



## EXECUTIVE SUMMARY

ARKANSAS IN THE BALANCE:  
MANAGING THE RISKS OF SHALE GAS  
DEVELOPMENT IN THE NATURAL STATE



Arkansas Public Policy Panel  
February 2011



**Find the full report at [ARPanel.org](http://ARPanel.org)**

***Front cover photos:***

***Top: “Fetchin’ in Ozark Streams”*** Flickr user OakleyOriginals, licensed under the Creative Commons Attribution 2.0 license

***Bottom: Heavy concentration of diesel in a stream 250 yards downstream of a spill on a gas well pad—Highway 10 near Greenwood.*** Arkansas Department of Environmental Quality (ADEQ) Investigation Report

# INTRODUCTION

Natural gas development in Arkansas brings with it economic opportunity, but also significant threats. The individual property rights of many Arkansans are being encroached upon by gas companies. Arkansas's natural ecosystems and the air, land, and water which we all depend upon for survival—some of the most pristine and abundant in the world—are at serious risk. Gas development must be balanced in a responsible approach that takes advantage of the opportunities created by the industry but also protects Arkansans from the risks of development—a balance that Arkansas has yet to find.

This report has two broad purposes. The first is to provide information to the citizens of Arkansas about the environmental impacts and property rights issues associated with natural gas extraction. The second is to provide a partial set of recommendations for how gas

development can be done responsibly while safeguarding Arkansans and their natural environment.

The Fayetteville Shale Play and other areas containing natural gas are potentially economically beneficial to Arkansas. New technology now allows us access to previously unreachable reserves of natural gas.

However, healthy human populations, clean drinking water, individual property rights, intact and functioning ecosystems, healthy fish and wildlife populations, and abundant access to natural landscapes are not only the rights of every Arkansan; they are significant contributing factors to Arkansas's economy and quality of life.

Natural gas is often considered a “clean fuel” because it burns cleaner than oil or coal. If not conducted properly, however, the processes of natural gas



***This confluence of two Ozark creeks shows sedimentation from a pipeline crossing flowing into the clear water typical of Ozark streams. Excess sediment kills fish and causes increases in algae and toxic substances in lakes and streams that support wildlife, attract tourists and provide drinking water.***

extraction, production, and transportation, can severely and adversely impact human health, water, air, land, agriculture, wildlife, and local economies.

Natural gas development poses many potential threats, from the point when land is leased by the operating company until well closure and reclamation at the end of gas production.

The massive scale of this industry, combined with a general lack of adequate oversight, is the greatest cause for concern. Approximately 7,000 wells already exist within the Arkoma Basin in Arkansas, and more than 14,000 are now projected for the Fayetteville Shale area. These wells can reach as much as a mile in depth and can also travel a little over a mile horizontally under the earth.

Deep layers of shale are fractured apart with explosives and water under high pressure. The water is combined with a chemical mixture designed to aid in the release of natural gas. Some of the chemicals and water remain in the wells indefinitely, while 30 to 70 percent of the mixture returns to the surface. The mixture is further contaminated with salts, chlorides, and hydrocarbons that it has been exposed to underground. Some of this contaminated water will need to be stored safely in hazardous waste disposal sites for decades after the industry is gone.

During the life of the Fayetteville Shale, hundreds of millions of gallons of fresh water will be pumped from lakes, streams and ponds to fracture wells, and thousands of acres of land will be cleared for well pads, roads and pipelines. Without proper care, clearing land causes erosion of steep slopes and washes sediment into the water. Sediment severely impacts the health of streams and the wildlife that depend on them.

As a result of natural gas development, the formerly pristine Ozark landscape is being transformed on a large scale. Colorado still bears the scars and is dealing with waste from mining operations that took place more than 100 years ago. The situation in that state stands as a lasting example of not doing it right.

Nearly every landowner in several counties will be affected by the gas industry in the next few years. Landowners across the region are already complaining of being forced to allow drilling on their property against their will and of having their property rights abused by the gas companies.

