

# Update on EPA's Retrospective Case Studies

## Technical Workshop on Case Studies to Assess Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

Richard Wilkin, EPA/ORD

July 30, 2013



# Case Studies

- Purpose: To determine if drinking water contamination has occurred at the case study locations and, if so, identify possible sources of contamination.
- Identification and selection
  - Stakeholder suggestions
    - Public meetings
    - EPA website
    - Webinars
    - Conferences
    - Regional input



*More than 40 locations for potential case studies were considered.*

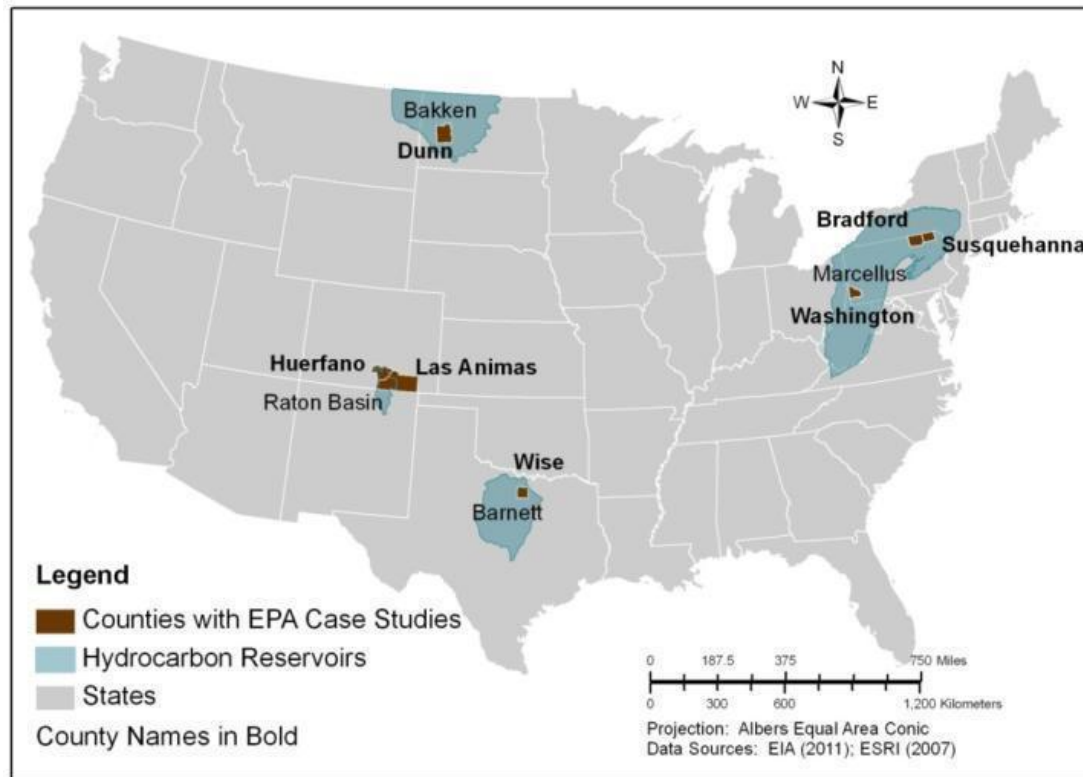
# Retrospective Case Studies

## Approach

- Identified and selected case studies based on various criteria:
  - Proximity of population and drinking water supplies
  - Evidence of impaired water quality
  - Health and environmental concerns
  - Knowledge gaps that could be filled by the case study
- Prioritized case studies based on:
  - Geographic and geologic diversity
  - Population at risk
  - Site status (planned, active, or completed)
  - Unique geologic or hydrologic features
  - Characteristics of water resources
  - Land use

# Retrospective Case Studies

- Selected 5 case studies to investigate reported drinking water impacts
- **Case study locations**
  - Bradford County, PA
  - Washington County, PA
  - Marcellus, PA
  - Susquehanna, PA
  - Wise County, TX
  - Barnett, TX
  - Huerfano, CO
  - Las Animas, CO
  - Raton Basin, CO
  - Bakken, ND
  - Dunn, ND



# General Analyte List

- Gasoline & Diesel Range Organics (DRO and GRO)
- Volatile and Semi-volatile Organics (VOCs and SVOCs)
- Glycols and Alcohols
- Carboxylic Acids
- Dissolved Organic and Inorganic Carbon (DOC and DIC)
- Major & Trace Cations (metals) and Anions
- Dissolved Gases (methane, ethane, propane, n-butane)
- Stable isotopes (O and H in water; C and H in methane, if detected; C in DIC; in some cases, S in sulfate/sulfide)
- Sr isotopes
- Radionuclides (Gross alpha/beta; Ra-226 and Ra-228)
- General Water Quality Parameters (pH, ORP, etc.)

