Comparative Databases for Water Quality and Quantity Regulations pertaining to Oil and Gas Development

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Basins with Assessed Shale Oil and Gas Formations, May 2013

Legend
- Assessed basins with resource estimate
- Assessed basins without resource estimate

Source: United States basins from U.S. Energy Information Administration and United States Geological Survey; other basins from ARI based on data from various published studies.
Estimate U.S., Russia, and Saudi Arabia Petroleum and Natural Gas Production
Barnett Shale Drilling From 1981 to 2010
Ft. Worth Basin, Texas

Barnett Shale Producers
- Horizontal (red)
- Vertical (black)

Urban Areas
Barnett Shale Limit

Barnett Shale Events
- 1981: 1st production; foam fracs
- 1985: Massive gel fracs
- 1997: Core analysis: gas-in-place = 3 x previous estimates
- 1997: Water fracs lower costs
- 1999: Refracs restore production
- 2003: Horizontal drilling expands

Barnett Shale Production

Gas BCF (Dry)

Miles

Eastland
Palo Pinto

Denton

Dallas

Fort Worth

Hood

Tarrant

Clay

Wise

Rockwall

Ellis

Hamilton

Erathe

McKinney

Ft. Worth

Cooke

Clay

Johnson

Hill

Burleson

Euda

Crosby

Tarrant

Ft. Worth

Mortague

West

Wise

Oklahoma

Texas

2010

EIA
Project Objective

• Produce and make publicly available, a searchable database of laws and regulations pertaining to shale oil and shale gas.
  • Water Quality
  • Water Quantity
  • Air Quality
## Current

<table>
<thead>
<tr>
<th>State</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Colorado</strong></td>
<td>Piceance, Niobrara</td>
</tr>
<tr>
<td><strong>Louisiana</strong></td>
<td>Haynesville-Bossier</td>
</tr>
<tr>
<td><strong>Montana</strong></td>
<td>Bakken</td>
</tr>
<tr>
<td><strong>New Mexico</strong></td>
<td>San Juan, Permian</td>
</tr>
<tr>
<td><strong>New York</strong></td>
<td>Marcellus, Utica</td>
</tr>
<tr>
<td><strong>North Dakota</strong></td>
<td>Bakken</td>
</tr>
<tr>
<td><strong>Ohio</strong></td>
<td>Marcellus, Utica</td>
</tr>
<tr>
<td><strong>Oklahoma</strong></td>
<td>Woodford</td>
</tr>
<tr>
<td><strong>Pennsylvania</strong></td>
<td>Marcellus, Utica</td>
</tr>
<tr>
<td><strong>Texas</strong></td>
<td>Eagle Ford, Barnett</td>
</tr>
<tr>
<td><strong>Utah</strong></td>
<td>Mancos, Uinta</td>
</tr>
<tr>
<td><strong>West Virginia</strong></td>
<td>Marcellus, Utica</td>
</tr>
<tr>
<td><strong>Wyoming</strong></td>
<td>Greater Green River, Powder River Basin</td>
</tr>
</tbody>
</table>

## Next

- Air Quality database (December 2014)
- Additional states and federal laws to all three databases (2015)
Comparative water quality database

- [www.lawatlas.org/oilandgas](www.lawatlas.org/oilandgas)
- Contains more than 1100 legal citations in five categories:
  - Permitting, Design, & Construction
  - Well Drilling
  - Well Completion
  - Production & Operation
  - Reclamation
Intermountain Oil and Gas BMP Project

Oil & Gas - Water Quality and Water Quantity

Improved technological developments in horizontal drilling and hydraulic fracturing, more commonly known as "fracking," have resulted in an oil and gas production boom nationwide. These technological advancements are used to unlock oil and gas from shale deposits across the country, including regions unaccustomed to the industry and those that have a century-long relationship with oil and gas extraction.

Increased shale oil and shale gas development has been accompanied by increased concerns about water quality, water quantity, and air quality issues related to the development. Wastewater discharges, hydraulic fracturing fluid chemicals, improper casing and/or cementing of the bore hole, and accidental spills pose potential water quality risks. The quantity of water used to hydraulically fracture a well also varies widely depending on geologic conditions - 2 to 7 million gallons of water per well - and a well may be fracked more than once. The amount of water consumed and the timing of the water usage are of growing concern nationwide, but particularly in and regions or in areas experiencing water shortages. The ability to reuse or recycle water from a well is an important technological and regulatory question.

This collection of datasets include statutes and regulations addressing water quality and water quantity in Colorado, Louisiana, Montana, New Mexico, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, Texas, Utah, West Virginia, and Wyoming. These states overlay major shale formations such as the Bakken, Eagle Ford, Greater Green River, Haynesville, Mancos, Marcellus, Niobrara, Permian, Piceance, Powder River, San Juan, Uinta and Woodford. These states are experiencing new or increased oil and gas development.

