

Starvation Reservoir Water Quality Report



CENTRAL UTAH WATER
CONSERVANCY DISTRICT

2019

Prepared by,

Joe Crawford

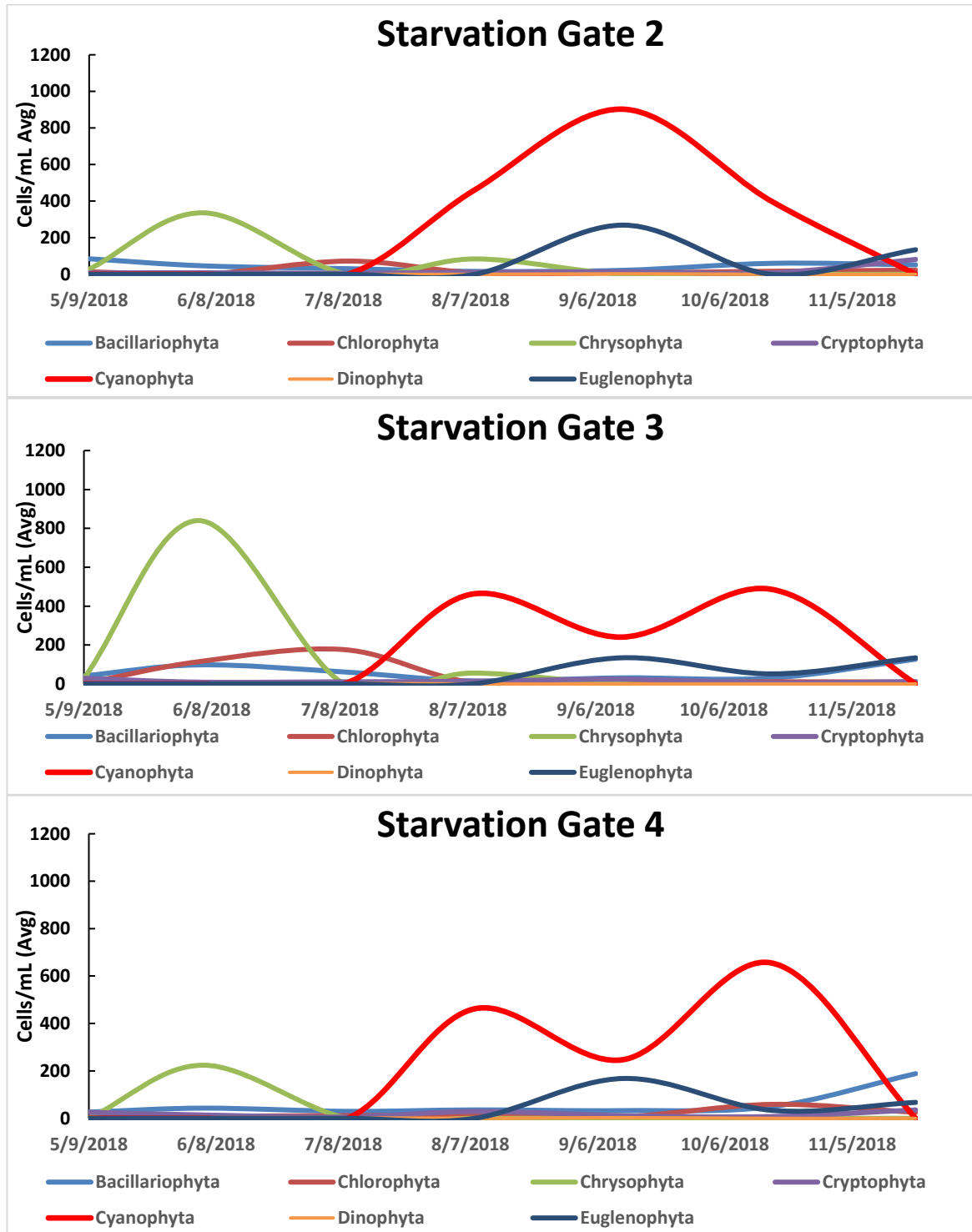
The water quality in Starvation Reservoir near the intake of the Duchesne Valley Water Treatment Plant was examined for the for the year 2018. Data was compiled and analyzed for the following parameters: phytoplankton, nitrate, total phosphorus (TP), dissolved total phosphorus (DTP), total organic carbon (TOC), and a Trophic State Index (TSI). Water samples were collected from Starvation Reservoir at the surface and bottom of the water column as well as at each intake gate elevation. Apart from phytoplankton all the 2018 parameter values are compared to values collected in previous years. Due to a change in the phytoplankton counting method in 2018 the values could not accurately be compared to previous years.

