A lake is the landscape's most beautiful and expressive feature. It is the earth's eye; looking into which the beholder measures the depth of his own nature.
..... Walden-- Henry David Thoreau

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To:	Chairman Dr. Wayne Stobo and Members, Halifax/Halifax County Watershed Advisory Board (WAB), HRM
From:	S. M. Mandaville (Professional Lake Manage.), Chairman & Exec. Director
Date:	April 24, 2001
Subject:	**Paleolimnology: an important tool for effective ecosystem management!**

Effective management of aquatic resources requires long-term environmental data. The job of the paleolimnologist is to analyze and interpret the diverse information contained in the sedimentary records of lakes, wetlands, reservoirs, and some parts of rivers. This history is archived in a surprisingly complete repository beneath their deep waters. Every second of every day, sediments are accumulating. Incorporated in these sediments is a record of the organisms that lived in and around the lake, as well as proxy data related to processes occurring in the lake, the composition of the lake's water, the conditions in its watershed, and the air above it!

Most environmental studies are done "after-the-fact", or after a problem has already been identified (such as an acidification of a lake or development of algal blooms or fish kills due to deepwater anoxia). It is often difficult to effectively assess and treat these problems without some historical knowledge of how and when the problems originally developed. Typical questions that a paleolimnologist might address may include: Why did the lake lose its deepwater oxygen, or was it naturally anoxic? Did the lake naturally have large algal blooms? If so, then perhaps mitigation efforts are fruitless as this is the lake's "natural state". At what point in time, and at what level of nutrient enrichment, did eutrophication symptoms become a problem? All these as well as many other questions need to be considered in an historical context.

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Mr. Chairman and colleagues on the WAB:

Attached please find a 10-page published paper of Prof. John P. Smol PhD FRSC which is quite relevant in understanding and dealing with the effective ecosystem management. Dr. Smol is a professor in the Dept. of Biology at Queen's University in Kingston, Ontario. He also co-directs the Paleoecological Environmental Assessment and Research Lab (PEARL) which is considered as definitely world-class. Prof. Dr. Smol, only in his 40s, has already published over 200 journal papers dealing with paleolimnology, as well as several books. He is also co-editor of the international Journal of Paleolimnology.

Applications: Paleolimnological approaches are now being used in enlightened societies to tackle a large suit of environmental and management questions. Although most of the work thus far has been related to lake eutrophication and acidification, these powerful approaches can be used to study problems such as the introduction of exotic species, taste and odor complaints, erosion problems, the extirpation of populations, tracking contaminant trajectories, consequences of water level changes and impoundments, ozone depletion and resultant increases in ultraviolet radiation, and the repercussions of climatic change.

Methodology: The most commonly used biological indicators in paleolimnology are the glass cell walls of diatoms, a major group of algae consisting of over 10,000 species. Diatoms are a very successful group of organisms that live in virtually every body of water. They are characterized by having cell walls made up of two glass or siliceous halves, called valves. The structure and sculpturing of these valves are species specific, so that a trained phycologist can identify diatom species simply by studying (using high-power light microscopes) the valve structure.

As each species of diatom has its own characteristic environmental requirements (e.g., some live in acidic or alkaline waters, some thrive in either low or high nutrient levels in lakes, some like to live on aquatic macrophytes, and so on), by reconstructing past diatom populations, paleolimnologists can accurately infer past lake conditions.

Other biological indicators commonly used in paleolimnology include the scales and cysts of chrysophyte algae, shells and body parts of animals, and the chitinous exoskeletons of a large number of invertebrates. Included in the latter group are, for example, the preserved head capsules of midge larvae (chironomids), which are excellent indicators of deepwater oxygen levels.