2017 Washington Lakes Water Quality Report

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by
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Special Thanks to Garrison Beck of Midcoast Conservancy

Executive Summary

We continued for 2017 the increased sampling frequency started in 2015, with Washington Lakes Watershed Association (WLWA) being responsible for Water Quality Measurement, rather than employing a professional on a once every three year basis. Our goal is to have a more consistent and complete monitor on water quality which will enable earlier recognition of both positive and negative influences on water quality. Unfortunately, manpower limited our detailed data gathering to Washington Pond, We intend to change this to include regular testing of Crystal Lake in 2018.

2017 continues to create our baseline data set. Many past years have featured only a few data points, if any, (especially on Crystal Lake), and so comparison and trend analysis over the entire open water season as a whole is difficult except on a grand scale.

2017 continues to show that our lakes maintain above average water quality, with many water quality indicators continuing at a consistent level, while showing some improvement in some parameters. It is necessary to keep in mind that annual weather variations make long-term trend analysis uncertain in this regard. Based on this test data, phosphorus levels seem to be consistent to slightly lower than historical average. Chlorophyll is in line with historical averages. Both of these parameters help us monitor potential for algae bloom. Washington Pond appears to continue to be stable.

Dissolved oxygen depletion in the lower, colder regions of both water bodies was less significant in the later summer weeks until "turnover" in mid- to late-September. This oxygen depletion has been observed historically in both water bodies and is also somewhat normal for shallow lakes. Analysis of data over the past five years indicates a downward (good) trend in oxygen depletion. Oxygen levels below 5 ppm can also stress fish populations. See discussion below in the report under Dissolved Oxygen.

Weather affects lake quality and chemistry. 2017 was somewhat hotter than normal, but not nearly as hot as 2016. Rainfall was greater than 2016 also. It is likely that these trends will continue with global climate change. It is important that we continue to monitor and encourage the public to reduce uncontrolled surface runoff as this is the largest contributor of phosphorus to the lakes, especially when faced with significantly larger single rain events (with greater erosion potential) even if total rain is average. We are encouraged that phosphorus actually shows a small decrease and water clarity was almost constant over the summer based on monthly averages.

Both ponds were inspected in 2016 by a trained plant identification volunteer in and around the public access points. No evidence of invasive aquatic plants was noted in the species found present. No inspections were done in 2017.

This statement taken from Scott Williams' 2012 Water Quality report is worth repeating:

> *The most effective way to insure that all indicators of water quality remain stable or even improve over time – is through watershed stewardship. This includes raising awareness among landowners about ways in which the effects of development on water quality can be minimized, and developing a community plan to protect and manage the watershed. Citizen watershed surveys can be very effective in raising community awareness and identifying and resolving*

land use problems. The Maine Volunteer Lake Monitoring Program offers workshops for groups interested in conducting watershed surveys. The LakeSmart program offered by Maine Congress of Lakes [and WLWA] is also an excellent way to effect positive change in lake watersheds.

Sampling Methodology

During the 2017 summer season, Washington Lakes Watershed Association (WLWA) volunteers endeavored to take water clarity readings at least every two weeks on Washington Pond. Surface grabs for phosphorus levels on Washington Pond, discontinued in 2016, were reinstituted to give us more comprehensive data. We plan their expansion in 2018. Phosphorus is the nutrient that feeds algae growth. Limiting Phosphorus helps to control algae growth and prevent objectionable algae blooms.

2016 WLWA transferred their collaborative equipment loan arrangement from the Damariscotta Lake Watershed Association (DLWA) to the Midcoast Conservancy (which merged with DWLA) in an effort to engage in regular dissolved oxygen monitoring of both Washington Pond and Crystal Lake. This continued in 2017 with use of Midcoast's test instrumentation throughout the summer as well as comprehensive testing of regular and historical baseline water quality parameters by Garrison Beck, in August.

All water quality monitoring and sampling was completed by certified volunteer lake monitors and was completed in accordance with standard procedures for the monitoring of Maine lakes and ponds established by the Maine Department of Environmental Protection and the Maine Volunteer Lake Monitoring Program. We owe a great debt of gratitude to MVLMP for their support and training for certified monitors. The 2017 sampling was done in a manner consistent with the historical sampling of these bodies of water, and the results are comparable.

