Study finds widespread stream biodiversity declines at low levels of urban development

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A new study from biology researchers at Baylor University and the University of Maryland-Baltimore has found that there are consistent and widespread declines in stream biodiversity at lower levels of urban development more damaging than what was previously believed.

The study found that aquatic life actually shows significant loss of biodiversity with less than two percent of developed land in a watershed. This is much less that what a decade-old analysis widely cited by environmental policymakers suggests that it takes up to 15 percent of solid surfaces like roads or parking lots, or 20 to 30 percent developed land in a given area before local water systems no longer sustain normal aquatic life.

"The findings are alarming and imply that water quality in streams is degraded rapidly with relatively low levels of development, which clearly has significant implications to the organisms that live in these streams," said study co-author Dr. Ryan King, associate professor of biology at Baylor. "Perhaps of even greater concern is that the decline of stream-dwelling animals implies that there is chemical pollution that could also be detrimental to human health via groundwater and downstream drinking water supplies. It is unlikely that it's just the rapid runoff of water from the impervious cover that is causing the loss of biodiversity, but more likely that chemical pollution is also responsible."

The researchers used samples from about 2,000 streams around Maryland and compared satellite imagery and land cover datasets to

analyze how the water ecosystem and biodiversity responded to various levels of impervious cover, which are areas where infiltration of water into the underlying soil is prevented. Roads, parking lots and buildings account for the majority of impervious cover.

Published research in recent years has consistently shown a strong relationship between the percentage of impervious cover in a watershed and the health of the receiving stream. Scientists generally agree that stream degradation consistently occurs at relatively low levels of imperviousness, such as 10 to 20 percent. However, when King and his research team applied a new statistical analysis method that they created called the Threshold Indicator Taxa Analysis (TITAN), it showed biodiversity loss at much lower development levels in the study area. In fact, the analysis showed that approximately 80 percent of the biodiversity loss came between .5 and two percent of impervious cover, and the remaining 20 percent of loss came between two and 25 percent.

"This new statistical analysis method is more precise than current methods and when we applied it to real world environments, it revealed a dramatically lower ecological 'tipping point' at which species are threatened," King said. "The implications of these findings are very important in water management strategies."

More information: The study appears on-line in the journal *Ecological Applications.*

Provided by Baylor University