Phytoplankton

Algal division values were plotted at each of the gate depths as well as the secchi depth level. Gate 1 was out of the water after the month of June and throughout the rest of the sampling season, no data is shown for that gate.

Generally, all the gates followed the same pattern, with Chrysophyta (golden algae) dominating the early months and Cyanophyta (cyanobacteria) dominating the later months. The samples collected at the secchi depth had the most cyanophyta of all the locations with an average of 967.9 cells/mL in the month of September followed closely by Gate 2 with a peak average of 902.5 (Figure 1). These locations both received the most sunlight which contributed to the increase in phytoplankton growth. The World Health Organization (WHO) has set the value of 10,000 cells/mL as a water quality threshold for cyanobacteria. While 967.9 cells/mL is higher than the rest of the averages, it is still well below the WHO threshold.

Figure 1



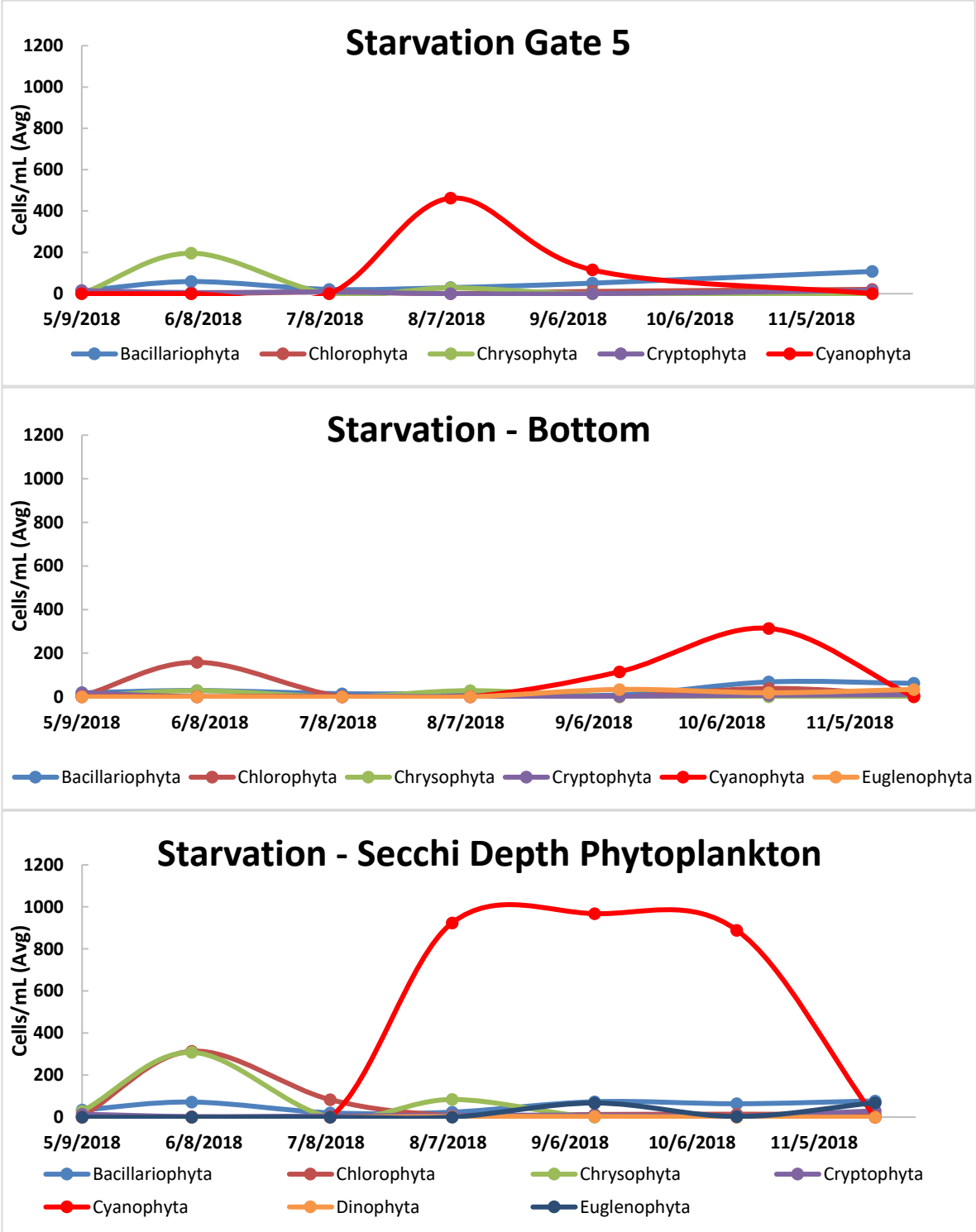


Figure 1: Phytoplankton cell counts measured at the Duchesne Valley Water Treatment Plant intake gate elevations as well as the bottom of the reservoir and the secchi depth. The highest cell count was during the month of September when the average cyanobacteria peaked at 967.9 cells/mL.

Nutrients

