

## **2009 SEYMOUR LAKE ASSOCIATION LAROSA PARTNERSHIP SUMMARY REPORT**

During summer 2009 volunteers of Seymour Lake Association (SLA), with guidance from Memphremagog Watershed Coordinator Ben Copans, continued their participation in Vermont Department of Environmental Conservation's (DEC) LaRosa Partnership Program. Seymour Lake Association and DEC scientists now have two years of data recording phosphorus, nitrogen and turbidity levels near the mouths of six tributaries of the lake. While we can make only limited judgments with just two years of data, some guidance is available from the data collected.

The detailed 2009 Report which includes data tables, graphs and charts as well as data reliability information can be obtained from any Seymour Lake Association Board member and is on file with DEC and at Northwoods Stewardship Center. Morgan's Board of Selectmen has been provided with copies of both reports.

We began this study to learn about sources of recent increased phosphorus pollution and declining water clarity in the lake, which is evident in the data collected by DEC's Lay Monitoring and Spring Sampling Programs. The question our multi-year LaRosa study seeks to answer is **"Does the increased pollution of the lake come mainly from alteration of the lake shore or are the tributaries which drain the land in the rest of the lake's watershed also contributing significant amounts of phosphorus and sediment to the lake?"**

DEC's Lay Monitoring Program of the lake water, conducted currently by SLA volunteer Tom Emery, documents increasing levels of phosphorus and decreasing water clarity during the decade 1994 – 2004. From 2004 through 2009, the downward trend in water quality parameters observed from 1994 – 2003 has leveled off. (See Figures A and B.) DEC's Kellie Merrell, who carries out the spring sampling and analyzes data pertaining to Seymour Lake, has advised SLA that during this current period with water quality trends holding steady, the Association has an opportunity to take action to work to remedy sources of pollution. SLA is presently using information from DEC's Spring Lake Sampling and Seymour Lake Lay Monitoring data to guide its survey programs and its outreach efforts to lake shore owners. SLA plans to step up those efforts by using additional tributary information provided by the LaRosa Partnership Program to guide planning and implementation of its educational programs, outreach activities, further watershed surveys and native shore land restoration efforts.

Kellie Merrell has also provided SLA with the opportunity to use an additional method to assess the impact of tributaries on phosphorus pollution in Seymour. Kellie and SLA volunteer Gil Wierschke began exploring the usefulness of placing plates on which algae can grow near the mouths of the six tributaries in the LaRosa project. The algal plates have been used on Sebago Lake (as well as other locations) to learn the degree to which nutrients carried into a lake from tributaries contribute to increased growth of algae in the lake. Growth of algae is directly correlated to the amount of nutrients in the water. The algal growth on the plates, which can be quantified in the lab, gives a picture over time of

the impact of nutrients from tributaries on the lake. This gives some depth to the LaRosa data which currently provides only a few snapshots (on the isolated sample collection days) of the flow of nutrients into the lake. Watershed Coordinator Ben Copans has suggested that the plates might also be useful in documenting runoff from highly developed lake shore properties such as those along Wayeeses Road and Jones Road.

The detailed 2009 Report provides new tributary data collected from June through October 2009 and an analysis of data from SLA's two years of participation in the LaRosa Partnership. 2008 data provided information on dry weather days. An improvement in the 2009 data is that three of the nine collection dates qualify as samples influenced by rain events. The inclusion of wet weather data provides a much more complete picture of sediment, phosphorus and nitrogen being transported into the lake by tributaries than data from 2008 which was only collected during dry weather.

### **Conclusions and Recommendations**

Although a two year study is not sufficient to establish clear trends, some conclusions and recommendations can be stated as a result of studying 2008 and 2009 Seymour LaRosa data.