2017 Weather Influences

Weather conditions can strongly influence indicators of water quality. 2017 temperatures were somewhat higher than normal, averaging 0.79 degrees C above normal (compared with 2.6 degrees the prior year), (Figure 1), while rainfall levels ran over 3.3 inches below normal for the year (see Figure 2). Currently our only source of rainfall data for the year is the National Weather Service, in Gray, Maine, and is for Portland. Observations randomly taken over the course of the summer indicated that it appeared that actual rainfall for Washington was significantly less than in Portland, although we have no hard data. In 2017 we will have a full season of rainfall measurement for Washington from a station on the pond reported by Wunderground.com. We originally thought in 2016 that the combination warmer and less wet might contribute to a higher potential for algae bloom, but now think that the reduced runoff slows the addition of phosphorous and other nutrients to the lakes thus *reducing* algae production. Taking readings several times each year as opposed to the previous regime of once every three years, is helping us understand the lake chemistry better.

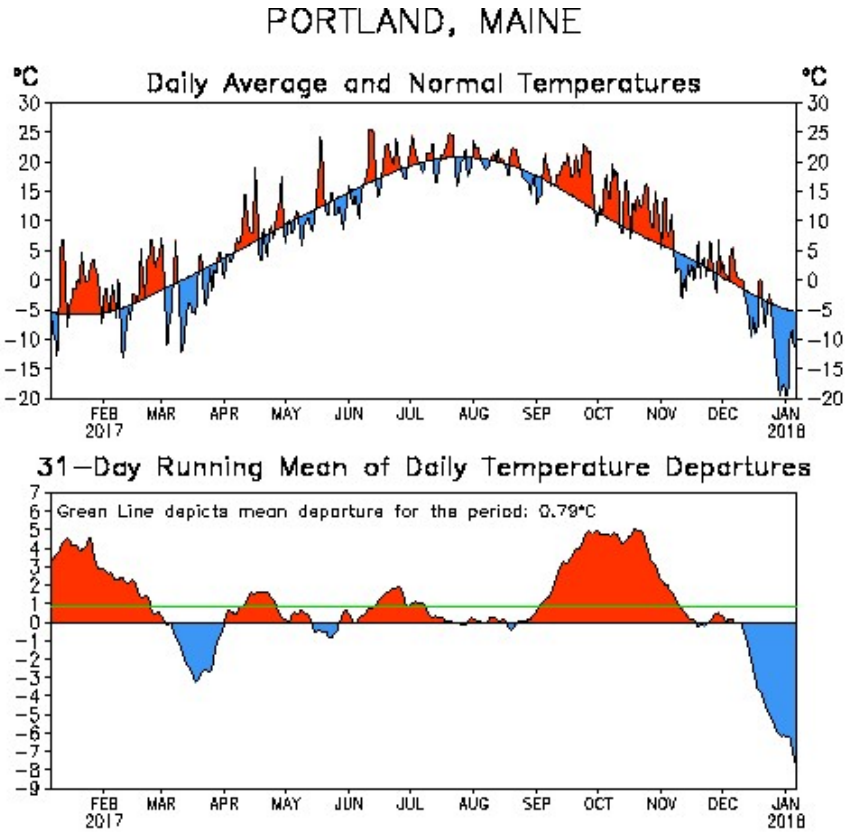

Figure 1

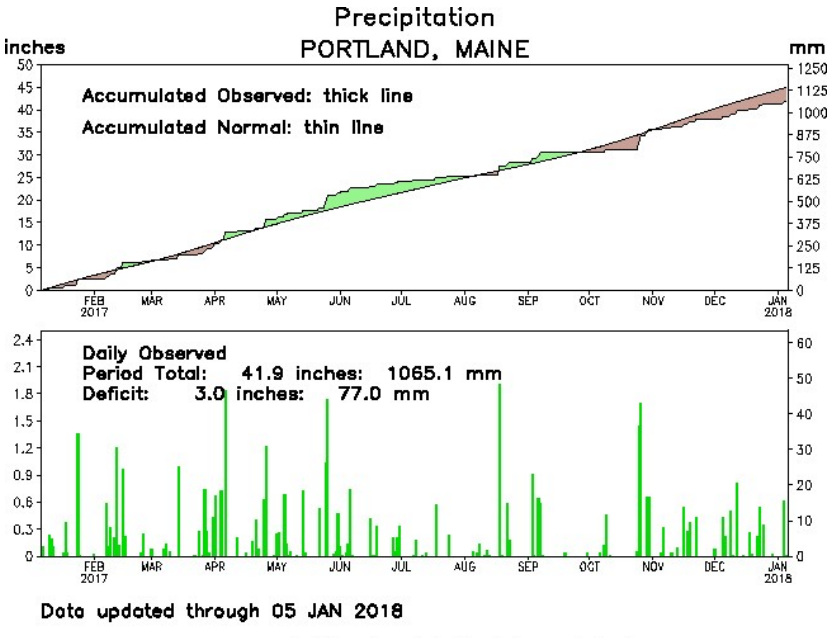

Figure 2

Washington Pond

Water Clarity

