



## **2013 Range Ponds Water Quality Report**

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The Range Ponds Environmental Association continued to monitor the health of Upper, Middle and Lower Range Ponds in 2013. Water quality monitoring was a combined effort of certified volunteer lake monitors and LWRMA biologists. Monitoring and sampling of the lakes took place from early May through October, during the time of year when lakes and ponds are the most biologically productive, water quality problems are most evident, and “worst case scenario” conditions may exist.

### 2013 Weather Influences :

Weather conditions during the 2013 lake monitoring season were less extreme than in 2012. The spring of 2013 was a relatively calm, dry period. However, moderate to heavy rain occurred on a regular basis during the early summer, followed by very warm weather for the remainder of the period. Stormwater runoff to lakes from winter snowmelt and rainfall during the spring and early summer period typically contributes a significant percentage of the annual phosphorus load to lakes from their watersheds. A number of lakes in the region exhibited better than average water clarity in the early summer, followed by a notable decline, following the early summer rain.

The following is a summary of findings for the three Range Ponds in 2013. Water clarity data are based on readings taken in August 3, 2012, as well as any water clarity data provided by certified volunteer lake monitors on the Range Ponds. All other summary data were obtained by LWRMA staff in August, at a time consistent with the historical gathering of “baseline” data for the Range Ponds.

## **Upper Range Pond:**

*Some of the indicators of lake water quality were below average for Upper Range, while others indicated average to above average conditions in 2013. The water somewhat less clear than the historical average, but a single phosphorus sample taken in August was slightly lower (better) than the average for the lake, and an August chlorophyll (algae) sample was also lower (better) than the historical average for these critical indicators of lake water quality. The August dissolved oxygen profile showed some oxygen loss in the deepest area of the pond, no worse than conditions documented for previous years.*

Water clarity averaged only 6.0 meters (~19.5 feet) in 2013, slightly improved from 5.8 meters in 2012, but significantly lower than 7.1 meters in 2011, 6.4 meters in both 2010 and 2009, 7.1 meters in 2008, 6.5 meters in 2007, 5.7 meters in 2006, 5.7 meters also in 2005, and 6.7 meters in 2004. The historical average for the lake is 6.4 meters (21 feet). Readings taken in 2012 ranged from 5.2-6.4 meters. The low reading of the summer (5.4 meters on June 16) is one of the lowest individual water clarity readings on record for Upper Range Pond. Many thanks to Maine VLMP certified lake monitor, Matthew Brettler, who provided several months of water clarity data for Upper Range Pond in 2013.

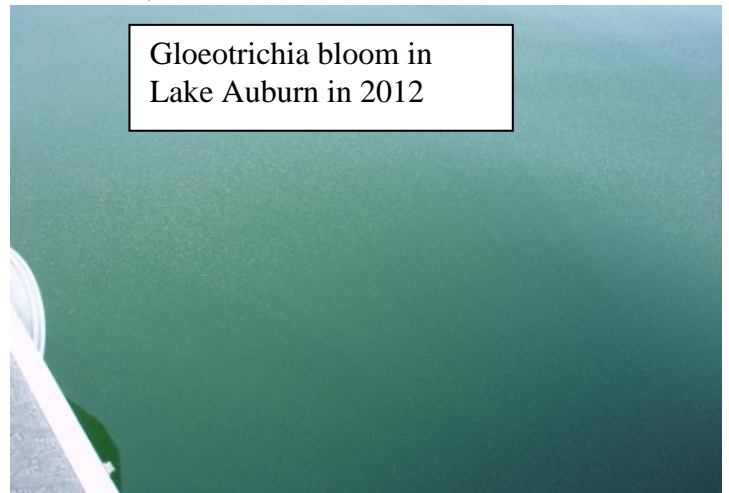
The concentration of phosphorus (the nutrient that is responsible for the growth of algae in lakes) measured 6 parts per billion (ppb) in the single sample taken on August 3, 2013. The historical average for Upper Range is 8 ppb. Total phosphorus concentrations in Upper Range Pond have ranged from 5-16 ppb since 1979, when phosphorus samples were first measured on this body of water. It is very important to note that the 2013 “average” was based on only a single sample taken in August. It is quite likely that the concentration of phosphorus in the pond varied during the course of the summer.

