Hydraulic Fracturing for Oil and Gas

Impacts From the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States

Briefing by the U.S. Environmental Protection Agency

December 13, 2016

Hydraulic Fracturing Drinking Water Study

- In 2009, Congress urged EPA to study the relationship between hydraulic fracturing and drinking water

- EPA launched this study with the purpose to:
  - Assess the potential for activities in the hydraulic fracturing water cycle to impact the quality or quantity of drinking water resources
  - Identify factors that affect the frequency or severity of impacts

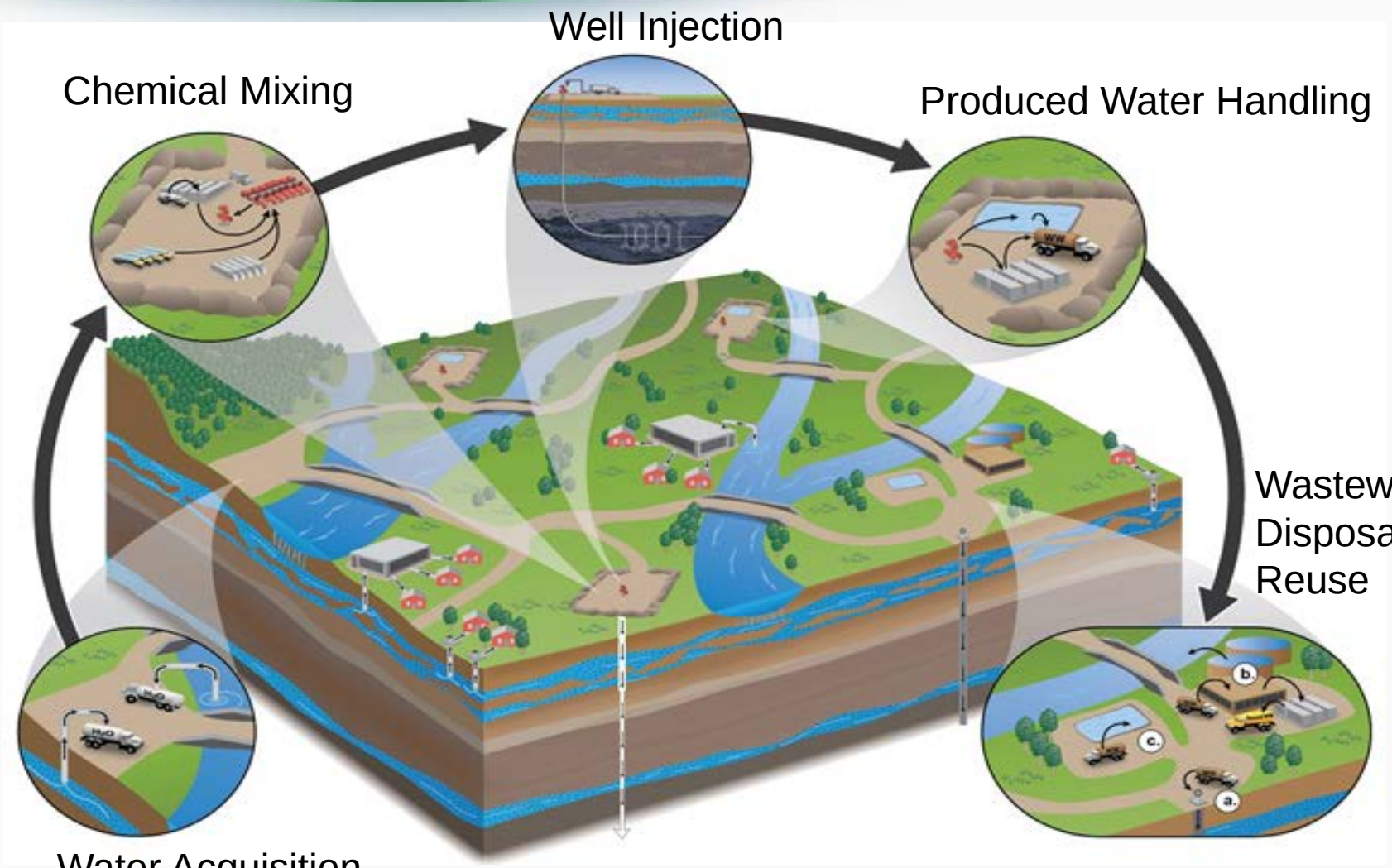
Hydraulic Fracturing Drinking Water Study

