

Northeast Aquatic Research



Twin Lakes 2025 Water Quality Report



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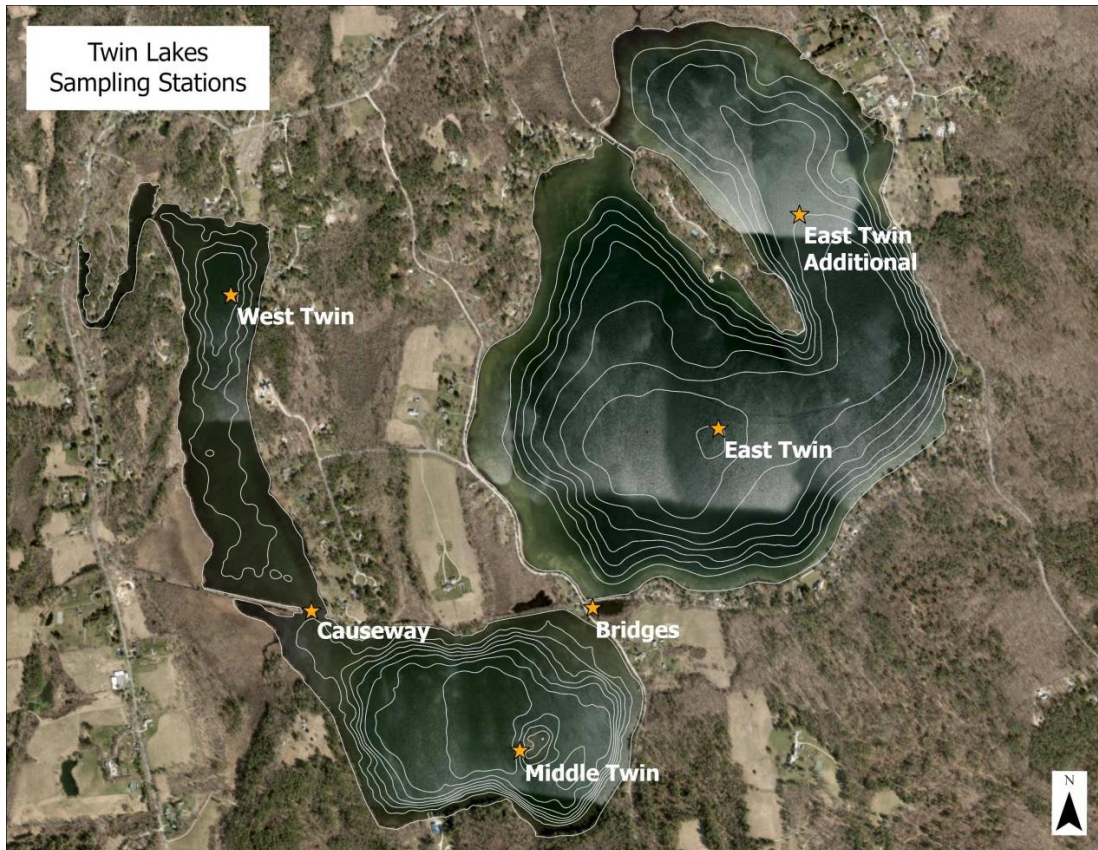
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Introduction

Northeast Aquatic Research (NEAR) conducted water quality monitoring at Twin Lakes once per month from March through November 2025. Monitoring was conducted at the location of deepest water in each of the three lakes (**Map 1**). Deepest water found so far in East Twin was 78 feet (23.8m), with 21 feet (6.4m) in Middle Twin and 11 feet (3.4m) in West Twin. Additionally, water clarity and dissolved oxygen profiles were recorded at a second location in East Twin Lake, in the East Bay (labeled East Twin Additional in **Map 1**).

At each of the three primary monitoring stations on each sampling date, water clarity, weather data, and dissolved oxygen, temperature, and conductivity profiles were recorded. Additionally, water samples were collected from the top, middle, and bottom of the water column at each site for analysis of total phosphorus and total nitrogen concentration. The East Twin Lake bottom water samples were also analyzed for ammonia. Water samples were also collected from the causeway between West and Middle Twin and at the bridges between Middle and East Twin for analysis of total phosphorus and total nitrogen.

Map 1. Twin Lakes water quality monitoring stations. Contour interval is 10' for East Twin and 3' for Middle and West Twin.



