

Highlights of [GAO-12-156](#), a report to the Ranking Member, Committee on Science, Space, and Technology, House of Representatives

Why GAO Did This Study

Water is a significant byproduct associated with oil and gas exploration and production. This water, known as “produced water,” may contain a variety of contaminants. If produced water is not appropriately managed or treated, these contaminants may present a human health and environmental risk.

GAO was asked to describe (1) what is known about the volume and quality of produced water from oil and gas production; (2) what practices are generally used to manage and treat produced water, and what factors are considered in the selection of each; (3) how produced water management is regulated at the federal level and in selected states; and (4) what federal research and development efforts have been undertaken during the last 10 years related to produced water. To address these objectives, GAO reviewed studies and other documents on produced water and interviewed federal and state regulatory officials, federal scientists, officials from oil and gas companies and water treatment companies, and other experts. GAO focused its review on the nine states that generate nearly 90 percent of the produced water, and conducted site visits in three states.

What GAO Recommends

GAO is not making any recommendations. A draft was provided to the Departments of Energy and the Interior, and EPA for review. None of these agencies provided written comments. EPA and Interior provided technical comments, which we incorporated as appropriate.

View [GAO-12-156](#). For more information, contact Anu Mittal or Frank Rusco at (202) 512-3841 or mittala@gao.gov or ruscof@gao.gov.

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ENERGY-WATER NEXUS

Information on the Quantity, Quality, and Management of Water Produced during Oil and Gas Production

What GAO Found

A significant amount of water is produced daily as a byproduct from drilling of oil and gas. A 2009 Argonne National Laboratory study estimated that 56 million barrels of water are produced onshore every day, but this study may underestimate the current total volume because it is based on limited, and in some cases, incomplete data generated by the states. In general, the volume of produced water generated by a given well varies widely according to three key factors: the hydrocarbon being produced, the geographic location of the well, and the method of production used. For example, some gas wells typically generate large volumes of water early in production, whereas oil wells typically generate less. Generally, the quality of produced water from oil and gas production is poor, and it cannot be readily used for another purpose without prior treatment. The specific quality of water produced by a given well, however, can vary widely according to the same three factors that impact volume—hydrocarbon, geography, and production method.

Oil and gas producers can choose from a number of practices to manage and treat produced water, but underground injection is the predominant practice because it requires little or no treatment and is often the least costly option. According to federal estimates, more than 90 percent of produced water is managed by injecting it into wells that are designated to receive produced water. A limited amount of produced water is disposed of or reused by producers in other ways, including discharging it to surface water, storing it in surface impoundments or ponds so that it can evaporate, irrigating crops, and reusing it for hydraulic fracturing. Managing produced water in these ways can require more advanced treatment methods, such as distillation. How produced water is ultimately managed and treated is primarily an economic decision, made within the bounds of federal and state regulations.

The management of produced water through underground injection is subject to the Safe Drinking Water Act’s Underground Injection Control program, which is designed to prevent contamination of aquifers that supply public water systems by ensuring the safe operation of injection wells. Under this program, the Environmental Protection Agency (EPA) or the states require producers to obtain permits for their injection wells by, among other things, meeting technical standards for constructing, operating, and testing and monitoring the wells. EPA also regulates the management of produced water through surface discharges under the Clean Water Act. Other management practices, such as disposal of the water into surface impoundments, irrigation, and the reuse of the water for hydraulic fracturing, are regulated by state authorities.

Several federal agencies, including EPA; the Department of Interior’s Bureau of Reclamation and U.S. Geological Survey; and a number of Department of Energy national laboratories, have undertaken research and development efforts related to produced water. These efforts have included sponsoring and issuing studies that describe the volume and quality of produced water, options for managing produced water and associated regulatory issues, as well as options for improving existing technologies for treating produced water and developing new technologies, such as more cost-effective filters.