- a. There is a need to continue this project, especially to collect more data during wet, high flow conditions. LaRosa Laboratory generously allowed us to add a non-scheduled sampling day in 2009 for this purpose. In addition, our 2009 volunteers were able to catch two other wet sampling days in the regular schedule. In general, none of the results show alarming amounts of sediments, phosphorus and nitrogen entering the lake from these tributaries. However, the data does show that there are times during both wet and dry weather that larger than normal amounts of phosphorus, turbidity and nitrogen are entering the lake from some tributaries.
- b. This suggests that SLA may want to divide its outreach efforts between shore land and stream banks, with somewhat more effort to owners on the shore land and especially near the deltas and ephemeral streams that have formed along the shoreline separate from the major tributaries. Deltas and ephemeral streams, which sometimes form gullies, are evidence of phosphorus bearing sediments entering the lake. Lake shore owners, especially on the Wayeeses and Jones Road shores have brought to the attention of SLA a good number of deltas, ephemeral streams and gullies. SLA volunteers began in 2009 to conduct surveys to learn of the existence of more deltas in the lake and streams/gullies draining into the lake.
- c. Due to a lack of historical tributary data, we do not know whether the present quantities of phosphorus entering the lake from these six tributaries in 2008 & 2009 is more, the same or less than has entered in the past. We can say that the data collected in 2008 & 2009 does not include alarming amounts of nitrogen, phosphorus and turbidity.
- d. As noted in the results, in 2009 the highest average phosphorus levels were at Mud Pond Tributary, while Sucker Brook East and Sucker Brook North average levels were also high, but slightly lower than Mud Pond Tributary. Elevated phosphorus levels occurred during both wet and dry conditions on Mud Pond Tributary. Levels were low

on Sucker Brook East and Sucker Brook North during dry conditions, but these tributaries had the highest levels of phosphorus under wet conditions. The elevated levels in these three tributaries are much higher than the other three tributaries. Stream walks to look for sources of erosion on all three tributaries, as well as other possible phosphorus sources in the Mud Pond Tributary, should be considered by SLA as time and energy permit.

- e. It would be useful to expand the Seymour LaRosa Partnership to include the use of algal plates to investigate the effects of the sediments and nutrients at tributary mouths, at areas of intense lake shore development, and where deltas are forming in the lake. DEC's Kellie Merrell and SLA's Gil Wierschke conducted a trial of this technique in 2009. Seymour is the first to investigate the use of algal plates in Vermont, although they have been shown to provide helpful data in Maine and other states.
- f. On the suggestion of several SLA LaRosa 2009 volunteers, and with the support of Ben Copans, the method used to determine flow for this project was refined in 2009 by changing from carrying a yard stick to measure depth at the South Tributary site on a specific rock to a semi-permanent installation of the yard stick at the culvert slightly downstream of the sampling site. This seemed to give more consistent depth measurements. The markings on yardstick used became blurred by the end of the season, so before the yardstick is installed for the 2010 season, it should be treated with a waterproof surface that can be wiped clean. It would be best for the yardstick to remain in place from year to year. In order to avoid the yard stick problems, Ron Kolar has suggested that in 2010, a metal yard stick be bolted in place at South Tributary to measure depth.
- g. The weekly observations of depth and water clarity should be continued in future years. This was useful in 2009 in assessing the accuracy of the sampling day depth measurements.
- h. We suggest that SLA seek to understand the source of the higher nitrogen levels occurring only under dry conditions on Southeast Tributary.
- i. Thus far, data gathered under the LaRosa Program seems to indicate that significant amounts of sediment and phosphorus that are being added to the lake are not coming primarily from the tributaries (although some is coming from tributaries). This suggests that SLA should emphasize looking at the lake shore for sites of erosion, while placing some emphasis on identifying sources of pollutants reaching the lake from tributaries. **There is compelling evidence that substantial amounts of sediment (and therefore phosphorus) are entering the lake on the shores west of and south of Wolf's Point.** This has been documented after Wayeeses Road and Sugarbush Road owners arranged for some erosion mitigating work in that area as well as the locations of deltas in the water. We recommend that SLA step up its outreach efforts to educate lake shore landowners and search for ways to encourage land owners to restore or maintain the natural lay of the land and the natural vegetation in a buffer area around the lake.

Submitted by SLA's 2009 LaRosa Partnership Volunteers

### Phosphorus Trends

The mean total phosphorus concentration from all 3 sampling stations was the same as last year (Figure 1). It is good to see an elevation in the levels, but is unfortunate that we didn't see a reduction either. Since 2000, the total phosphorus has been staying consistently around 10 ug/L. Prior to 2000, the mean phosphorus levels were more along the order of what you would expect for an oligotrophic lake, with the mean hovering around 7 ug/L. However, because of the consistently higher levels since 2000, the concentrations are in the mesotrophic range and so is the long term average.

