

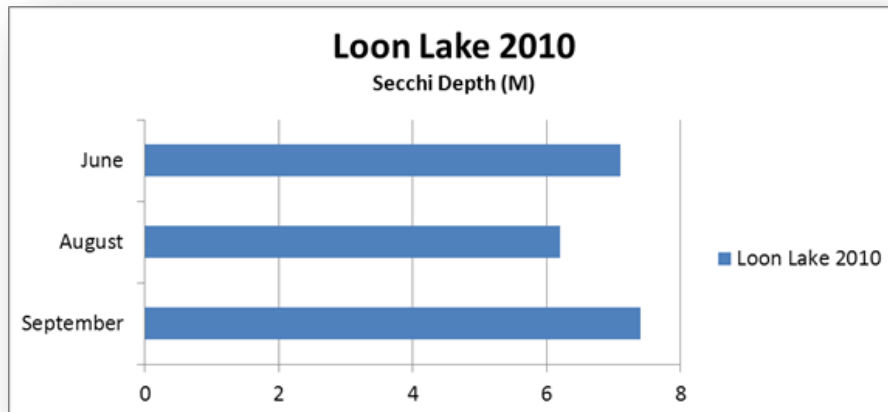
Loon Lake Property Owners Association
Citizen Water Quality Monitoring
2010 Summary Report
Prepared by Jim Davies
April 15, 2011

The Loon Lake Property Owner's lake water monitoring program was again successful in this, our fourth year. Although another year of information gathered does permit general comparisons to the previous years, scientific methodology insists that many observations over several years must be made before definitive conclusions can be made about water quality trends.

There is room for skepticism about the extent to which Loon Lake's water quality is deteriorating, how long term or short term it may be, how much of it is manmade, and what if anything we can or should do about it. Though there may be room for skepticism due to the short period of time (4 years) that we have been performing water quality analysis, it is much harder to be skeptical about whether deterioration has been occurring, to whatever extent and for whatever reason, over the last few decades. The data is clear. Loon Lake water quality has been and is deteriorating. This is not visible on the surface. Indeed it was not readily apparent until historical data is compared to the newer data becoming available from the 2007, 2008, 2009 and 2010 water column studies. These results show that in the middle to late summer below 15 meters depth there is insufficient dissolved oxygen to sustain a healthy, deep/cold water Kokanee and Mackinaw fishery. The data seems to validate recent fishery management studies for Washington Department of Fish and Wildlife that point to an anoxic hypolimnion limiting Loon Lake salmonid habitat (Scholz *et al*, 1988, McClellan *et al*, 2005).

WATER CLARITY: The clarity of the lake's water is measured by submerging a Secchi disk until it disappears. In 1985 the Fisheries study conducted for the Department of Fish and Wildlife (WDFW) by EWU reported a summer average of 6.5 meters (21 feet). The 2007 Secchi disk measurements averaged very close to those 1985 averages, (6.1 meters - 20 feet). The 2008 measurements averaged 6.8 meters (22.1 feet). The 2009 measurements averaged 6.95 meters (22.6 feet). Figure 1 below shows the 2010 measurements, 6.2 meters (20.2 feet).

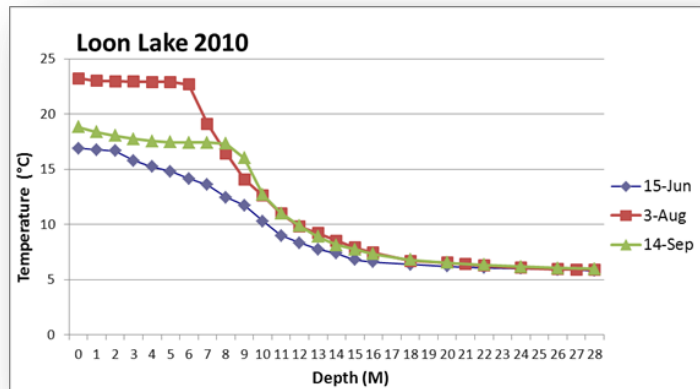
Figure 1. Loon Lake Secchi disk clarity



Note: The lake is also measured from top to bottom for temperature, dissolved oxygen, pH and conductivity with our Hydrolab Data Sonde. The instrument must be carefully calibrated before and after each use and properly stored and cared for by LLPOA/LLDF citizen volunteers that have been trained in its use and maintenance..