Water clarity readings are made using a Secchi disk and monitoring scope to determine the depth at which the disk can still be seen. The higher the number (deeper sight depth) the clearer the water. Readings were taken multiple times per month during the 2017 season and for several prior years on Washington Pond. The following graph (exhibit 3) indicates monthly averages for the past five years. 2015 (light blue) had an unusually higher set of readings and 2017 (red) returned closer to historical averages. Water clarity is an important measure of lake quality, and this measurement keeps our lakes in the upper percentiles of Maine lakes.

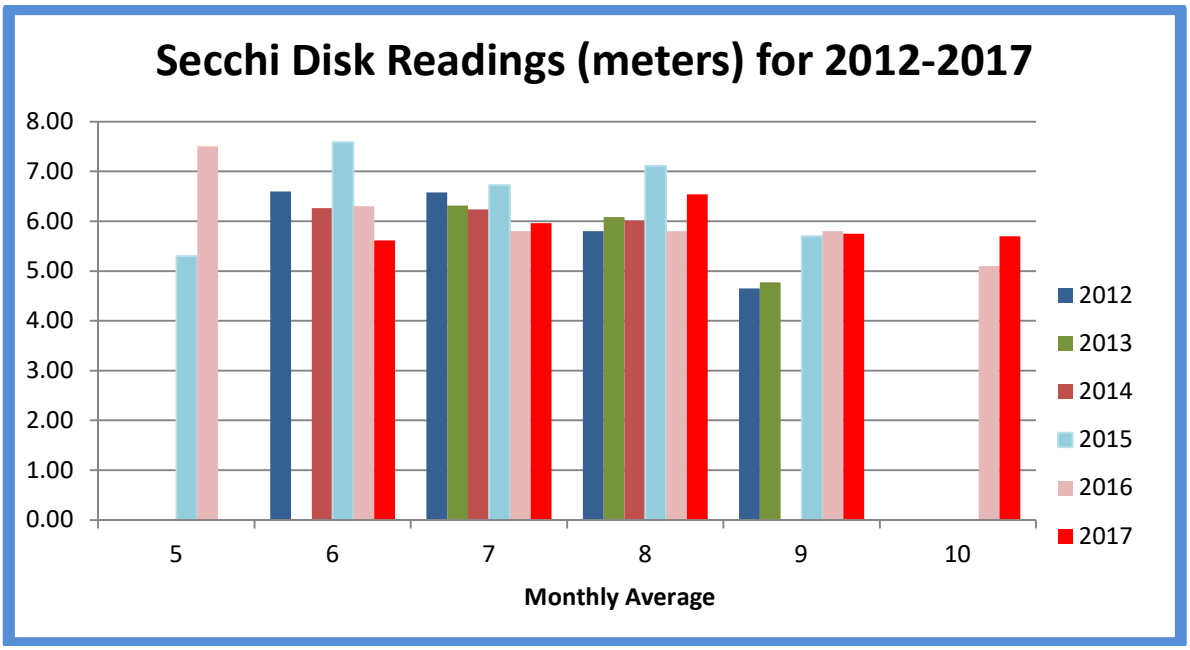

Figure 3

Phosphorus

A phosphorus sample taken from a 8-meter core water column sample measured 5 parts per billion (ppb), slightly below historical average of 6 ppb in core samples 5 meters and above. As phosphorus is the nutrient that most directly influences the growth of algae in lakes and ponds and phosphorus concentrations in the 12-15 ppb range have been associated with algal blooms in some Maine lakes, these lower sample concentrations are a good trend. A bottom sample showed no significant change from past history. (Figure 4). Bottom samples help us understand the potential for anoxic release of phosphorus from the bottom sediments.

