

North Lake Monitoring Report 2024

North Lake Management District

Prepared by Kristyn Armitage

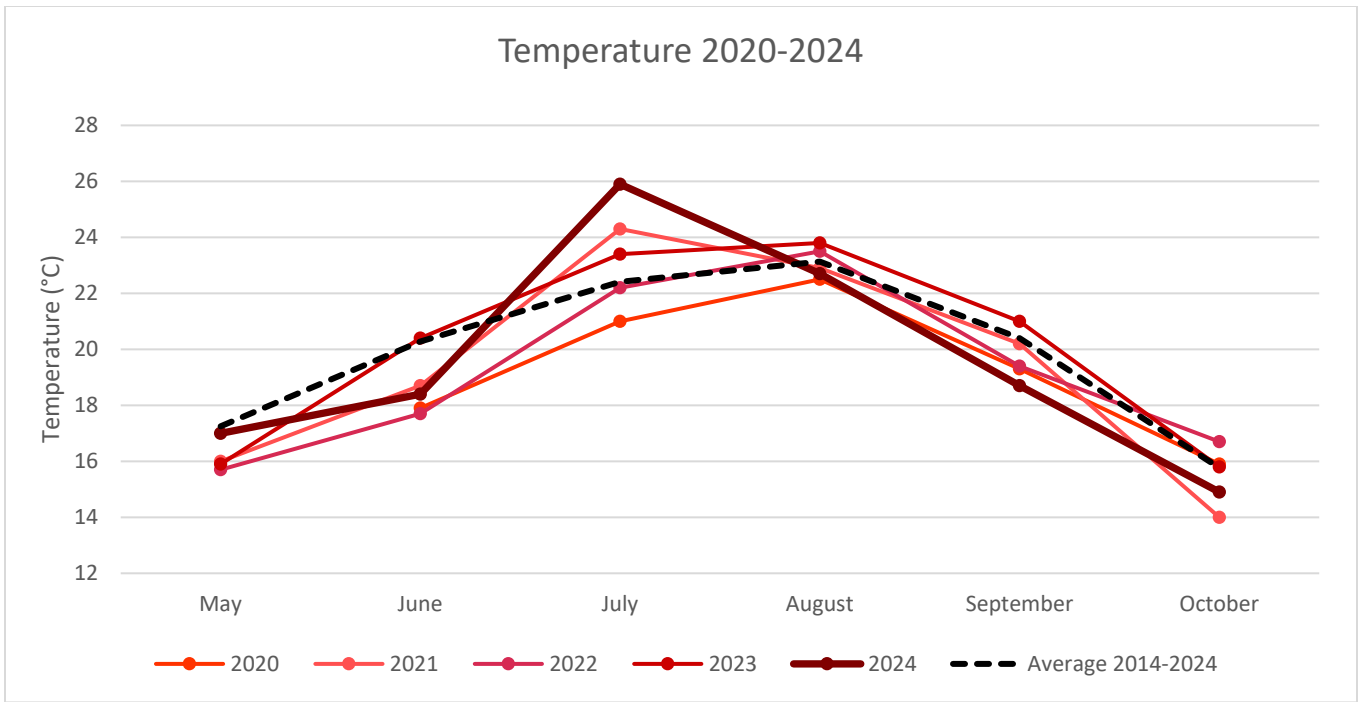


Figure 1: Temperature measurements 2020 to 2024. Temperatures for each month remained fairly stable compared to the 10-year average. July 2024 had a higher temperature than average due to higher ambient temperatures ranging from 23.3-37.7 °C for 24 days consecutively. The temperature criteria for rainbow trout is 18 °C and most summer months exceed that criteria. For this particular graph, the temperatures are surface temperatures and are not representative of aquatic fish habitat for North Lake.