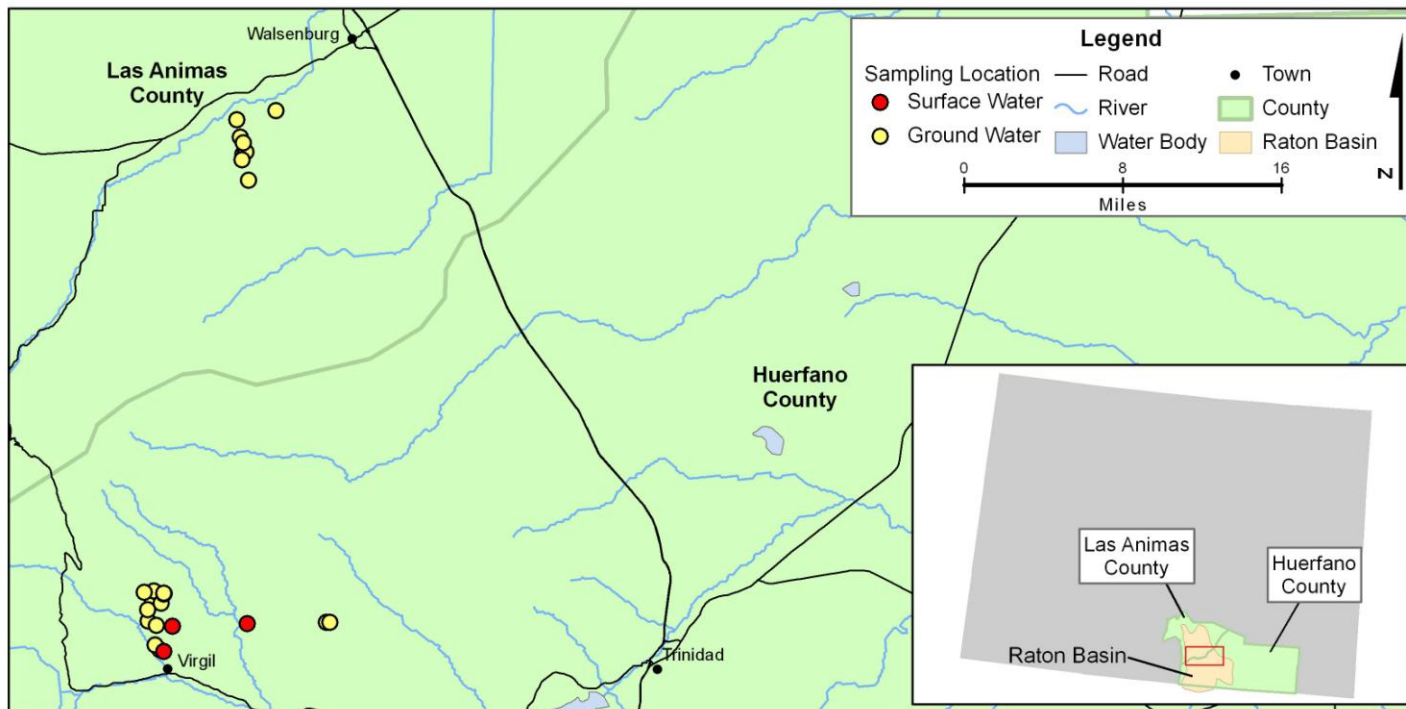


# Las Animas/Huerfano Counties (Raton Basin), CO

**HF Target Formation** – Coal Bed Methane (Vermejo & Raton Formations)

**Drinking Water Resources** – Poison Canyon Formation and nearby underground sources of drinking water

**Research Focus** – Ground water and surface water



# Las Animas/Huerfano Counties (Raton Basin), CO

## Progress

- Sampling events:
  - October 2011
  - May 2012
  - November 2012
  - April/May 2013
- Locations sampled:
  - Domestic wells
  - Production wells
  - Monitoring wells
  - Surface water (streams)



