Steel Lake Monitoring 2022

Steel Lake Management District

Prepared by Kevin Du

5/8/2023

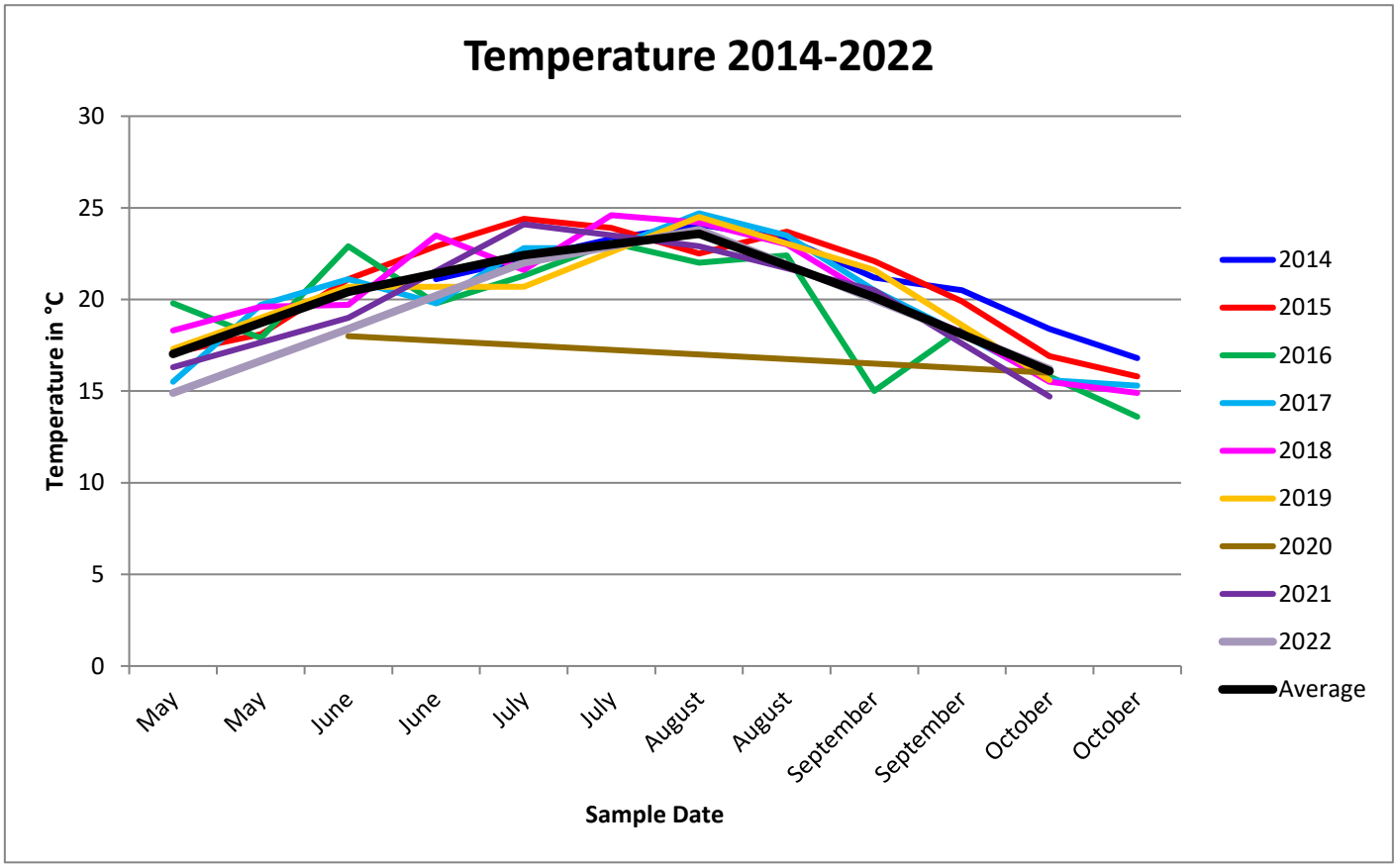

Figure 1: No significant changes in 2022. No significant differences between average temperature and individual years. Dissolved oxygen and temperature probe malfunctioned during July, August, and September of 2020 hence the straight line. Temperature criteria is 18°C, however temperature measurements used in the graph are only surface temperature they are not representative of aquatic fish habitat.