Figure 1. Total Phosphorus Concentration

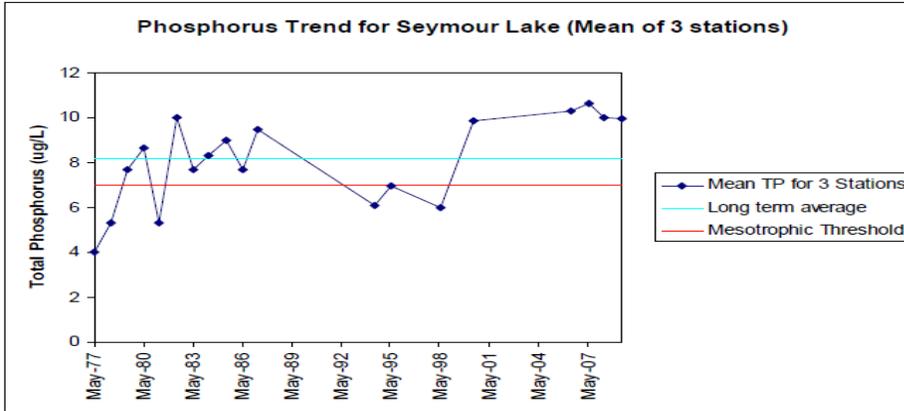


Figure A: Kellie Merrell, DEC Lake Assessment Specialist, provided the above graph of spring sampling phosphorus trends when spring sampling 2009 had been completed.

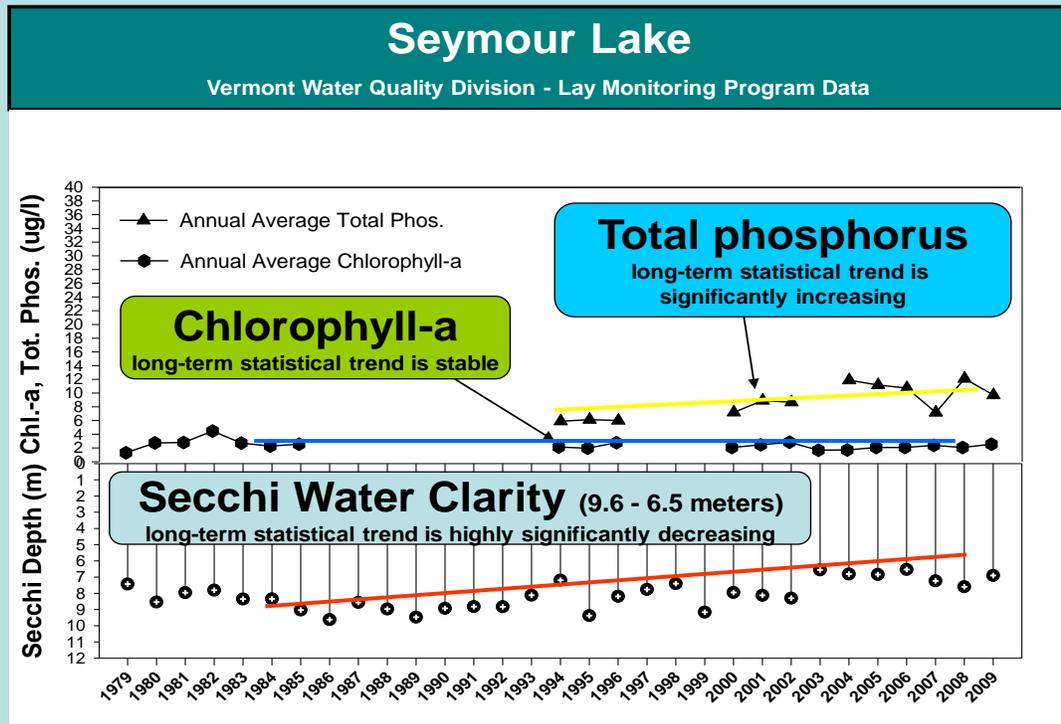


Figure B: Amy Picotte of DEC's Lay Monitoring Program supplied the above graph after 2009 summer lake lay monitoring data was added.