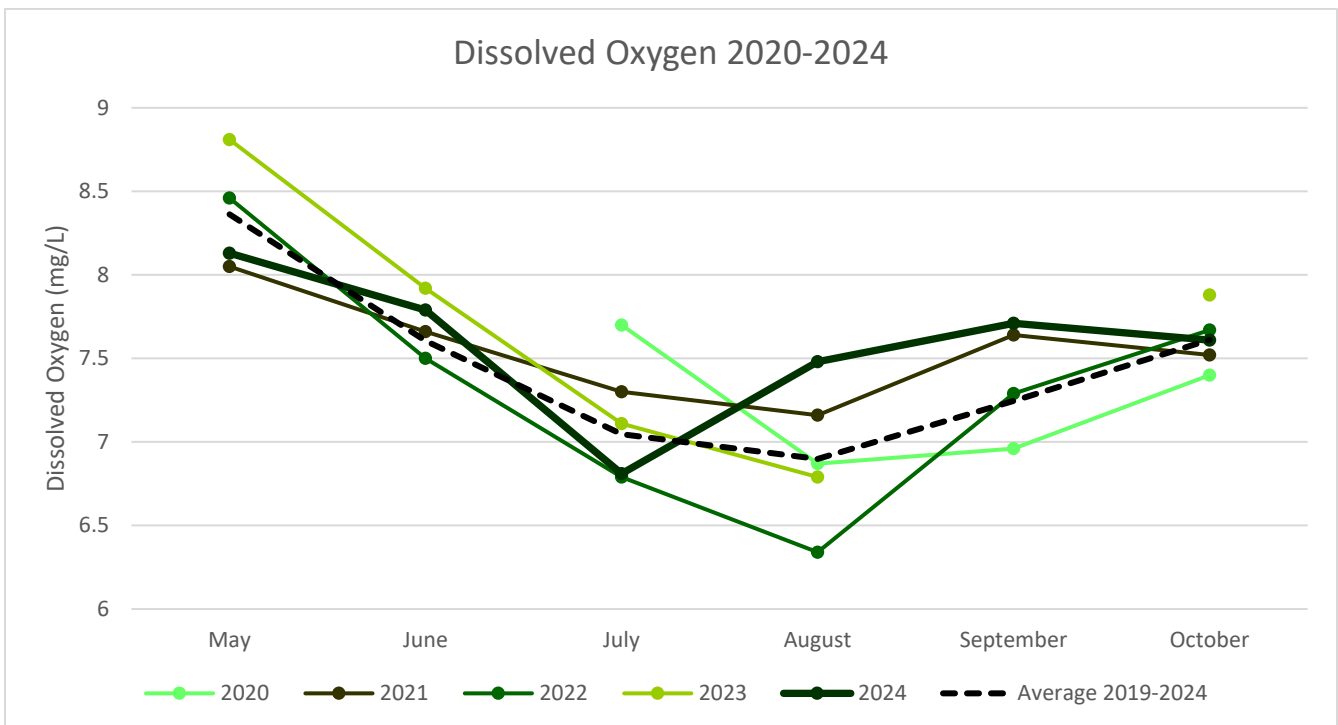


Figure 2: Dissolved oxygen concentrations 2020-2024. Dissolved oxygen levels were mostly above the 10-year average for 2024. Concentration dropped during the month of July due to higher than normal ambient temperatures. The dissolved oxygen criteria for Redband trout which is a subspecies of rainbow trout in lakes is 8 mg/L. Even though concentrations for 2024 were above the average, they remained under the criteria for most of the sampling period.