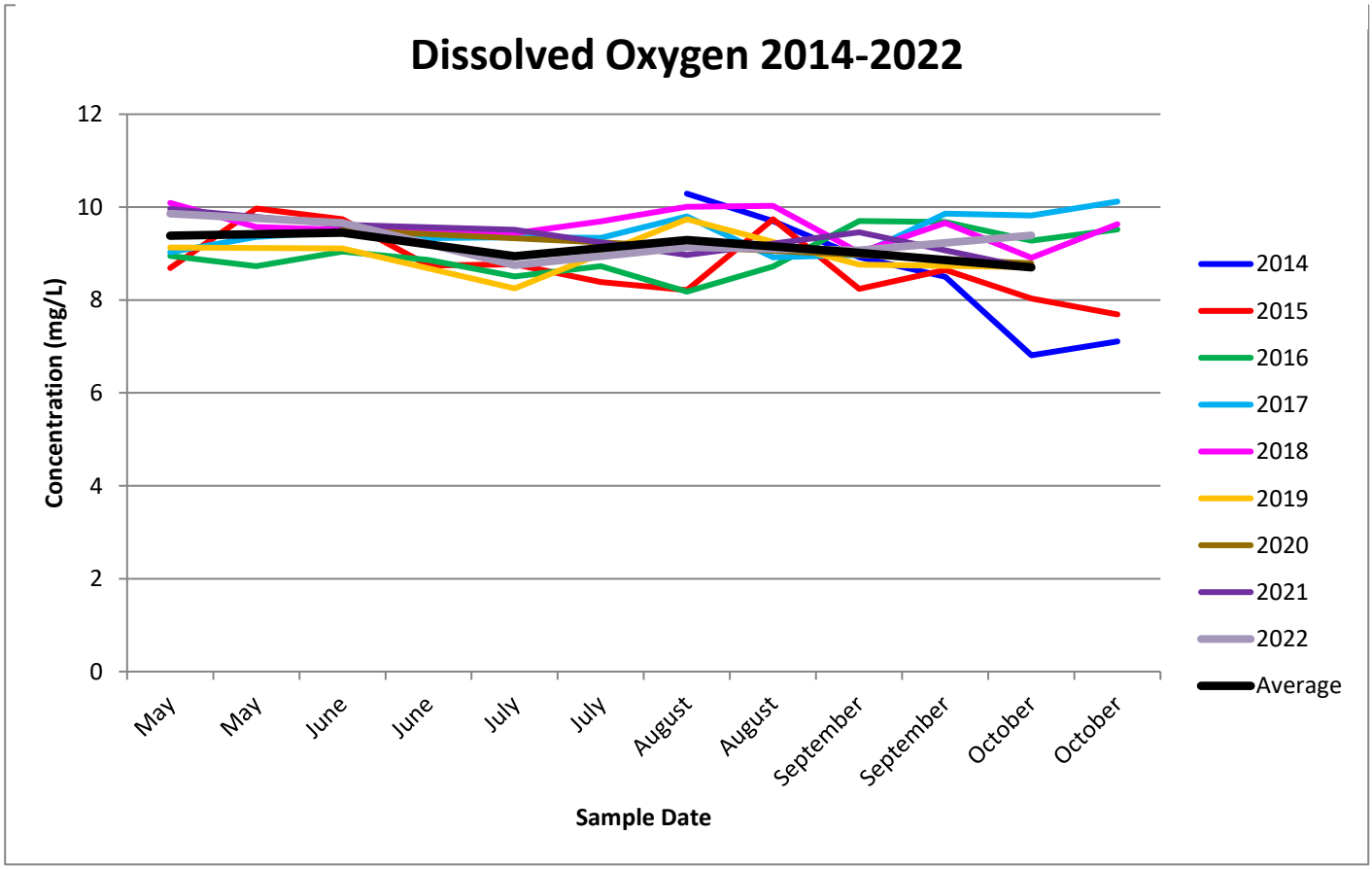

Figure 2: Dissolved oxygen is stable. Steel Lake supports Redband Trouts a subspecies of rainbow trout which means the lakes DO criteria is 8 mg/L. 2022 concentrations were above the criteria.

