Appendix B1. Data Supporting EPA's Approach for Deriving Numeric Nutrient Criteria for Florida Lakes

Appendix B1 contains the data EPA used to derive numeric nutrient criteria for Florida lakes. It is being provided in electronic form on CD. A copy of the CD can be obtained by contacting EPA's docket office. The docket identification number is EPA-HQ-OW-2009-0596.

The Office of Water (OW) Docket Center is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The OW Docket Center telephone number is 202-566-1744 and the Docket address is OW Docket, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC 20004.

Appendix B2. Analysis of Paleolimnological Data

Although naturally eutrophic lakes occur in Florida, and may be common, just because a lake is naturally eutrophic does not necessarily mean that it has not eutrophied further as a result of human activities. Nutrient criteria for naturally eutrophic lakes (most probably developed as site-specific alternative criteria, or SSAC) should protect the natural state of the lakes and prevent further eutrophication. Hyper-eutrophication of Florida lakes can be manifested as increased dominance of blue-green algae (Riedinger-Whitmore et al. 2005) or as an ecosystem shift from submerged vegetation dominance (transparent water) to extreme phytoplankton dominance (loss of transparency; see, Bachmann et al. 1999, 2002; Lowe et al. 1999, 2001; Scheffer et al. 1993, 2001). EPA examined evidence whether Florida lakes have increased in trophic state since early settlement or development.

EPA reanalyzed the paleolimnological findings reported by Whitmore and Brenner (2002), and Whitmore-Riedinger et al. (2005). Analysis was restricted to the WACALIB inferred TP for 32 lakes reported (Whitmore and Brenner 2002, Whitmore-Riedinger et al. 2005). Total phosphorus concentration of the lakes was inferred from the diatom species composition from surface and 1 m deep samples of sediment cores, from 1 to 4 cores for each lake (Whitmore and Brenner 2002). EPA only used data from the top and bottom of the cores reported in an appendix table of Whitmore and Brenner (2002), plus two additional cores from Whitmore-Riedinger et al. (2005). Intermediate samples between the sediment surface and 1 m depth have also been analyzed by Whitmore and colleagues for a subset of the 32 lakes.

Inferred TP concentrations were log-transformed (common logarithm). An appropriate statistical test is the paired *t*-test of the inferred top and bottom TP concentrations, which is equivalent to a *t*-test of the differences, where the null hypothesis is zero difference. To avoid artificially inflating the sample size with multiple cores, the *t*-test was performed on lake-average differences (N = 32). The results were highly significant—on average, the inferred limnetic TP is higher in surface sediments than in pre-industrial sediments in these lakes. The average difference was 0.132 (common log units), which is equivalent to a 35% increase in TP. There was less than 1% probability of these results being due to chance alone ($p = 0.00167$; $t_{31} = 3.44$).

Although a 35% increase in TP might not seem particularly large, it is important to remember that 35% is the *average* estimated increase over *all* 32 lakes. Several lakes had almost no inferred difference (no change); a small number of lakes actually decreased in inferred TP (apparent oligotrophication); and in more than half of the lakes the inferred TP increased, some more than doubling. Table B2-1 shows the breakdown of the magnitudes of apparent TP change.

In summary, inferred TP increased by more than 25% in 59% of the lakes examined, and the inferred TP more than doubled in 19% of lakes. Inferred TP decreased by more than 20% (oligotrophication) in 13% of lakes.

Table B2-1. Decrease or increase of inferred TP in 32 lakes.

Magnitude of Inferred Change, 1m Sediment vs. Surficial Sediment	N of Lakes	% of Lakes	Notes
Lakes with decreased TP	4	13%	Total oligtrophication
Decrease by more than 33%	2	6.2%	Apparent oligotrophication
Decrease by 20–33%	2	6.2%	Probable oligotrophication
Decrease less than 20% and increase less than 25%	9	28%	No apparent change in TP
Increase by 25–50%	6	19%	Probable eutrophication
Increase by 50–100%	7	22%	Apparent eutrophication
Increase more than 100% (more than double)	6	13%	Severe eutrophication
Lakes with increased TP	19	59%	Total eutrophication

Source: data analyzed from Whitmore and Brenner (2002) and Whitmore-Riedinger et al. (2005).

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