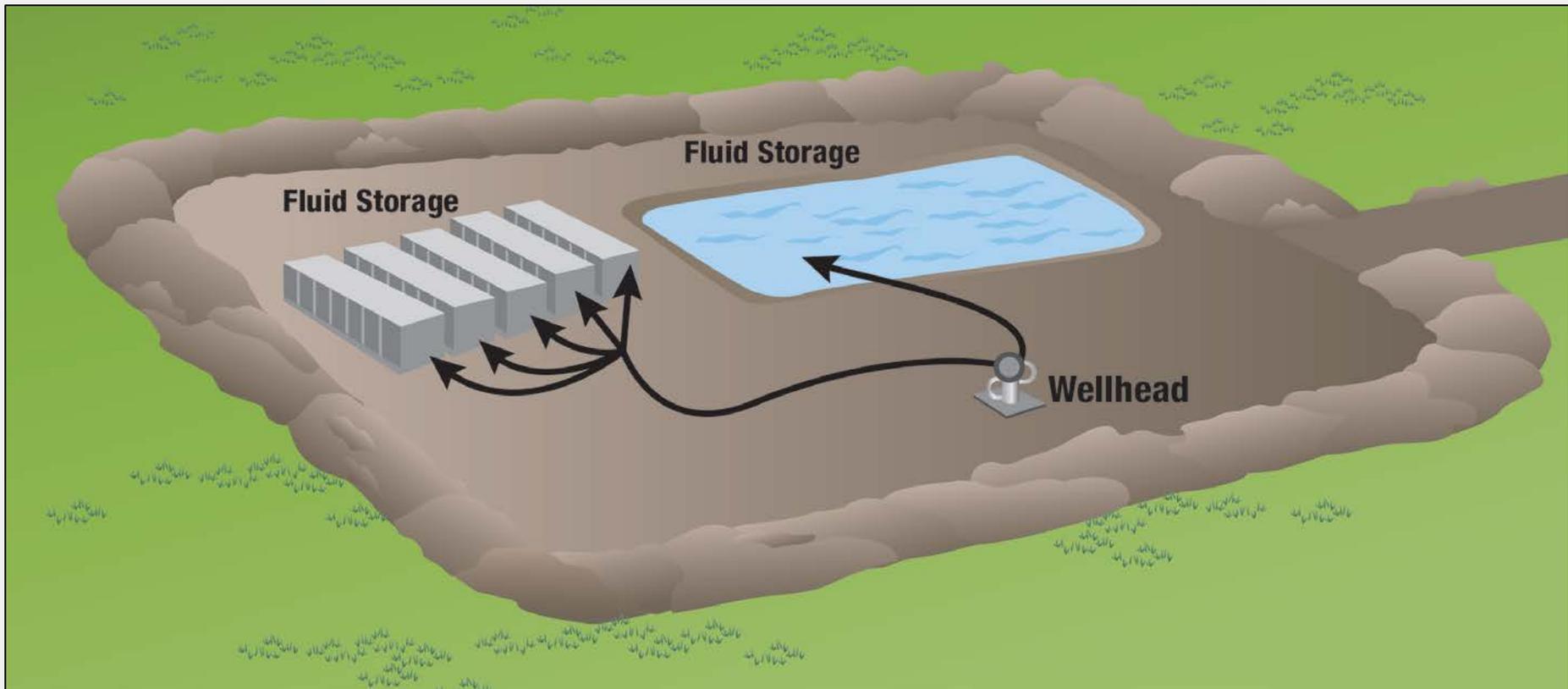


# Flowback and Produced Water

*Jeanne Briskin*



# Flowback and Produced Water



What are the possible impacts of surface spills on or near well pads of flowback and produced water on drinking water resources?

# Research Projects

- **Composition of hydraulic fracturing wastewater**
  - Literature Review
  - Well File Review
- **Frequency, severity and causes of hydraulic fracturing-related spills**
  - Spills Database Analysis
  - Service Company Analysis
  - Well File Review

# Charge Question #9

Please identify literature or specific data on the composition of **flowback** and **produced** water.

