Study finds water quality improvements in Maryland's Choptank River

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The Chesapeake Bay has a long history of nutrient pollution resulting in degraded water quality. However, scientists from the University of Maryland Center for Environmental Science's Horn Point Laboratory are reporting some improvements in the Choptank River on Maryland's Eastern Shore.

"The data presented here indicate that public and industrial investments in reductions of atmospheric emissions and upgrades to wastewater treatment plants have improved estuarine water quality in the Choptank," said University of Maryland Center for Environmental Science Professor Emeritus Tom Fisher.

For the last 20 years, scientists have worked with farmers, wastewater treatment plant operators, government agencies, and water quality groups to encourage conservation efforts and to discern trends in water quality in the Choptank basin. In this study, scientists evaluated whether the total maximum daily load (TMDL) for the Chesapeake—established by the U.S. Environmental Protection Agency to address degraded water quality—and other management practices to curb atmospheric deposition, clean up point sources for pollution such as waste water treatment plants, and reduce runoff from agriculture have led to improved water quality in streams and in the Choptank estuary.

Fisher and fellow researchers evaluated progress towards water quality goals between 1998 and 2017. They found that both atmospheric deposition and wastewater treatment inputs declined due to these management actions, whereas overall inputs increased due to higher agricultural inputs, despite conservation efforts.

Out of three monitoring stations on the Choptank River, the one nearest a wastewater treatment plant outfall, a few miles downstream from Cambridge, Maryland, showed improvement, indicating that public and industrial investments in reductions of atmospheric emissions and upgrades to wastewater treatment plants have improved estuarine water quality. In surface waters, water clarity increased and the amount of algae decreased. In bottom waters, dissolved oxygen increased.

"An interesting question is why there is improving water quality at the monitoring station near the wastewater treatment plant despite an overall

increase in nitrogen and pollution inputs to the estuary as a whole," said Fisher. "This response suggests that local actions matter; in this case greatly reducing local inputs from the largest wastewater treatment plant in the area improved adjacent estuarine water quality, even when the overall estuary was receiving more nutrient pollution."

The agricultural sector, the dominant source of nitrogen and phosphorus pollution, appeared to provide little contribution to improved water quality during this period, despite efforts to encourage best management practices such as fertilizer management, drainage control structures, or winter cover crops to reduce losses of nitrogen and phosphorus from fertilizers applied to fields. The watershed contains numerous concentrated animal feeding operations, particularly poultry, which produce manure that is applied as organic fertilizer on crop fields. Fertilizer applied to crops such as corn, wheat and soybeans may also enter the watershed through surface runoff or groundwater.

The Choptank is a tributary of Chesapeake Bay on the Delmarva Peninsula, and its watershed lies primarily in the state of Maryland, with a portion in Delaware. There are strong similarities between the Choptank basin and the Chesapeake as a whole, which enables the Choptank to be used as a model for progress in the Chesapeake.

"The eutrophication of the Choptank estuary is a microcosm of the Chesapeake Bay as a whole," said Fisher.

The Chesapeake Bay is an estuary which has undergone considerable water quality degradation from human impacts and nitrogen and phosphorus pollutants from the air and land that have impaired use of receiving waters for drinking and recreation, and result in algal blooms and hypoxia. Algae blooms occur downstream in the Choptank and Chesapeake, blocking sunlight and reducing oxygen after the algae settle to the bottom, making it difficult for fish and oysters to survive.

"If reductions in agricultural nitrogen and phosphorus inputs over broad areas do occur in the future, improvements in estuarine water quality larger than those reported here, and more consistently throughout the entire estuary, could be expected. For this reason, it is important to continue monitoring agricultural areas with enhanced management practices," said Fisher.

The paper "Localized water quality improvement in the Chesapeake estuary, a tributary of Chesapeake Bay" was published in *Estuaries and Coasts.*

More information: "Localized water quality improvement in the Chesapeake estuary, a tributary of Chesapeake Bay" *Estuaries and Coasts.*

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