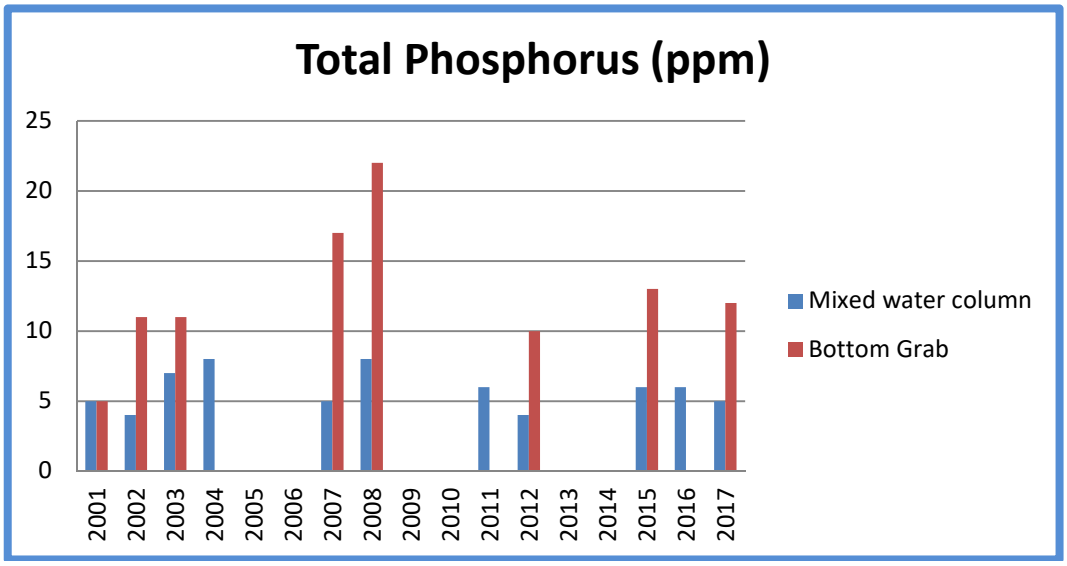

Figure 4

Chlorophyll

Samples from a 8 meter core sample in August showed Chlorophyll at 2.8 ug/l, higher than last year but well within historical range of 1.8 to 5 so no significant change. Chlorophyll-a (CHL) is the pigment measured in lake water that is used to determine the concentration of algae in the water. Clorophyll is a good indicator of amount of algal bloom, so having it lower than historical average confirms the slightly improved quality, probably most influenced by the close to average rainfall amounts, and phosphorus nutrient being low, limiting the available nutrients.

