

Preferred methodology for assessing the effects of discharging package plant effluent into lakes

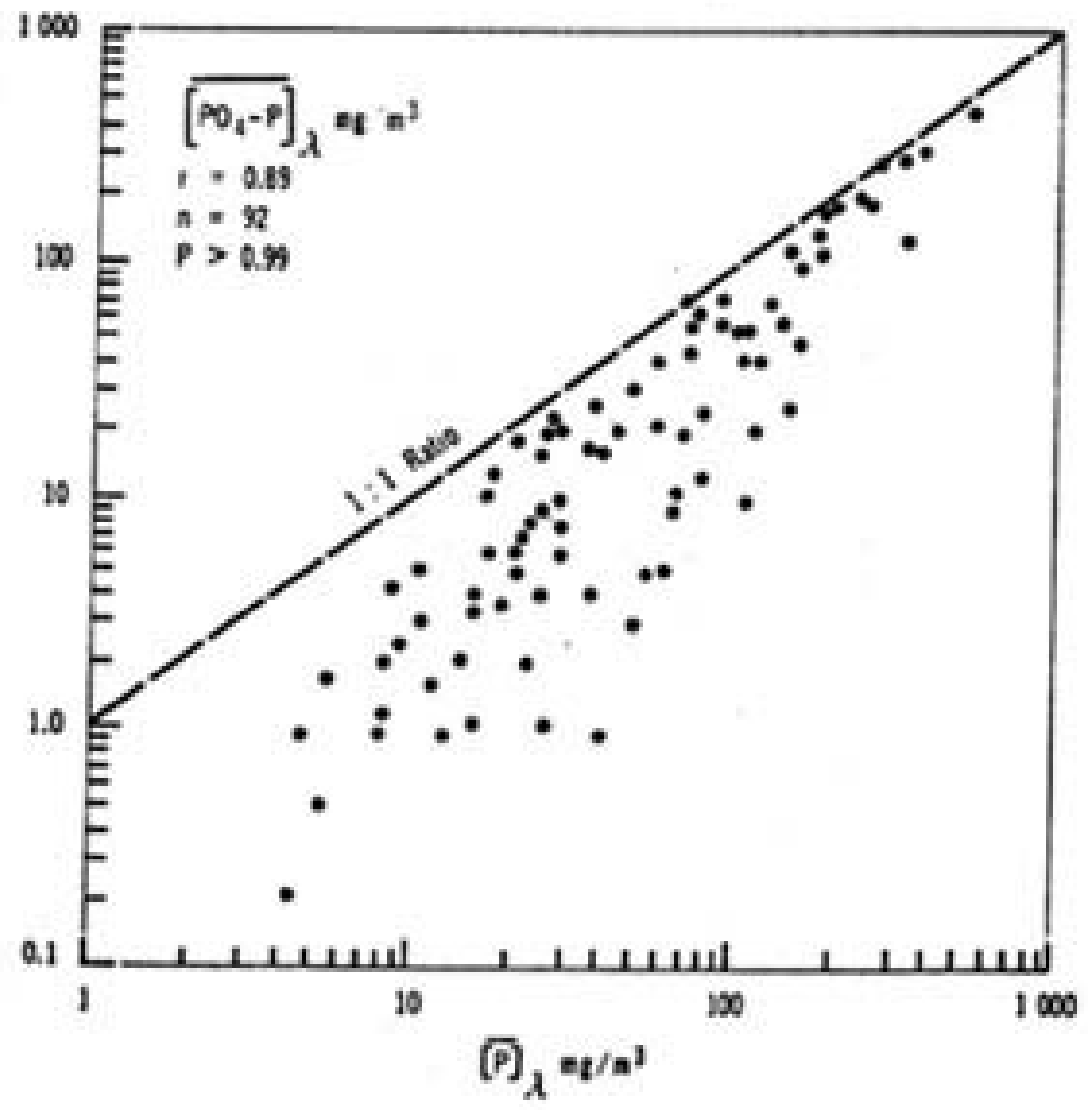
The decadal OECD research was the concerted effort by 18 member western countries at 50 research institutes involving 80 of the western world's leading limnologists of the time culminating with the final (1982) report by Vollenweider and Kerekes (formerly with Environment Canada).

Ortho-phosphate-P vs. Total-Phosphorus:

With increasing trophicity, among the ortho-phosphate/total phosphorus relationship, the mineral component tends to become the dominant fraction. On average, the orthophosphate-P fraction increases from less than 20% for Total-P concentrations of 10 mg/m³ and less, to over 45% for Total-P concentrations of 200 mg/m³ and over.

For both cases, individual lakes may be at variance with the rule. The importance of these trends is that, with increasing trophicity a correspondingly higher fraction of easily metabolized mineral components become available for algal growth. In part, this greater availability depends on the metabolic processes taking place in the lake, but it is also due to a correspondingly greater supply of these components in culturally eutrophied lakes, i.e., depending on the sources causing eutrophication.

In management terms, these findings mean that the control of sources of phosphorus of high biological availability (dissolved mineral fractions) probably have a greater effect on the reversal of eutrophication than an unselective control, though equal in relative terms, of all sources. In other words, priority is to be given to control of biologically readily available components. The following Figure can be used for assessment purposes (Kerekes, 1983).



PREDICTING TROPHIC RESPONSE TO PHOSPHORUS ADDITION IN A CAPE BRETON ISLAND LAKE

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Freshwater Lake in Cape Breton Island is characterized by clear water (2-8 Hazen u), and high water temperature (10-12°C) and low oxygen levels (0-20% air saturation) in the hypolimnion in late summer. The lake receives ca. 27 mgP/m²/y from developments and sea spray in addition to the natural, edaphic phosphorus load of 106 mgP/m²/y. The lake is considered oligo-mesotrophic based on transparency (Secchi depth 7 m), total phosphorus (7.6 mg/m³), annual mean and peak chlorophyll (2.5 and 6.4 mg/m³, respectively), low hypolimnetic oxygen levels and relatively dense growth of macrophytes in shallow areas. A proposed development would increase the phosphorus load by ca. 5 mgP/m² during the summer which would increase the epilimnetic total phosphorus concentration to 8.6 mg/m³ and peak chlorophyll to 9.8 mg/m³, assuming an average lake response. These changes would place the lake into the mesotrophic category. Close to the outflow of the secondary treatment discharge, nuisance levels of algal response and macrophyte growth could be expected.