

Testimony of
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U.S. Senate Committee on Energy and Natural Resources
Subcommittee on Water and Power

On
SHALE GAS PRODUCTION AND WATER RESOURCES IN THE EASTERN UNITED STATES

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Madam Chair, ranking member Lee, and members of the Subcommittee:

My name is Katy Dunlap, and I am the Eastern Water Project Director for Trout Unlimited—the nation’s largest coldwater conservation organization dedicated to conserving, protecting and restoring North America’s trout and salmon fisheries. I thank the members of the Subcommittee for holding this important hearing and for the opportunity to testify.

Most of Trout Unlimited’s 140,000 members like to fish, and they give back to the rivers and streams by dedicating more than 600,000 volunteer hours each year. We are fortunate to have such a committed group of volunteers, as the challenges we face are great: nearly half of the rivers and streams in the U.S. are considered to be impaired.

Natural gas development is occurring in several regions in the Eastern half of the United States, including the Antrim Shale in Michigan, Fayetteville Shale in Arkansas, and Marcellus Shale in the northern Appalachians. My testimony today will focus on the Marcellus Shale, and specifically on the impacts of development in Pennsylvania, where more than 1,600 wells are in production.¹

Trout Unlimited supports natural gas development that is done the right way, and in the right places. Improperly sited or poorly managed natural gas development, however, can cause serious harm to water resources, which I will explain in greater detail later in my testimony. Declines in water quality directly affect Eastern brook trout, the East’s only native trout, and a species whose survival depends on a steady supply of clean, cold water. A recent assessment found that brook trout are either greatly reduced or have vanished from 50 percent of their historic range, and are at risk of disappearing from other areas. The report found that two of the major impacts to brook trout are habitat fragmentation and sedimentation due to road crossings and construction—two impacts that are also associated with drilling in the Marcellus Shale.

¹ <http://www.prweb.com/releases/Marcellus/Production/prweb8855519.htm>

With our state and federal agency partners, as well as our conservation allies, Trout Unlimited members are working hard to reverse the decline in brook trout populations all along the Appalachian mountain range, from Georgia to Maine. In Pennsylvania, Trout Unlimited's 12,000 members and staff have been diligently working for more than a decade to restore trout streams that suffer the legacy impacts of past coal mining. And we are making progress. For example, work to remediate acid mine drainage in the Babb Creek in Tioga County, Pa. restored water quality to the point that brook trout were able to repopulate the stream for the first time in decades. Yet in 2011 alone, 181 Marcellus Shale wells have been drilled in Tioga County. As we work to achieve hard-won fishery restoration gains, it is imperative that we avoid additional losses that can result from poorly managed natural gas development.

The potential for natural gas development to impact water resources and trout fisheries exists at several stages of the development process. While Trout Unlimited is concerned about the potential contamination of water resources that can be directly caused by the hydraulic fracturing process, we are equally concerned about the surface impacts that can result from the associated activities of hydraulic fracturing and natural gas development. Specifically, we are concerned about the locations of well pads, wastewater storage areas, and pipelines; well pad, pipeline, and access road construction; water withdrawals from small headwater streams; spills and leaks of toxic substances; and the management, storage and disposal of drilling wastewater.

State and local governments are almost entirely responsible for regulating gas development in the Marcellus Shale region. Federal regulation of the stormwater and drinking water aspects of gas development could have been helpful, but were eliminated by the 2005 Energy Bill passed by Congress. With the lack of any federal oversight, states have taken very different regulatory paths, as I'll explain below. But in the heart of the Marcellus development area, in places such as Pennsylvania, well intentioned state regulatory programs are struggling mightily to keep up with the challenges posed by rapid gas development.