Chlorophyll-a (CHL) is a pigment that is measured to determine the concentration of algae in lake water. The August 2013 sample measured 3.4 parts per billion (ppb), compared to 4.5 ppb in 2012, 3.8 ppb in 2011, and 2.6 ppb in 2010. The historical average for Upper Range is 4.2 ppb. Annual CHL averages in Upper Range have varied from 2.4 ppb to 9.9 ppb. In many cases, the “average” is based on a single sample taken during the summer, as was the case, in 2013. A single sample taken in late summer often, but not always, represents the period when lakes are most biologically “productive”, and algae concentrations in the water are highest for the monitoring period.

A temperature and dissolved oxygen profile taken on August 3 indicated that Upper Range was strongly stratified, with water temperatures ranging from 24.5C at the surface to 9.7 C at 10 meters depth, approximately one meter from the bottom of the sample station at the deepest point in the lake. Dissolved oxygen levels ranged from 8.2 parts per million (ppm) at the surface to a low level of 1.4 ppm at 10 meters depth. Late summer dissolved oxygen loss in Upper Range Pond has been minimal in past years, and conditions encountered in 2013 were somewhat typical for this lake.

Other water quality indicators that are measured to help support the primary data (pH, Total Alkalinity and Color) were within the normal range of historical values for Upper Range in 2013

The bluegreen alga/cyanobacteria, (*Gloeotrichia echinulata*) that is a current focus of research in New England Lakes, was observed on the August 2013 site visit at a relatively low concentration in *Middle Range*, (0.5 on the VLMP “Gloeo” scale), and moderate (2.0) in Upper Range, but was not observed in Lower Range Pond. “Gloeo” appears to have been on the increase in some Maine lakes in recent years. The implications of this increase are not well understood, however, recent research has suggested that this alga may have the potential to play a role in changing lake water quality. The adjacent photo was taken at the surface of Lake Auburn last summer during the peak of a *Gloeotrichia* bloom. Gloeo



observations took place at the boat launch area and at the deep monitoring station for each of the three lakes.

### **Middle Range Pond:**

*The water clarity of Middle Range Pond was once again very clear in 2013, compared to its historical average. The concentration of phosphorus in the water was slightly below average, as was the concentration of algae in the lake in early August (based on a single sample). Overall, conditions were above average for the lake.*

The average water clarity in 2013, based on 6 months of data provided by VLMP certified lake monitor, Barry Kutzen (in addition to our August reading) was 6.81 meters (~22 feet), a significant improvement over conditions encountered in 2012, when the average was 6.1 meters, and closer to the very high (good) 7.1 meter average in 2011. The historical average for Middle Range is 6.1 meters. Water clarity ranged from 7.7 meters on August 28, to the low reading of 5.95 meters on June 16. An analysis of the historical water clarity data for Middle Range suggests a possible positive trend (improved clarity) in the lowest readings taken each year.

The phosphorus concentration measured at the deep sampling station in August measured 7 parts per billion (ppb), compared to the historical average for the lake of 8 ppb. Historical phosphorus levels in Middle Range Pond have varied from 5-12 ppb since samples have been collected starting in 1985.

The concentration of chlorophyll-a (algae concentration in the pond) was slightly lower than the historical average for the lake, measuring 4.1 ppb in August, compared to the historical average of 4.2 ppb. Based on the clarity of the water, the concentration of phosphorus, and algae in the water, conditions in 2013 were much improved, compared to the previous year. Middle Range exhibited resiliency following the extreme weather conditions in 2012.

A temperature and dissolved oxygen profile taken on August 3 indicated that Middle Range was strongly stratified, with water temperatures ranging from 24.8 degrees C at the surface (nearly 3 degrees cooler than in August, 2012) to 6.5 C at 20 meters depth, near the bottom of the sample station at the deepest point in the lake. Dissolved oxygen levels ranged from 8.3 ppm at the surface to a low level of 2.3 ppm at 20 meters depth. Late summer oxygen levels in Middle Range are low, but are not yet critically so. Efforts to protect the water quality of Middle Range may help prevent DO levels from declining further in the future.

The concentration of the bluegreen algae, *Gloeotrichia echinulata* (see above) measured 0.5 on the Maine VLMP “Gloeo” scale on August 3 at the deep monitoring station. In August, 2012, the concentration recorded was 1.0. The scale for monitoring *Gloeotrichia* density runs from 0-6.0. Many Maine lakes have experienced late summer Gloeo concentrations in the 0.5 range.