Nutrient levels in the water column were averaged for each month that samples were collected. The Division of Water Quality has determined that Total Phosphorus (TP) levels start to impact water quality at 0.025 mg/L and Nitrate (NO₃) influences water quality at 4 mg/L. During September of 2018 following the Dollar Ridge fire and a large rain event that caused large amounts of sediment, debris and organic matter to enter the reservoir the average TP concentration peaked at .05 mg/L (Figure 2). This sampling event was the only time we saw the TP value surpass the 0.025 mg/L threshold over the last four years. We will continue to monitor this site in 2019 to determine if there has been an overall upward shift in total phosphorus concentrations as a result of the fire. Nitrate levels in starvation reservoir continued to be minimal in 2018 even after the fire and rain events (Figure 3). Over the last four years the NO₃ concentration has not come close to exceeding the State's standard.

Figure 2

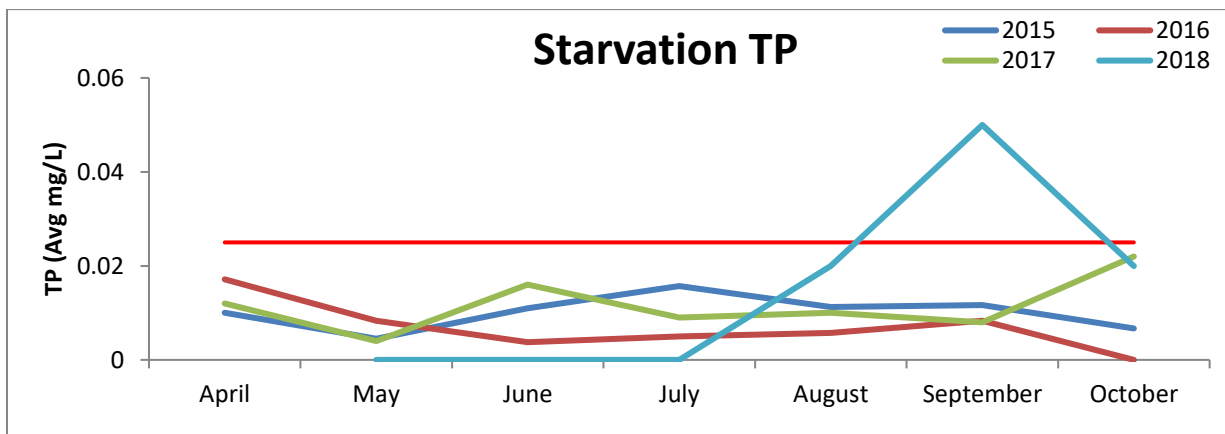


Figure 2: Total Phosphorus was measured at each gate depth and bottom of the reservoir and then averaged together for the entire water column. Following the Dollar Ridge Fire and large rain event the average total phosphorus concentration peaked at 0.05 mg/L in September 2018.