From what we see on the ground, regulation of gas development is not adequate to protect water resources, and we are working hard to fill the gaps. From cradle to grave, water use management for drilling and hydraulic fracturing needs significant improvement to eliminate or reduce incidents of water-related pollution and to ensure overall protection of water resources. My testimony today will illustrate a few examples of drilling-related surface impacts occurring on the ground, including: erosion and sedimentation; blowouts, leaks, spills and illegal discharges; impacts of water withdrawals from headwater streams; and insufficient regulation of wastewater management. I will then discuss what Trout Unlimited is doing to prevent harm to water resources and aquatic habitat, and the policy changes that are needed in Pennsylvania and beyond to facilitate responsible energy development while sustaining the healthy ecosystems that support \$76.7 billion in hunting- and fishing-related economic activity across the United States.

I. Water Quality and Quantity Impacts

Of the 925 violations issued by the Pennsylvania Department of Environmental Protection (DEP) to Marcellus well operators, from January to August of this year, the greatest percentage of violations issued were related to spills, leaks, and illegal discharges. However, by far the most prominent and concerning impact that Trout Unlimited members are seeing on the ground is the failure or lack of erosion and sediment controls on well pad construction sites and access roads.

A. *Erosion and sedimentation*

Erosion and sedimentation can lead to the overall degradation of water supplies and irreversible impacts on valuable and irreplaceable trout streams. In March 2011, development of a gas well site in West Branch Township, Potter County, led to an erosion problem that resulted in the DEP issuing a cease-work order to Chesapeake Energy. A significant amount of sediment and silt was discharged from the site into a stream that is a tributary to a water source serving the Borough of Galeton. The Galeton Water Authority was forced to use another permitted drinking water source. If the water supply operator had not been on site to shut off an intake valve, the water supply for 1,400 Pennsylvanians would have experienced irreparable damage. DEP issued a violation to Chesapeake for failure to implement erosion and sediment controls required in the permit.

In addition to affecting the quality of public water supplies, erosion and sedimentation can greatly impact high quality coldwater habitat. At least 15 different direct negative effects from sedimentation have been demonstrated to impact trout and salmon, ranging from stress, altered behavior, reductions in growth and direct mortality:

Suspended sediment blocks light affecting feeding and movement of fish and causes direct gill damage (if concentrations are high enough) that may lead to death. Excessive sediment in the stream bottom may act as a physical barrier and stop the emergence of fry or prevent proper flow of water to redds . . . Proper water flow is necessary to carry dissolved oxygen to incubating eggs and to remove waste products from developing embryo.²

Earlier this month, a world-renowned trout stream in north central Pennsylvania was seriously impacted by the construction of a Marcellus natural gas pipeline. Pine Creek—a federally-designated Wild and Scenic River—experienced severe turbidity as a result of vegetation clearing for the El Paso pipeline in Potter County. The open ditches running up and down the mountain failed to include appropriate erosion and sediment management controls, resulting in excessive sediment loading that will likely negate spawning in the exceptional value trout stream. This incident is currently being investigated by Pennsylvania’s DEP, Fish & Boat Commission and the Potter County Conservation District to determine the ultimate impact on Pine Creek and its coldwater fishery.

These are just two examples of sedimentation pollution incidents that have resulted from DEP inspection at sites where an erosion and sediment control permit was required. In reality, there are numerous sedimentation pollution incidents that go un-noticed and uninvestigated by the state—largely because oil and gas development sites less than five acres are not required to receive a permit under current federal and state law. Collectively, these impacts will result in the overall degradation of water resources.

It is estimated that by 2030 between 38,000 and 90,000 acres of Pennsylvania’s forest cover will be cleared by Marcellus gas development.³ The loss of forest cover will leave bare soil exposed

² Lloyd, D.S. 1987. Turbidity as a water quality standard for salmonid habitats in Alaska. Pages 34-35. *North American Journal of Fisheries Management*. American Fisheries Society. Bethesda, MD.

