

Don Weller and Tom Jordan

Streamside forests reduce nutrient pollution of aquatic ecosystems

Streamside forests provide many valuable ecological benefits, especially the service of removing pollutants in the water draining from uphill areas. This helps keep pollutants from agricultural and developed lands out of waterways and reduces damage to aquatic ecosystems. For years, scientists have measured pollutant removal by these “riparian buffers,” but only in small study areas, not across entire watersheds or broader regions. We developed new methods to estimate the combined benefits of all the riparian buffers in an entire watershed. We tested the new methods on 321 study watersheds that lead to the Chesapeake Bay. We focused on nitrate, the dominant form of nitrogen lost from agricultural fields and an important contributor to environmental problems in Chesapeake Bay. We found that riparian buffers greatly reduce the amount of nitrate in the streams that drain agricultural watersheds. Aggregate nitrate removal by riparian buffers was less than suggested by many small-scale studies, but still very significant. The existing buffers in the study watersheds remove an average of 16 percent of the nitrate that flows from croplands. Replanting missing riparian buffers downhill from croplands might further reduce the nitrate in streams by up to 32 percent below current levels, which could significantly improve water quality in the Chesapeake Bay. Buffers in Coastal Plain watersheds removed much more of their nitrate inputs than buffers in other parts of the Chesapeake Bay drainage. Our findings provide decision makers with realistic regional estimates for nitrate removal in riparian buffers and help identify where buffer restoration can offer the greatest additional benefit.

BIOS

Donald Weller is a Senior Scientist and Quantitative Ecologist at the Smithsonian Environmental Research Center in Edgewater, Maryland. He earned a B.A. in Biology from Wabash College, and a Ph.D. in Ecology from the University of Tennessee. He has almost 30 years of post-graduate research experience. Don has expertise in ecological modeling and landscape ecology. His recent research has focused on the linkages of watersheds to wetland condition, to stream chemistry and biology, and to estuarine health.

Thomas Jordan is a Senior Scientist and Chemical Ecologist at the Smithsonian Environmental Research Center in Edgewater, Maryland. He earned a B.S. in Biology from Bucknell University and a Ph.D. in Biology from Boston University. He has 31 years of post-graduate research experience. His research focuses on processes controlling the flows of nitrogen and phosphorus through ecosystems, especially flows from watersheds to estuaries and the role of wetlands in modulating these flows.