- Participants: Landowners, Colorado Oil and Gas Conservation Commission, Pioneer, Petroglyph

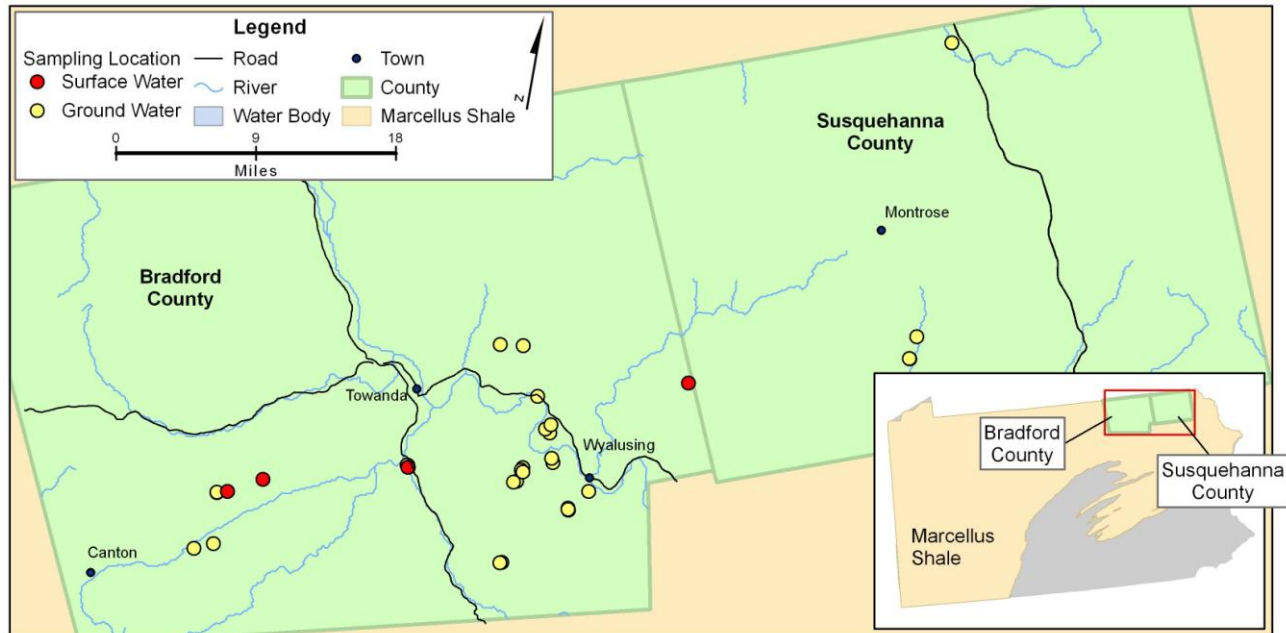
# Bradford County, PA

HF Target Formation – Marcellus Shale

Drinking Water Resources – Stratified drift & bedrock aquifers and surface water

## Research Focus

- Ground water and surface water studies
- Reports of methane in multiple drinking water wells





# Bradford County, PA

## Progress

- Sampling events:
  - October/November 2011
  - April/May 2012
  - May 2013
- Locations sampled:
  - Domestic wells
  - Surface water (springs, streams, ponds)
- Participants: Landowners, PA Department of Environmental Protection, Chesapeake, Cabot



