Unique data confirms why water turns brown

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By analysing almost daily water samples taken from the same river from 1940 until today, researchers at Lund University in Sweden have confirmed their hypothesis that the browning of lakes is primarily due to the increase in coniferous forests, as well as rainfall and sulphur deposits.

The study was carried out on the Lyckebyån River in southeast Sweden. However, Martin Škerlep, doctoral student at Lund University and the leader of the study, believes the results are relevant for why the water has turned brown in other running waters and lakes in northern Europe and North America.

To be able to apply the study in these areas, there must have been an increase in forest volumes in the surrounding catchments.

The researcher team has investigated the change in water colour over the past 79 years, since 1940 when the Karlskrona municipality started to archive data from the samples of the drinking water supply. Martin Škerlep says that the frequency of the testing (nearly daily) and the time period covered by the data series (from 1940 until today) is what makes the study unique.

"It is thanks to this unique data series that we can understand what actually causes the browning of running waters and lakes with greater certainty than in previous studies. The amount of data and the duration provides great reliability," says Martin Škerlep, who continues:

"We therefore know that the water colour did not change in response to increasing acidification, which peaked in the 1970s and 1980s. This means that the observed variation in water colour, with a notable browning in the last decades cannot be explained primarily by variation in acid deposition. "

In their work, the researchers have compared the data on water colour with long-term data on climate variables, sulphur deposition, and volumes of coniferous forest. The results show that a change in the landscape to an increase in coniferous forest is the primary cause of the browning of water, a result that supports their previous studies.

During the last 100 years, the forest industry has focused on spruce, a type of tree that grows relatively quickly and is financially profitable. In spruce forests, over the years, the organic soil layer becomes thick and rich in organic material. When it rains, carbon leaches out into the lakes and streams and colours the water brown. The most significant leaching occurs when it rains a lot in a short period following drought.

"In the past 40-50 years, the water in the Lyckebyån River has turned a lot browner," says Martin Škerlep.

To see how much coniferous forest there is in the area around the Lyckebyån River, researchers used data from the Swedish National Forest Inventory. In doing this, they were able to detect a 200 percent increase in the volume of coniferous forest around the river since 1928.

In addition to coniferous forest, the study shows that rainfall and sulphur deposition also affect the colour of the water.

More information: Martin Škerlep et al, Afforestation driving long-term surface water browning, *Global Change Biology* (2019). DOI: 10.1111/gcb.14891

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