Federal regulatory authorities cannot be looked to for help. In 2005, the oil and gas industry was exempted from the Clean Air and Clean Water Acts. Arkansas, like many other states, must act on its own to protect these resources.

There is hope, however. The industry can develop natural gas in Arkansas much more responsibly. “Do it right” campaigns are being led by citizens across the nation. Other states and localities are taking action to protect their resources while developing gas fields. States are addressing these problems by implementing new regulations to close loopholes in federal regulations, increasing the amount of permit fees and exacting fines for violations. Cities and counties are enacting local ordinances to protect their health and environment. Arkansas can do the same.

Our most valuable natural resources—notably, clean water and land—will last forever if we protect them. We must make sure that the property rights of Arkansas residents are respected and that Arkansas’s billion dollar agricultural, recreational, and tourism industries are protected.

If we move forward together and plan responsibly, we can meet the challenges before us. We hope the natural gas industry will join us as a partner in implementing solutions. It is clear that some companies are doing a much better job than others, but the industry as a whole must take responsibility. Blame should no longer be shuffled off to subcontractors and the bad actors of industry. Those with the capacity to do it right must lead the rest. The production of natural gas will only increase in Arkansas. Responsible energy development is essential in order to preserve the natural legacy of our state.



## BAD PRACTICES



*This stream crossing, with downed silt fences and broken pipeline, is contaminated with sediment from previous washouts and has a new road damming the creek with no protection from washing out again.*



*A closed reserve pit leaking black, discolored seepage. Drilling fluids stored in reserve pits are supposed to be properly disposed of—rather than buried in the pit—when it is closed out.*



*Mud washed out from gas company activities pours over a low water bridge on the once-clear Grassy Creek, smothering aquatic life.*



*This land farm was shut down by ADEQ after releasing drilling toxins into a stream, killing fish.*

## BEST PRACTICES



*A remediated slope with Best Management Practices in place: stabilized, seeded and with water bars to minimize erosion.*



*This stream crossing follows Best Management Practices, with silt fences placed parallel to the creek, a bridge that allows water flow and water bars on the slope.*



# EXECUTIVE SUMMARY

The life cycle of a natural gas well in the Fayetteville Shale poses many different potential threats to water quality, water quantity, air quality, human health, wildlife, natural landscapes and individual property rights. We examine the threats at each stage in the process and conclude with recommendations of measures by which Arkansas can continue to reap the benefits of responsible gas development while protecting its people and the natural resources they depend on.

## *Phase One: Leasing*

Many Arkansas landowners do not have adequate information about their rights when gas company lawyers and representatives negotiate leases. The gas companies can even force unwilling landowners to lease their land for development against their will through a practice called forced integration. Most Arkansans, who hold only surface rights, have even less protection. Gas companies, in most cases, dictate decisions such as where wells are located (as near as 200 feet from homes), how many wells are drilled, and the hours that company operators are on their property. Landowners are not even given notice about what and when company activities occur on their land.

## *Phase Two: Exploration*

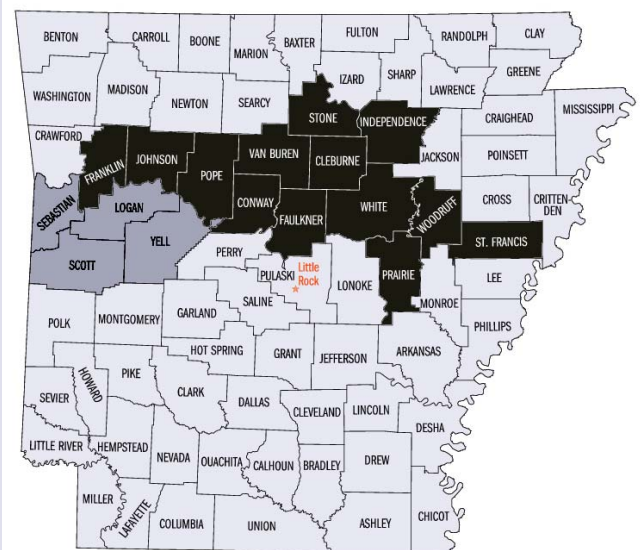
Exploration begins with a seismic survey that is completed by recording sonic vibrations from explosives or thumper trucks that shake the ground.

