APPALACHIAN
LANDSCAPE CONSERVATION COOPERATIVE

# Stream Impacts from Water Withdrawals in the Marcellus Shale Region

*Assessing current and future water withdrawal scenarios to inform decisions for achieving sustainable water flows that meet human demands and sustain healthy ecosystems*

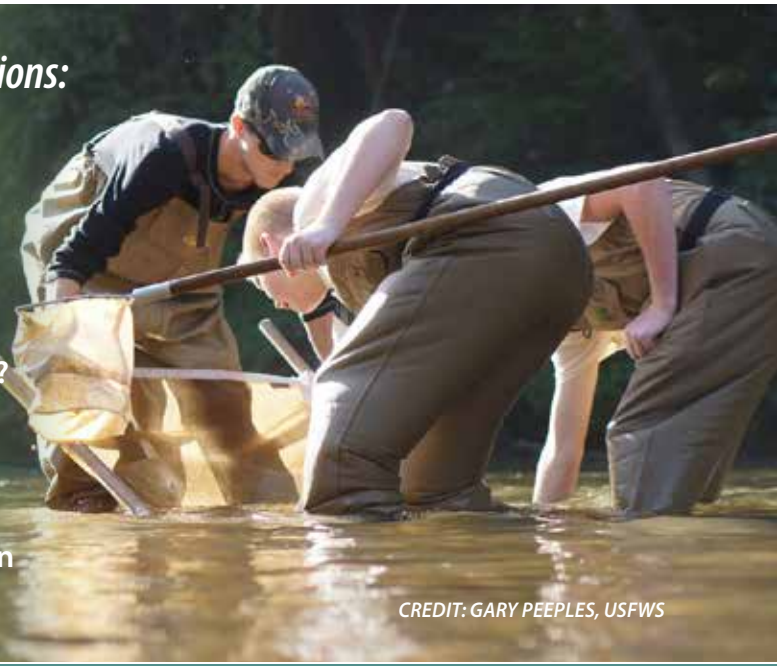
The rivers and streams of the Central Appalachians are home to an abundance of unique aquatic life, including more than 200 species of fish. They also provide a reliable source of drinking water, recreational opportunities and associated economic benefits to people living in large cities and surrounding communities. With so many benefits and uses from this natural resource, it is critical to under stand how the region's surface freshwater supply will change in the coming years under likely increased water withdrawals from human activities.

Through a grant to Cornell University Environmental Engineers, the Appa-lachian LCC funded a study on how the region's surface freshwater supply may be altered in the coming years. One area that could present major conflict in water use is the need to meet energy demands for the expanding U.S. population – specifically in supporting hydrologic fracturing to release natural gas reserves in shale rock formations. Thus the research focuses on the Marcellus Shale region in the Central Appalachians, including portions of New York, Pennsylvania, Ohio, Maryland, West Virginia, and Virginia.

New information and recommendations generated could help resource managers, industry, and others make more informed decisions in achieving sustainable river and stream flows. Information could also aid early project design and planning as well as setting a foundation for discussions about associated biological and ecological effects.

## *The research aimed to answer these specific questions:*

- **What are the observed impacts 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?**



CREDIT: GARY PEEPLES, USFWS

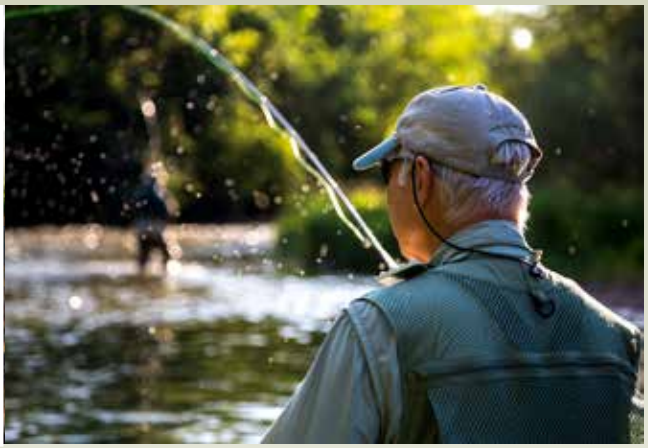
*To learn more about this project, visit: http://applcc.org/research/stream-impacts*

## Key Findings and Recommendations

**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 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, scientists developed models showing how water withdrawals impact sustainability of aquatic ecosystems in the region. 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.

CREDIT: GARY PEEPLES, USFWS



*Key findings and recommendations from the research include:*

- Flow-ecology relationships indicate fish are sensitive to changes in low flows as well as 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.
- A balance between human/energy needs and flows necessary to sustain fish and aquatic ecosystems can be realized if flow standards due to water withdrawal regulations vary with stream size and season.

**APPALACHIAN LANDSCAPE CONSERVATION COOPERATIVE**

National Conservation Training Center
698 Conservation Way, Shepherdstown, WV 25443
communications@applcc.org

To learn more about the Appalachian LCC, visit http://applcc.org

LANDSCAPE CONSERVATION COOPERATIVES

For information on the national network of LCCs, visit http://lccnetwork.org