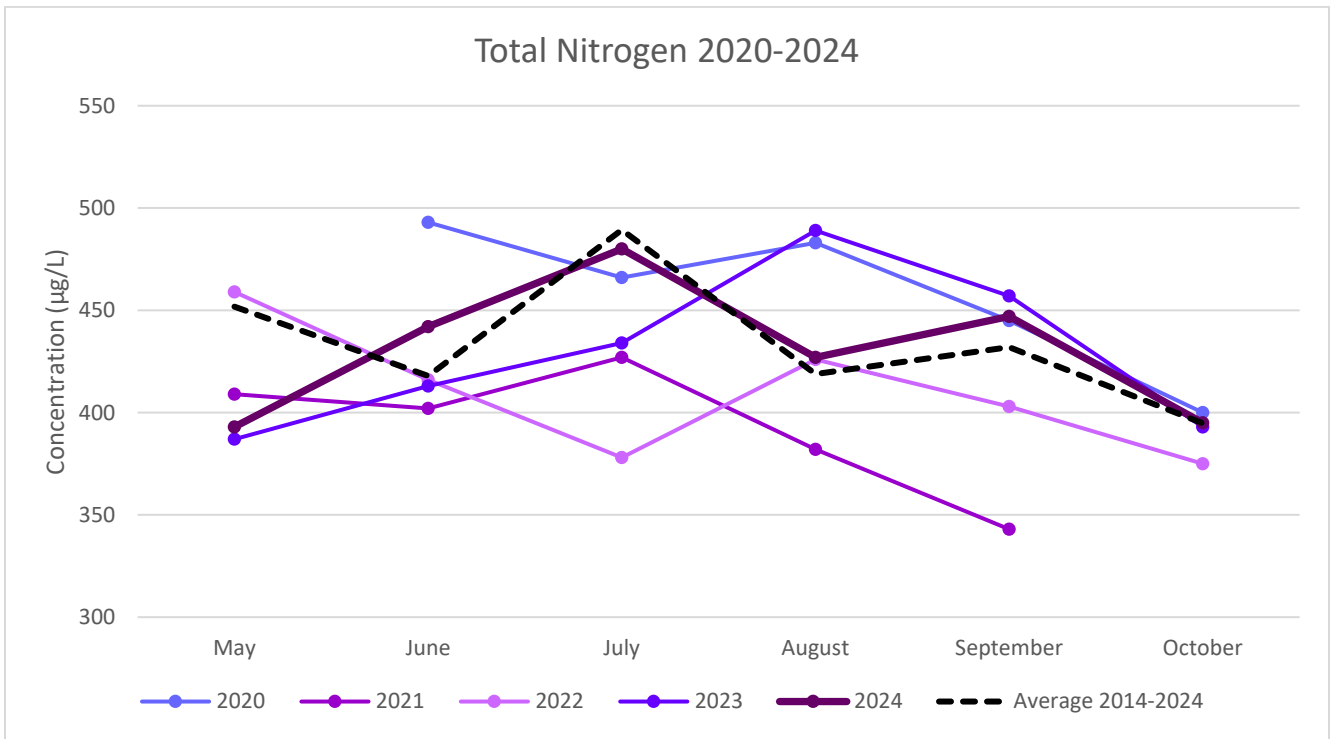


Figure 3: Total Nitrogen Concentrations 2020-2024. Total nitrogen levels for 2024 was slightly higher than the 10-year average. Currently, there is no criteria for total nitrogen in WA. Generally, the lower the concentrations the better. An extreme outlier from 2017 was removed from the 10-year average as it caused the average for the month of September to be not representative.

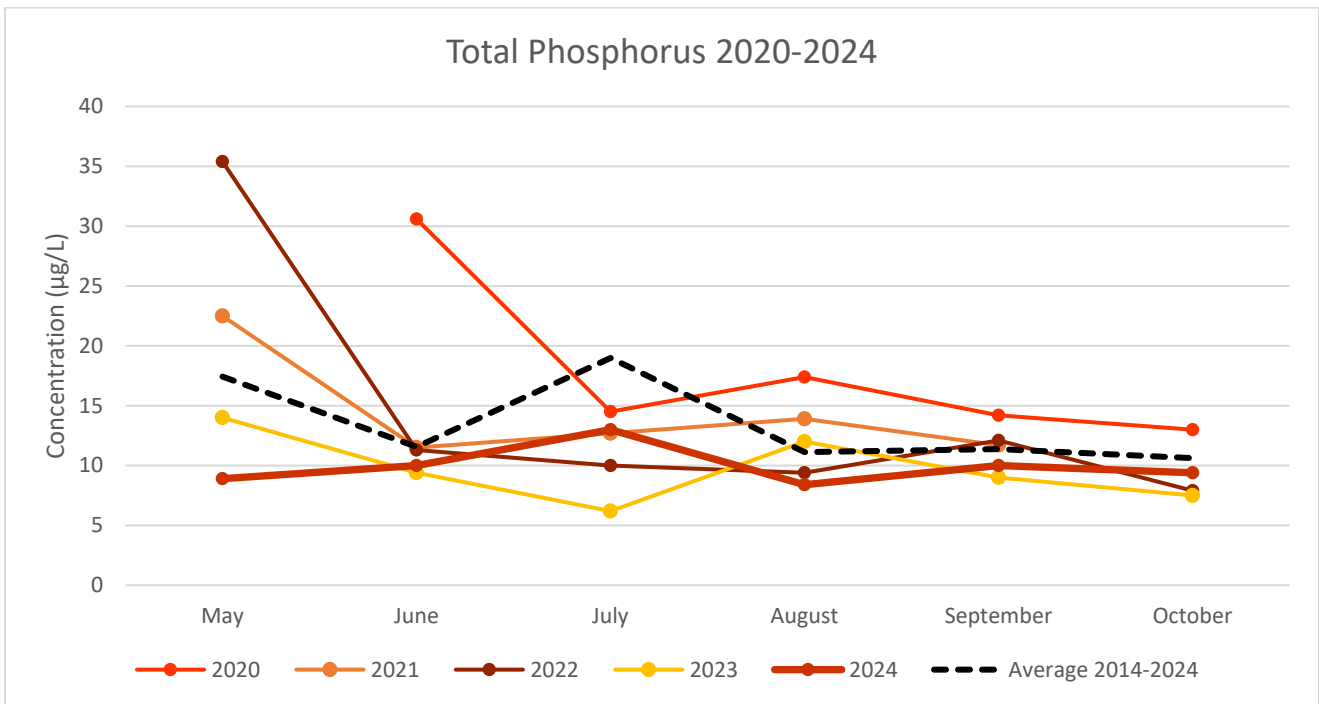


Figure 4: Total Phosphorus concentrations 2020-2024. North Lake is within the Puget Lowlands ecoregion and it is recommended to start a study if concentrations are greater than 20 µg/L. The 10-year average is below that threshold and no samples from 2024 were above 20 µg/L. With the exception of 3 sampling events from previous years, concentrations are relatively low. An extreme outlier from September 2017 was removed from the 10-year average to get a more accurate representation.