³ Johnson, Nels (2010). Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas & Wind, p.9. *The Nature Conservancy, Pennsylvania Chapter*.

and lead to significant increases in erosion and potential water quality impacts, if left unregulated and unchecked. Without oversight on oil and gas development-related construction sites of one acre or more, this pollution problem will perpetuate.

B. Blowouts, leaks, spills and illegal discharges

Blowouts, spills, and leaks related to drilling activity make the news much more often than erosion and sediment control violations. These activities may cause immediate short-term impacts to water resources and contribute to overall water resource degradation in the long-term.

On April 19, 2011, equipment failure at a Chesapeake Energy gas well site near LeRoy Township, Pa. caused a leak, resulting in the release of 30,000 gallons of salty flowback water from the site and into a tributary to Towanda Creek. The well site was located less than 500 feet from the tributary that drains into Towanda Creek—too close to prevent drilling fluid from entering the creek. Towanda Creek is a well-known trout stream that meets the Susquehanna River about 16 miles downstream of the spill. The Susquehanna River supplies 45 percent of the fresh water in the Chesapeake Bay.

In March 2010, Airfoam HB—a wetting chemical used in gas drilling—was discharged into Pine Creek near Waterville, Pa. The material originated from a Pennsylvania General Energy Company LLC (PGE) well site approximately 2,000 feet uphill from Pine Creek and was found by local citizens in Pine Creek. Pennsylvania Fish & Boat Commission investigators determined that the surfactant was pumped down the well during the drilling process and, in all probability, accumulated in a void in the sedimentary rock layers. The surfactant was then flushed laterally through the underground rock strata by heavy rain runoff before emerging as a soapy discharge at a spring, on the mountainside approximately 2,000 feet away.⁴

In Clearfield County, Pa., several leaks caused contamination of groundwater springs and high quality trout waters in 2009. At a well site owned by EOG, a small hole in a drilling wastewater hose allowed gas and flowback water to leak and percolate onto the ground and into Little Laurel Run for over two months, contributing to the contamination at Reed Springs and Alex Branch. Another accident occurred at the site, when almost 8,000 gallons of water and fracking fluids leaked from a tank and into the Alex Branch and Trout Run. Alex Branch is a tributary of Trout Run, one of the area's better fishing creeks, which flows into the West Branch of the Susquehanna River. Investigations by the DEP and the Pennsylvania Fish & Boat Commission subsequently determined that several accidental discharges of contaminated water and fluids at EOG's Marcellus operations, including leakage from the pit over a two-month period from August through October 2009, had caused the contamination of Reeds Spring.⁵ That same EOG well experienced a blowout in June 2010, releasing at least 35,000 gallons of brine and toxic fluids from hydraulic fracturing into the air over 16 hours. The DEP shut down the company's drilling operations for 40 days statewide, and six weeks later, fined EOG and a drilling contractor a total of \$400,000.⁶ Just this one well site alone caused several incidents of contamination to surface and ground water sources, demonstrating the potential contamination that may be caused by the 50,000 to 80,000 wells that are projected for Pennsylvania alone.

⁴ http://www.fish.state.pa.us/newsreleases/2011press/pge_settle.htm

⁵ <http://www.post-gazette.com/pg/11156/1151527-503.stm>

⁶ <http://www.post-gazette.com/pg/11156/1151527-503.stm#ixzz1asSTB7RA>

C. Water quantity concerns

While the states overlying the Marcellus Shale region are blessed with abundant rivers and streams, these water resources are not infinite. Large, consumptive withdrawals for gas drilling can have deleterious effects on sensitive watersheds and their aquatic life. To hydraulically fracture each Marcellus well, approximately five million gallons of water is needed. The timing and location of water withdrawals for gas drilling, as well as consideration of other major withdrawals in the basin during the same period, will determine the short- and long-term impacts on the watershed. Because many of the more productive Marcellus drilling areas are in or nearby smaller watersheds containing headwater streams, such large water withdrawals could be devastating to coldwater habitat and other aquatic resources.

