

Fertilizers -- a growing threat to sea life

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A rise in carbon emissions is not the only threat to the planet. Changes to the nitrogen cycle, caused in large part by the widespread use of fertilizers, are also damaging both water quality and aquatic life. These concerns are highlighted by Professor Grace Brush, from Johns Hopkins University in Baltimore, USA, in her historical review of landscape changes around Chesapeake Bay, a large estuary on the Atlantic coast of the USA. Her findings are published online this week in Springer's journal *Estuaries and Coasts*.

Professor Brush studied the organisms and materials preserved in sediments in Chesapeake Bay spanning 1000 to 14,000 years, alongside available historical records covering the past 300 years, to trace the history of changes to nitrogen loading in the estuary. She highlights how population growth, agricultural expansion, and urbanization have released nitrogen from the land and moved it to Chesapeake Bay, where it has accumulated and degraded both the natural wildlife and water quality.

The combination of the increasing use of fertilizers, deforestation and the draining of wetlands and floodplains to provide more land for crops, has led to an imbalance in the nitrogen cycle, in particular reduced opportunities for the natural removal of nitrogen. As a result, there is an excess of nitrogen in the estuary, also known as eutrophication. This in turn has led to the deterioration of the local ecosystem through reduced concentrations of oxygen in the bay, affecting both the water quality and the fish populations.

Providing food for an increasing population is the main reason for these changes, according to Professor Brush. Although the estuary supplied an abundance of fish species, humans also need plant-based food products in their diets, hence the increase in grasslands and use of fertilizers. She adds that aquatic deterioration is not unique to Chesapeake but a global phenomenon. Marine "dead zones" with low oxygen and/or toxic algae, caused primarily by the run-off of fertilizers from the land, as well as a greater reliance on fossil fuel, are on the increase.

Professor Brush concludes her review by looking at the likely implications of this imbalanced nitrogen cycle on future ecosystems as well as ways to improve water quality. She recommends multiple processes to reduce nitrogen accumulation, both natural and engineered, and notes that ultimately the decision to proceed will come down to politics.

Brush comments, "The future of the Chesapeake and coastal regions in general will depend very much on the recognition of the importance of nitrogen removal for goals other than restoring the fishery, how successful the various tools for nitrogen removal are, and the willingness of the public to pay for the implementation of those tools that can successfully achieve multiple goals."

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