Researchers review environmental conditions leading to harmful algae blooms

August 27 2019

Filamentous algae in a nutrient-impacted Greenbrier River, West Virginia. Credit: West Virginia Department of Environmental Protection. Reproduced with permission of Wiley Publishing.

When there is a combination of population increase, wastewater discharge, agricultural fertilization, and climate change, the cocktail is detrimental to humans and animals. This harmful cocktail produces harmful algal blooms, and many of these are toxic to humans and wildlife.

Wayne Wurtsbaugh, Professor Emeritus in the Watershed Sciences Department at Utah State University, along with Hans Paerl and Walter Dodds published a global review of conditions that lead to these harmful algal blooms in rivers, lakes, and coastal oceans. Wurtsbaugh says that the review will be an excellent resource for students studying pollution and for managers wanting to review recent advances in this field of study. Their review highlights how agricultural, urban, and industrial activities have greatly increased nitrogen and phosphorus pollution in freshwater and marine systems. This pollution has degraded water quality and biological resources costing societies billions of dollars in losses to fisheries, the safety of drinking water, increases to greenhouse gas emissions and related social values. Their findings have been published in, "Nutrients, eutrophication and harmful algal blooms along the freshwater to marine continuum."

Their scientific review highlights that although individual bodies of water may be more effected by increases in either phosphorus or nitrogen, the unidirectional flow through streams, lakes, and into marine ecosystems creates a continuum where both nutrients become important in controlling the algal blooms. The authors report how increasing nutrients has caused harmful blooms in waters as diverse as Utah Lake (Utah), mid-west agricultural streams, and the Gulf of Mexico where a 5,800 mi2 (15,000 km2) dead zone has developed. The authors conclude that although the specifics of algal production varies in both space and time, reducing the human causes of both phosphorus and nitrogen may be necessary to decrease the harmful algal blooms along the freshwater to marine continuum. These algae blooms make waters dysfunctional as

ecological, economic, and esthetic resources.

The technology currently exists to control excessive nutrient additions, but more effective environmental regulations to control agricultural nutrient pollution, and investment in more advanced wastewater treatment plants will be needed to reduce these inputs and improve water quality. The enhancement of the quality of freshwater and coastal systems will become essential as climate change and human population growth place increased demands for high quality water resources.

Toxic cyanobacterial (Microsystis) bloom in the Liangxi River, Wuxi, China. Credit: Hans Paerl, June 2016. Reproduced with permission of Wiley Publishing.

Bloom of the cyanobacterium (Nodularia) in Farmington Bay of the Great Salt Lake. This toxic species creates dangerous blooms in saline estuaries such as the Baltic Sea and Gippsland Lakes, Australia. Credit: Wayne Wurtsbaugh. Reproduced with permission of Wiley Publishing.

More information: Wayne A. Wurtsbaugh et al, Nutrients, eutrophication and harmful algal blooms along the freshwater to marine continuum, *Wiley Interdisciplinary Reviews: Water* (2019). DOI: 10.1002/wat2.1373

Provided by Utah State University