Exploration can have significant environmental impacts. Drinking water wells have clouded or dried up after nearby seismic tests, according to landowners who say the tests stir sediment and create fissures that change groundwater flows. Significant land disturbances can occur during exploration. Sometimes land is cleared more aggressively than necessary, using heavy equipment such as bulldozers and causing significant erosion when less intrusive practices would suffice.

Exploration by companies has also raised significant property rights issues. Landowners complain that gas

## The Fayetteville Shale

Approximately 14,000 gas wells are predicted for the Fayetteville Shale area (in black on the map below), a geological formation approximately 350 million years old, containing an unconventional gas reservoir. Unconventional reservoirs are shale or tight sand formations that require fracturing—a process whereby they are broken apart underground using explosives or high pressure water and chemical mixtures—to release gas. The Fayetteville Shale ranges in thickness from 50 to 550 feet and lies 1,500 to 6,500 feet beneath the surface. It is very similar to the Barnett Shale in the Fort Worth area of Texas and the Caney Shale found on the Oklahoma side of the Arkoma Basin.



The Fayetteville Shale underlies the northern part of the Arkansas side of the Arkoma Basin (in dark gray), which already has approximately 7,000 wells. Several other shallower formations of sandstone and shale that overlie the Fayetteville Shale have been producing natural gas from conventional gas wells for a number of years around Booneville and other areas.

Some of the water bodies likely to be affected by natural gas development in the Fayetteville Shale include the Mulberry River, the Little Red River, and Greers Ferry Lake.

company contractors often come onto land without permission; clear land without permission or fair compensation; trample crops; leave livestock gates open or destroy fences; trench fields with heavy equipment; and interrupt farm and family activities by entering their property without warning.

### ***Phase Three: Site Preparation, Drilling, Fracturing, and Production***

**Drilling for natural gas carries significant risks of chemical contamination.** Potentially significant health impacts on residents who live near shale gas production have been found in numerous studies in other states, though much more monitoring and study is needed. Water that returns to the surface carries with it toxic chemicals and compounds such as benzene, a known human carcinogen, and metals such as mercury, lead and arsenic. These hazardous pollutants are not monitored sufficiently to ensure public health.

Controversy surrounds the hydraulic fracturing methods used in unconventional gas wells, which some feel threatens aquifers with contamination deep under the earth where the fracturing occurs. However, most geologists believe that chemical contamination from the fracture process, deep below the nearest aquifers, is not the major pathway of water contamination.

**The much greater danger of contamination from unconventional wells is from casings or other equipment failing,** causing leaks of fluids or gases into aquifers higher in the drill shaft, and even leaking in from spills of chemicals on the surface. Reports from across the nation indicate contamination of water wells and aquifers from these sources.

The potential cumulative effect of even small leaks at 7,000 current and more than 14,000 new drill sites is significant. Casing failures and leaks will occur. Such failures, which are likely to contaminate nearby water sources, will have lasting negative impacts. The EPA recently launched a two year study, in order to answer questions about the risks of fracturing technology.

**Erosion and sedimentation of streams resulting from**

**poor construction practices are among the industry's greatest impacts.** Erosion from well pad, pipeline and road construction releases massive amounts of sediment into Arkansas lakes and streams. This is an issue of great concern, because sediment smothers fish eggs, kills other aquatic organisms, carries toxic pollutants, disrupts natural processes, and fouls water supplies. Sediment problems will also significantly impact other industries, such as tourism and recreation.

