



2011 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 2011. 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.

The weather that occurs during and preceding lake monitoring can have a strong influence on indicators of lake water quality, and is likely responsible for some of the variability that is measured within individual seasons and from one year to the next. The weather during the first several months of 2011, was extremely “wet”, resulting in moderate stormwater runoff to lakes from their watersheds. Runoff to during the first several months of the year typically accounts for a high percentage of the annual load of phosphorus to Maine lakes from their watersheds. The combination of phosphorus loading, sediment from storm water runoff and turbulence associated with rain events creates the potential for less clear lake water during the spring and summer months. For more information on the effects of weather on lake water clarity, see the attached statewide perspective on lake water clarity for 2011.

The following is a summary of findings for the three Range Ponds in 2011. Water clarity data are based on readings taken in August, 2011, as well as any water clarity data provided by certified volunteers 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:

2011 was an above average year for Upper Range Pond. The water was significantly clearer than the historical average (based on a reduced number of readings in 2011), and both phosphorus and chlorophyll (algae) levels measured in August were lower (better) than the

historical average for these critical indicators of water quality.

Water clarity averaged 7.1 meters (about 23 feet) for the summer monitoring season, compared to 6.4 meters in both 2010 and 2009, 7.1 meters (23 feet) 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 also 6.4 meters (21 feet). Readings taken in 2011 ranged from 6.7-7.8 meters. All readings taken on Upper Range in 2011 were above average for the pond, and compared to the state average for Maine lakes monitored in 2011. Upper and Middle Range Ponds were tied for “clearest” of the three ponds in 2011.

The concentration of phosphorus (the nutrient that is responsible for the growth of algae in lakes) measured 7 parts per billion (ppb) in the single sample taken on August 17, 2011, compared to 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 8 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.

Chlorophyll-a (CHL) is a pigment that is measured to determine the concentration of algae in lake water. The August 2011 sample measured 3.8 ppb, compared to 2.6 ppb in 2010, the historical average for Upper Range is 4.2 ppb. The 2010 sample was one of the lowest (best) readings on record for Upper Range, whereas the 2009 average was one of the highest on record. 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.

A temperature and dissolved oxygen profile taken on August 17 indicated that Upper Range was strongly stratified, with water temperatures ranging from 23.4C at the surface to 9.7 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 8.3 parts per million (ppm) at the surface to a low level of 0.0 ppm at 10 meters depth. Late summer dissolved oxygen loss in Upper Range Pond has been minimal in past years, but was somewhat greater in 2011 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 2011.

Middle Range Pond:

Once again, Middle Range Pond experienced a substantially above average year in 2011, in that the lake was clearer than average, there was less algae in the water, and phosphorus levels were lower than the historical average for the lake. The average water clarity in 2011 (based on five months of volunteer data, in addition to the reading that we took in August) was 7.1 meters (23+ feet), compared to the 2010 average of 7.0 meters, 2009 average of 7.1 meters, 2008 average of 6.7 meters (22 feet), and the historical average of 6.1 meters. The August 17 reading was an excellent 7.3 meters (~24 feet). Water clarity ranged from 6.1-7.9 meters during the course of the 2011 monitoring period. Water clarity in Middle Range has improved to the point where the long-term historical average for the lake has improved slightly during the past three years. There appears to be a positive trend in improving water clarity in this lake. Middle and Upper Range were tied for “clearest” of the three ponds in 2011.

The phosphorus level measured in August was 6 parts per billion (ppb), compared to 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 lower (better) than the historical average for the lake, measuring 3.8 ppb in August, compared to the historical average of 4.1 ppb. CHL was somewhat lower than many of the previous years. This suggests that overall biological productivity and algal growth has decreased somewhat in recent years, most probably due to the weather influences mentioned above and below. However, weather influences aside, the overall clarity, a reflection of the amount of algae in the water in Middle Range Pond, has improved measurably during the past decade.

A temperature and dissolved oxygen profile taken on August 17 indicated that Upper Range was strongly stratified, with water temperatures ranging from 23.8 C at the surface to 6.0 C at 20 meters depth, near the bottom of the sample station at the deepest point in the lake. Dissolved oxygen levels ranged from 8.5 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.

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 an average year in 2011, in that the lake was very close to its historical water clarity average, phosphorus was slightly lower than the average for Lower Range, and the baseline chlorophyll (algae) level was slightly higher than the historical average. The lake was slightly less clear than average in 2011, averaging 6.8 meters (~22 feet), based on 6 months of readings by volunteer lake monitors, and our August reading of 6.55 meters. This was somewhat less than 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.

The total phosphorus concentration in Lower Range Pond last summer, based on the single August sample, was 6 ppb, compared to 6 ppb in both 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 3.9 ppb in August, compared to 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 2.9-4.7 ppb.

A temperature and dissolved oxygen profile taken on August 17 indicated that Lower Range was strongly stratified, with water temperatures ranging from 22.6 C at the surface to 7.7 C at 13 meters depth, near the bottom of the sample station at the deepest point in the lake.

Dissolved oxygen levels ranged from 8.1 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 12 ppb – twice the concentration measured from the surface core sample. This may suggest that oxygen depletion is causing phosphorus to be released from the bottom sediments. This 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.

Additional supporting indicators of water quality were within the normal range of the historical data for Lower Range Pond in 2011.

It is important to note that our baseline sampling of the lake in 2011 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 2011 readings 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 2011 results.

Summary:

Overall, 2011 was a good year for the Range Ponds, in that all three of the ponds were as clear as, or significantly clearer than they have been historically. Approximately half of more than 400f Maine lakes that were monitored in 2011 were clearer than their historical averages, but overall, Maine lakes were less clear in 2011.

Concentrations of total phosphorus and algae in the three ponds were also generally average, or better, during the summer. Lake water clarity is highly valued by the public, often ranking first in terms of desirable attributes in user-perception surveys.

Special thanks are due to the outstanding team of volunteer lake monitors who measured water clarity data for the three Range Ponds in 2011. Their efforts added substantially to the value of the data used to create this report!

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