Mystery on the Hudson

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Carbon exists in many forms in the air, soil, and water, and is an integral part of most living organisms. In a recent study, Stuart Findlay (Institute of Ecosystem Studies, Millbrook, New York) discovered changes in the amount of carbon in the Hudson River. Exactly why the amounts changed, and what's causing these changes, remains a mystery.

In "Increased carbon transport in the Hudson River: unexpected consequence of nitrogen deposition?" published in the April issue of Frontiers in Ecology and the Environment, Findlay explores what may be driving this phenomenon.

Most large rivers contain dissolved organic carbon (DOC) in fair quantities, but recent tests have shown a doubling of the amount of DOC accumulating in the Hudson River over the past fifteen years. Soggy peatlands, wetlands, or increased agriculture could all lead to increases in the carbon levels. Some areas have shown increased DOC after nitrogen fertilization of forests. Yet activity along the Hudson River, including agricultural use, has declined over the years.

According to the paper, "temperature, water yield, and land cover have not changed in ways that would make these viable causes for the altered DOC."

Findlay proposes two possible suspects: either the composition of materials flowing into the Hudson has changed or the bacteria that normally process carbon are not metabolizing some of the carbon material entering the river. The second possibility, that the metabolism

of the bacteria in the river has changed, would result in higher levels of DOC flowing downstream to the freshwater tidal flats.

According to Findlay, if the bacteria are bypassing the material flowing into the river, then downstream waters would receive larger amounts of DOC. This process would add to oxygen demand, increasing the river's susceptibility to eutrophication-driven problems of hypoxia, such as regularly occurs in the Gulf of Mexico.

Looking at current evidence, if carbon degradation, or the amount of carbon processed by bacteria, had not changed over the past fifteen years, possibly 20 percent less DOC would flow from the upper to the lower regions of the Hudson river.

There is also evidence that the amount of carbon flowing into the Hudson has changed. Other studies have found that increased nitrogen, whether from sources such as fertilizer or acid rain, alter the amount of carbon flowing into small streams and lakes.

These unexpected interactions point to possible larger changes across ecosystems, suggesting that DOC may be a sensitive indicator of changing ecosystems.

Source: Ecological Society of America