**Gas companies, pipeline companies, and their contractors have already been cited for numerous violations of safeguards,** including improper disposal of waste, failure to obtain necessary permits, and polluting the waters of the state. Water bodies such as the Little Red River, Greers Ferry Lake, and many underground aquifers remain at risk.

**Landowners are not informed about what chemicals are used on their land,** how much is used, or how they



***Barnett Shale gas drilling rig near Alvarado, Texas.***

are disposed of. Many gas field residents are concerned about their drinking and irrigation water but cannot afford to test their water for toxic substances. The secrecy with which gas companies guard the details about their chemical and water use and disposal makes testing even more difficult and expensive.

**Water quantity, especially in dry years, is also a major concern.** This type of gas production requires millions of gallons of water each time a well is stimulated. This will add up to billions of gallons of water being consumed out of Arkansas watersheds and aquifers. These withdrawals of water are nearly unregulated, and there is no way of knowing exactly how much is being consumed or what the impact of losing that much water means to Arkansas. In-stream flow studies must be done to determine how much water can be safely removed from streams without causing harm to aquatic life. Industry claims of negligible impact are unsubstantiated.

**Much is known about the serious human health effects of some of the gas emissions** coming from every well pad, drill site, and pipeline, but little is known about the exposure rates of people living in affected areas and monitoring of these emissions is negligible. Regulators do not account for the concentrated impact of dozens of well sites in close proximity to homes, farms, and wildlife. Additionally, dust from hundreds of heavy trucks, water tankers, chemical trucks, and enormous equipment on rural dirt roads is a serious concern.



***Drilling mud, which can contain natural gas and other flammable materials, leaking from tanks at a land farm that has since been shut down.***

**The industry is also forever changing Arkansas's landscape,** clearing hundreds of square miles for drill pads, pipelines, and roads. The state does not require companies to develop plans to minimize impacts even though some private homes and farms are nearly surrounded by wells.

### ***Phase Four: Transportation***

**Construction of roads and pipelines will also require the long-term clearing of tens of thousands of acres of land.** Erosion of these disturbed land surfaces will forever change the Ozark landscape and pollute lakes and streams.

**Although pipelines are monitored for leaks, the leaks may go undetected** even with the most stringent guidelines. Pipelines cross rivers and sometimes travel through aquifers, posing very real risks to water quality should a leak occur. Even though pipeline explosions have occurred in other states, emergency first responders in the Fayetteville Shale are neither trained nor equipped to handle such emergency situations.

### ***Phase Five: Waste Disposal***

**Much of the water pumped into a well comes back out and contains hazardous elements.** Both surface and groundwater are at risk of contamination by pollutants from gas wells, many of which can affect human health. Waste may be held in reserve pits, applied to land, or disposed of in injection wells. Numerous industry violations of Arkansas's current disposal laws have already occurred.

Volatile compounds can disperse from the surface of holding ponds waiting for disposal. Improperly contained waste can enter air or water. Unsecured pits can also become a hazard for wildlife, domestic animals, and humans.

Gas companies are not required to report where they have injected water, what chemicals they added, how much they used, how much they recaptured, how much was left in the well, what levels of contamination the recaptured water contained, or how they disposed of the



contaminated water. Waste is currently disposed of in injection wells in south Arkansas, Oklahoma and Texas. More injection wells have been proposed for central Arkansas as well.

### ***Phase Six: Closure and Reclamation***

Arkansas had 1,777 abandoned wells in 2006. We will have many more in the years ahead. Arkansas needs to ensure that gas companies put up sufficient bonds to pay for closure and reclamation of wells that exhaust their productive use.

