St. Mary Lake Field Data Acquisition & Analysis Program for 2014/15

Prepared by Technical Advisory Committee to SSWIPA

RATIONALE & PURPOSE

A principal aim of the St. Mary Lake management plan is to reduce phosphorus (P) in the lake, and in turn, limit the frequency and severity of algal blooms. Work over the past four months by the Technical Advisory Committee (TAC) has identified three major shortcomings in the available baseline data, concerning P sources and sinks, and the P balance. Specifically these are: 1) verification that septic effluent seeps into the lake and measurement of the corresponding P load, if any; 2) improvement of estimates of runoff P loads, including seasonal variations; and 3) determination of spatial variation in nutrient and algal distributions within the lake. The last is crucial for understanding lake mechanisms in general, and the effect of remediation measures in particular. These factors must be addressed in order to evaluate remedial methods for reducing P.

The planned data acquisition program will obtain the information required to fill these gaps during the summer-fall of 2014, and through the winter of 2015. The methods are outlined below, along with the collaborating agencies and the estimated cost.

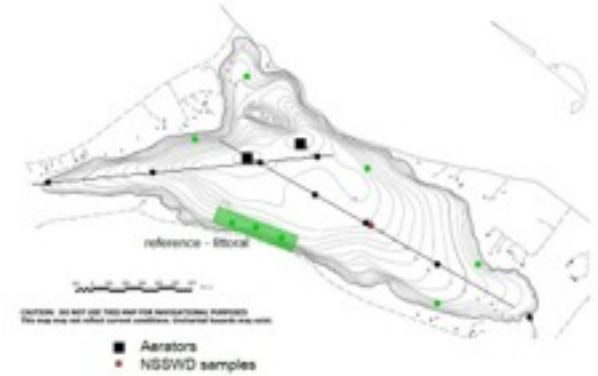
APPROACH

Three properties close to the lake will be selected for P monitoring. Several small wells will be placed between their septic drainfields and the lake, and sampled for bacteria and nutrients (phosphorus and nitrogen) a few times during the summer, and next January. This covers both dry and wet periods when septic drainfields may varying in treatment efficacy. In addition a tracing dye will be added to the household wastewater. This too will be sampled in the wells and in the lake. Detection of the dye will provide proof that effluent is (is not) reaching the lake and will indicate where to sample the littoral zone for maximum amounts of P and N. The results will be used to calibrate P-uptake coefficients in our loading model and, in turn, to revise estimates for the total P-septic load reaching the lake.

An expanded in-lake sampling program is planned with the network of stations shown on the map below. These stations cover both the deep-water pelagic region of the lake, and the shallow littoral zone along the shoreline. From May to November water samples will be collected bi-weekly while the lake stratifies and then remixes in the fall. During the winter, sampling will be monthly. In addition to water samples, detailed profiles of water properties will be measured at 0.5-m intervals with a recording instrument. Parameters include nutrients, dissolved metals, temperature, oxygen, pH, redox potential, phycocyanin (algae), and secchi depth. The results

will provide improved estimates of P-stock and P-cycling in the lake from both the greater sampling frequency and the measurement of gradients in lake properties.

P-loads from runoff will be simulated with the CANWET computer model, a watershed evaluation tool developed in Ontario. This model combines a hydrological component that tracks precipitation and runoff to both creeks (point sources) and the lake (non-point sources), and a nutrient loading component that adds P and N into the runoff and then to the lake. It takes the watershed topography, land cover, land use and soil composition in account with a spatial resolution of about 20 m. Simulations are run using historical precipitation records yielding day-by-day outputs of flow and P-load. These data can then be compared with changes in lake properties to determine the importance of precipitation forcing.



Proposed sampling locations (black, green dots)

WHO IS DOING WHAT

The project will be carried out primarily by members of the TAC and by staff of the NSSWD with assistance from Island Health. Lisa Rodgers of UVic will be responsible for the runoff modelling. Don Hodgins of TAC will act as Project Manager.

Many organizations are collaborating on this project: **SSIWPA-TAC** provides direction and scientific expertise, **CRD** – financial support, **Island Health** – financial/technical support, **NSSWD** – equipment, technical and financial support, **UVic –** modelling/analysis, **UBC** – technical support, **BCMFLNRO** – scientific support, **BCMoE** – scientific/financial support, **Seaconsult** – equipment, materials, in-kind financial support.

WHAT WILL WE LEARN

We will determine if properties located close to shore are a significant source of P to the lake. Beyond that we will obtain site-specific values for P uptake by soil which can then be used with our P-septic load model to calculate the input from all properties. Second we will obtain better estimates of P loading from runoff – how much enters the lake and how that varies throughout the year. We will also determine how P-runoff varies from year-to-year in relation to precipitation patterns. Third, we will gain a far better understanding of P cycling in the lake, the P-balance and and the relative magnitude of external P sources to the internal lake dynamics. Each is critical to evaluating possible remediation methods for reducing P, and for a better assessment of the effects, beneficial or negative, of such remedial measures, including the aerators.

THE COST

The total project cost is estimated to be $136,000. Of this $91,100 will be contributed in-kind and/or donation by various organizations. Direct financing in the amount of $44,900 is required. The Phase 2 cost for winter septic monitoring is $5,638, of which $2,560 in direct financing is required.