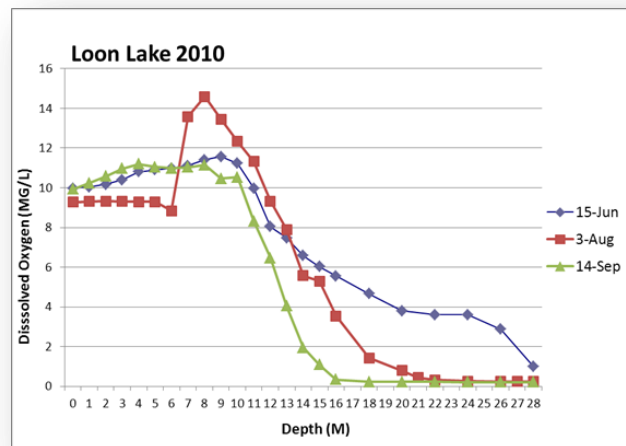
TEMPERATURE: The temperature measured over depth for each field trip is shown in Figure 2 and is consistent with past years of monitoring. It clearly shows the typical summer stratification. The measured profile shows an epilimnion (top warmer layer), the metalimnion (middle layer where temperature drops relatively quickly with depth), and the hypolimnion (bottom layer, which is cold).

Figure 2. Loon Lake Water Column Temperature profiles



DISSOLVED OXYGEN: When the lake is thermally stratified, the bottom layer cannot mix with the upper layer and reoxygenate. Decaying organic matter on the bottom (dead algae, other aquatic plants and pollution), releases phosphorus. Also, too much of this decaying organic matter and the bacteria responsible for the decay uses up almost all the oxygen in the hypolimnion. Figure 3 shows that there is plenty of oxygen in the upper part of the water column. Later in the summer the dissolved oxygen goes to less than four milligrams per liter (mg/L) below approximately 15 meters. At this concentration of dissolved oxygen, fish cannot survive for long and phosphorus starts to be released from the sediments. The dissolved oxygen levels below 15 meters in Loon Lake are not good, but similar to those found in previous years. It is not yet possible to positively say if they are getting better or worse.

Figure 3: Loon Lake Dissolved Oxygen Profiles – Note: Dissolved Oxygen is shown in milligrams per liter (mg/L). A milligram is one one thousandths of a gram.



NUTRIENTS: Elevated phosphorus of the hypolimnion caused by the summers decay of excessive organic matter can be seen in Figure 4. Phosphorus gets remixed into the lake during the fall and contributes to next year's algae growth. This self-perpetuating cycle of internal phosphorus loading gets worse if pollution is not controlled. Loon Lake Sewer District #4 was formed to stop septic system phosphorus from getting into the lake. However it is very important that remaining sources of phosphorus are stopped. These sources include; storm water from hardscape (roofs, driveways, roads, etc.); fertilizer from landscaping; remaining large on site septic systems with drain fields (Granite Point Park); and small scale septic systems (the east side of the lake from Granite Point south). It is also important to provide shoreline vegetative buffers and maintain wetlands adjacent to the lake in order to absorb nutrients (most importantly phosphorus) as they migrate toward the lake. Nitrogen, although an important polluting nutrient, is not nearly so dangerous to the lake environment, especially without attendant high levels of phosphorus. All new development within the Loon Lake drainage system (The Loon Lake Watershed) should be regulated in such a way so as to retain wetlands in their natural state; minimize or prevent runoff; prevent contamination of the aquifer from sewage systems through export of effluent to a location outside the watershed as does Sewer District #4; and protect uplands from inappropriate development so that the aquifer may continue to be recharged by precipitation.

Figure 4. LOON LAKE TOTAL PHOSPHORUS BY STRATUM

Note: Nutrient charts are shown in micrograms per liter ug/L. A microgram is one millionth of a gram.