Figure 3

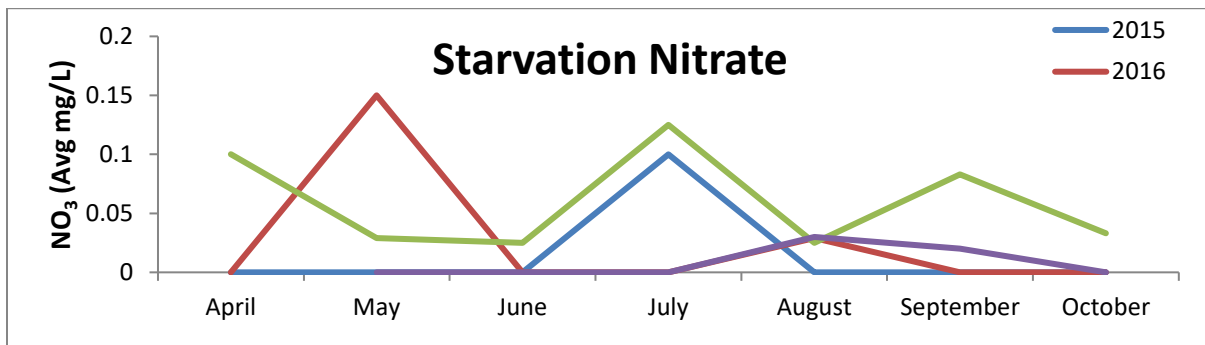


Figure 3: Nitrate was measured at each gate depth and bottom of the reservoir and then averaged together for the entire water column. Over the last four years nitrate concentrations have been low.

Total Organic Carbon

Total Organic Carbon (TOC) levels over the last four years have ranged from 2.1 – 3.8 mg/L. The highest values occurred in September and October 2018. This increase was expected due to the amount of organic material being washed into the river from the Dollar Ridge fire.

Figure 4

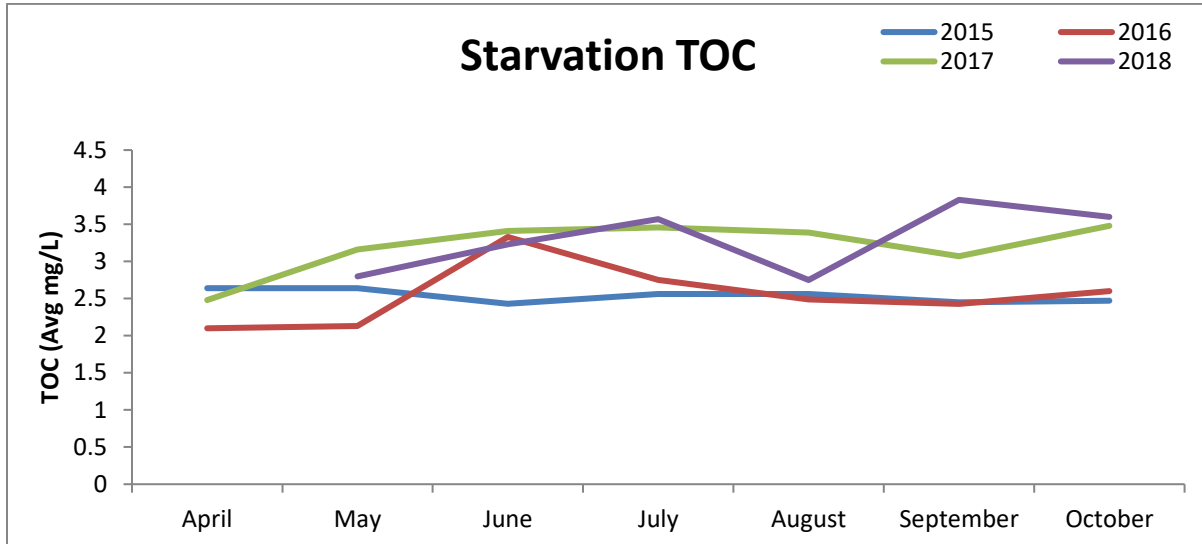


Figure 4: Total Organic was measured at each gate depth and bottom of the reservoir and then averaged together for the entire water column. The values have varied from 2.1 – 3.8 mg/L over the last four years.