For example, Horton Run, a tributary of the East Fork of Sinnamahoning Creek and classified as an “Exceptional Value” trout stream, was virtually de-watered by water withdrawals for gas well development. Fish kills have occurred as a result of water withdrawals that de-watered Cross Creek and Sugarcamp Creek in Washington County, Pa. Four gas companies have paid a total of \$1.7 million to settle charges of illegal water withdrawals from Pennsylvania trout streams, including Chief Oil & Gas, which took 3.5 million gallons from a tributary of Larry’s Creek, and Range Resources, which took 2.2 million from Big Sandy Run. Additionally, water withdrawals have damaged Meshoppen, Pine and Sugar creeks. These examples clearly demonstrate the risk that water withdrawals from small headwater streams pose to aquatic habitat.

D. Wastewater management

Marcellus Shale operators in Pennsylvania have reported that approximately 15 percent of the roughly 5 million gallons of water used to fracture a well is returned to the surface during the initial flowback period, and the Secretary of Energy Advisory Board’s (SEAB) 90-day report found that “... in the Marcellus, primarily in Ohio, New York, Pennsylvania and West Virginia, the flow-back water is between 20 and 40 percent of the injected volume.”^{7, 8} Flowback from Marcellus Shale hydraulic fracturing contain pollutants of concern – particularly high levels of dissolved salts, often several times saltier than sea water. High Total Dissolved Solids (TDS) levels can have significant impacts on trout populations and the waterways they rely upon.

Hauling fresh water and wastewater to and from a well pad site is a service that is often sub-contracted to several hauling companies. Each of those trucking crews may be operating several trucks, and each of those drivers may be making several trips a day. In southwest Pennsylvania, one such hauler was recently charged with illegally dumping millions of gallons of Marcellus Shale drilling wastewater into holes, mine shafts and waterways in a six-county region between 2003-2009. Robert Shipman and his company, Allan’s Waste Water Services, are collectively facing 175 criminal charges.⁹

While the return water (flowback plus produced water) is increasingly being re-used and recycled by the industry, ultimately decreasing the demand for freshwater, there continues to be a lack of a comprehensive treatment plan for wastewater generated from hydraulic fracturing and drilling practices. In Pennsylvania, the DEP asked drillers to voluntarily stop taking wastewater

⁷ http://www.pagoppolicy.com/Display/SiteFiles/112/2011Hearings/112_4_21_11_Jugovic_DEP_Testimony.pdf

⁸ The SEAB Shale Gas Production Subcommittee Ninety-Day Report – August 11, 2011, p. 9.

http://www.shalegas.energy.gov/resources/081111_90_day_report.pdf

⁹ <http://www.post-gazette.com/pg/11077/1132812-454.stm>

to municipal treatment plants, as these facilities are designed to treat biological agents and not equipped to treat the chemicals and high salts found in drilling wastewater. Several companies have complied. However, there is still a need for long-term wastewater management planning, as even recycled wastewater must be partially treated before re-use and will eventually need to be disposed. Other avenues for wastewater disposal have been underground injection wells. In general, Pennsylvania drillers have been sending their wastewater to Ohio for underground injection.

In the face of these hazards for water resources, states in the region have responded differently. Pennsylvania and West Virginia have the most active Marcellus Shale gas development and the most active state regulatory programs. Conversely, not one horizontal Marcellus gas well has yet been developed in Maryland or New York, and in fact, drilling will not be permitted in the drinking watersheds for New York City and Syracuse because of water quality concerns. New York has been working on a study of the impacts of gas development since 2008, and is on the verge of allowing active development in other parts of the state in 2012. Maryland is undergoing a study to determine whether and how Marcellus Shale gas development might occur in the state. A final report is expected by August 2014.

II. Solutions

TU is actively involved at local, state, and federal levels to find solutions which will allow well sited, well planned, and well executed gas development. The large numbers of wells being developed in Pennsylvania, and the hugely important trout fisheries which are a hallmark of the state and its \$1.3 billion angling-related economy,¹⁰ make it ground zero for our work.

