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The Recovery of Water Quality in Lakes Does Not Lead to Recovery of Ecosystems

What is this research about?

In south-central Ontario, freshwater lakes and rivers have been under siege from a number of 'stressors' caused by humans. These stressors include climate change, acidic deposition (acid rain), pollution, and other harmful factors. They began to take their toll on the region in the mid-19th-century, when Europeans settled and cleared the region's forests. Humans further affected lakes by building roads, towns and industry in the area. However, scientists did not begin to monitor the region's lakes and rivers until the 1970s. In other words, there has been a lack of historical information about these bodies of water. Paleolimnology, the study of past lake environments via examination of fossils preserved in sediments, offer scientists a powerful tool to learn about the past. Paleolimnological methods enable us to analyze the information that is archived in underwater sediments, which, over the years, accumulate and form a continuous record of past environmental changes. They enable us to see how lakes and rivers have changed over long spans of time in response to various natural or human-caused factors.

What you need to know:

The recovery of water quality in lakes does not mean there will be a recovery of ecosystems in these lakes.

What did the researchers do?

Professor Roberto Quinlan at York University, working with researchers at a number of institutions, has participated in numerous studies that have been carried out using paleolimnological methods. In this study, he looked at 54 lakes in south-central Ontario. His goal was to examine how lakes have recovered from multiple disturbances, caused by humans, over the last >150 years.

What did the researchers find?

Although the amount of nutrients in lakes and rivers has returned to natural levels, after a period of elevated values following deforestation, the ecological structure in these water systems continues to be degraded. For example, even though 'water quality' (as typically monitored by regulatory agencies, with a focus on nutrient and pH levels) has returned to pre-disturbance

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conditions in many lakes, communities of algae are still very different today compared to their previous composition, before they were disturbed by human activities. It is likely that multiple stressors caused by humans have interacted to influence the structure of these communities. In other words, new combinations of stressors may be resulting in new kinds of aquatic communities. As a result, it is important to avoid assuming that the recovery of water quality in lakes will lead to a recovery of ecosystems in these lakes.

How can you use this research?

Scientists studying lakes should not focus solely on water quality, but should look at changes in the structure of the aquatic communities living in these lakes. Traditional modeling approaches that look at water quality should be used with caution. Scientists need to take multiple approaches when analyzing how lakes have been affected by humans over time.

About the Researchers

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This Research Snapshot is from a larger study, co-authored with Roland I. Hall (University of Waterloo), Andrew M. Paterson (Ontario Ministry of Environment), Brian F. Cumming and John P. Smol (Queen's University).

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Knowledge Mobilization at York

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