# Wastewater Composition Data

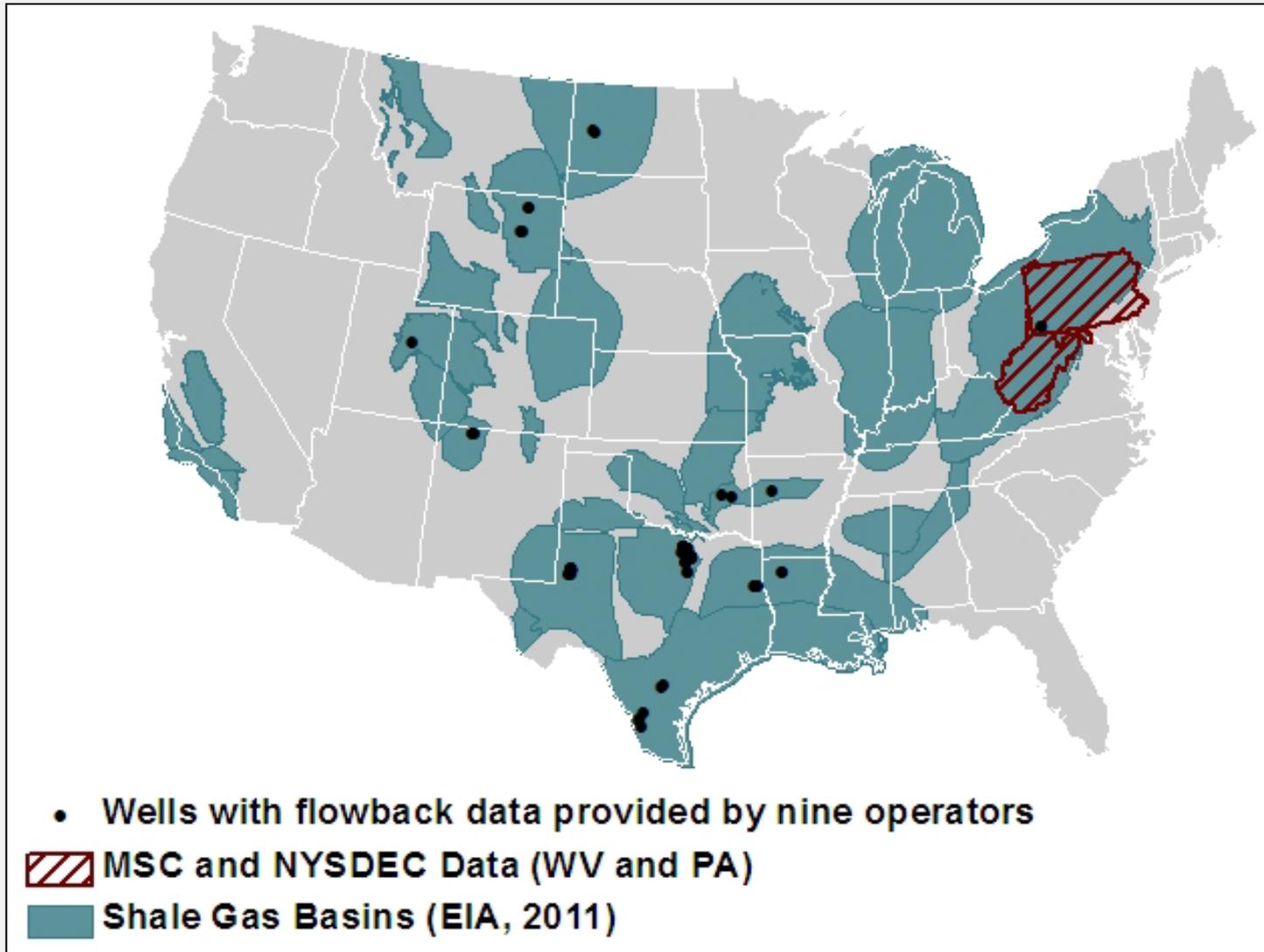
- **Report by NY State Department of Environmental Conservation (NYSDEC):** (Revised Draft) Supplemental Generic Environmental Impact Statement (SGEIS) on the Oil, Gas and Solution Mining Regulatory Program, 2011
- **Report by Gas Technology Institute (GTI) for Marcellus Shale Coalition (MSC):** Sampling and Analysis of Water Streams Associated with the Development of Marcellus Shale Gas, 2009
- **Well File Review:** Sampling Data for Flowback and Produced Water Provided to EPA by Nine Oil and Gas Well Operators, 2011