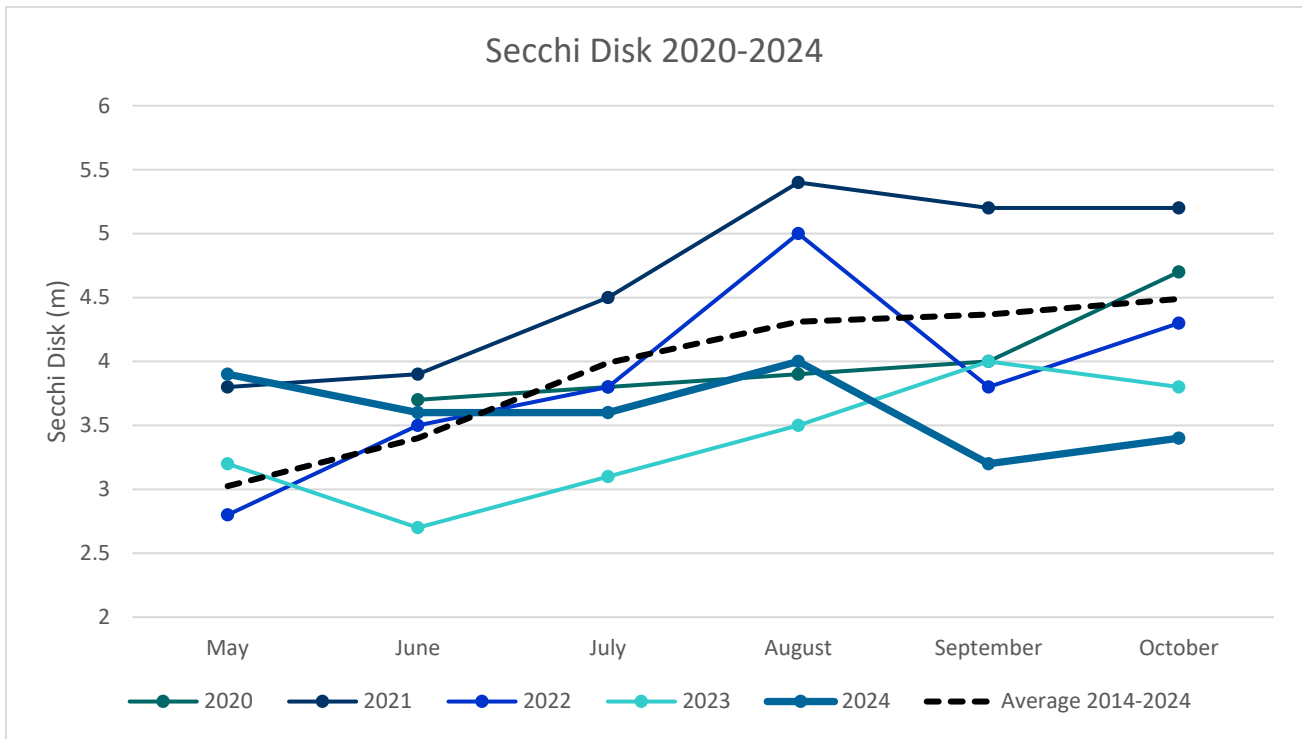


Figure 5: Secchi Disk 2020-2024. The clarity of North Lake was less in 2024 compared to the 10-year average and most of the other years shown above. Clarity generally increases at the end of the summer and or fall.

