Correspondence from Maggie Squires, previous member of SSIWPA Technical Advisory Committee

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From: **Maggie Squires** <squires.maggie@gmail.com>
Date: Thu, Jan 21, 2016 at 1:25 PM
Subject:
To: Shannon Cowan <ssiwpacoord@gmail.com>, Dale Green <dgreen@crd.bc.ca>, Meghan McKee <meghan@nsswaterworks.ca>

Find attached the final update of the St. Mary Lake Biomanipulation report. The final update includes the results of the discrete-depth sampling of plankton undertaken by Meghan and Maggie last August. Also find attached the Excel spreadsheets that contain all of the plankton data collected with the MoE grant money, plus data for one phytoplankton sample collected from the south end of the lake near the weir that was paid for by NSSWD.

Shannon, when posting the report refer to the report by it's entire title **Can biomanipulation reduce algal biomass in St. Mary Lake? An assessment of trophic levels & potential interactions in the context of physical, chemical, and biological regimes in St. Mary Lake, Salt Spring Island, British Columbia** (i.e. do not shorten the title to Biomanipulation report).

Next, for your information, I am just finishing up a report on St. Mary Lake that summarizes my current understanding of the SML ecosystem. Last, I'll be sending comments on Lisa Rodger's thesis (already sent to Lisa) that challenge her conclusion that internal loading is a major factor in SML.

Maggie Squires

Late Agenda Item 2 January 22, 2016 - Item 4.9.3

By email from Maggie Squires received January 22, 2015 5:58am

To communicate to Steering Committee and TWG:

Comments on Rodgers. L. 2015. Synthesis of Water Quality Data and Modeling Non-point Loading in Four Coastal B.C. Watersheds: Implications for Lake and Watershed Health and Management. University of Victoria, B.C. Canada.135 pp.

I have let Lisa Rodgers know that I disagree with the conclusion in her thesis that internal loading is a main factor affecting lake water phosphorus concentration in SML. My disagreements with the thesis are explained below

If I understand correctly the arguments made in the thesis, my main issue (but not my only issue) is with her dismissal of water residence time (WRT) as a factor affecting St. Mary lake water solute concentrations, including phosphorus.

The dismissal of WRT as a factor affecting lake water phosphorus concentration appears to be rationalized by claiming that because 'external P-loading may be approximately equivalent to P-out at Duck Creek' the effect on solute concentrations in SML of a WRT that is close to 7-years is somehow negated. This thinking is incorrect, as explained below:

Calculation of Theoretical Water Residence Time (WRT) and Effect of WRT on Conservative Solute Concentration
Inflow (rain + runoff) / lake volume = 6 years
Net inflow (rain + runoff corrected for loss to evaporation and groundwater (rain + runoff - evap - groundwater) = 8 years
Based on inflow data in the new Hydrology report, average WRT = 7 years (average of 6 years and 8 years)

Effect of 7-yr WRTon conservative solute concentrations: each year, 1 unit in, each year 1/7 unit out, over 7-years the concentration factor is x6.

Interestingly, the P mass balance work presented in Lisa's thesis finds a concentration factor of x6 that cannot be explained by the estimates of external loading (watershed, rain) that are presented in the thesis. However, attributing solely to internal loading the x6 concentration of lake water P concentration over and above the effect of external loading (i.e. dismissing the concentration of solutes expected as a result of a 7-year WRT) is indefensible, I believe.

A second issue of mine with the thesis is the apparent lack of appreciation for recent advancements in understanding factors that control internal loading, e.g. iron and sulfur availability, and the presence in sediments of redox-insensitive P-compounds. In short, the old 'oxygen controls internal loading paradigm' has been found to be flawed. I still find in surprising that after two rounds of

expensive artificial aeration (many hundreds of thousands of dollars), that no sediment chemistry work has ever been undertaken in SML (the cost would be on the order of $10,000, I think).