2025 Twin Lakes Water Quality Results

Water Clarity

Water clarity in East Twin Lake remained good to excellent for the entire monitoring season, with Secchi disk depths ranging from 4.8 to 8.7m (**Figure 1**). The water clarity in 2025 was similar to 2023 and 2024. Water clarity in East Twin tends to begin the season, March, April and May, slightly less than or equal to 6 meters. Clarity improves during the season with best clarity in September or October, reaching or exceeding 8 meters. In each of the three years of monitoring, East Twin showed a decrease in clarity in July. This decrease was fairly pronounced in 2023, when clarity declined by 3.1m, and 2024 when clarity declined by 1.6m meters, but barely noticeable in 2025 when clarity declined by a few tenths of a meter. The three years show generally the same trend, with similar seasonal averages (2023=6.6m, 2024=7.0m, and 2025=6.5m).

The East Twin Additional Site had slightly better water clarity than East Twin Station 1, with a seasonal average of 7.3m. Clarity followed the same seasonal trend but was slightly better in July and November.

Middle Twin Lake water clarity was not as good as East Twin, ranging from a low of 3.1m to a high of 5.1m, with an average in 2025 of 4.0m. Average clarity in 2023 was 4.4m, and 4.6m in 2024. Clarity was above 4 meters on 4 dates, each setting a record for both the poorest readings, and the number of poor readings in a season. Middle Twin water clarity barely reached 5m only twice in 2025.

West Twin Lake clarity readings were also good, in that the Secchi disk was visible on the lake bottom on all sampling dates. The maximum depth of West Twin Lake ranges from 3-3.5m, so the Secchi disk should always be visible on the bottom of this lake.

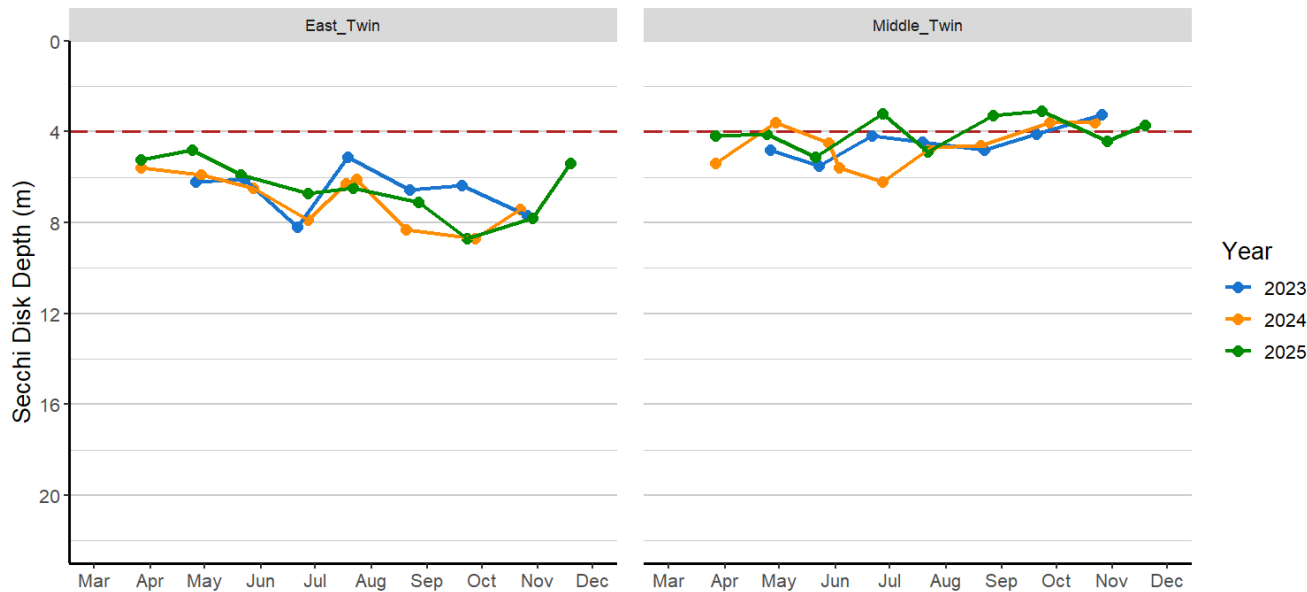


Figure 1. East Twin and Middle Twin Lake Secchi disk depths, 2023-2025.