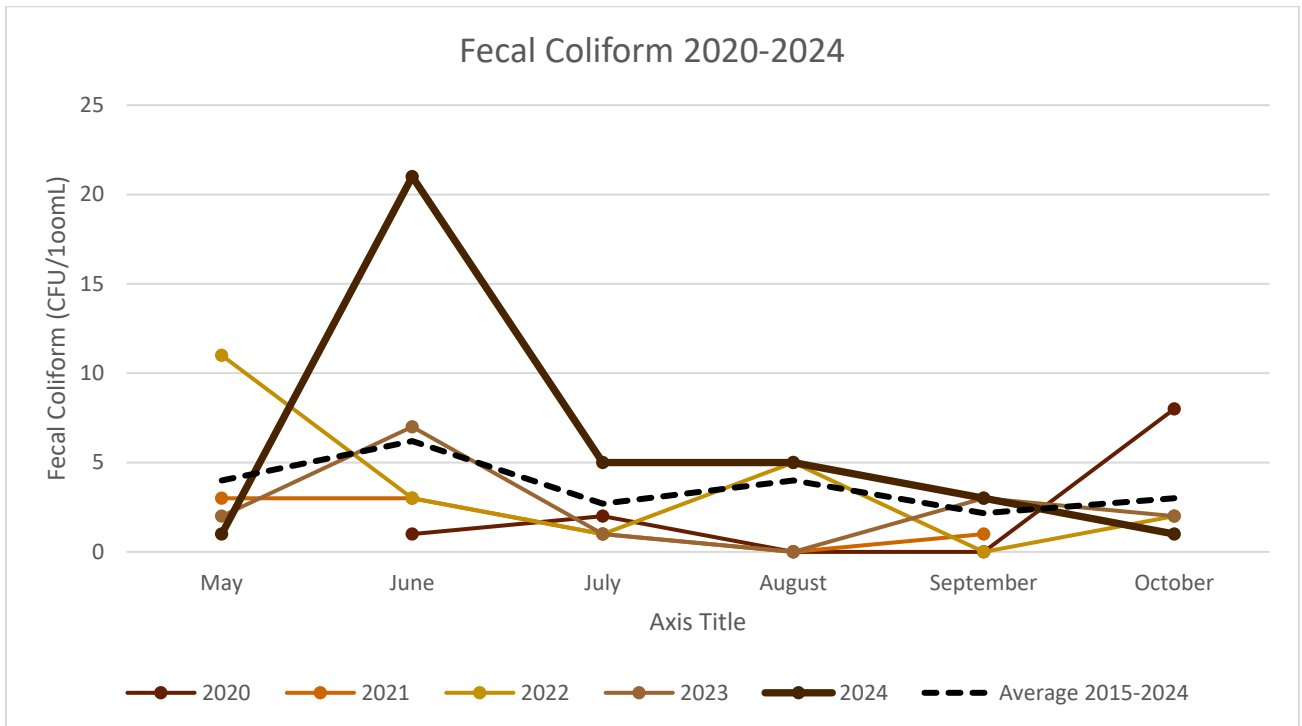


Figure 6: Fecal Coliform 2020-2024. Measurements for 2024 were higher than the 9-year average and previous years. In June of 2024, the fecal coliform was 21 CFU/100mL. Criteria for fecal coliform is 100 CFU/100mL and all years were well below that threshold. The criterion for fecal coliform criteria expired on 12/31/2020 and replaced with E. coli.

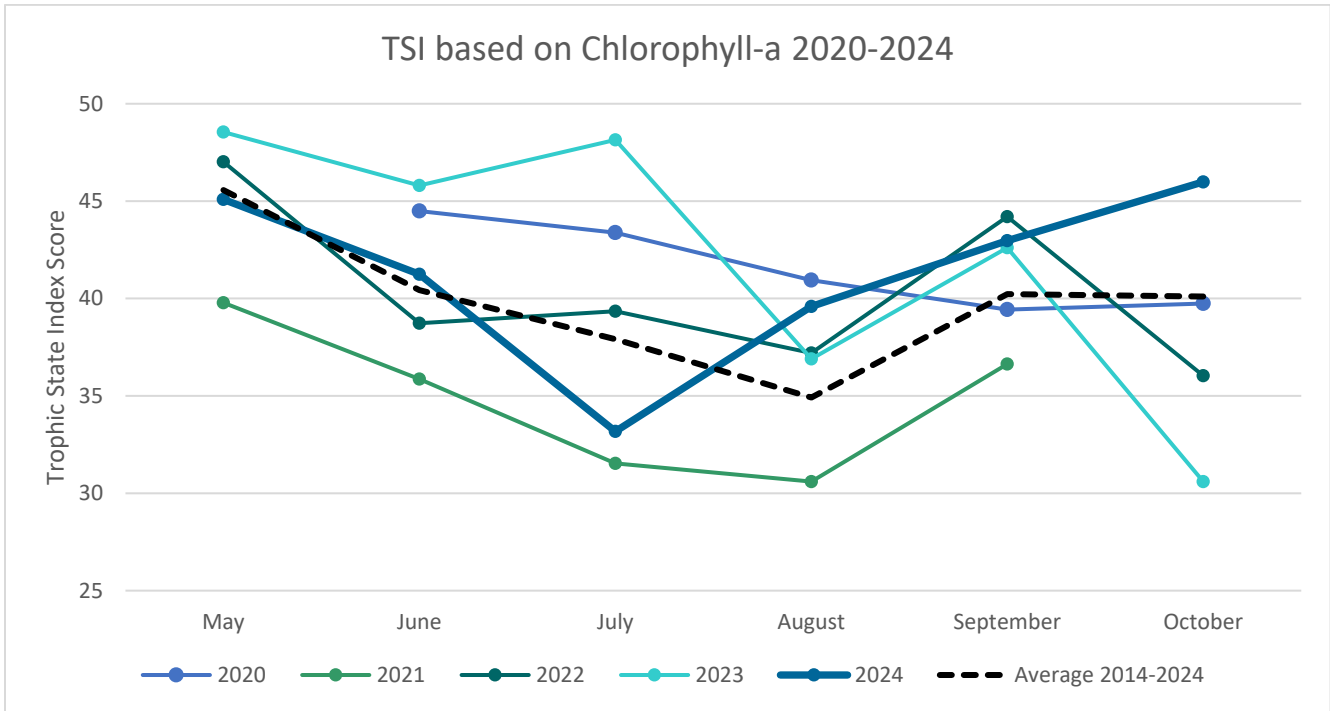


Figure 7: TSI based on Chlorophyll-a 2020-2024. Chlorophyll-a is the most accurate representation of TSI score for the summer as noted by Carlson the developer of TSI value system. The 10-year average score ranged from 34-45 which is considered between oligotrophic and mesotrophic.