- EPA's study has produced multiple products:
  - 2011 Study Plan; 2012 Progress Report
  - Over 25 EPA technical reports and journal articles

- Draft and final hydraulic fracturing drinking water assessment report

- Completed products available online:
  - **www.epa.gov/hfstudy**

Hydraulic Fracturing Water Cycle: Follow the Water



Hydraulic Fracturing Assessment Report

What it is:

- The capstone product of EPA's drinking water study
- A state-of-the-science integration and synthesis of information concerning impacts on drinking water resources
- Based upon EPA research results, a robust literature review, and other information, including input from stakeholders

What it is <u>not:</u>

- Not designed to be a comprehensive list of documented impacts
- Not a human health, exposure, or risk assessment
- Not site specific
- Does not identify or evaluate best management practices
- Does not identify or evaluate policy options

Main Conclusions

- Hydraulic fracturing can impact drinking water resources under some circumstances
- Examples of impacts were identified for all stages of the hydraulic fracturing water cycle
- Impacts can range in frequency and severity, depending on the combination of hydraulic fracturing activities and local- or regional-scale factors
- Significant data gaps and uncertainties prevent quantifying the number or frequency of impacts across the country

Important Activities and Factors

- Water withdrawals:
  - In times or areas of low water availability
  - In areas with limited or declining groundwater resources

- Spills of hydraulic fracturing fluids and chemicals or produced water:
  - Large volumes or high concentrations
  - Reaching groundwater or surface water

Important Activities and Factors

- Injection of hydraulic fracturing fluids:
  - Into wells with inadequate mechanical integrity
  - Directly into groundwater resources

- Wastewater management:
  - Discharge of inadequately treated wastewaters to surface water resources
  - Disposal or storage of wastewaters in unlined pits

Chemicals in the Hydraulic Fracturing Water Cycle

- Some chemicals in the hydraulic fracturing water cycle are known to be hazardous to human health
- Of the 1,606 chemical identified by EPA, 173 had chronic oral toxicity values
- Data insufficient to determine which chemicals have the greatest potential to impact drinking water resources and human health
- Site-specific data on chemicals and chemical concentrations would be needed to conduct human health risk assessments
- Multi-criteria decision analysis using selected chemical, physical, and toxicological properties promising, but currently limited by available data

Data Gaps and Uncertainties

- Comprehensive information on the location of activities in the hydraulic fracturing water cycle is lacking
  - Above- and belowground locations of water withdrawals
  - Surface locations of hydraulically fractured oil and gas production wells and staging sites
  - Belowground locations of hydraulic fracturing
  - Locations of hydraulic fracturing wastewater management practices, including the disposal of treatment residuals
- Locations of drinking water resources also lacking, particularly underground drinking water resources

Data Gaps and Uncertainties

- Pre- and post-fracturing data on groundwater and surface water quality is generally lacking
- Full characterization of the fate and impacts of spilled hydraulic fracturing fluids, additives, and produced water also generally lacking
- Causal assessment of alleged impacts challenging
- Information on chemicals associated with hydraulic fracturing incomplete
- Data gaps limit full characterization of the frequency and/or severity of impacts

Utility of Assessment Report

- Provides the scientific foundation to help states and other better protect drinking water resources.
- Reduces vulnerabilities by identifying conditions under which impacts can be more frequent or severe.
- Informs future efforts to further understanding by identifying uncertainties and data gaps.
- Stimulates and informs dialogue among stakeholders.