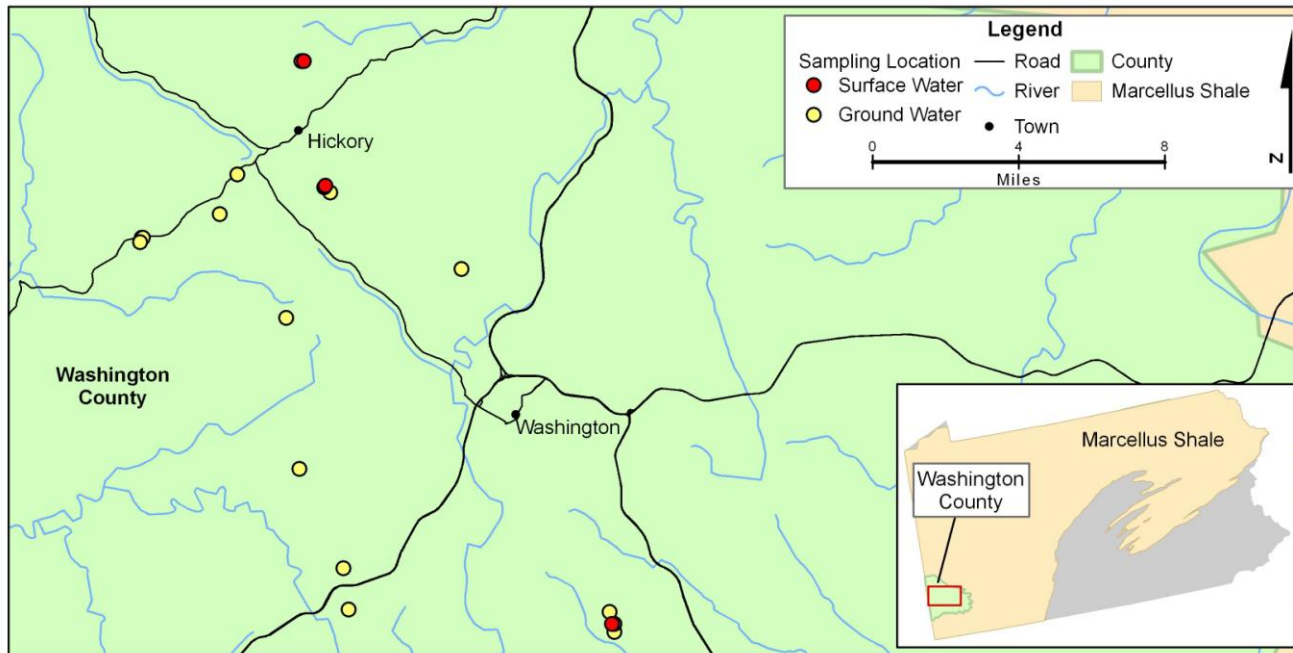
# Washington County, PA

HF Target Formation – Marcellus Shale

Drinking Water Resources – Surficial & shallow confined aquifers and surface water

## Research Focus

- Reported changes in drinking water quality
- Reported methane in wells



# Washington County, PA

## Progress

- Sampling events:
  - July 2011
  - March 2012
  - May 2013
- Locations sampled:
  - Domestic wells
  - Surface water (springs, stream)
- Participants: Landowners, Range Resources, Atlas Energy



