



Fracking: a serious concern for surface water as well as groundwater

While the ecological impact of shale gas exploration and extraction on groundwater has received considerable attention, the implications for surface water and terrestrial ecosystems is often overlooked, according to a new US study. Although more data are needed, preliminary results suggest that regulations based on proximity to surface water could be necessary to protect valuable ecosystems.

Due to a recent surge in drilling for shale gas, most notably in the United States, the environmental impact of the hydraulic fracturing, also known as 'fracking', is under intense debate. Although scientists and policymakers are familiar with concerns about contamination of groundwater, few studies have considered the ecological impact of fracking on surface water and terrestrial ecosystems.

In the new study, researchers used two of the most productive shale sites in the US, Fayetteville and Marcellus, to review the potential for environmental impacts of fracking on nearby surface water. On average, active wells were situated just 300m from streams and rivers, with several hundred wells less than 100m away from stream channels. The fact that wells are typically located close to surface water increases the risk to aquatic ecosystems in three main ways: water withdrawal, contamination and excess sediment.

Fracking uses high-pressure fluid jets to fracture shale rocks and each well requires between 7.5 and up to 26 million litres of water, which may be drawn directly from surface water sources. This may cause regional water shortages, resulting in altered flow regimes and degradation of critical habitat for aquatic organisms.

Fracking fluids typically contain chemical additives, e.g. friction reducers, biocides and surfactants, some of which contain substances known to be toxic or carcinogenic. Up to 70-90% of the fracking fluid is not recovered in the Marcellus shale and its fate in the environment is largely unknown. Inadequate storage, treatment or disposal of wastewater can also result in nearby surface water contamination. Very little is known about the potential effects of the chemicals, metals, organics or other contaminants once they enter terrestrial or aquatic food webs.

Land clearing and construction of wells, pipelines and roads can result in excessive sediment in surface water. The researchers found that the amount of sediment in seven major streams in the Fayetteville Shale strongly corresponded with the density of gas wells in their drainage area. These preliminary data suggest the potential for detectable cumulative effects from shale gas development and could signal the need for regulation to protect surface water resources.

Potential ecological impacts of increased sediment and/or contamination are reductions in feeding efficiencies and impaired growth and reproduction in aquatic creatures, resulting in changes in community structure and overall ecosystem functioning. However, little ecological data are currently available. The researchers call for further scientific investigation into the toxicity of contaminants mixtures on complex communities and ecosystems in order to improve scientific understanding of the risks. Research could also trace methane and fracking chemicals to help to identify their fate in the environment and inform environmental policy.

Currently, there are no federal laws in the US to regulate fracking unless diesel fuel is used in the process, meaning that the regulations and the level of monitoring environmental impact differs greatly from state to state. Shale gas production is expected to increase threefold in the US by 2035 and extend to other parts of the world. It is therefore critical that the environmental costs and benefits are fully assessed, say the researchers.

Source: Entekin, S., Evans-White, M., Johnson, B. & Hagenbuch, E. (2011). Rapid expansion of natural gas development poses a threat to surface waters. *Frontiers in Ecology*. 9(9): 503-511.

Contact: sentrekin@uca.edu

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