Water Temperature and Dissolved Oxygen

East Twin Lake Water Temperature

The water temperature in East Twin in late March was a consistent 4.7°C from top to bottom (**Figure 2**). In April, the whole water column was still mixing, with lake warming occurring to the bottom where water warmed by at least 3°C since March, with upper waters having warmed by up to 8°C. After April, water below 14m stopped warming, increasing only a degree or two by October, forming a true Hypolimnion, where cold, dark water is isolated from the surface. Water above 14m gained heat at varying rates, with the very surface having highest water temperatures, with warmest water of 26.4°C in July. An upper mixed layer forms where the top several meters have equal warm water temperature and are saturated with dissolved oxygen from the atmosphere. Below this is a middle layer extending to 14m, where water temperature drops quickly with depth. The lake loses heat after July, causing the upper mixed layer to reach deeper into the lake, as shown by the RTRM values below.

Relative Thermal Resistance to Mixing (RTRM) is a unit-less number that describes the difference in water density between each meter of water. Mixing is defined as taking water from two adjacent meters, each with different temperatures, and blending them together to create a two-meter-thick layer of the same temperature. Higher RTRM numbers (longer bars) indicate stronger thermal resistance to this blending or stratification. RTRM values near zero indicate no resistance to mixing, values between 5 and 30 indicate weak resistance to mixing, values between 30 and 60 indicate strong resistance to mixing, and values above 60 indicate very strong resistance to mixing.

In March, RTRM values were 0 at all depths, indicating complete mixing from top to bottom. In April, the top few meters had RTRM values of 12-15, indicating weak resistance to mixing, and all lower depths had no resistance, meaning the water column was still fully mixed, though not for much longer. The lake was strongly stratified in May with an upper mixed layer down to 6m (**Figure 3**). From June through September, there was very strong resistance to mixing. In August, the strongest RTRM of the season (122) was present between 7 and 8 meters. Weak resistance to mixing was present in October and the lake had returned to a fully mixed state by November.

The water above the stratification is the Epilimnion, where the water temperature is close to isothermal. This part of the lake is generally where phytoplankton are found. This layer has turbulent mixing from surface wind, allowing for suspension of plankton. Plankton, except for cyanobacteria, that sink through the stratification die.

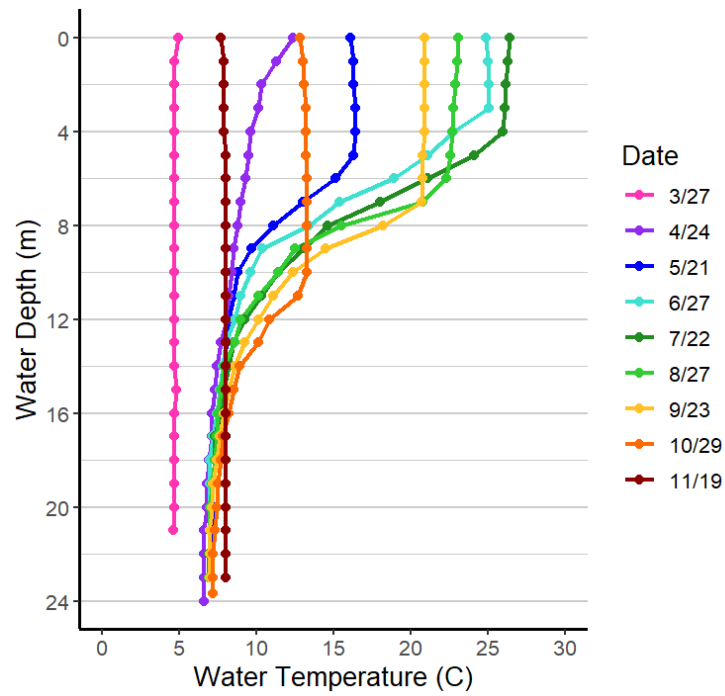


Figure 2. Water temperature profiles in East Twin Lake in 2025.