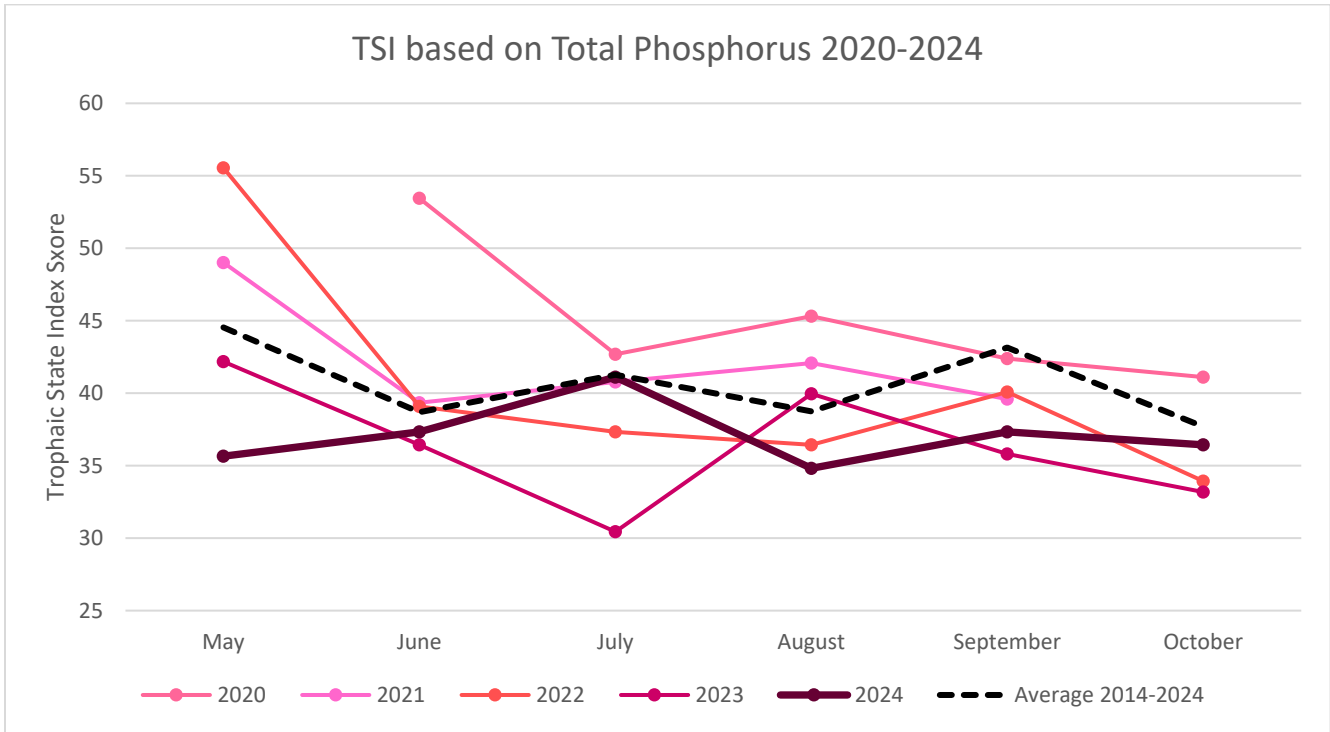


Figure 8: TSI based on total phosphorus concentration 2020-2024. Scores for 2024 ranged from 35-41 which is considered between oligotrophic and mesotrophic. This would indicate moderate clarity and biological productivity.