See Tables A-3 and A-4 of the *Progress Report*

# Wastewater Composition Data

	<b>NYSDEC SGEIS</b>	<b>GTI/MSC Report</b>	<b>Well File Review</b>
No. of unique wells	<ul style="list-style-type: none"> <li>• Not provided</li> </ul>	<ul style="list-style-type: none"> <li>• 19</li> </ul>	<ul style="list-style-type: none"> <li>• 81</li> </ul>
Location of wells	<ul style="list-style-type: none"> <li>• PA and WV (Marcellus Shale)</li> </ul>	<ul style="list-style-type: none"> <li>• PA and WV (Marcellus Shale)</li> </ul>	<ul style="list-style-type: none"> <li>• Various basins across the country</li> </ul>
Data source	<ul style="list-style-type: none"> <li>• Data provided by well operators</li> </ul>	<ul style="list-style-type: none"> <li>• Marcellus Shale Gas Coalition member companies</li> </ul>	<ul style="list-style-type: none"> <li>• Data provided by well operator</li> </ul>
Time-series data	<ul style="list-style-type: none"> <li>• Most are one sample per well</li> </ul>	<ul style="list-style-type: none"> <li>• 1, 5, 14, 90 days after hydraulic fracturing</li> </ul>	<ul style="list-style-type: none"> <li>• Data varies widely in terms of number of constituent sampling days per well</li> </ul>
Analytes	<ul style="list-style-type: none"> <li>• Metals</li> <li>• Few VOCs</li> <li>• Radium 226, 228</li> <li>• Typical water quality parameters (e.g., TDS, hardness)</li> </ul>	<ul style="list-style-type: none"> <li>• Metals</li> <li>• VOCs and SVOCs</li> <li>• Alcohols, glycols</li> <li>• Some acids</li> <li>• Typical water quality parameters</li> </ul>	<ul style="list-style-type: none"> <li>• Metals</li> <li>• VOCs and SVOCs</li> <li>• Radium 226, 228</li> <li>• Some acids</li> <li>• Typical water quality parameters</li> </ul>

# Wastewater Composition Data



# Wastewater Composition

- Flowback and produced water can include:
  - Injected chemicals
  - Reaction and/or degradation products
  - Hydrocarbons
  - Native formation fluid
- Flowback and produced water are expected to vary based on different types of geology
- Additional data needed

# Technical Stakeholder Input\*

- Produced water quantity, duration and quality vary considerably between shale plays and can even vary geographically within the same play
  - Barnett: Large volumes of produced water; TDS and Chloride (Cl) increase significantly over time
  - Fayetteville: Relatively low Cl, Magnesium (Mg) and Total Dissolved Solids (TDS)
  - Haynesville: High Calcium (Ca), Mg, Cl, TDS and Total Suspended Solids (TSS)
  - Marcellus: High Sodium (Na), Ca, Mg, Cl, TDS and specific conductance; often high Barium and Strontium
- Salinity of produced water increases over time

# Charge Question #10

Please suggest ways for the EPA to use data from the **spills database analysis** or other data to more comprehensively assess how spills or leaks may impact drinking water resources.

# Spills Database Analysis

## Identify Data Sources

- State and federal spill databases
- Information provided by well operators and hydraulic fracturing service companies