To address the next challenge facing Pennsylvania's coldwater streams, Trout Unlimited launched a Marcellus Shale campaign aimed at working with state agencies and the industry to identify, avoid and mitigate the impacts of gas development on trout populations and coldwater habitat. Trout Unlimited and other sportsmen and women have met with state regulators to discuss protections for ecologically-sensitive watersheds and opportunities for improving monitoring, oversight and enforcement of drilling related activities. We have developed a partnership with a drilling company in southwest Pennsylvania to create a model well pad site and demonstrate how best management practices and appropriate well siting and design can increase the likelihood that water resources and trout populations are protected.

To provide an extra set of eyes and ears on the ground, Trout Unlimited initiated the Pennsylvania Coldwater Conservation Corps in 2010. We have trained more than 200 volunteers to conduct stream surveillance to monitor the impacts of Marcellus Shale development on the commonwealth's valuable water resources. Our members conduct water quality testing on sensitive coldwater streams and survey watersheds for impacts associated with drilling-related activity where Marcellus development is occurring or is projected to occur in the near future. In the field, Trout Unlimited members are witnessing impacts that do not always make the headlines.

Volunteer efforts and industry best practices form two legs of the stool, with the third being effective regulations. Trout Unlimited recommends the following changes to deal with the problems identified above.

¹⁰ <http://www.census.gov/prod/2008pubs/fhw06-pa.pdf>

A. Erosion and sedimentation

Unlike other construction sites, due to an exemption provided through the Energy Policy Act of 2005, oil and gas construction sites are not covered by the Clean Water Act's stormwater provisions.¹¹ This exemption prevents the application of Clean Water Act stormwater runoff rules to the construction of exploration and production facilities by oil and gas companies and the roads that service those sites. In light of the impacts of construction-related stormwater from natural gas development on fish habitat and water resources, this exemption makes little sense and should be repealed.

In Pennsylvania, an erosion and sediment control permit is required only if a well operator is proposing five acres or more of earth disturbance. However, the average Marcellus Shale well pad size in Pennsylvania is approximately three acres—making the majority of well pads exempt from the state's erosion and sediment control permit requirements.¹² Due in large part to gaps in regulatory oversight, streams are turning turbid and muddy from the erosion, sedimentation and runoff from nearby Marcellus construction sites.

B. Blowouts, leaks, spills and illegal discharges

Steps should be taken to reduce the risk of impacts to water, including removal of the exemption to the Safe Drinking Water Act for hydraulic fracturing. Some spills and other accidents may be unavoidable. For these, we should reduce their direct impacts on water resources by requiring setbacks from waterways for natural gas infrastructure. Construction of well pads, compressor stations, storage pits and other drilling infrastructure should not be authorized, at a minimum, within 300 feet of surface waters. Well pad development and construction of impoundments should be prohibited in 100-year floodplains.

C. Water quantity concerns

In Pennsylvania, one-third of the state does not have a comprehensive water withdrawal permitting program. While the state requires each company to submit a Water Management Plan for drilling within a region, the plan only requires identification of the source, the amount, the counties where the water will be used and a low flow analysis. The plan does not require monitoring to ensure compliance with the permit or signage at the withdrawal site, making it difficult for the public to know whether a withdrawal is legally permitted. Additionally, while the plan is valid for five years, there is no specific time restriction associated with the withdrawal and the operator has 30 days to notify the DEP after initiation of the withdrawal. At that point, the damage could be done. In the Ohio River basin, the DEP established "guidelines" similar to the Susquehanna River Basin Commission, but these are merely guidance—not requirements—and DEP inspectors do not visit water withdrawal sites to ensure compliance with the water management plan.¹³ Furthermore, the DEP has never suspended a water withdrawal approval for drilling because of inadequate streamflow conditions, even during recent drought declaration periods.