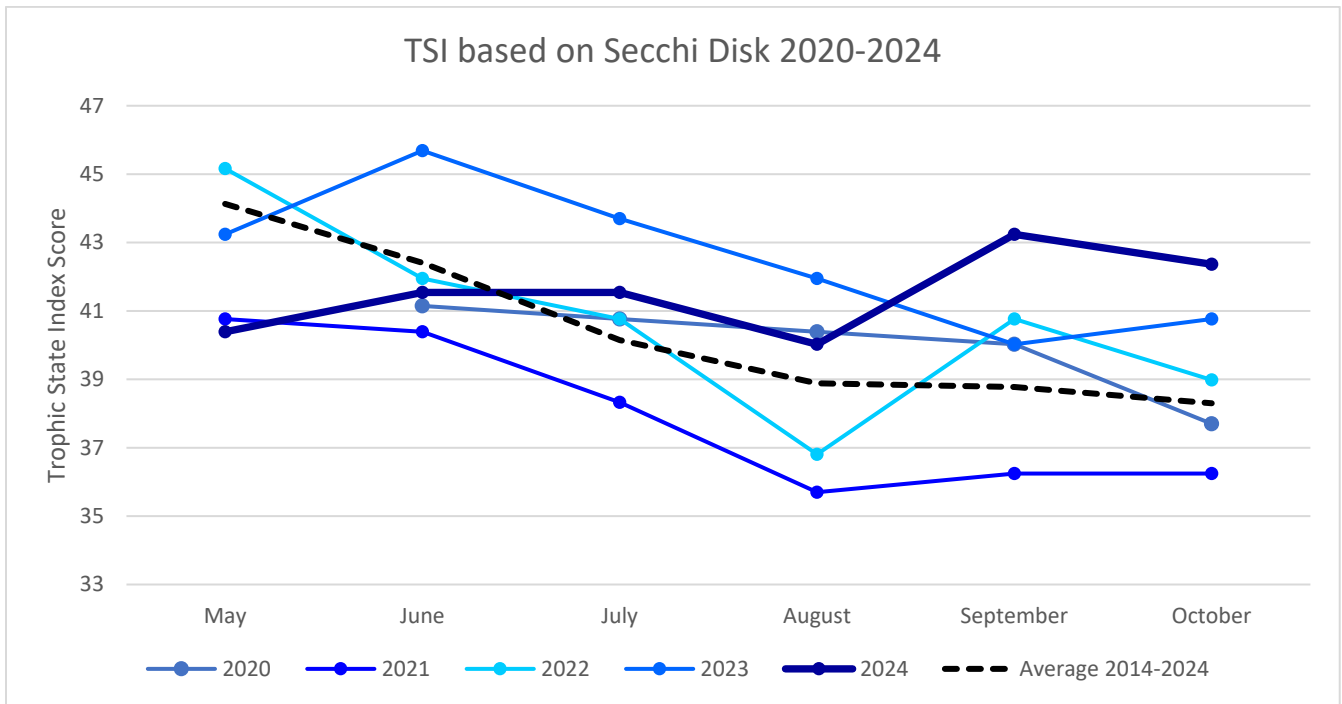


Figure 9: TSI based on Secchi Disk 2020-2024. Scores from 2024 ranged from 40-43 which is mesotrophic and it indicates that the lake is moderately clear. Scores for 2024 were higher compared to the 10-year average that ranged from 38-44.

TSI Table (Carlson, 1977)			
TSI Value	Attributes	Water Supply	Add fishing
<30	Oligotrophy: Clear water, oxygen throughout the year in the hypolimnion.	Water may be suitable for an unfiltered water supply.	Salmonid fisheries dominate.
30-40	Hypolimnia of shallower lakes may become anoxic.		Salmonid fisheries in deep lakes only.
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.	Hypolimnetic anoxia results in loss of salmonids. Walleye may predominate
50-60	Eutrophy: Anoxic hypolimnia, macrophyte problems possible.		Warm-water fisheries only. Bass may dominate.
60-70	Blue-green algae dominate, algal scums and macrophyte problems.	Episodes of severe taste and odor problem.	Nuisance macrophytes, algal scum and transparency may discourage swimming and boating.
70-80	Hypereutrophy: (light limited productivity). Dense algae and macrophytes.		
>80	Algal scums, few macrophytes.		Rough fish dominate; summer fish kills possible.

Figure 10: Trophic State Index Table developed and authored by Carlson, 1977.