LawAtlas Interactive Maps:
- Water Quality: Permitting, Design, and Construction
- Water Quality: Well Drilling
- Water Quality: Well Completion
- Water Quality: Production and Operation
- Water Quality: Reclamation
- Water Quantity: Quantity
Baseline Water Sampling Example

Explore the Law
make selections from the categories below

- At least one of these selections apply
- All of these selections apply

Baseline water source testing
- Yes
- Yes, but only for injection wells
- Only in Specific Jurisdictions
- No

Location requirements for water source testing
- None
- Distance from Operations
- Other

Jurisdiction(s) Found 5
Show Map
Baseline Water Sampling Example

Where At least one of these selections apply

**Is baseline water source testing required?** Yes

### 5 Jurisdictions Found

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Effective</th>
<th>Valid Through</th>
<th>Law</th>
<th>Baseline water source testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>05/01/2013</td>
<td>07/31/2013</td>
<td><img src="#" alt="View Law" /></td>
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<tr>
<td>North Dakota</td>
<td>04/01/2013</td>
<td>08/31/2013</td>
<td><img src="#" alt="View Law" /></td>
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<tr>
<td>Ohio</td>
<td>09/10/2012</td>
<td>07/29/2013</td>
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<tr>
<td>West Virginia</td>
<td>12/14/2011</td>
<td>07/31/2013</td>
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<td>Wyoming</td>
<td>08/17/2010</td>
<td>01/01/2013</td>
<td><img src="#" alt="View Law" /></td>
<td>Yes</td>
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</tbody>
</table>
Baseline Water Sampling Example

www.lexatlas.org/query?dataset=water-quality-permitting-design-construction\&VDT5OnaTowards

Where At least one of these selections
Is baseline water source testing

5 Jurisdictions Found
Jurisdiction Effort
Colorado 05/04/2006
North Dakota 04/2010
Ohio 09/2007
West Virginia 12/14/2011 07/31/2013
Wyoming 08/17/2010 01/01/2013

Citations
OH Statute 1509-06-A-8
OH Regulation 1501-9-1-02-F

Excel

Close
Baseline Water Sampling Example

Where At least one of these selections is baseline water source

5 Jurisdictions Found

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Colorado</td>
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<td>West Virginia</td>
<td></td>
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<tr>
<td>Wyoming</td>
<td></td>
</tr>
</tbody>
</table>

View Law

DH Statute 1509-06-A-8

(b) Except as provided in division (A)(B)(C) of this section, for an application for a permit to drill a new well within an urbanized area, the results of sampling of water wells within three hundred feet of the proposed well prior to commencement of drilling. In addition, the owner shall include a list that identifies the location of each water well where the owner of the property on which the water well is located denies the owner access to sample the water well. The sampling shall be conducted in accordance with the guidelines established in “Best Management Practices For Pre-drilling Water Sampling” in effect at the time that the application is submitted. The division shall furnish those guidelines upon request and shall make them available on the division’s web site. If the chief determines that conditions at the proposed well site warrant a revision, the chief may revise the distance established in this division for purposes of pre-drilling water sampling.

(c) For an application for a permit to drill a new horizontal well, the results of sampling of water wells within one thousand five hundred feet of the proposed horizontal wellhead prior to commencement of drilling. In addition, the owner shall include a list that identifies the location of each water well where the owner of the property on which the water well is located denies the owner access to sample the water well. The sampling shall be conducted in accordance with the guidelines established in “Best Management Practices For Pre-drilling Water Sampling” in effect at the time that the application is...
Chemical Disclosure Example

Explore the Law
make selections from the categories below

- At least one of these selections apply
- All of these selections apply

Disclosure of chemicals in fracturing fluid

- Yes
- No

Timing of chemical disclosure

- Before use
- Within 30 days of use
- Within 31 to 60 days of use
- Other

Jurisdiction(s) Found 12

Show Map
Chemical Disclosure Example

Explore the Law
make selections from the categories below

Exemption for trade secrets

- Yes
- No

Access to trade secret information

- Oil & Gas State Agency
- Other State Agency
- Health Care Professionals
- Other
- Nobody

Jurisdiction(s) Found 5

Show Map
Chemical Disclosure Example

Where All of these selections apply
- Is public disclosure of chemicals/additives in fracturing fluid required? Yes
- Is there an exemption from disclosure requirements for trade secrets? Yes
- Who may access the trade secret information? Oil & Gas State Agency

6 Jurisdictions Found

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Effective</th>
<th>Valid Through</th>
<th>Law</th>
<th>Disclosure of chemicals in fracturing fluid</th>
<th>Exemption for trade secrets</th>
<th>Access to trade secret information</th>
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<td>Oil &amp; Gas State Agency</td>
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</tbody>
</table>
This page displays laws in effect through the button below.