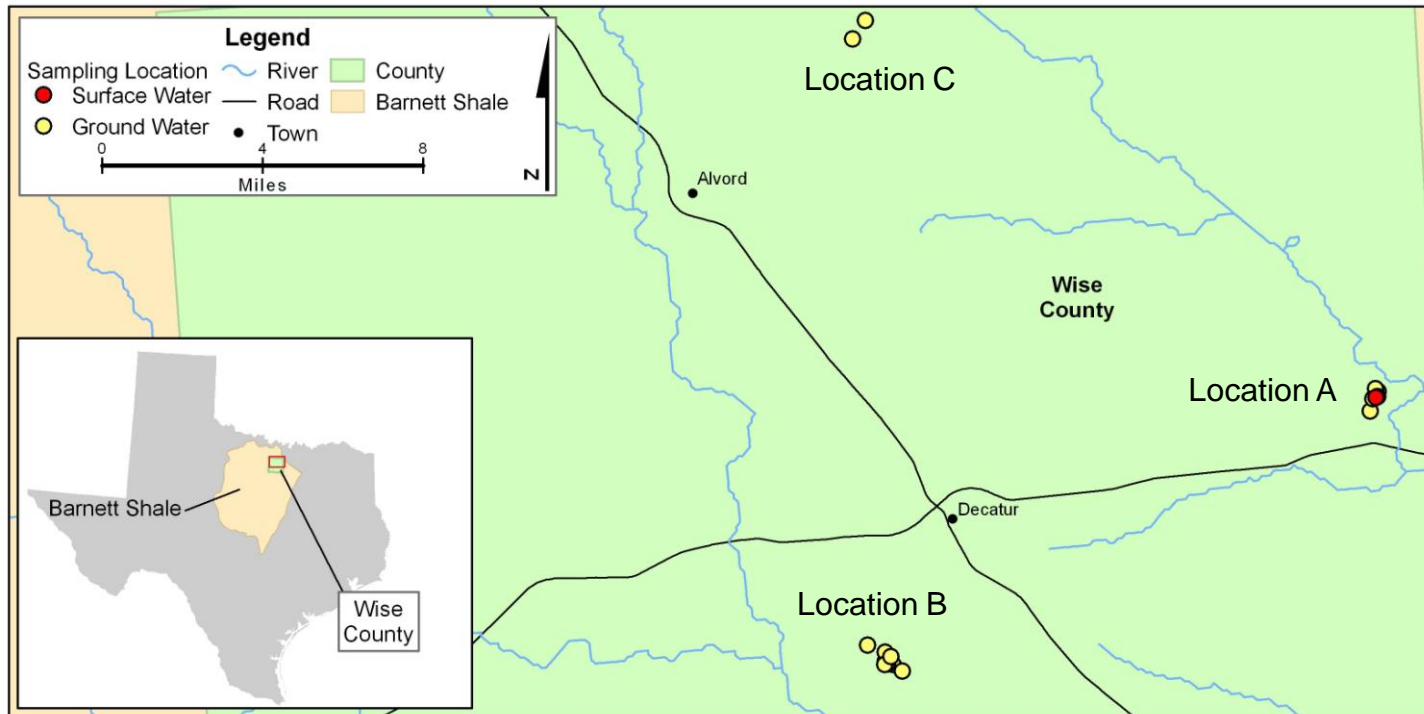
# Wise County, TX

HF Target Formation – Barnett Shale

Drinking Water Resources – Trinity aquifer and surface water

Research Focus

- Drinking water wells

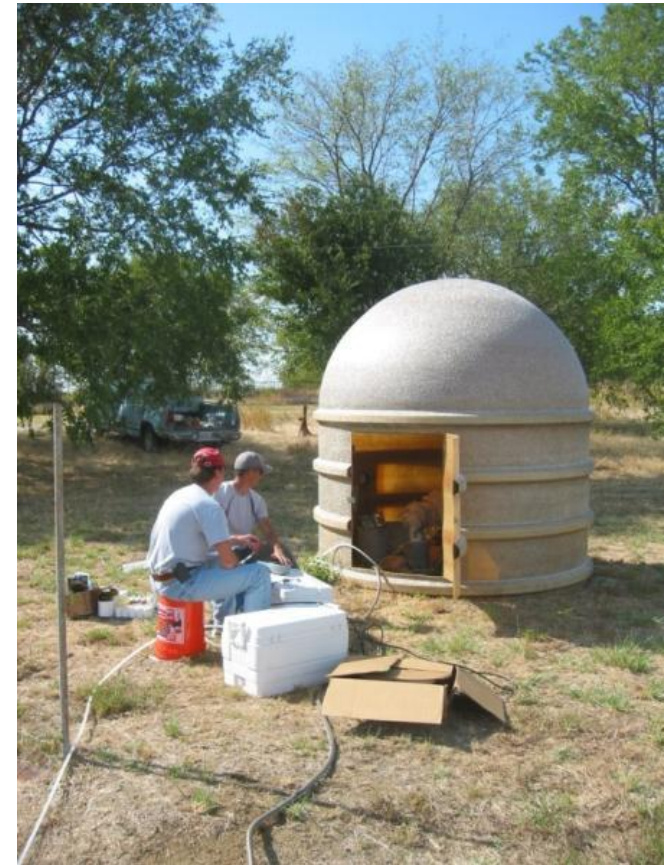




# Wise County, TX

## Progress

- Sampling events:
  - September 2011
  - March 2012
  - September 2012
    - Limited (1 production well and 2 domestic wells in Location B)
  - December 2012
  - May 2013
- Locations sampled:
  - Domestic wells
  - Industrial well
  - Surface water (ponds)