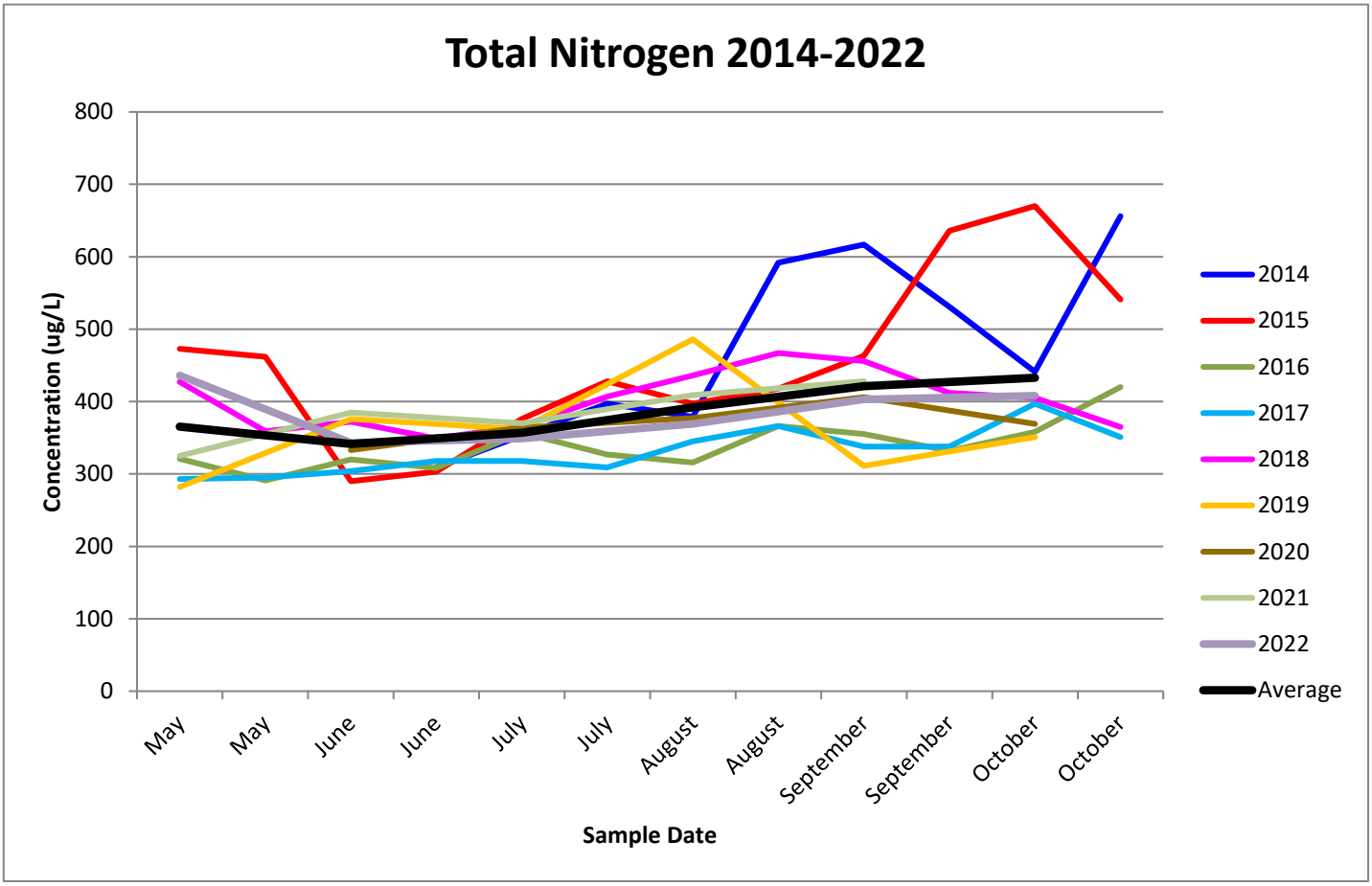

Figure 3: No WA criteria for total nitrogen. Majority of data follows the average trend line except for a few data point during 2014 and 2015. Generally, the lower the concentration the better. Total nitrogen data for 2022 had no significant differences from the average trend line.

