VIRGINIA CHAPTER of the AMERICAN FISHERIES SOCIETY
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Marcellus Shale in Virginia
Water Resources Information Sheet
March 17, 2010

- The Marcellus Shale Formation underlies parts of 24 counties in western Virginia (Frederick, Shenandoah, Rockingham, Augusta, Highland, Bath, Alleghany, Rockbridge, Botetourt, Craig, Giles, Roanoke, Montgomery, Pulaski, Bland, Wythe, Smyth, Washington, Wise, Dickenson, Scott, Russell, Buchanan and Tazewell) (Soeder and Kappel 2009).

- The Commonwealth has 2,350 miles of wild trout water, all located in the Blue Ridge and Ridge and Valley Physiographic Provinces (VDGIF 2010).

- The Marcellus Shale Formation underlies 214 wild trout streams, tallying 748 miles. Thousands of miles of warm water streams could also be directly or indirectly impacted by Marcellus Shale drilling. Many of these streams/rivers are currently impaired from other pollutants (VDEQ 2008), and natural gas extraction could intensify these impairments. These warm water streams/rivers harbor unique habitats, in some cases are home to threatened and endangered aquatic species, and provide a valuable recreational resource to the citizens of the Commonwealth.

- The fisheries resources in these Marcellus areas (and downstream) have considerable economic value. The American Sportfishing Association estimated that in 2006 the total economic impact of freshwater fishing in Virginia was over $800 million and created 9,213 jobs (Southwick Associates 2007). Total fishing related expenditures in Virginia for the year 2006 totaled $734 million (USFWS 2006). In regards specifically to wild trout streams, a VDGIF survey conducted in 2001-2003 showed that anglers spent an average of $34 per trip while fishing wild trout streams in Virginia (Reeser and Mohn 2004). In addition, a recent survey of Virginia anglers also showed that warm water streams and rivers were the most preferred fishing destinations (O'neill 2001)

- It is estimated that it takes up to 3 million gallons of water per fracking event for each well (Harper 2008) and one drilling site could contain several wells. Some references suggest that up to 8 million gallons of water may be needed per treatment. Many small headwater streams undergo severe flow reductions during the summer and early fall, making them very susceptible to further water reductions. Drawing production water from these streams could cause reductions in fish populations or damage them permanently. Similarly, massive withdrawals of groundwater in these headwater watersheds could adversely affect surface water flow. (PSU 2009 ; NYDEC 2009)

- As much as 60 – 80% of the hydrofrac water can return to the surface (Staaf and Masur 2009) contaminated with tens of thousands of pounds of chemicals, salt, and sand. This wastewater, stored in holding ponds adjacent to wild trout and warm water streams, is subject to overflow, leakage, or spillage. Contact with adjacent waterways could cause fish kills or affect entire food webs. All of these streams have floodplains, and often a complex series of dry flood channels that are sensitive to disturbances in these areas. The majority of incidents that lead to surface water contamination result from spills and leakage during the transfer and draining of these pits (NYDEC 2009).

- Contaminated frac water that is trucked off the drilling site to local wastewater treatment plants may not be able to be effectively treated (Soeder and Kappel 2009; Levy and Smith 2010) and, in fact, might render the plant useless (by killing off active media). Sand, salt, and a mixture of biocides, surfactants, lubricants, and solvents may pass through these treatment plants directly into larger rivers. Many of these rivers are already under stress from other contaminants and this would potentially add to pollution troubles.

- Land application of contaminated frac water and solids have been known to sterilize soils and kill forest plots.

- Millions of gallons of contaminated frac water can remain in the ground during and after production. Wells are supposedly cased in extra steel and concrete to protect groundwater, however, corrosive agents used in slickwater frac could erode casings and contaminate entire aquifers. Many of these shale deposits are adjacent to limestone geology, thus residual frac water under pressure could find its way into groundwater supplies.

- Fuel oil, surfactants, and biocides are also used in slickwater frac and this gelatinous mixture has the potential to fill fissures underground and create pollution issues. Although it is surmised that these compounds comprise only a small fraction of the fracturing fluid, it becomes additive when millions of gallons of water are pumped into the ground. This could add up to hundreds of pounds of chemicals over the production life of a well (Soeder and Kappel 2009).

- Concentrated solids, contaminated with **radioactive waste** (i.e. radium) are often extracted from the ground after being used to fracture the shale. Some frac water in New York State exceeded the EPA safety standards for radioactivity. However, more study is needed to determine the potential impacts of radioactive materials on aquatic organisms (Sumi 2008; Rabb 2010).

- Each drilling pad occupies 1 – 5 acres of ground, not including roads and stream crossings. Several pads can occupy one site, creating the potential for a significant volume of non-point runoff (NYDEC 2009). Fugitive dust may be problematic for adjacent waterways.

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