

Soil & Water Conservation Society of Metro Halifax (SWCSMH)

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To: **Environment & Sustainability Standing Committee, HRM**
Cc'd Mayor Mike Savage
Cc'd CAO, Richard Butts
From: S. M. Mandaville Post-Grad Dip., Professional Lake Manage.
Chairman and Scientific Director
Date: December 18, 2012
Subject: Lake science, i.e., limnology, and a `critique' of HRM's conclusions: Part-2

Intro on our informal and/or formal submissions:--

The primary purpose of the series of submissions that I am making to the valued Standing Committee of Council is to raise `awareness' of lake science so that one could understand our freshwater lakes/ponds lot better. Several years ago, Dr. Tony Blouin (formerly with the HRM's EMS Dept., now with Halifax Water) did email me that municipalities are not in the business of conducting research. He alluded to that as well in a staff report d/September 19, 2001 to the Regional Council (see our web page, http://lakes.chebucto.org/HRM/HISTORY/lakes_authority.html). I do indeed acquiesce with Tony. But there is always time for a fresh start and new beginnings if one is genuinely interested in our lakes which all Canadians should be proud of. I will appreciate if you can share the submissions with interested councillors or anyone else.

This is being formulated on an informal basis, hence, may have typos/grammar. Please feel free to ask me any questions, and I will endeavour my level best to respond either via emails and/or in person at one of your meetings, if invited to do so.

Preamble:- "Using the Trophic State Indices Beyond Classification":

(Excerpt) "When more than one of the three variables is measured, it is possible that different index values will be obtained. Because the relationships between the variables were originally derived from regression relationships and the correlations were not perfect, some variability between the index values is to be expected. However, in some situations the variation is not random and factors interfering with the empirical relationship can be identified. These deviations of the total phosphorus or the Secchi depth index from the chlorophyll index can be used to identify errors in collection or analysis or real deviations from the "standard" expected values." (Carlson and Simpson, 1996).

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Critique:- The recent (October, 2012) study by consultants to the HRM did not take the aforesaid important aspect into account when they analyzed the HRM's open water sampling of select lakes, 2006 to 2011, incl. (see HRM's SEMO web page, <http://www.halifax.ca/environment/semo.html>).

Our team has been conducting such analyses of our own data as well as of almost all the available historical data inclusive of the HRM's aforesaid data, in steps.

Important:-- In some cases, the TSI (*Cha*) was higher than expected in comparison with TSI (TP). It is quite probable that factors other than increases in phosphorus are responsible for this deviation.

Kindly study Aspects #1 and #2 to understand the possible reasons for the deviation.

ASPECT #1: "Anomalous rise in algal production linked to lakewater calcium decline through food web interactions" (Korosi *et al*, 2012).

Abstract (excerpt):-

"Increased algal blooms are a threat to aquatic ecosystems worldwide, although the combined effects of multiple stressors make it difficult to determine the underlying causes. We explore whether changes in trophic interactions in response to declining calcium (Ca) concentrations, a water quality issue only recently recognized in Europe and North America, can be linked with unexplained bloom production. Using a palaeolimnological approach analysing the remains of Cladocera (herbivorous grazers) and visual reflectance spectroscopically inferred chlorophyll *a* from the sediments of a Nova Scotia (Canada) lake, we show that a keystone grazer, *Daphnia*, declined in the early 1990s and was replaced by a less effective grazer, *Bosmina*, while inferred chlorophyll *a* levels tripled at constant total phosphorus (TP) concentrations. The decline in *Daphnia* cannot be attributed to changes in pH, thermal stratification or predation, but instead is linked to declining lakewater [Ca]. The consistency in the timing of changes in *Daphnia* and inferred chlorophyll *a* suggests top-down control on algal production, providing, to our knowledge, the first evidence of a link between lakewater [Ca] decline and elevated algal production mediated through the effects of [Ca] decline on *Daphnia*. [Ca] decline has severe implications for whole-lake food webs, and presents yet another mechanism for potential increases in algal blooms."

ASPECT #2: Info on Appendix A.

A schematic of the top-down and bottom-up controls in a hypothetical lake is inserted in Appendix-A.

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Appendix-A:

Following is a facsimile reproduction from Benndorf et al. (1984) and depicts a hypothetical scheme showing the connections involved in biomanipulation; shaded area=connections not yet clear (modified after Kossatz, 1982).

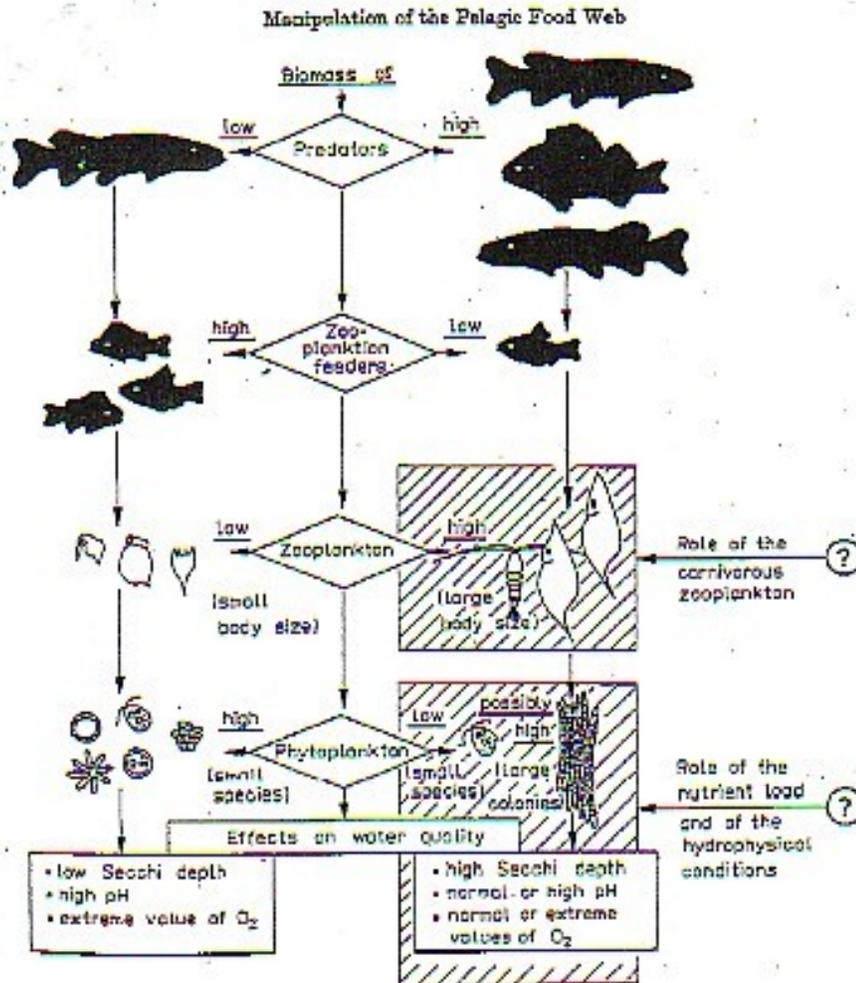


Figure 1. Hypothetical scheme showing the connections involved in biomanipulation; shaded area=connections as yet unclear (modified after Kossatz (1982)).