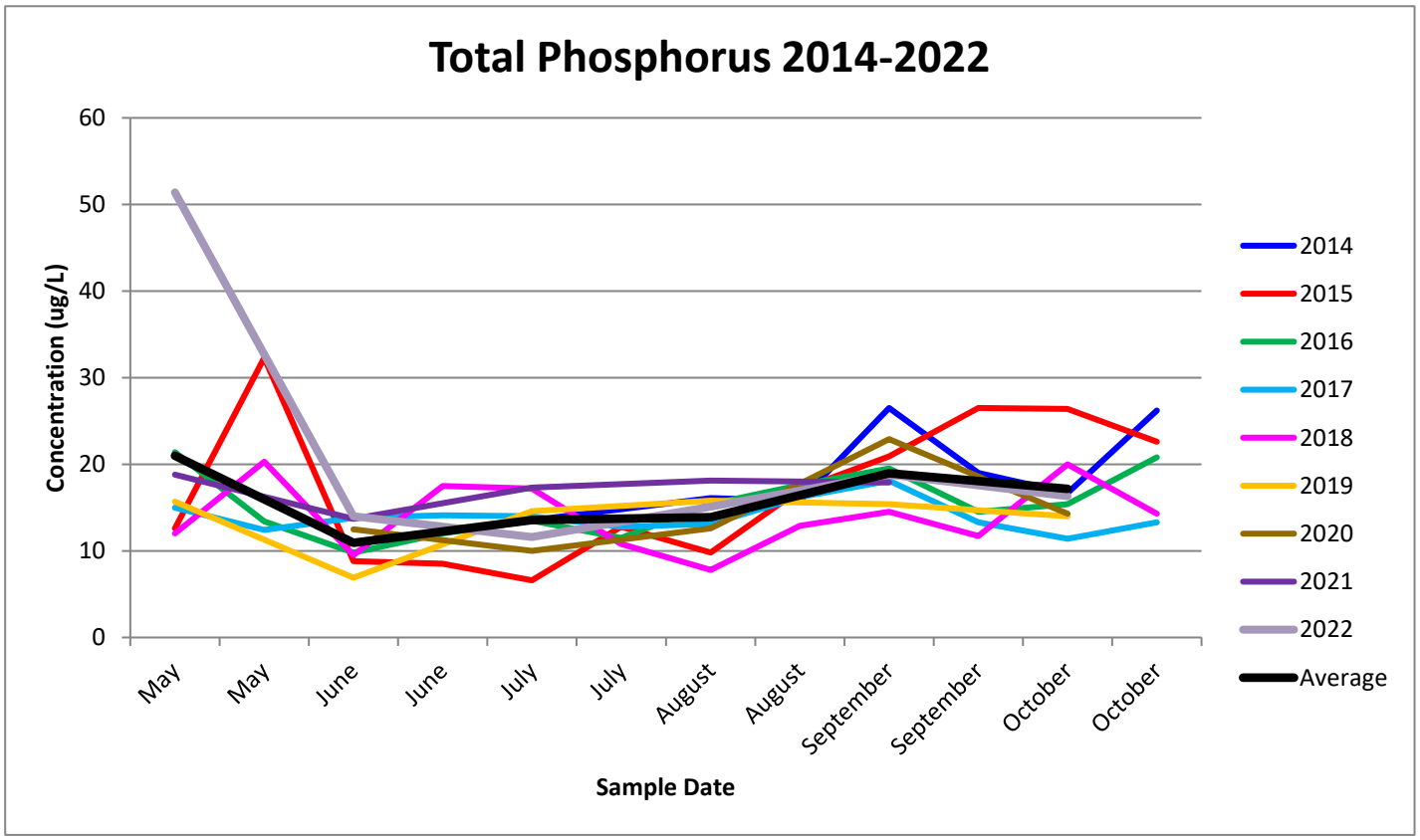

Figure 4: Steel Lake is a lake within the Puget Lowlands therefore its recommend to take action to study the lake if concentrations are greater than 20 ug/L. There are multiple instances where this threshold was breached during 2014, 2015, 2020, and 2022. Otherwise, values are fairly stable. For 2022 total phosphorus was below the criteria except for May. In general the months of May and September tend to have higher phosphorus concentrations. Lower concentrations during the months of June, July, and August could be due to lack of rain/runoff.