Other water quality indicators that are measured to help support the primary data (pH, Total Alkalinity and Color) were within the normal range of historical values for Middle Range in 2013.

### **Lower Range Pond:**

*Overall, Lower Range Pond recovered from a slight decline in 2012, and experienced a well-above average year in 2013, in that the lake was substantially cleared than its historical water clarity average, the concentration of phosphorus was slightly lower (better) than the average for Lower Range, and the baseline chlorophyll (algae) concentration in August was also well below the historical average, based on a single sample taken on August 3. No *Gloeotrichia* colonies were observed at that time.*

The lake was clearer than average in 2013, averaging 7.5 meters (~24 feet), compared to 6.8 meters (~22 feet) in 2012. The 2013 average was based on our August reading, plus 6 months of readings by Maine VLMP certified lake monitors John and Poppy Connor Crouch. The historical average for Lower Range is 6.9 meters, which has recently increased slightly as a result of several very clear years for the lake. Water clarity readings in 2013 ranged from a low reading of 6.4 meters on August 12 to an outstanding high reading of 9.3 meters (~30 feet!) on May 28, prior to the early summer rain.

The total phosphorus concentration in Lower Range Pond last summer, based on the single August sample, was 6 ppb, compared to 8 ppb in 2012, 6 ppb in 2011 and 2010 and 2009, 7 ppb in 2008 and 2007, and the historical average of 7 ppb. Phosphorus levels have ranged from 6- 15 ppb in Lower Range since 1981. The very high 15 ppb sample was taken in 1981, and none of the samples taken since have approached this level.

Chlorophyll-a (measuring algal growth in the water) measured 2.6 parts per billion in August, 2013, compared to 5.1 ppb in August 2012, 3.9 ppb in August, 2011, 3.3 ppb in 2010, 3.5 ppb in 2009, the 2008 average of 3.0 ppb, 3.6 ppb in 2007, and the historical average of 3.7 ppb. CHL levels in Lower Range have ranged from 2.9-6.5 ppb, the highest reading having been measured

in 1993. The 2013 reading/concentration was consistent with the excellent water clarity and relatively low concentration of total phosphorus in 2013.

A temperature and dissolved oxygen profile taken on August 3 indicated that Lower Range was strongly stratified, with water temperatures ranging from 24.1 degrees C at the surface (nearly 4 degrees lower than in August, 2012), to 9.6 degrees C at 13 meters depth, near the bottom of the sample station at the deepest point in the lake. Dissolved oxygen levels ranged from 8.2 ppm at the surface to a low level of 0.0 ppm at 13 meters depth. Late summer dissolved oxygen levels in Lower Range have been consistently depleted in the deepest area of the lake. A second phosphorus sample taken near the bottom of the deepest point in the pond measured 11 ppb. This may suggest that oxygen depletion is causing phosphorus to be released from the bottom sediments, a phenomenon has the potential to negatively impact the overall health of the lake over time. Aggressive measures to protect water quality through the identification and mitigation of sources of phosphorus in the watershed may help to stabilize or improve late summer DO loss in Lower Range.

As indicated previously, no colonies of the bluegreen alga/cyanobacteria, *Gloetrichia echinulata*, were observed in Lower Range Pond on August 3 at, and near the deep monitoring station.

Additional supporting indicators of water quality were within the normal range of the historical data for Lower Range Pond in 2013.

It is important to note that our baseline sampling of the lake in 2013 was limited to the month of August, whereas much of the historical data for the three Range Ponds is based on both mid and late summer sampling. This change in the sampling schedule may have influenced the 2013 averages for some of the indicators that were monitored, relative to historical levels for some indicators. However, volunteer lake monitors on the three lakes provided additional substantial water clarity (Secchi transparency) readings for the full summer monitoring season. It is important to keep the change in sampling frequency in mind when considering the 2013 results.

The Range Ponds Association has been a steadfast steward for the three Range Ponds and their watersheds for several decades. In addition to supporting comprehensive annual water quality monitoring of the ponds, the association has conducted surveys of the watersheds to identify and remediate soil erosion problems, and has produced a Watershed Management Plan to provide landowners, community planners and others with guidance for the long-term protection of the Range Ponds.

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