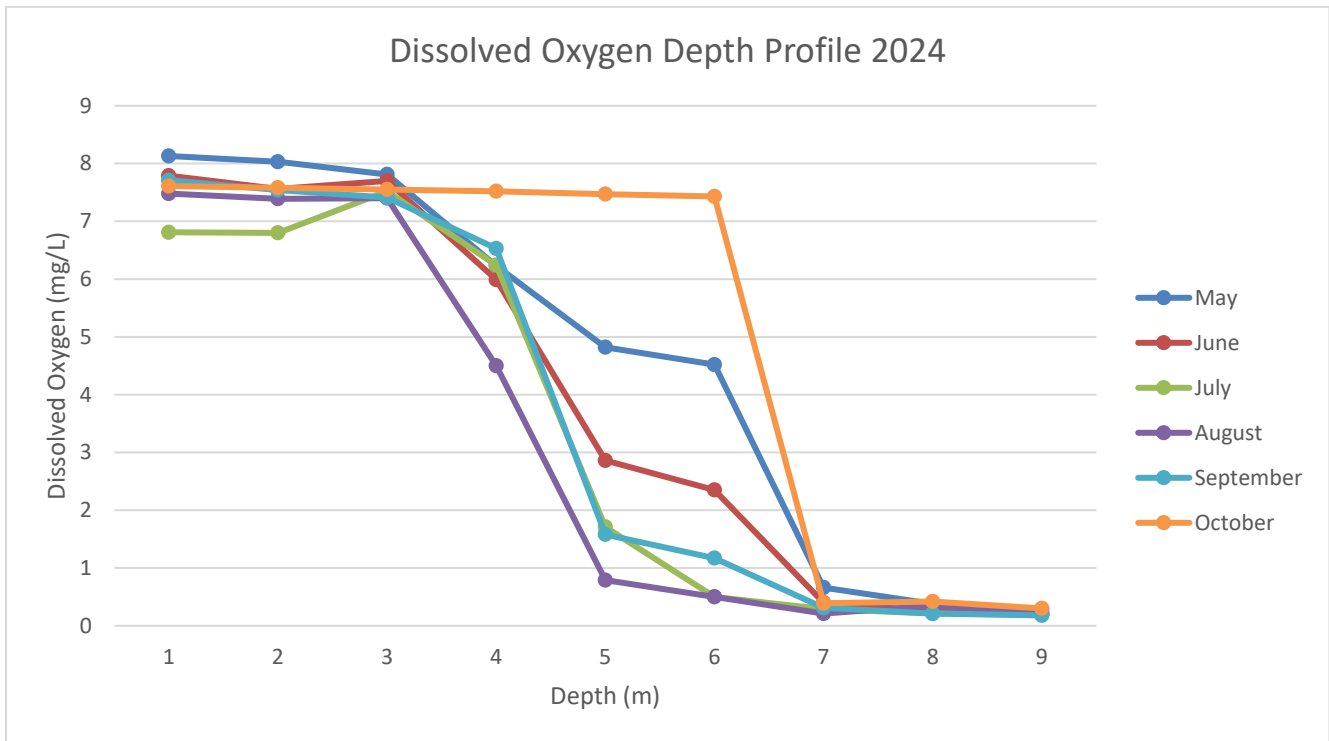


Figure 11: North Lake Dissolved Oxygen Depth Profile 2024. The dissolved oxygen concentration starts to drop between 3-4 meters. The criteria of dissolved oxygen for Redband trout, a subspecies of rainbow trout in lakes is 8 mg/L. Except for the first couple meters in May, dissolved oxygen concentrations were below the criteria overall.

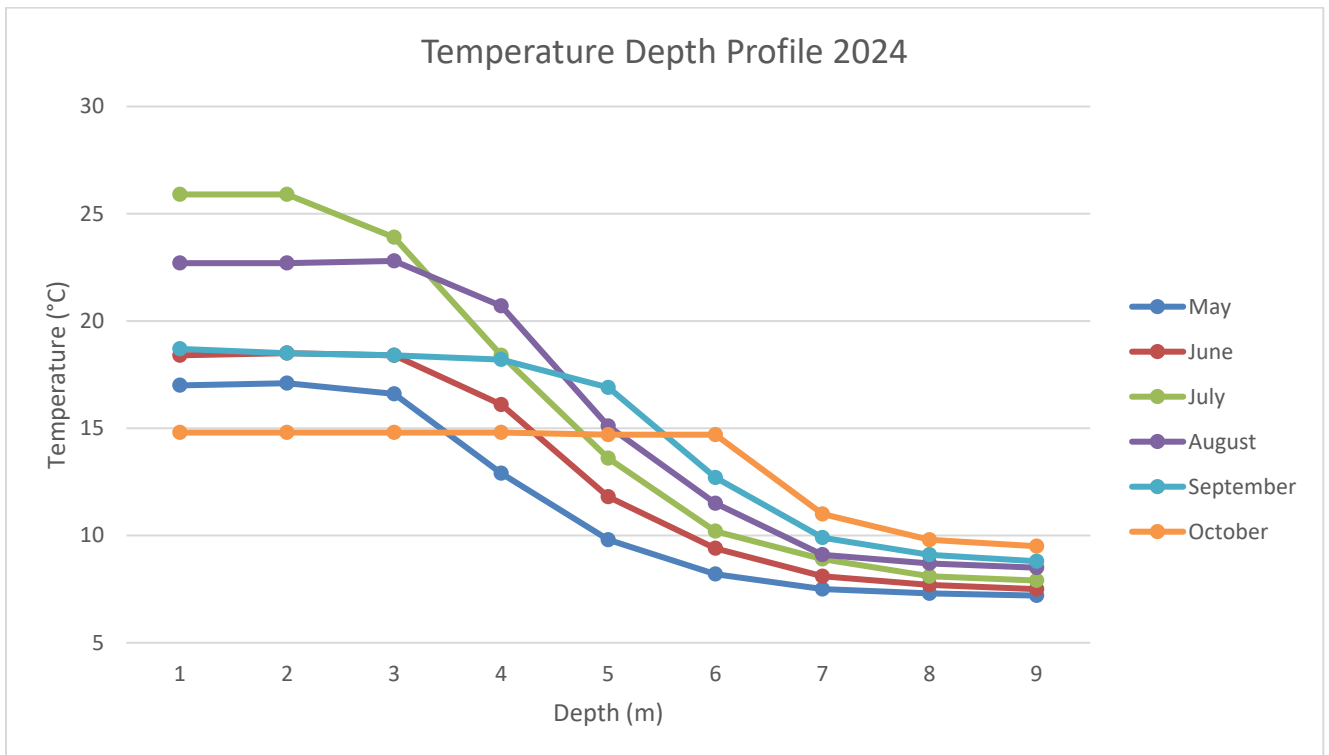


Figure 12: North Lake Temperature Depth Profile 2024. Temperatures start to decline around 4 meters. The temperature criteria for rainbow trout in lakes is 18 °C. The summer months are slightly above the criteria for the first few meters and steadily declines with increasing depth.