SFWMD BOARD SUMMARY OF LOWQIP v. 11.23.19

The new 2019 Board’s mission statement puts SFWMD in position to restore Lake Okeechobee to nutrient concentrations below cyanophyte inducing levels. Two nutrients chemicals, phosphorus and nitrogen are essential for all plant life in Lake Okeechobee, namely : emergent aquatic vegetation [EAV], submergent aquatic vegetation [SAV] and open water phytoplankton, one being cyanophytes. World-wide, a lake’s water column health balance ratio for N/P ranges from 10/1 to 17/1. Lake Okeechobee is in that healthy range making it conducive to cyanophyte blooms. A second cyanophyte inducer is the concentration of these nutrients in the water column of the lake. TP [total P] has increased ~ 4-fold in 5 decades from ~ 40 ppb TP [parts per billion Total P] to 150 ppb TP in 2019. TN has also increased in that time period. Nutrient control is optimal for P as it can be precipitated from the lake’s water column with alum at ~ $0.5 billion to form a settleable solid top layered sediment suitable for removal at ~ $3.0 billion. An alternative is calcium additions that should increase TP retention in the lake’s sediment. There is increasing evidence that internal cycling, namely, the net release of sediment TP into the water column is increasing as current sediment retaining ability by calcium is decreasing and river inflows of TP remain 3.5 times higher than TMDL. The other known source of excess nutrients in Lake Okeechobee is from all river inflows of ~ 500 Metric tons [~1 million lbs.] of TP/yr. of which 35 Mt is aerial deposition over the lake surface. LOWRP is designed to reduce the river input of the major contributor, the Kissimmee River/C-38 combination.

The water column threshold for cyanophyte bloom occurrence is > 100 ppb TP. Lake Okeechobee has been above that level and climbing for the last 2 decades resulting in recent lake coverage of the toxic blue-green cyanophyte, *Microcystis aeruginosa* almost annually since 1998. The lake’s TP water concentration is primed for cyanophyte blooms for the foreseeable future yet no existing or pipeline programs will be effective to reduce TP levels < 100 ppb ; below HAB [harmful algae bloom] potential*. M. aeruginosa* produces a suite of toxic chemicals, chief among them, microcystin, upon cellular death.. Worldwide, lakeswith *Microcystis* blooms correlate with chronic human liver non-alcoholic deaths by a 3/1 margin compared to non-*Microcystis* lakes. Martin, St. Lucie and Okeechobee counties document positive for those type deaths. To date, less certain correlation in necropsy data tie another *Microcystis* chemical, BMAA, with three neurological diseases- Parkinson’s, dementia, ALS. Lake Okeechobee under former SFWMD watches has become toxic from HAB’s.

Starting at LOTAC II in 1985, this author stated that lake sediments were a prime cause of the then high and increasing TP level in the lake’s water column approaching the HAB threshold. Since then, many peer reviewed scientists have reinforced that position. SFWMD in 2003 let a contract to determine how to deal with that sediment load. Today the total TP load of the lake’s sediment is unknown but the top 4 inches is a mucky “molasses” like consistency measured at ~ 50,000 Mt [110 million lbs.] of TP. Sediment to water TP internal cycling is one of two major causes of TP exceeding HAB threshold but not been officially recognized nor solutions addressed by SFWMD. Joint dollar emphasis by USACE is reducing annual 500 Mt TP rivers inputs, an essential goal, however such reductions, if achieved to significant levels may not immediately reduce the HAB potential of the lake as TP will migrate initially from the “molasses” muck top layer and later from deep to surface sediments and diffuse upwards into the water column. LOWRP will reduce river inflows and its TP loading into the lake but may never achieve TMDL [Total Maximum Daily Load] of 140 Mt TP/yr. Now is the opportune time for the Board to act on short circuiting internal cycling.

This author has had success in Treasure Coast retention lakes, achieving 61 to 77 ppbTP discharges and in-lake levels over 40 years. None of the author’s lakes have had HAB problems to date. These lakes use a combination of SAV, EAV, fertilizer control, some chemical application and biomass removal. SFWMD has used these same control activities but with reduced SAV sediment coverage. The key difference is the lack of sunlight penetration to Lake Okeechobee’s sediment bottom to produce large SAV sediment coverage. The author’s lakes have much clearer water, greater sunlight penetration creating sediment carpeting SAV underwater meadows at 20% to 40% surface area. Lake Okeechobee’s SAV ranges 1% to 8.5% coverage. Water clarity in Lake Okeechobee is a water quality issue. The most efficacious solution is initial TP precipitation followed by top muck sediment layer removal. Then light penetration will increase resulting in major SAV expansion below lake stage manipulation and EAV competition. And with SAV expansion, many other benefits accrue—reduction of water column TP levels < 100 ppb, leading to long term reduction/elimination in HAB blooms, less suspended solids both within the water column and its discharges, which would then allow the northern estuaries to self-cleanse to an unknown degree decades of ecosystem smothering lake muck accumulated in them, increase the functional lifetime of the STA’s by at least twofold, increase the lake’s bass and commercial fish loads, with corresponding increase in recreational and economic production for the area and most significant for human health, elimination of HAB’s chronic non-alcoholic liver deaths centered around Lake Okeechobee.

The Lake Okeechobee Water Quality Improvement plan [LOWQIP] has two distinct elements- water column TP reduction and increased sediment holding ability from long term maintenance with SAV growth and its many ecological and economic enhancements.

Time is of the essence with the current SFWMD Board to include both alum treatment and muck removal and/or calcium addition to the sediment. LOWQIP could be the most cost-effective expenditure of dollars to restore Lake Okeechobee’s ecology, overall Everglades restoration and human well-being.



High-High Standard Mortality Rates from non-alcoholic deaths [SMR] for St. Lucie, Okeechobee and Martin, FL counties all within the SFWMD. From F. Zhang, J.Lee, S. Liang,  CK Shum 2015, *Environmental Health*2015**14**:41