## **Recommendations**

The changes we recommend include:

- » **Improve protections for private landowners**, including more information about their rights and the best management practices they should expect from gas companies, better notification when gas company officials will be on their land, and disclosure of gas company practices and chemicals used on their property.
- » **Improve disclosure from gas companies** so the public knows the amounts and types of chemicals used, assurance that chemical waste disposed of properly, the source of water used in the process, the level of contamination of the produced water, how much water is left inside the well, and the fate of the remaining contaminated water after the fracture process.
- » **Require gas companies to reduce the noise from their operations** to preserve the peace of rural communities.
- » **Monitor and regulate air emissions from the gas industry**, especially in places where many wells and compressors are concentrated near populated areas, and require the companies to use all cost effective measures to reduce air emissions.
- » **Protect water quality from contamination** by the gas industry by requiring the gas industry to follow their own best management practices; testing of private water wells that are near proposed gas wells before and after drilling occurs; strengthening regulations and monitoring to ensure that chemicals do not contaminate water at any stage of the drilling process; strengthening regulations that ensure the drill shafts do not corrode or leak into underground aquifers; and requiring the industry to reduce the erosion impacts of the thousands of miles of pipelines, roads and drilling pads.
- » **Improve inspection and enforcement** at gas drilling sites to make sure each well is inspected at least once a year and more often during critical stages of development to ensure that violations are caught and quickly corrected. The report recommends that Arkansas agencies create a fee system for gas drillers to pay for better inspection and enforcement programs so Arkansas tax payers are not asked to subsidize the industry.
- » **Increase bonding requirements** to make sure Arkansans do not have to pay for the clean up and closure of abandoned mines.

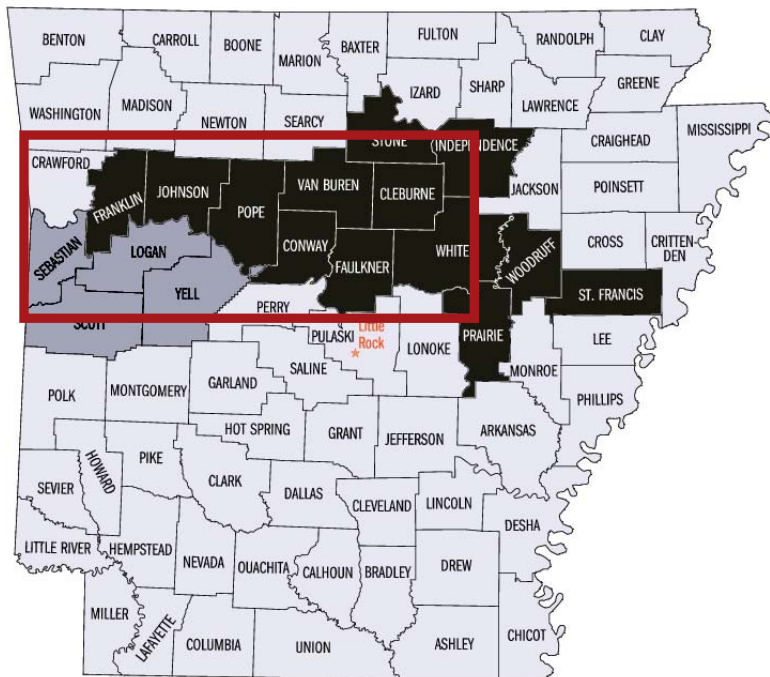
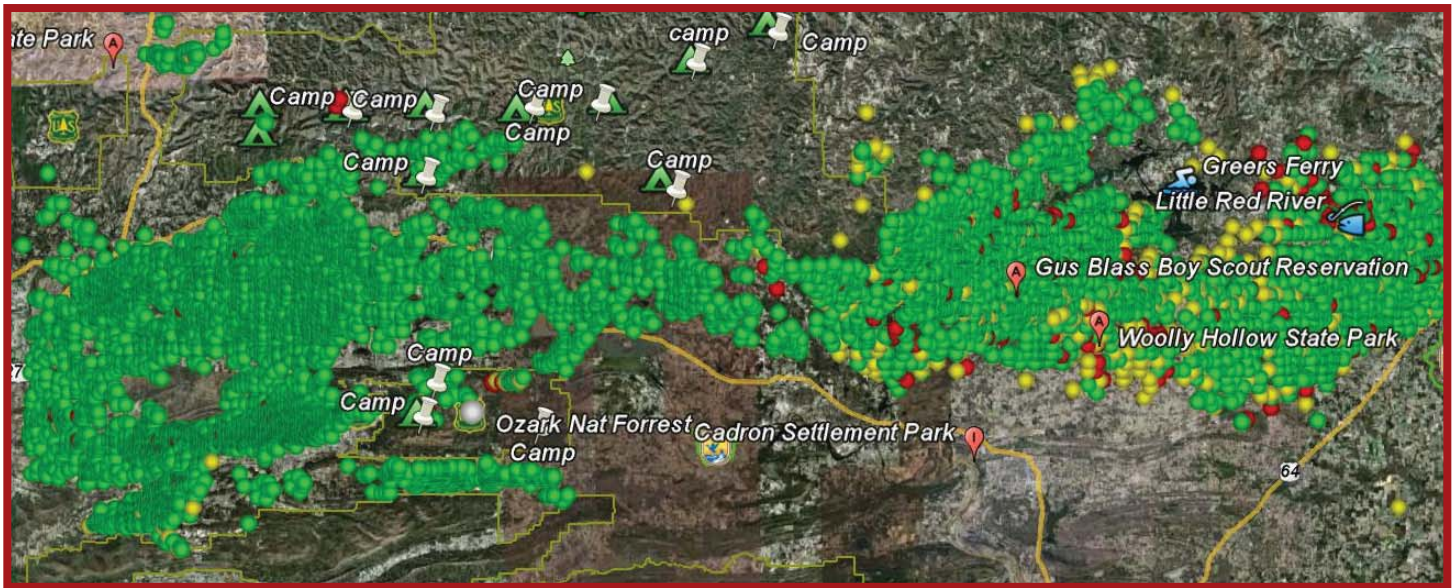