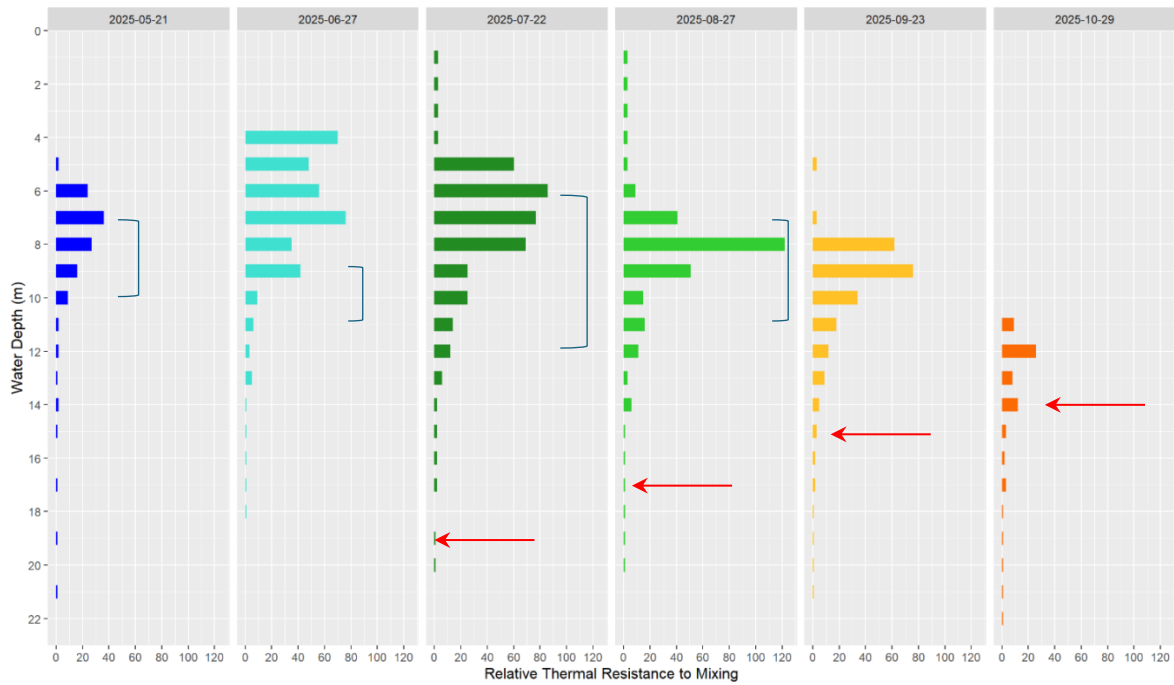


Figure 3. RTRM values in East Twin Lake during 2025.

East Twin Lake Dissolved Oxygen

In conjunction with the fully mixed state of the lake in March, the water column was fully oxygenated on this sampling date, with ~12mg/L of DO from top to bottom (**Figure 4**).

The bottom water became anoxic (DO less than 1mg/L) in June, with the anoxic boundary rising steadily until reaching a maximum height of 13.8m, as measured down from the surface, in October. This means the bottom 10 meters of water were devoid of dissolved oxygen on that date. Based on the slope of the ascent of the boundary in **Figure 5**, the oxygen deficit rate appears to be low. From June through October, the anoxic boundary was slightly higher in the water column compared to the prior two years (**Figure 5**). Anoxic water likely covered a maximum of about 190 acres in October. During the October sampling, NEAR staff noted a strong hydrogen sulfide smell in the bottom water. In anoxic conditions, microbes switch from oxygen respiration to reducing nitrate and iron. After these are used up, bacteria begin reducing sulfate. This sulfate reduction produces hydrogen sulfide, thus the smell. The water column mixed quickly after this October sampling, and the water column was consistently oxygenated from top to bottom in November.

A strong MOMax (Metalimnetic Oxygen Maximum) was present between 6 and 12 meters from May through September. This occurs when dissolved oxygen is super saturated, often caused by phytoplankton at this depth producing oxygen. The MOMax was strongest in July.

Dissolved oxygen profiles were collected from the eastern portion of East Twin Lake (inside the herbicide treatment area) from June through September (**Figure 6**). This sampling station was 14m deep. Here, a MOMax was present between 7 and 9 meters, and DO was reduced in the bottom water but anoxia was not recorded.

