

Sustaining Aquatic Resources in the Central Appalachians

- The Appalachian Landscape Conservation Cooperative (LCC), a forum for partners to identify regional conservation priorities and develop the science to address them, collaborated with Cornell University to study the environmental impacts of surface water withdrawals in the Central Appalachian region.
- The rivers and streams of the Central Appalachians are home to more than 200 species of fish and other aquatic life. They also provide a reliable source of drinking water, recreational opportunities and associated economic benefits to people living in large cities and surrounding communities.
- The Cornell study looks at how the region's surface freshwater supply – and the health of natural systems delivering this resource – have been impacted and may be altered in the coming years under increasing water withdrawals.
- It focuses on the Marcellus Shale region in the Central Appalachians, including portions of NY, PA, OH, MD, WV and VA.
- In addition to considering the cumulative impacts of water withdrawals, the researchers looked at specific impacts of large water withdrawals with hydraulic fracturing in the Marcellus Shale region as one example.
- The study attempts to answer these key questions:
 - What are the observed impacts of water withdrawals on freshwater fish communities and ecosystems associated with current levels of water withdrawals?
 - What might those impacts look like under a range of potential water withdrawal scenarios associated with expanding energy development?
 - Is it possible, using sophisticated computer modeling techniques, to identify different flow regimes that deliver a more balanced approach for regulating water withdrawals to meet human demands and sustain healthy ecosystems?

The overall goal of this research is to provide new information to help resource managers, industry and others make more informed decisions in achieving sustainable river and stream flows that balance the needs of society and healthy ecosystems.

Information could also be beneficial for early project design and planning as well as setting a foundation for discussions about associated biological and ecological effects.

Study results

- The Appalachian LCC-funded study is the first region-wide assessment to document “flow-ecology” relationships – showing connections between observed impacts under current water withdrawal standards (based on daily water gauge data collected over the last 15 years and fish surveys) and the decline in freshwater fish communities.
- Based on the assessed relationships and factors such as season, stream size, and projected expansion of natural gas development in the region, scientists developed models showing how water withdrawals impact sustainability of aquatic ecosystems.
- Cornell researchers also applied a model to vary water withdrawal scenarios – for example from current standards to a more seasonally variable scenario – that provided critical information on how flow regimes can be modified to achieve a balance in meeting both human/energy water needs and those required to maintain healthy ecosystems and diversity.
- Key findings and recommendations from the research include:
 - Flow-ecology relationships indicate fish are sensitive not only to changes in low flows, but also to changes in a variety of flow components (season, median, and high flows). This has important implications for setting sustainable flow standards and designing monitoring campaigns.
 - A considerable number of streams are at high risk of flow alteration due to withdrawals during the summer and fall seasons – especially smaller streams in the southwestern (western portions of Ohio River Basin) and northern (headwaters of the Upper Susquehanna and Hudson River Basins) sections of the region.
 - Though these high-risk streams are individually small, combined they drain the majority of the study region.
 - Fixed minimum aquatic flow standards that do not consider seasonal changes in flows and throughout the year may not be adequate to sustain fish populations and aquatic biodiversity.
 - But a balance can be realized if flow standards due to water withdrawal regulations vary with stream size and season and thus provide the necessary balance between human needs and flows needed to sustain fish and aquatic ecosystems.
- This research underscores the Appalachian LCC’s role as a science-driven forum for partners to identify regional conservation priorities and develop information and tools that help people make informed decisions about land use that will help sustain important natural resources.
- For more information about the findings and recommendations from the research including access to the final report and data, view: www.applcc.org/research/flows-water-withdrawals