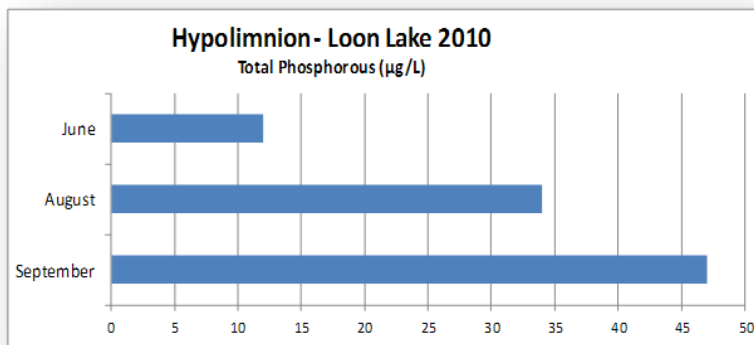
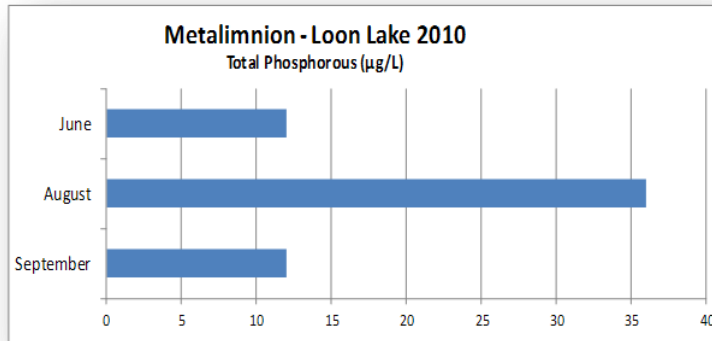
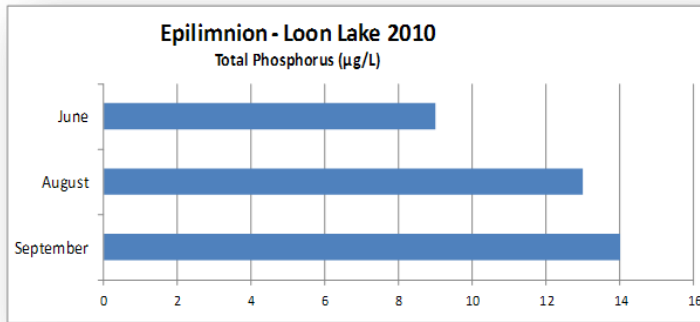
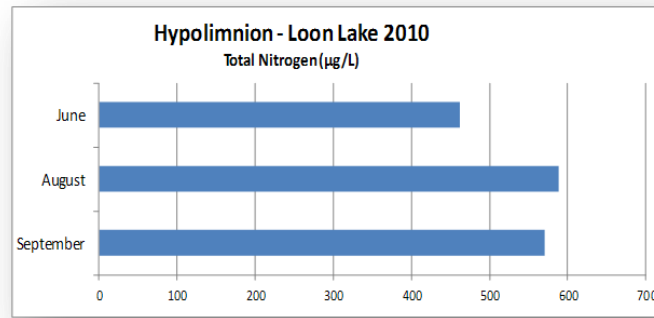
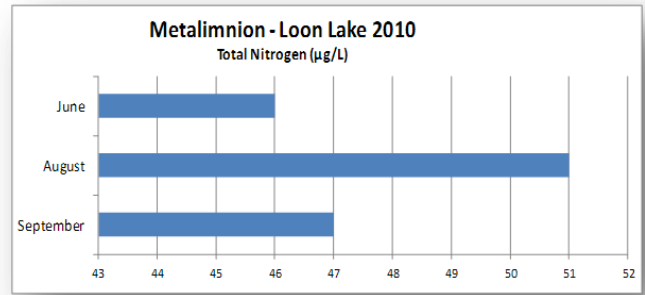
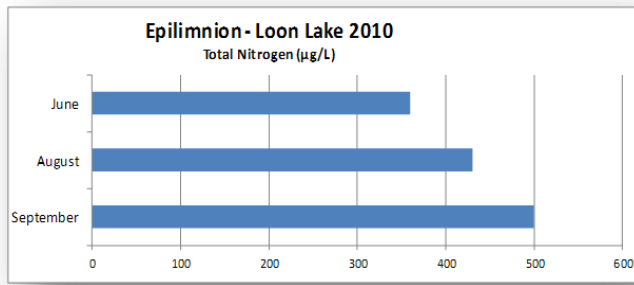


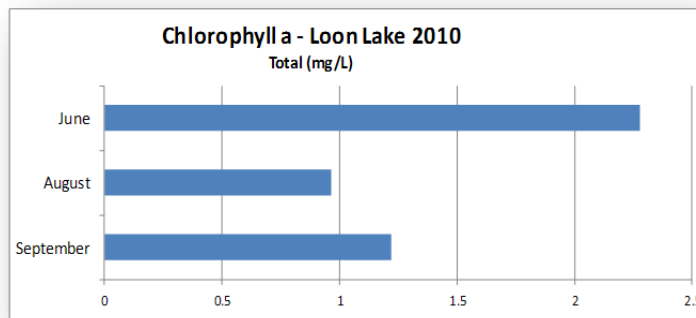
Figure 6: TOTAL NITROGEN BY STRATUM



CHLOROPHYLL a:

Chlorophyll a sampling is done on the surface using a Kemmerer Capture Bottle. A 300 mL sample is collected at depths of 1, 3, and 5 meters depth and blended. Chlorophyll sample bottles are wrapped in foil to protect them from light, are kept in cold storage and are immediately delivered to the Spokane Tribal Lab for analysis.

Figure 7: CHLOROPHYLL a



Note: Detailed original data, original field notes including conditions and volunteer staff present are not included in this report. If you need this information please contact J. Davies at 509-233-2651.