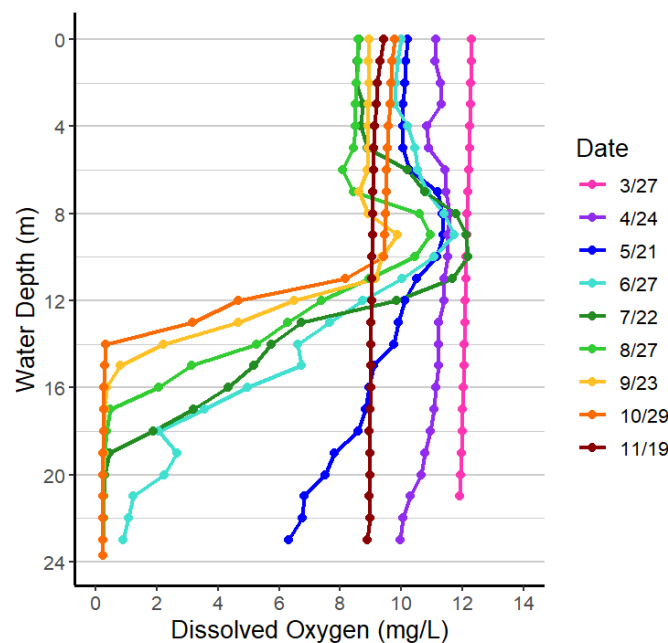


Figure 4. Dissolved oxygen concentrations in East Twin Lake Station 1, during 2025.

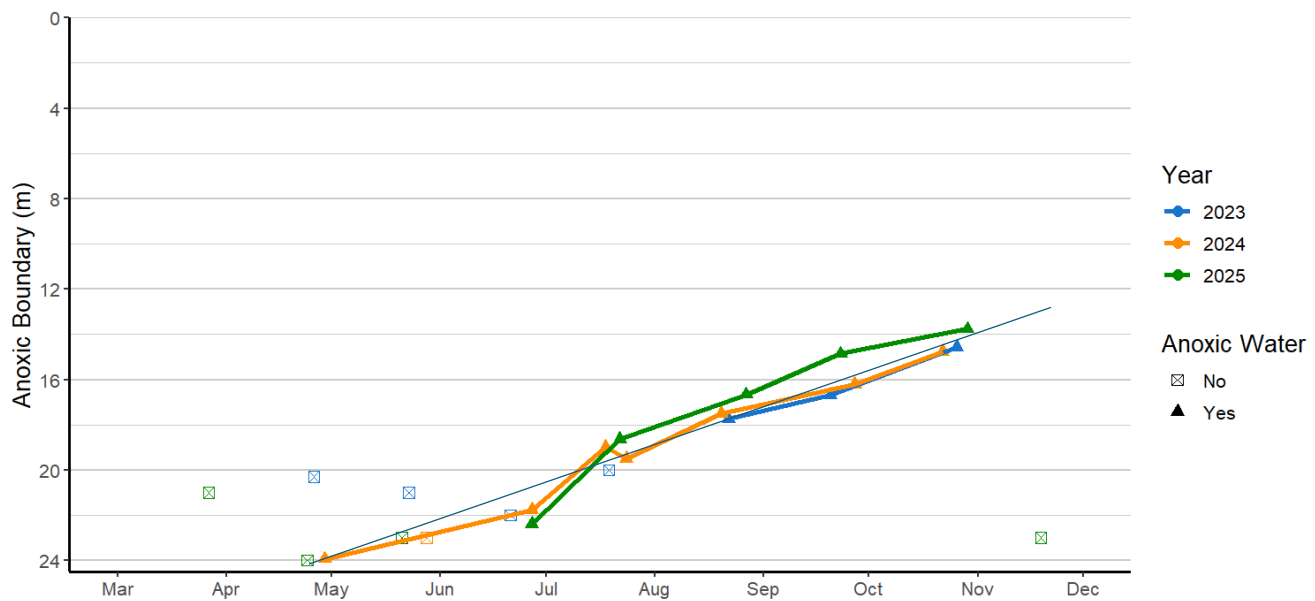


Figure 5. East Twin Lake anoxic boundary depths, 2023-2025.