*Johnny Wiedower's gate, locked by the gas company without notice or key. After having to cut the chain twice to access his own property, the gas company finally gave Johnny a key to his own gate.*

# CONCENTRATED IMPACTS

A well pad requires clearing 3 to 10 acres of land, though multiple wells can be drilled from a single pad. Roads and pipelines leading to every well require additional land to be cleared, often causing erosion on the steep slopes of the Ozarks. Each well requires about 3 million gallons of water, and the chemicals used in the process are not released to the public.

The impact of a single well on land, water, property and health may be small, but the cumulative impact of 7,000 wells in close proximity—and many more to come—will be huge if proper measures are not taken to mitigate these impacts.



*Each dot on this map represents a gas well in the Fayetteville Shale area.*



## Report Author:



**Debbie Doss** is Chair of the Arkansas Conservation Coalition, Environmental Caucus Chair of the Arkansas Citizens First Congress, Conservation Chair of the Arkansas Canoe Club and a life time member of the Canoe Club and the Ozark Society.

She holds degrees in history, biology and education and has done additional work in physical geography, art and graphic design and writing. She also holds a masters degree in Psychology and has worked as a psychological examiner in the rural schools of central Arkansas for 15 years. Debbie has taught secondary courses in math and science and taught psychology as adjunct faculty at the University of Arkansas Community College at Morrilton. She now works as a volunteer and consultant on environmental issues and on building and designing canoe trails in eastern and southern Arkansas.

## Commissioned and Released by:

The Arkansas Public Policy Panel is a statewide 501(c)(3) organization dedicated to achieving social and economic justice by organizing citizen groups around the state, educating and supporting them to be more effective and powerful, and linking them with one another in coalitions and networks. The Panel seeks to bring balance to the public policy process in Arkansas.

***Back cover photo:***

***Pipeline and road on an extremely steep slope with no water bars or other Best Management Practices in place to control runoff. US Fish and Wildlife Service***