Trophic State Index

The aquatic ecosystem productivity of a lake is often described by the terms: oligotrophic, mesotrophic and eutrophic. Oligo, as a prefix means, "few" and trophic is defined as: "relating to nutrition (or food)," thus oligotrophic means "little food" and eutrophic means "many foods" with mesotrophic being in the middle.

The Trophic State Index (TSI) is a tool that classifies lakes and reservoirs into different trophic levels. It is often calculated using water clarity, via secchi depth, and phytoplankton biomass (chlorophyll *a*). Generally, the lower the TSI the greater the water clarity and the lower the phytoplankton biomass. A TSI value greater than 50 is considered Eutrophic, a value greater than 40 and less than 50 is Mesotrophic, and a value less than 40 is Oligotrophic. For the last several years Starvation Reservoir has varied between Mesotrophic and Oligotrophic. Based on the variability of the data I would be comfortable declaring Starvation as a Mesotrophic Reservoir.

Figure 5

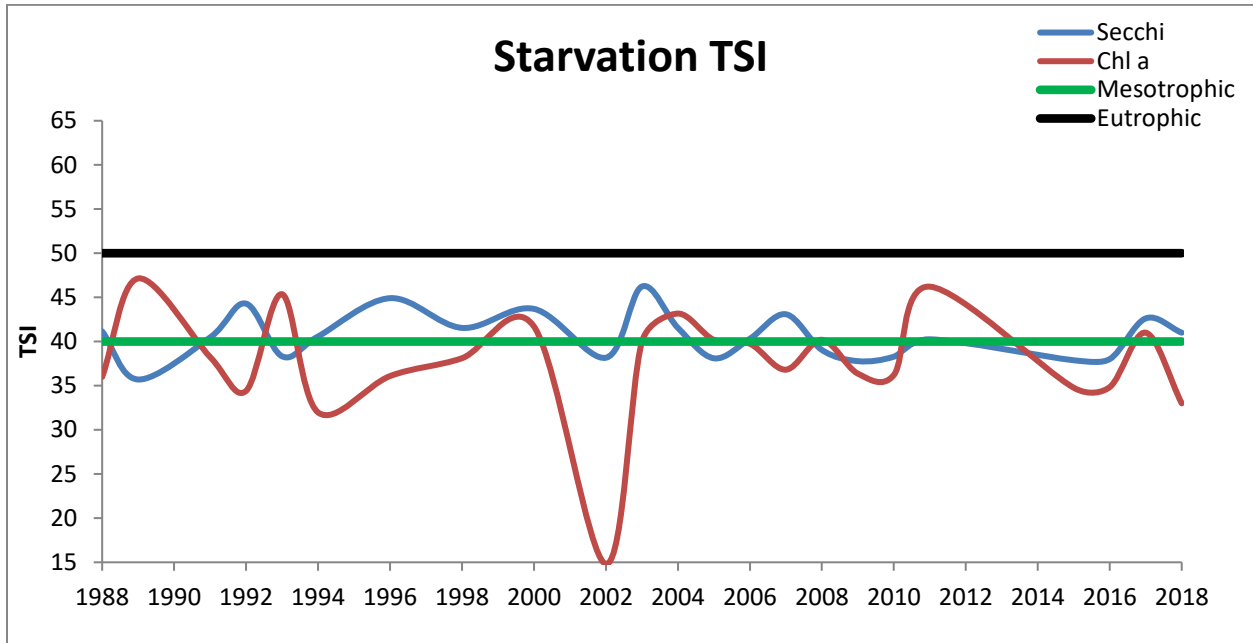


Figure 5: Trophic State Index for Starvation Reservoir for the last 30 years. The trend is varying between Oligotrophic and Mesotrophic.

Summary

While the long-term Mesotrophic status continues for Starvation Reservoir, the Dollar Ridge Fire increased TOC and TP levels. Phytoplankton cell counts were similar at the different intake elevations with the highest levels being measured at the secchi disk level. The average cell count at that level peaked at 967.9 cells/mL in the month of September. With the changes that occurred last year to the surrounding landscape and reservoir it will be important to continue to monitor water quality trends in the reservoir.