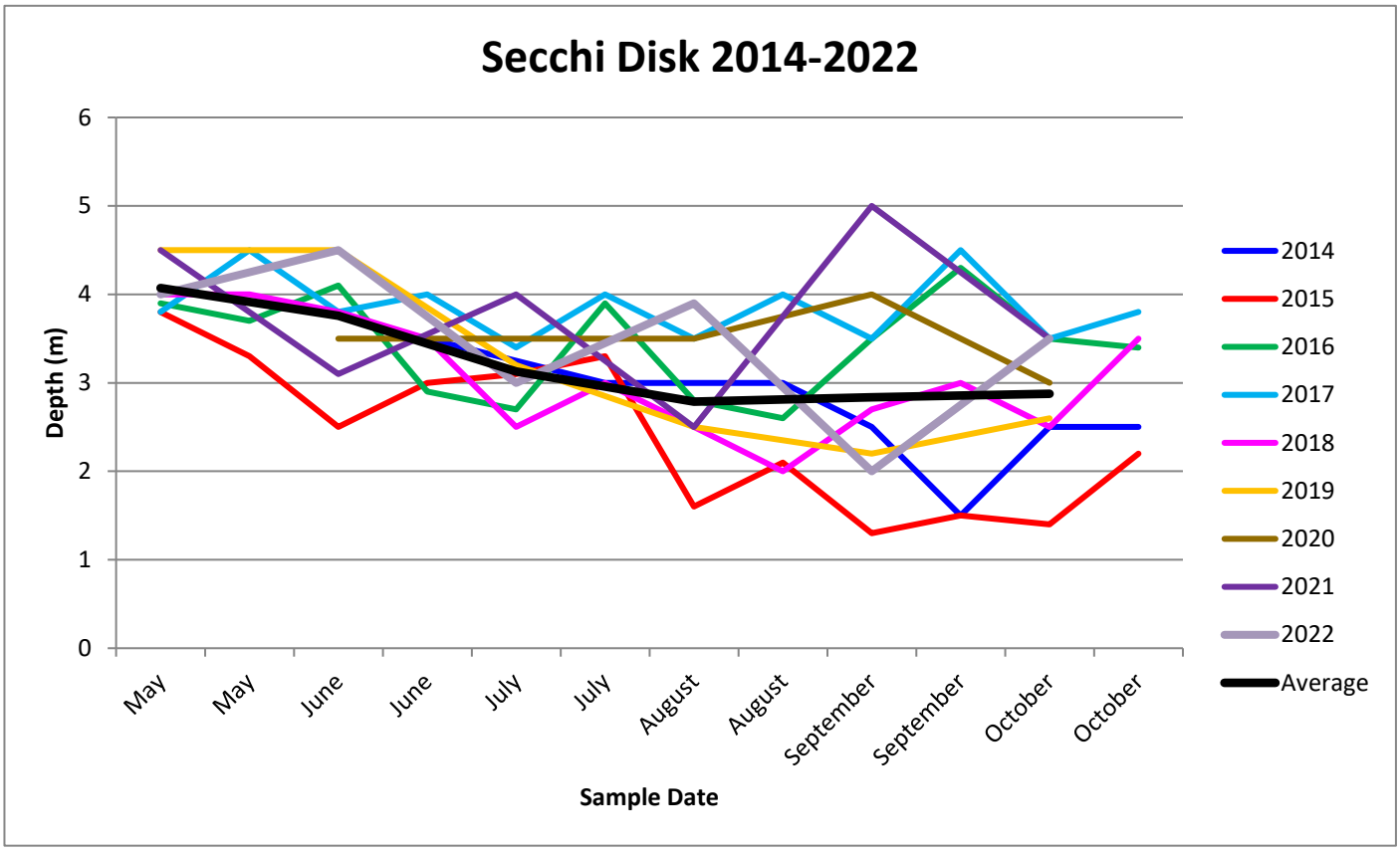

Figure 5: Clarity of the lake is fairly stable. As a shallow lake it's more likely to see unstable results. Lakes clarity decreases slightly going into the summer, likely due to algae growth and recreational use, and clarity increases going into the fall. For 2022 the lake clarity was higher than average for 3 of the 6 months.