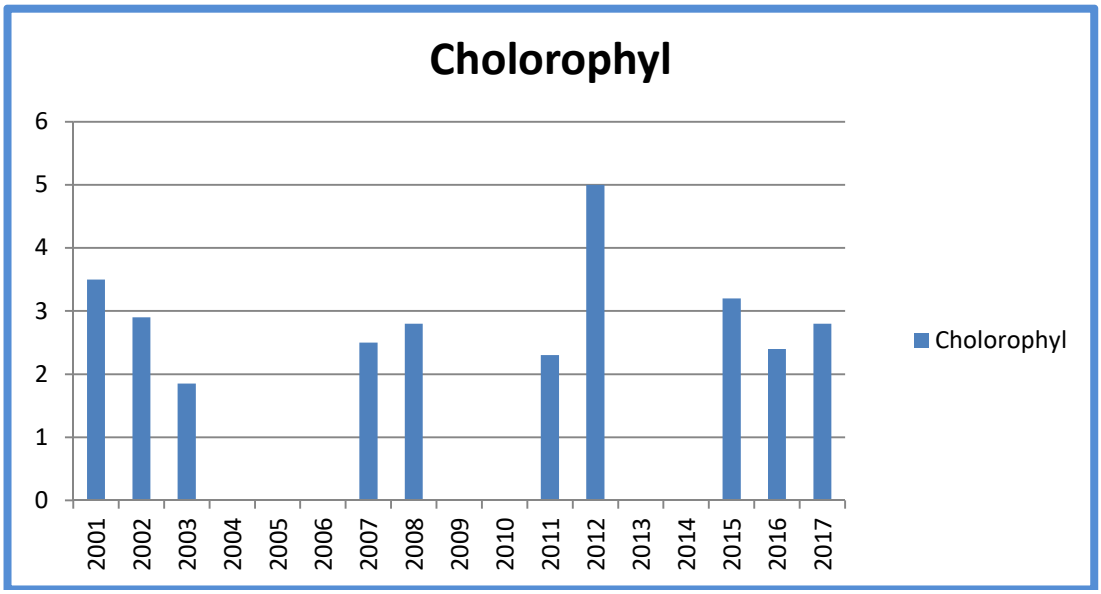

Figure 5

Dissolved Oxygen

We have the advantage that dissolved oxygen profiles were taken in 2012 on Washington Pond as well as those taken four times (our new test regimen) each the summer of 2015 through 2017 by the WLWA water quality team. The following graph (figure 6) shows *improving* (lines to the right indicate more oxygen at greater depths) dissolved oxygen for 2017 (red family lines).