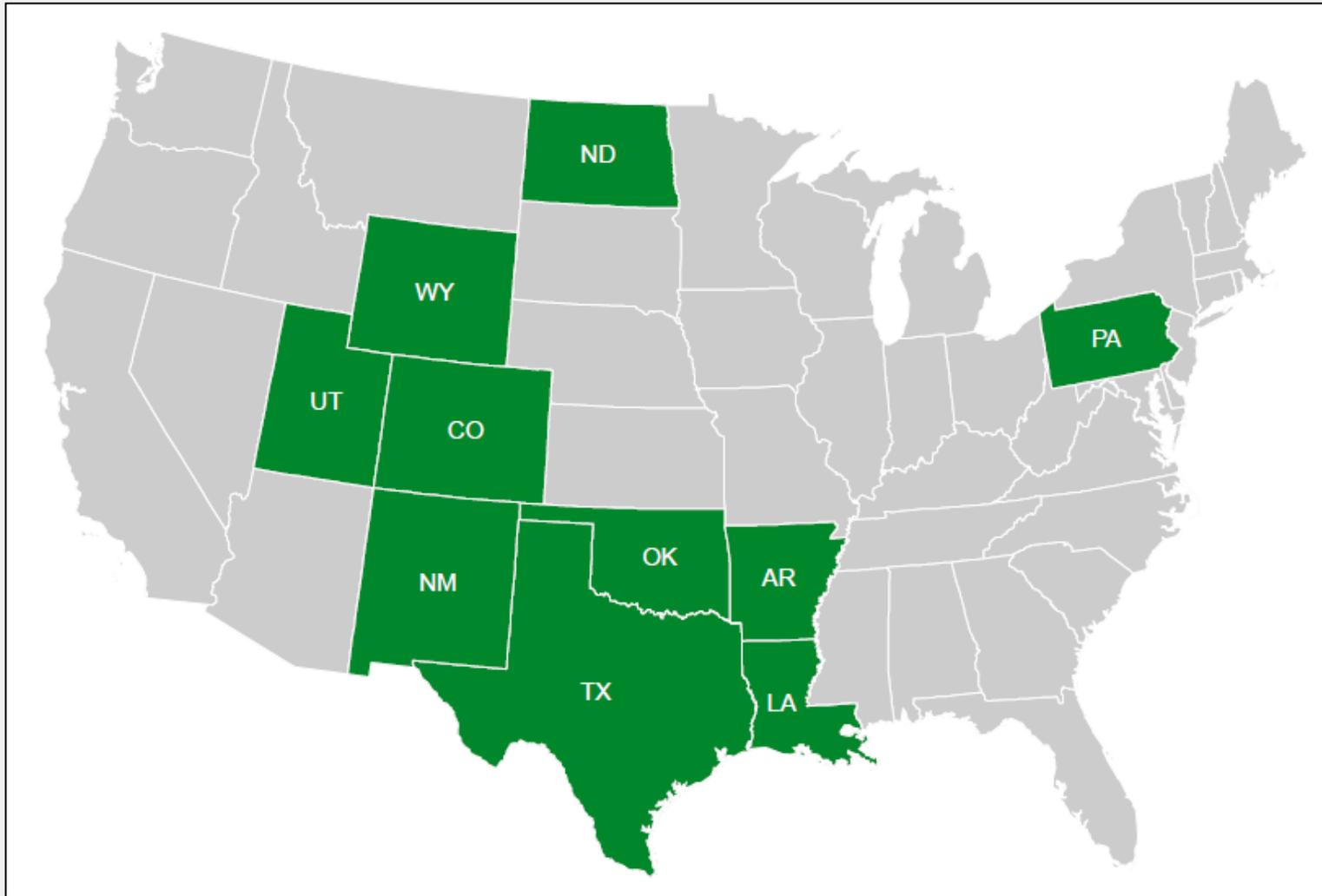
## Identify Hydraulic Fracturing-Related Spills

- Onsite spills of hydraulic fracturing fluids/chemicals, flowback and produced water

## Analyze Data from Relevant Spills

- Cause, chemical/substance spilled, estimated/reported spill volume, reported impact (if any)

# Spills Database Analysis



States were selected based on the number of wells entered into FracFocus as of Feb. 2012

# Data Sources

<b>STATE</b>	<b>DATABASE</b>
Arkansas	Department of Environmental Quality Complaints and Inspections Database
Colorado	Oil and Gas Conservation Commission COGIS - Spill/Release Database
Louisiana	Department of Environmental Quality
New Mexico	Energy, Minerals and Natural Resources Department Spills and Pit Data
North Dakota	North Dakota Industrial Commission, Oil and Gas Division and the North Dakota Department of Health, Environmental Health Section
Oklahoma	Corporation Commission
Pennsylvania	Department of Environmental Protection Compliance Reporting Database
Texas	Railroad Commission H8 Spill Records
Utah	Department of Environmental Quality Division of Environmental Response and Remediation
Wyoming	Oil and Gas Conservation Commission Spill Database

**National data collected from the National Response Center**

# Scope of Analysis

## **EPA is gathering information on:**

- Onsite spills, leaks, overflows and releases
- Incidents that occurred between Jan. 1, 2006, and April 30, 2012

## **Incidents outside the current scope include:**

- Transportation-related spills
- Spills from drilling activities
- Air releases
- Injection well disposal spills
- Well construction and permitting violations

# Technical Stakeholder Input\*

- Although companies have incident tracking systems, inconsistent terminology makes their use complicated
- Additional sources of information suggested:
  - Industry SOPs for addressing spills under the reporting limit
  - Company “daily operations reports”
  - Additional state spills databases
  - Shale Water Research Center data from Rice University and Washington University

# Challenges

- Databases do not clearly identify hydraulic fracturing-related spills/releases
- Variation in reporting for different states
  - Reporting limits vary by state
  - Difficult to categorize reported spills and to identify causes, chemical identity and volumes
- Lack of electronic accessibility to state data

# Charge Questions

9. Please identify literature or specific data on the composition of **flowback** and **produced** water.

10. Please suggest ways for the EPA to use data from the **spills database analysis** or other data to more comprehensively assess how spills or leaks may impact drinking water resources.