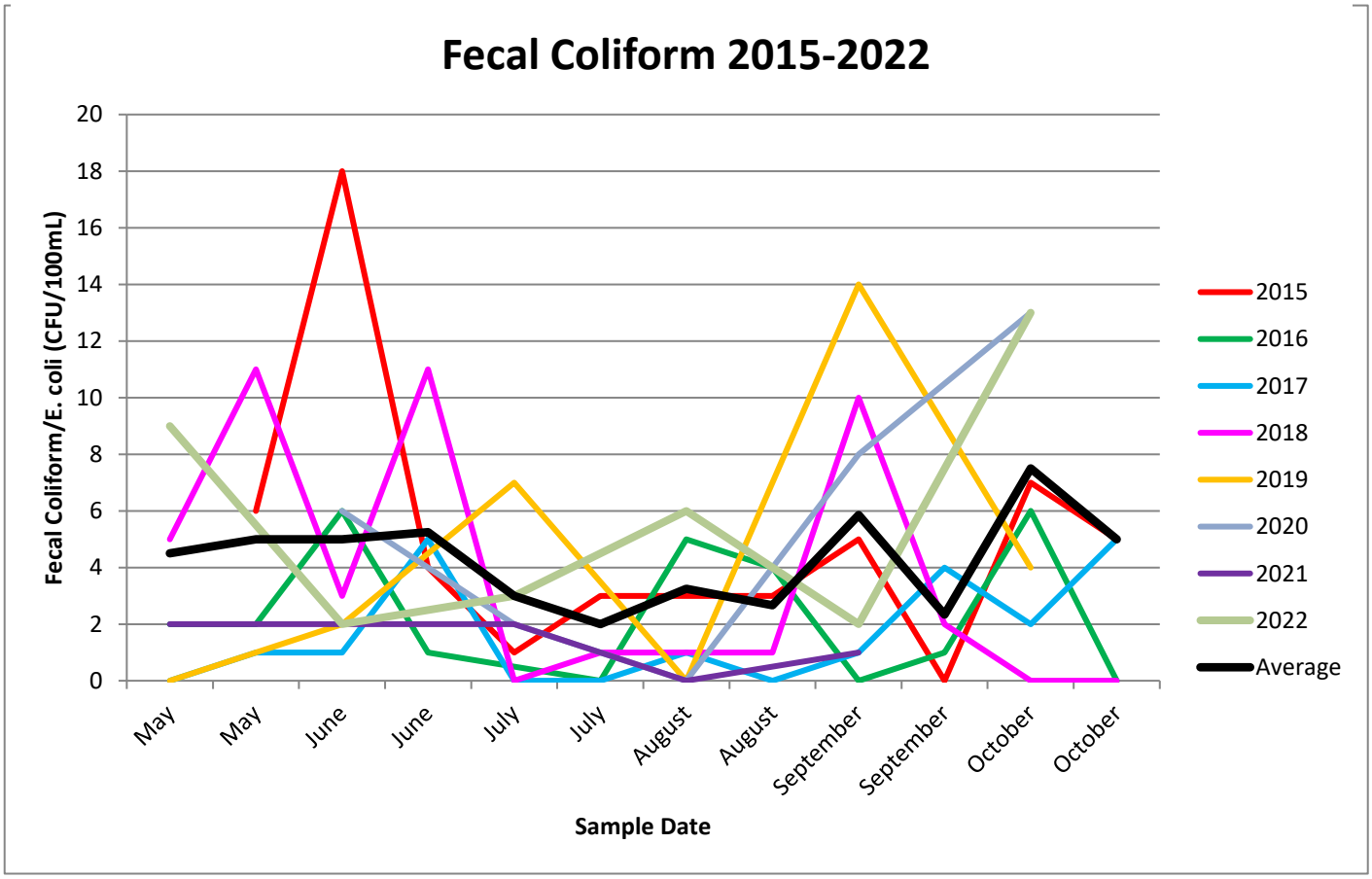

Figure 6: Fecal coliform criteria expires 12/31/2020 replaced with E. coli criteria. The criteria for primary contact recreational use is 100 CFU/100mL and results are well below the 100 CFU/100mL threshold. For 2022, the high was 13 CFU/100mL in Oct with a low of 2 CFU/100mL in June & September.

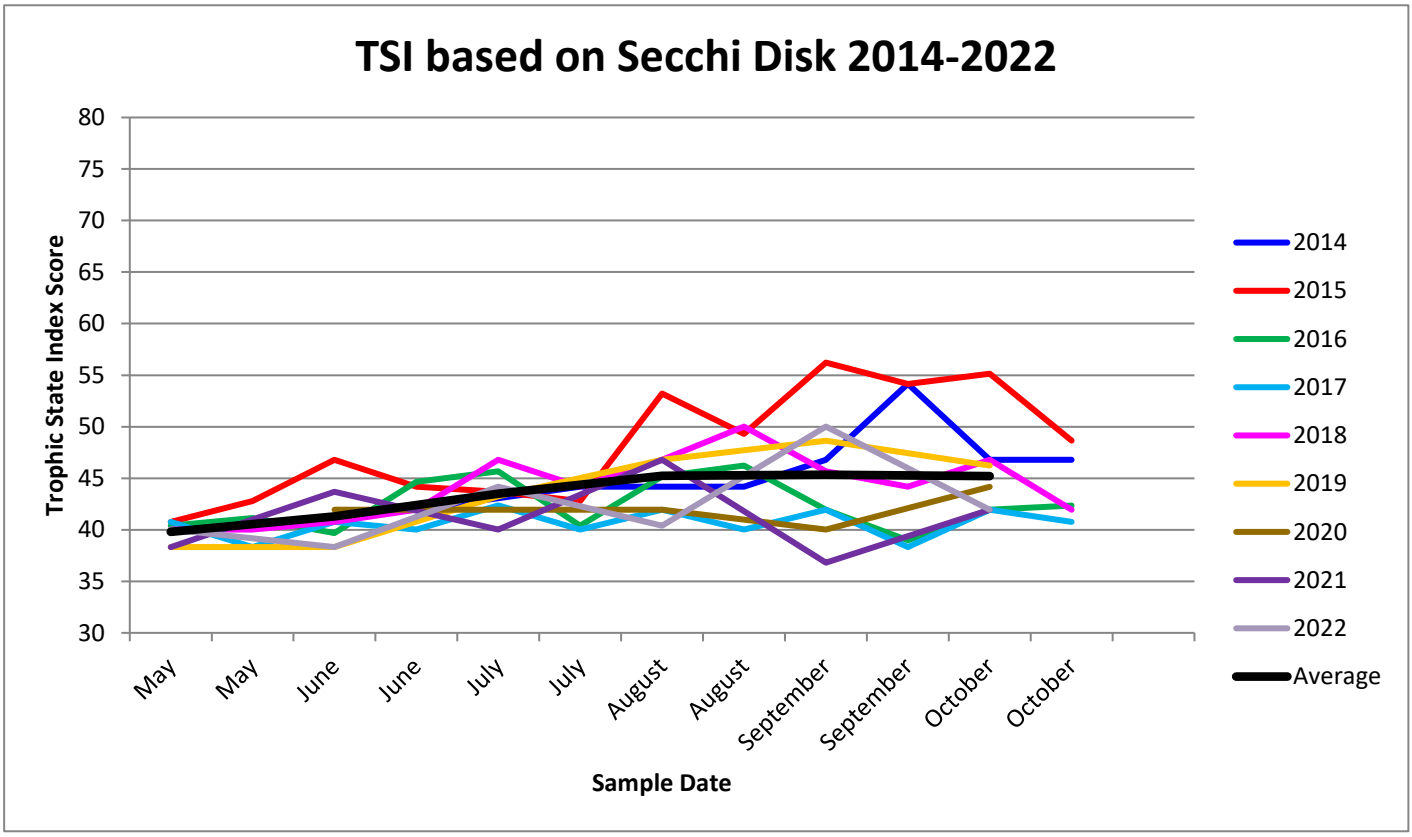

Figure 7: TSI based on secchi disk measurements. Average score ranges from 40-50 which means the lake is mesotrophic. Meaning the lake is fairly clear and has potential to become eutrophic. For 2022 the TSI had a high of 50 in September and a low of 38.3 in June. The high of 50 was right on the lower end of being eutrophic