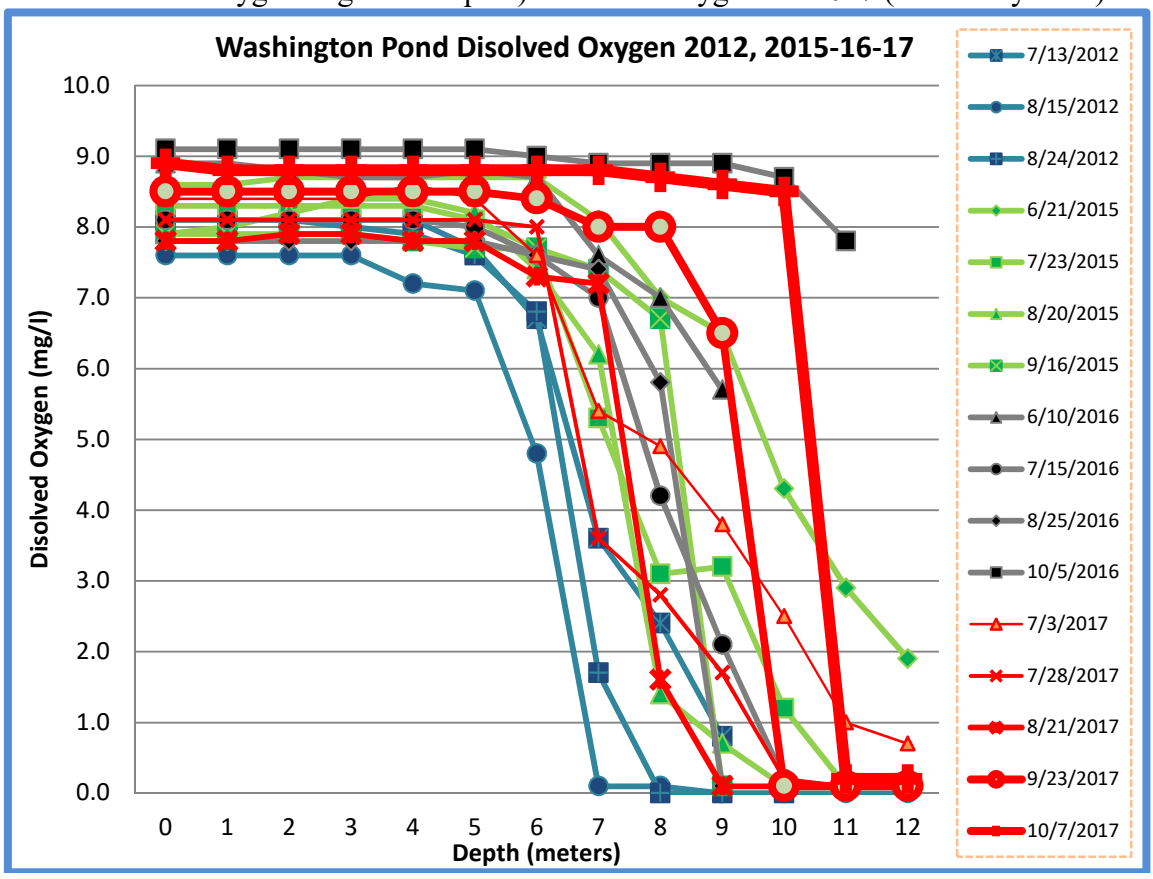

Figure 6

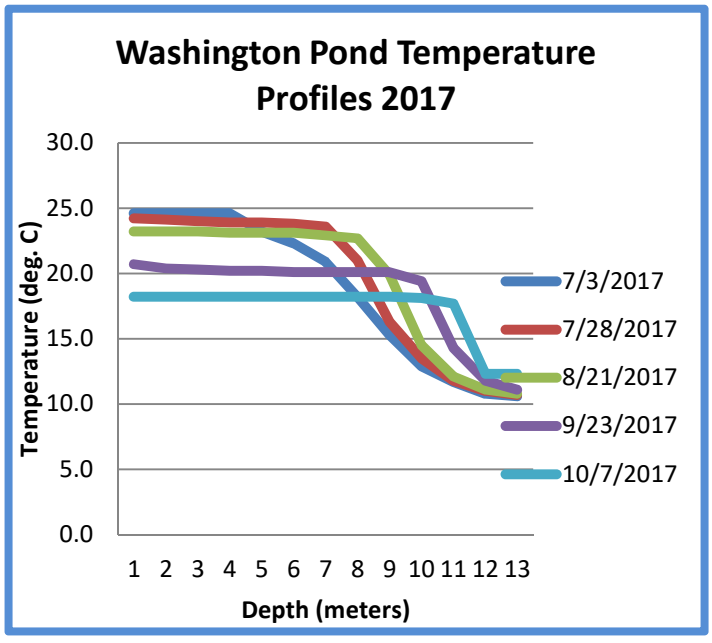

Figure 7

Higher DO concentration is good news. The oxygen levels throughout the lake were high in early and late summer, while the oxygen depletion became more significant in the latter part of the summer in waters with temperature of 17 degrees Celsius or lower, the region desired by cold water fish such as trout. Figure 7 shows the temperature profiles that we saw for the five DO readings in 2017.

This means that these fish are stressed in the latter part of the summer. In general we are pleased with the profiles taken, as they show somewhat higher oxygen levels than in prior years

According to Inland Fisheries and Wildlife biologist Scott Davis, who presented at the 2015 annual meeting of WLWA. The observed lack of any cold water regions containing oxygen levels above this threshold is a concern for the viability of cold water fish stocking programs on Washington Pond, but Davis has recorded population "holdover" from one year to the next on this lake in the past, and cold water species such as trout have also been caught in Crystal Pond. It is now believed that springs on the bottom of both lakes are providing "holdover havens" for cold water fish species during the end of the summer.

It is clear that the springs which feed Washington Pond are a significant water source for the lake. Although water levels were lower than usual, the springs help counteract the normal evaporation when there is no rainfall. They also, no doubt, supply cool water for the spots where cold water fish can congregate at levels that still have adequate oxygen.

It is also important to note that readings in early July and again in early October showed good oxygenation levels, better than seen in previous years. More data over future years is needed to see if all of this results in a long term positive trend.

Alkalinity was 5.0, same as historical average. The pH of the sample was 6.5, typically average.

Color was also unchanged at 8, about historical average.

Trophic State Index

Trophic State calculations (TSI) using collected data indicates a TSI based upon Secchi data at 34 (unchanged from 2016), based on Chlorophyll at 40.7 (slightly higher than 2016) and based on phosphorus at 27.4 (lower than 2016). This places Washington Pond in an Oligotrophic State with an anoxic hyperlimnia due to bottom oxygen depletion. We would like to see the TSI under 40. Above 40 would push our classification into Mesotrophic. Our average is 34.

Algae Sighted

Gloeotricchia echinulata, a planktonic blue-green algae that has been on the increase in Maine lakes in recent years was sighted in Washington Pond for only about two weeks in late August of 2016, the first time it has been recorded in Washington Pond. We encountered it for a longer period of time, but in relatively sparse densities mid August to late September.

Crystal Lake

No tests were taken at Crystal Lake in 2017. This was because of limited manpower as we have lost our resident Crystal Lake monitor. Crystal has been consistent in past years and we expect resumption of regular testing in 2018.