



2012 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 2012. 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 September, 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.

2012 Weather Influences :

Weather conditions prior to, and during the annual lake monitoring period can strongly influence indicators used to assess water quality. Several meteorological phenomena occurred in 2012 that appear to have had a negative effect on lakes and ponds in the region:

1. Winter and spring weather was unusually warm, resulting in the earliest ice-out conditions on record (mid- March) for many Maine lakes.
2. Ambient air temperatures in the 80 degree F. range were recorded in March. This resulted in the rapid warming of lake water, and the development of thermal stratification (temperature layers) several weeks earlier than normal.
3. In early June, a severe rain event dropped several inches of rain (8 inches in Auburn) on the area in a period of less than 48 hours, resulting in extremely heavy and erosive stormwater runoff from lake watersheds.
4. This was followed by many days of unusually warm weather. Water surface temperatures of 80 degrees F. were recorded in many lakes and ponds in the region by the end of June.

The combined influence of these unusual conditions resulted in below average water clarity, an extended period of thermal stratification, higher than normal dissolved oxygen loss, and a measureable increase in algae growth for a substantial percentage of Maine lakes in 2012 – all of

which can be characterized as stressful to lake systems. For more information on the effects of weather on lake water clarity, see the attached statewide perspective on lake water clarity for 2012.

The following is a summary of findings for the three Range Ponds in 2012. 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:

Overall, 2012 was a below average year for Upper Range Pond. The water was less clear than the historical average, a single phosphorus sample taken in August was slightly lower than the average for the lake, and an August chlorophyll (algae) sample was higher than the historical average for these critical indicators of lake water quality.

Water clarity averaged only 5.8 meters (about 19 feet), compared to 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 (5.2 meters) is one of the lowest individual water clarity readings on record for Upper Range Pond. Maine VLMP certified lake monitors provided several months of water clarity data for Upper Range Pond in 2012.

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, 2012, compared to the 2011 sample, which measured 7 ppb, the very low concentration of 4 ppb in 2010, and the dramatically high 16 ppb sample in 2009. The historical average for Upper Range is 6 ppb. Total phosphorus concentrations in Upper Range Pond have ranged from 5-16 ppb since 1979, when phosphorus sampling began on this body of water. It is very important to note that the 2012 “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 2012 sample measured 4.5 ppb, compared to 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 2012.

A temperature and dissolved oxygen profile taken on August 3 indicated that Upper Range was strongly stratified, with water temperatures ranging from 26.7C at the surface to 9.9 C at 11 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 0.2 ppm at 11 meters depth. Late summer dissolved oxygen loss in Upper Range

Pond has been minimal in past years, but was somewhat greater in 2012 than in several recent years.

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 2012

One particular bluegreen alga, (*Gloeotrichia echinulata*) that is the current focus of research in New England Lakes, was observed on the August site visit at moderate concentrations in Middle Range (2.0 on the VLMP “Gleo” scale). “Gleo” appears to have been on the increase in lakes throughout Maine during 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 the decline of lake water quality. The adjacent photo was taken at the surface of Lake Auburn last summer during the peak of a Gleo bloom.



Middle Range Pond:

Unlike the past few years, when Middle Range Pond has been exceptionally clear, the lake was average in 2012, compared to its historical average. The concentration of phosphorus in the water was also average, but algae growth in August, was measurably higher than average for Middle Range (based on a single sample).

The average water clarity in 2012 (based on 6 months of volunteer data, in addition to the reading that we took in August) was 6.1 meters, which was a full meter (~3 feet) less clear than the 7.1 meter average in 2011. The 2010 average was 7.0 meters, 2009 was 7.1 meters, 2008 was 6.7 meters (22 feet), and the historical average is 6.1 meters. The August 3 reading was only 5.35 meters, compared to the exceptionally clear reading of 7.3 meters (~24 feet) in August, 2012. Water clarity ranged from 4.8-7.1 meters during the course of the 2012 monitoring period. The 4.8 meter reading was one of the lowest on Middle Range for more than a decade.

The phosphorus concentration measured at the deep sampling station in August measured 8 parts per billion (ppb), compared to 6 ppb in 2011, 5 ppb in 2010, and 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 (algal concentration in the pond) was higher than the historical average for the lake, measuring 5.8 ppb in August, compared to 3.8 ppb in August 2011, and the historical average of 4.2 ppb. The substantial decline in water clarity in Middle Range in 2012 was likely due to weather influences, including the unusually early and warm spring and summer weather, resulting in higher than normal water temperatures, and the extreme

rain event in June. Even though conditions declined in 2012, the overall water clarity was average for the lake.

A temperature and dissolved oxygen profile taken on August 3 indicated that Upper Range was strongly stratified, with water temperatures ranging from 27.0 degrees C at the surface (several degrees warmer than in August, 2011) to 6.8 C at 20 meters depth, near the bottom of the sample station at the deepest point in the lake. Dissolved oxygen levels ranged from 8.1 ppm at the surface to a low level of 2.5 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 will help prevent DO levels from declining further in the future.

The concentration of the bluegreen algae, *Gloeotrichia echinulata* (see above for Upper Range) measured 1.0 on the Maine VLMP “Gloeo” scale on August 3 at the deep monitoring station.

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 2011.

Lower Range Pond:

Overall, Lower Range Pond experienced a somewhat below average year in 2012, in that the lake was slightly below its historical water clarity average, phosphorus was slightly higher than the average for Lower Range, and the baseline chlorophyll (algae) concentration in August was substantially higher than the historical average.

The lake was slightly less clear than average in 2012, averaging 6.8 meters (~22 feet), based on 6 months of readings by Maine VLMP certified volunteer lake monitors, and our August reading of 5.80 meters (compared to the August, 2011 reading of 6.55 meters). The 2011 average was also 6.8 meters, down somewhat from the 2010 average of 7.3 meters (24 feet). In 2009, the average was also 7.3 meters; 2008 was 7.2 meters (23.5 feet), and the historical average of 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 2012 ranged from 5.8 to 7.4 meters – all good readings for the pond, but not as clear as in several recent years.

The total phosphorus concentration in Lower Range Pond last summer, based on the single August sample, was 8 ppb, compared to 6 ppb in 2011 and 2010 and 2009, 7 ppb in 2008 and 2007, and the historical average of 8 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 5.1 ppb in August, compared to 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 3.6 ppb. CHL levels in Lower Range have ranged from 2.9-6.5 ppb, the highest reading having been measured in 1993. The 2012 reading was one of the highest in recent years.

A temperature and dissolved oxygen profile taken on August 3 indicated that Lower Range was strongly stratified, with water temperatures ranging from 27.6 degrees C at the surface (several degrees warmer than in August, 2011) 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 0.1 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.

The concentration of the bluegreen algae, *Gloeotrichia echinulata* (see above for Upper Range) measured 1.0 on the Maine VLMP “Gloeo” scale on August 3 at the deep monitoring station.

Additional supporting indicators of water quality were within the normal range of the historical data for Lower Range Pond in 2012.

It is important to note that our baseline sampling of the lake in 2012 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 2012 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 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 2012 results.

The attached addendum to this report provides a broad statewide perspective on Maine’s lakes in 2012. A substantial percentage of more than 400 lakes monitored throughout Maine in 2012 were less clear than their historical average.

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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