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# Arkansas Water Currents: Article Discusses Vulnerability of Streams from Changes in Land Use (August 15, 2016)

## Arkansas Environmental, Energy, and Water Law Blog

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The Arkansas Water Resources Center has published an article titled *Researchers Evaluate Vulnerability of Streams from Changes in Land Use* ("Article").

The *Article* was published in the August edition of *Arkansas Water Currents*.

Dr. Sally Entrekin, associate professor of Biology at the University of Central Arkansas, and Lucy Baker, graduate research assistant, ask:

Are some streams more vulnerable to water quality problems due to their natural landscape characteristics?

The *Article* addresses the issue from an Arkansas perspective noting:

... Due to increasing population growth and demands for food and energy, land use in Arkansas is changing, especially in the Central and Northwest regions. As humans modify the landscape, water quality can be negatively affected. But, the natural characteristic of the landscape can also influence the extent that streams and rivers might be impacted. For example, when forests are replaced with pasture land, nearby streams and rivers with more sloped channels and erosive soils might be more vulnerable to nutrient and sediment pollution compared to streams with less sloped channels and less erosive soils.

Methods the authors used to evaluate the vulnerability of sub-watersheds to changes in land are addressed noting:

... Stream water quality can be influenced by characteristics of the natural environment, known as sensitivity variables, and by human alteration of the environment, known as exposure variables.

The authors evaluated certain variables in 140 sub-watersheds, ranking all variables in each class (the sensitivity and the exposure) across all sub-watersheds and summed the variables for a total score for each class. Further, to define the vulnerability of a sub-watershed, the *Article* states they multiplied the sensitivity score by the exposure score.

A stream site in 40 of the sub-watersheds was subsequently selected. These are stated to have represented a gradient of vulnerability scores. Particular attention was paid to natural gas development. At the 40 sample sites the authors are stated to have:

. . .collected and identified macroinvertebrates to evaluate water quality using biological indicators such as diversity and the percentage of sensitive organisms. They were then able to relate the level of vulnerability of each sub-watershed to these biological indicators of stream water quality.

The authors conclude that a vulnerability score, which combined sensitivity and exposure scores, was better at predicting decreases in water quality. They conclude that water quality is highly dependent on both natural characteristics and human alterations of the landscape. They express surprise that there was no difference in the biological indicators of water quality across the gradient of natural gas development compared pasture land cover, meaning that both activities were equally stressing to the landscape and water quality.

The authors conclude some areas in Central Arkansas are more prone than others to degraded water quality due to both natural characteristics and human alterations of the landscape. The information generated in the research is deemed helpful in guiding land and water resource manager “in deciding where new developments should go and where they shouldn’t go in order to protect water quality”.

[A link to the article can be found here.](#)