**Explore the Law**

**Water administration type**

Report physical source of water used

- Yes
- No

**Preparation of a water plan**

- Use groundwater for oil and gas development
- Surface water permitted for oil and gas development
- Diminutions of water quantity addressed
### Water Quantity Example

#### 8 Jurisdictions Found

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Effective</th>
<th>Valid Through</th>
<th>Law</th>
<th>Report physical source of water used</th>
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</tbody>
</table>
## Water Quantity Example

The type of water source - surface or ground water - the county where each water source to be used for water withdrawals is located, and the latitude and longitude of each anticipated withdrawal location is required for horizontal wells that will use more than 210,000 gallons during a 30-day period.

### 8 Jurisdictions Found

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Effective Dates</th>
<th>Water Source</th>
<th>Withdrawal Location</th>
<th>Required Location</th>
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<td></td>
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<td>Oklahoma</td>
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<td>Wyoming</td>
<td>05/01/2014</td>
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</tbody>
</table>
In addition to the other requirements of this section, if the drilling, fracturing or stimulating of the horizontal well requires the use of water obtained by withdrawals from waters of this state in amounts that exceed two hundred ten thousand gallons during any thirty day period, the application for a well work permit shall include a water management plan, which may be submitted on an individual well basis or on a watershed basis, and which shall include the following information:

(1) The type of water source, such as surface or groundwater, the county of each source to be used by the operation for water withdrawals, and the latitude and longitude of each anticipated withdrawal location;

(2) The anticipated volume of each water withdrawal;

(3) The anticipated months when water withdrawals will be made;

(4) The planned management and disposition of wastewater after completion from fracturing, refracturing, stimulation and production activities;

(5) A listing of the anticipated additives that may be used in water utilized for fracturing or stimulating the well. Upon well completion, a listing of the additives that were actually used in the fracturing or stimulating of the well shall be submitted as part of the completion log or report required by subdivision (14), subsection (6), section five of this article;

(6) For all surface water withdrawals, a water management plan that includes the information requested in subdivisions (1) through (5) of this subsection and the following:
### Montana

**05/01/2014 - 05/31/2014**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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</thead>
<tbody>
<tr>
<td>What type of water administration system does the state have?</td>
<td>Prior appropriation</td>
</tr>
<tr>
<td>How are surface water rights obtained in the state?</td>
<td>Permit</td>
</tr>
<tr>
<td>Is beneficial use a requirement for obtaining a surface water right?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is providing for the “public interest” a requirement for obtaining a surface water right?</td>
<td>No</td>
</tr>
<tr>
<td>How are groundwater rights obtained in the state?</td>
<td>Permit, Other</td>
</tr>
<tr>
<td>Is beneficial use a requirement for obtaining a groundwater right?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is providing for the “public interest” a requirement for obtaining a groundwater right?</td>
<td>No</td>
</tr>
<tr>
<td>Does the state require reporting the physical source of water - surface, surface or groundwater - used for oil and gas development?</td>
<td>No</td>
</tr>
<tr>
<td>Does the state require preparation of a water plan for oil and gas development?</td>
<td>No</td>
</tr>
<tr>
<td>Can groundwater legally be used for oil and gas development?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the state distinguish among types of groundwater for use in oil and gas development?</td>
<td>No</td>
</tr>
</tbody>
</table>
Project Objectives

• Create a free, online database documenting BMPs for responsible oil and gas development in the Intermountain West

• Provide BMPs and other resource information to a wide audience, including industry, community, government, and environmental advocates
Intermountain Oil & Gas BMP Project

Project Components

- Geographic Scope
  - CO, MT, NM, UT, WY
  - Beyond the Region
- Website Background Materials
  - Resource Pages
  - Law and Policy
    (Federal, state, local, tribes)
- Database and Bibliography
  - Voluntary practices
  - Required practices
- Research Services
- Workshops
Project Results

• The database contains 8,500 BMPs, from nearly 500 source documents in categories such as Wildlife, Water, Air, Health, Soils, and Vegetation.

• Resource and Law & Policy sections provide additional information, such as Hydraulic Fracturing, Economics of BMPs, Reclamation, and laws and policies governing oil and gas development in the Intermountain West.
For more information

Browse the websites at www.oilandgasbmmps.org and www.lawatlas.org/oilandgas

Contact Matt Samelson
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303-519-5769
for questions related to the comparative database.

Contact Kathryn Mutz
Kathryn.Mutz@colorado.edu
303-492-1293
for questions related to the BMP project.