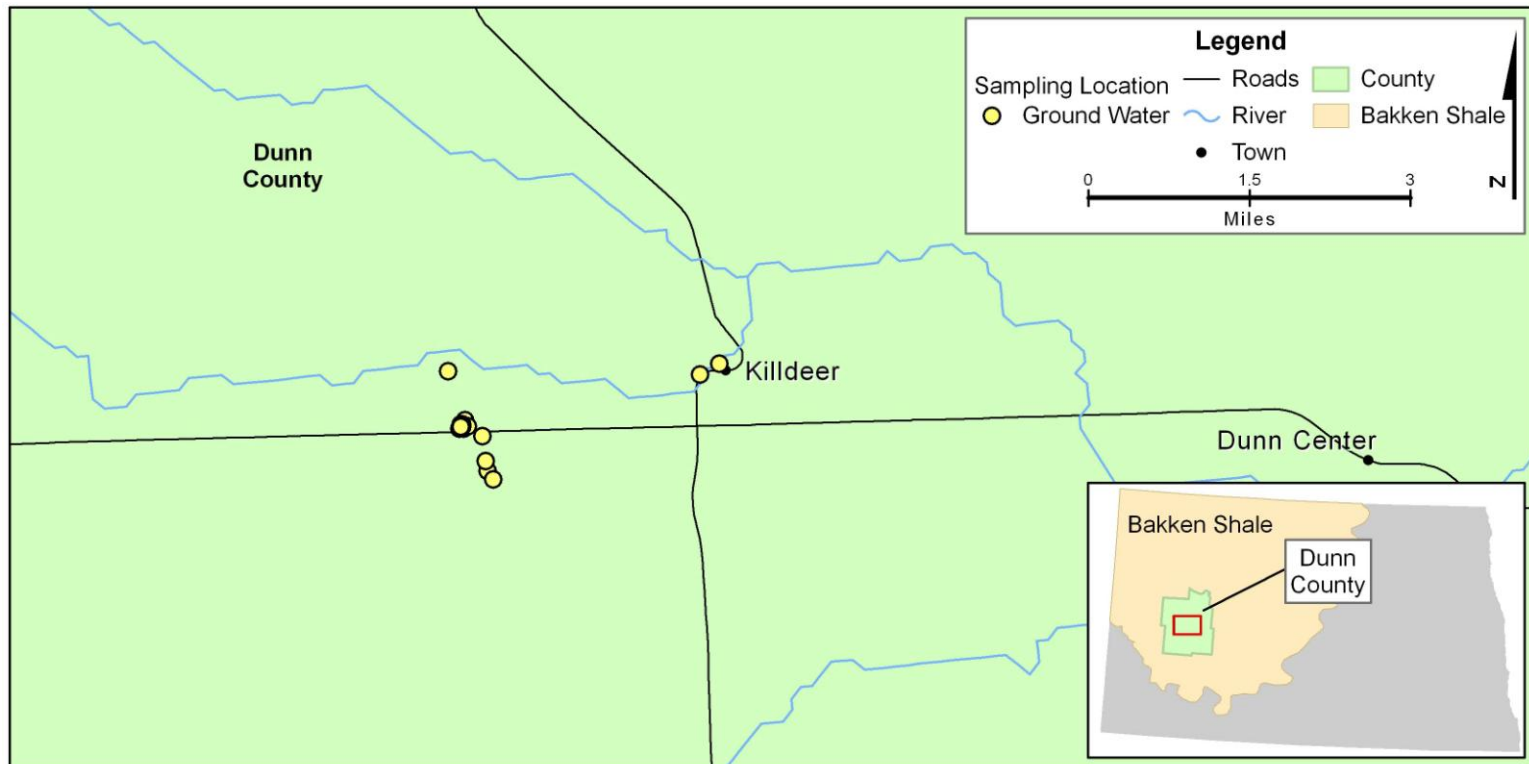
# Dunn County (Killdeer), ND

HF Target Formation – Bakken Shale

Drinking Water Resources – Killdeer aquifer

Research Focus

– Drinking water aquifer



# Dunn County (Killdeer), ND

## Progress

➤ Sampling events:

- July 2011
- October 2011
- October 2012

➤ Locations sampled:

- Monitoring wells
- Domestic wells
- Supply wells
- Municipal well



➤ Participants: Landowners, Denbury, North Dakota Industrial Commission's Oil and Gas Division

# Retrospective Case Studies: Next Steps

- Data Evaluation
  - Statistics
  - Comparison with existing data
  - Temporal/spatial evaluation
  - Geochemical modeling & evaluation
  - Environmental record searches