¹¹ Section 323 of the Energy Policy Act of 2005, P.L. 109-58.

¹² Johnson, Nels (2010). Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas & Wind, p.9. *The Nature Conservancy, Pennsylvania Chapter*.

¹³ Information provided by Scott Perry, Chief of Pennsylvania DEP Bureau of Oil & Gas Management (12/28/10).

Pennsylvania's current water quantity management fails to comprehensively manage the impacts on stream flows. State regulators should conduct a cumulative impact assessment to determine how taking billions of gallons of water out of a watershed will impact the small headwater streams that provide integral ecosystem services for downstream users and that support trout spawning. And where necessary, the state should establish ecologically-based withdrawal limitations to prevent damage to headwater streams.

D. Wastewater management

A comprehensive management plan for wastewater generated during the drilling process, using a cradle-to-grave approach including disclosure, tracking and proper treatment and disposal, must be developed to protect valuable water resources. Trout Unlimited supports the SEAB Committee's recommendation that regulators begin working with industry and other stakeholders to develop and use an integrated water management system. An integrated water management system should include common principles, such as adoption of a life-cycle approach for tracking and reporting all water flows throughout the process; measurement and public reporting of the composition of water stocks and flow throughout the process; and manifesting of all transfers of water among locations.¹⁴ Real-time tracking systems should be required for trucks hauling fresh water, flowback water and chemicals, including GPS systems and electronic manifest systems, to allow for regulatory entities and emergency personnel to track and respond to potential accidents and to prevent haulers from disposing of drilling wastewater illegally.

In Pennsylvania, permits were issued, drilling began and wastewater was generated before the industry or the state had a solid plan for managing and treating wastewater. To date, short-term fixes have been utilized to dispose of wastewater. However, as with any commercial industrial sector, the natural gas drilling industry must invest in long-term wastewater treatment and disposal solutions.

Finally, Trout Unlimited supports the SEAB Committee's recommendation that regulatory entities immediately adopt rules for full disclosure of the chemicals used in the fracturing process and the chemical composition on a well-by-well basis. Such disclosure should be made on a publicly available website.

The management actions described above would do much to reduce the risk of harmful impacts on water resources and aquatic habitat from natural gas development. However, it will never be possible to fully eliminate the impacts of intensive energy development. The SEAB 90-Day Report stated that: "The combination of impacts from multiple drilling and production operations, support infrastructure (pipelines, road networks, etc.) and related activities can overwhelm ecosystems and communities." Due to unavoidable impacts, Trout Unlimited supports the SEAB recommendation to "Declare unique and/or sensitive areas off-limits to drilling and support infrastructure as determined through an appropriate science-based process." Such areas include high quality brook trout habitat identified through Trout Unlimited's Conservation Success Index,¹⁵ for example key watersheds in the Monongahela National Forest in West Virginia where no wells have yet been permitted, and the George Washington National Forest, which now is considering adopting a strong policy on horizontal drilling for natural gas.

¹⁴ The SEAB Shale Gas Production Subcommittee Ninety-Day Report – August 11, 2011, p. 22.

http://www.shalegas.energy.gov/resources/081111_90_day_report.pdf

¹⁵ <http://www.tu.org/science/conservation-success-index>

III. Conclusion

Trout Unlimited thanks the Subcommittee for holding this timely hearing, and for its interest in the issue. There is no doubt that natural gas is now, and will be, a major component of the nation's energy supply. But gas development in the Marcellus region is harming fish habitat and water resources, and the long term cumulative impacts are not being adequately studied. Both of these facts are troubling to those of us who care about balanced resource extraction.

We urge this Congress to take a more careful look at the full range of gas development impacts on water resources, and to consider reinstating the Clean Water Act stormwater and Safe Drinking Water Act provisions that should right now be at work on the ground protecting those resources from gas development.

Thank you for the opportunity to provide testimony today.

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