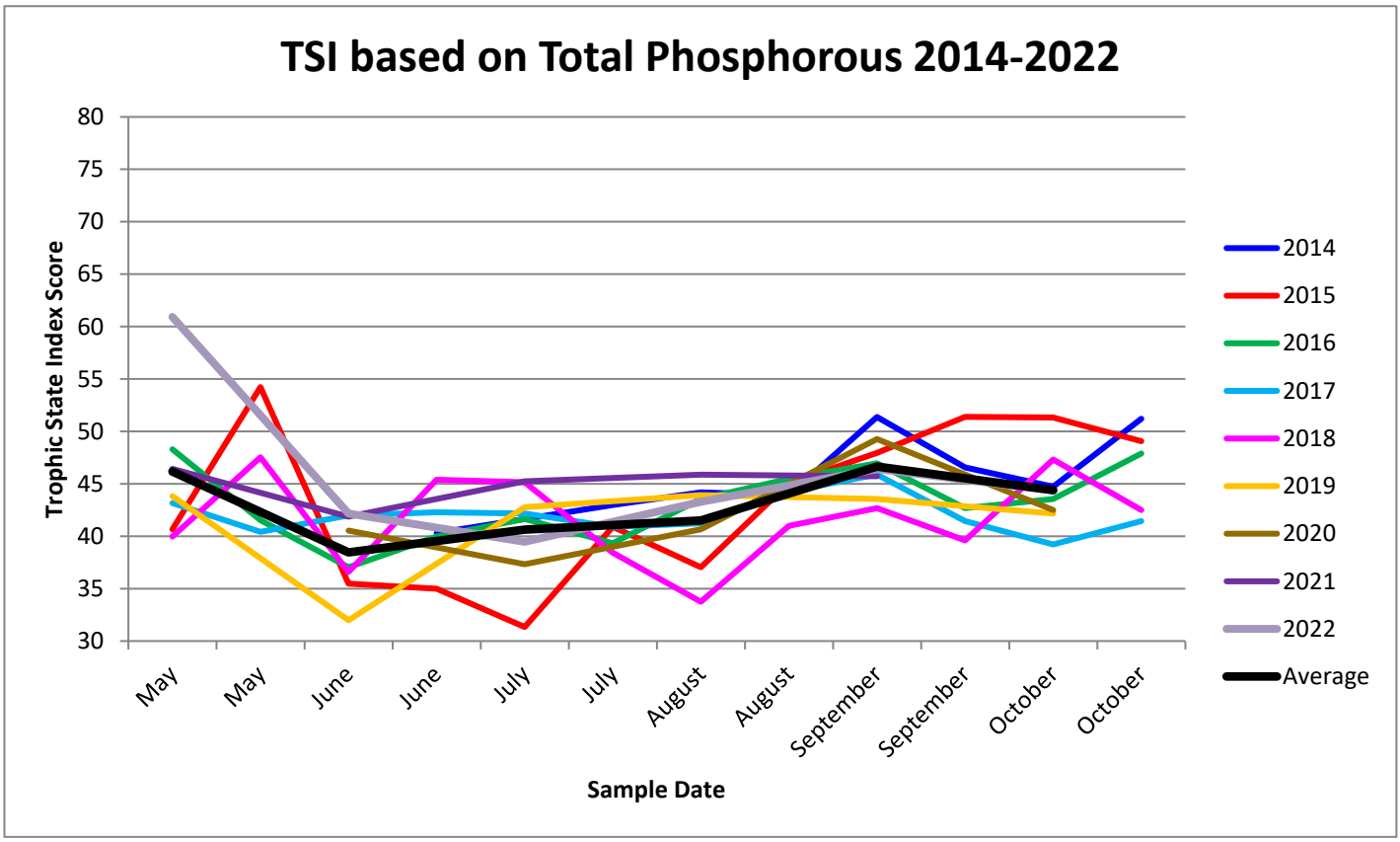

Figure 8: TSI based on total phosphorous. Average score ranges from 38 as the low and 47 as the high, which means the lake is mesotrophic. For 2022, TSI high 60.9 due to unusual high phosphorous concentrations and is an outlier compared to previous years. TSI low was 39.5. If we remove the outlier the range would be 39.5-46.4 which is in the mesotrophic range.

