**Assessment of Water Quality Responses to Sediment Removal in Lake Hancock**

Polk County and FDEP contracted with PBS&J to examine the potential benefits to water quality in Lake Hancock associated with sediment removal. The project design included two concurrent field experiments. The first (Task 1) was a manipulative experiment to determine if variation in nutrient availability could bring about decreases in blue-green algal vigor and/or abundance. The second experiment (Task 2) was a manipulative mesocosm study designed to evaluate whether partial removal of the lake's sediments would likely result in significant improvements in water quality.

Results from Task 1 found (not surprisingly) that phytoplankton communities in Lake Hancock are adapted to the low light levels that accompany the lake's very poor water clarity. Also, there was an immediate increase in nitrogen fixation rates within the lake upon phosphorus enrichment. These results suggest that nitrogen fixation is sensitive to relatively low concentrations of phosphorus enrichment, and that rates of nitrogen fixation are "saturated" at TP concentrations of 0.16 mg/liter.

Results from Task 2 show that levels of TN were reduced between 13 and 53 percent with sediment removal, while levels of TP were reduced between 21 and 77 percent. Levels of total suspended solids were reduced between 35 and 78 percent, while turbidity levels decreased by 14 to 75 percent. Chlorophyll *a* concentrations were reduced by 5 to 31 percent with sediment removal. Ratios of TN to TP increased between 26 and 111 percent with sediment removal, resulting in TN:TP ratios that are considered less favorable for blue-green algae.

An appropriate target for TP levels in Lake Hancock would likely be between 0.08 and 0.16 mg / liter. In contrast, TP levels in the lake averaged 0.52 mg/liter between 1992 and 2004. The results from Task 2 suggest that sediment removal could substantially reduce TP levels in Lake Hancock and if results can be scaled up to whole-lake expectations, TP levels could potentially be reduced to biologically relevant concentrations for at least portions of the year.

An additional assessment was conducted that examined the probability of sediment resuspension in Lake Hancock, using the "Dynamic Ratio" theory. Calculation were made using a series of scenarios, including one that incorporated the removal of 3 feet of lake sediments combined with a 1.8 feet increase in water level. Results suggest that an increase in the lake's effective water depth of 4.8 feet would reduce the frequency of whole-lake sediment resuspension events from approximately once a week to just over once every two weeks. Since productivity of blue-green algae increases in response to phosphorus pulses from sediment resuspension, actions that decrease sediment resuspension by increasing the effective water depth (e.g. increasing water levels or removing sediments), are likely to improve water quality in Lake Hancock.

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Robert Kollinger, P.E.
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Mr. Kollinger:

This is to verify that the existing contract between PBS&J and Polk County, in the amount of $ 232,500, includes funding that is to be provided by the Florida Department of Environmental Protection (FDEP).

We fully acknowledge that receiving full payment of our final invoice to Polk County is contingent upon the County first receiving payment from FDEP for the amounts associated with two specific project components. The first of these two items was $ 2,500 from FDEP for the analysis of water quality samples for Biological Oxygen Demand, via direct pass through of these costs from PhosLab, Inc. The second of these two items was $ 30,000 from FDEP for final report writing and data analysis.

If you have any questions regarding this issue, or if our understanding is in error, please contact me at your convenience.

Thanks!

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