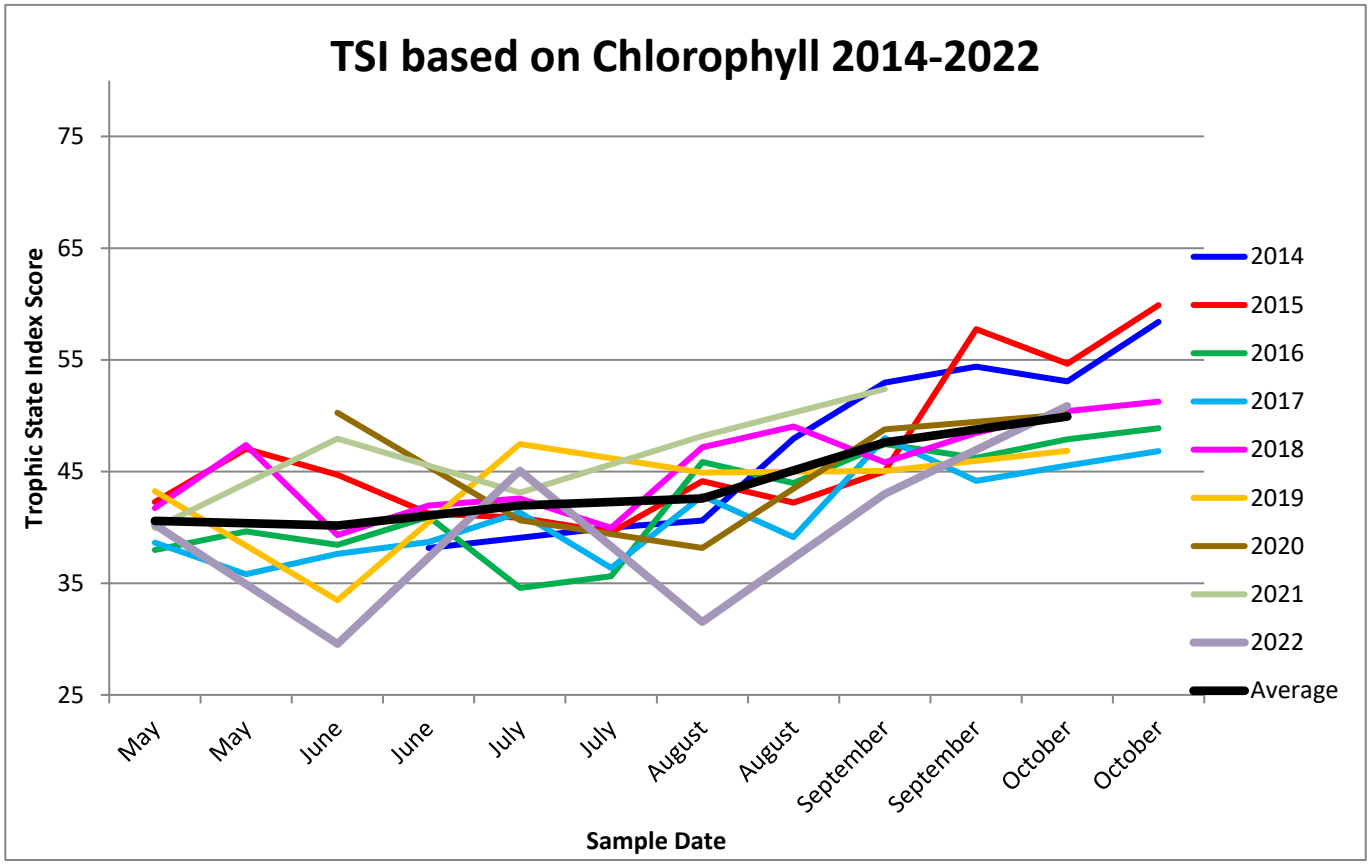

Figure 9: TSI score based on chlorophyll-a abundance. Chlorophyll-a is considered the most accurate representation of TSI during the summer as noted by Carlson, the developer of TSI value system. For 2022, TSI ranged from 40.2-49.9 which is mesotrophic, but close to being eutrophic.

TSI Table (Carlson, 1977)		
TSI Value	**Attributes**	**Water Supply**
<30	Oligotrophy: Clear water, oxygen throughout the year in the hypolimnion.	Water may be suitable for an unfiltered water supply.
30-40	Hypolimnia of shallower lakes may become anoxic.	
40-50	Mesotrophy: Water moderately clear; increasing probability of hypolimnetic anoxia during summer.	Iron, manganese, taste, and odor problems worsen. Raw water turbidity requires filtration.
50-60	Eutrophy: Anoxic hypolimnia, macrophyte problems possible.	
60-70	Blue-green algae dominate, algal scums and macrophyte problems.	Episodes of severe taste and odor problem.
70-80	Hypereutrophy: (light limited productivity). Dense algae and macrophytes.	
>80	Algal scums, few macrophytes.	