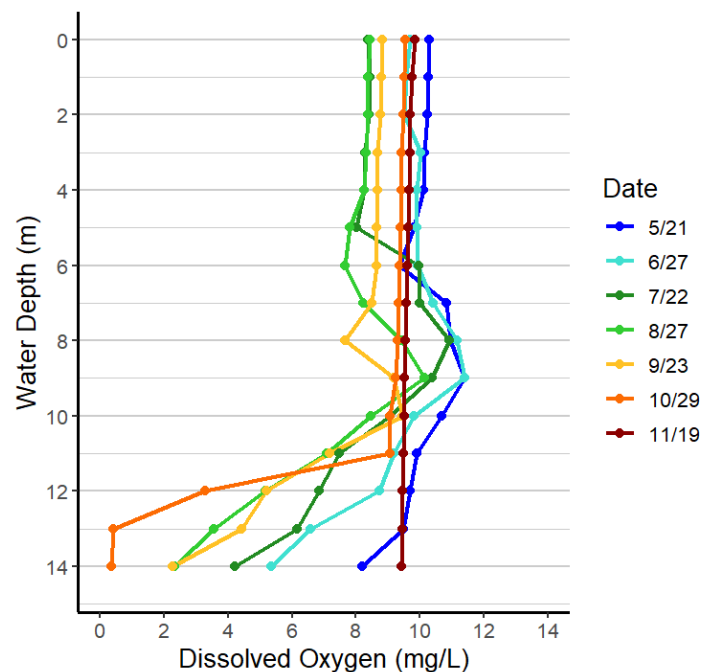


Figure 6. Dissolved oxygen concentrations in the East Twin Lake treatment area.

Middle Twin Lake Temperature and Dissolved Oxygen

Middle Twin Lake was well mixed for most of the 2025 season, with nearly consistent temperatures along the water column (**Figure 7**). There was some weak resistance to mixing in the bottom water in May, and strong to very strong resistance to mixing in the bottom water in June and July (**Figure 8**). Only water below 5m showed decreases in water temperature in May through September. The lake was isothermal in March and April and again in October and November.

Anoxic water was present in Middle Twin Lake in June, July, and August, but anoxia remained near the bottom (Figure 9). The anoxic boundary reached a maximum height of 5.1m in July, meaning the bottom 1 meter of water was anoxic, with the area of the anoxia covering ~50 acres. The duration and extent of anoxia in 2025 was similar to that observed in 2023. In 2024 however, no anoxic water was observed in Middle Twin. Ideally, the bottom water in Middle Twin should remain oxygenated throughout the season.

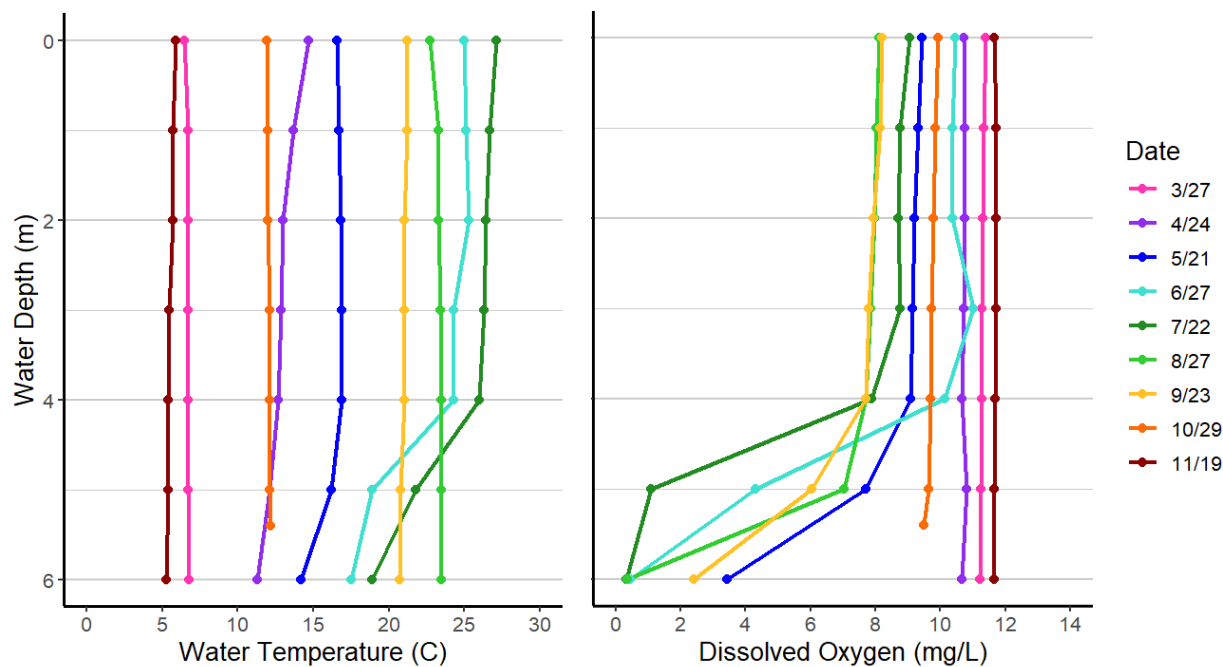


Figure 7. Dissolved oxygen and water temperature profiles in Middle Twin Lake in 2024.

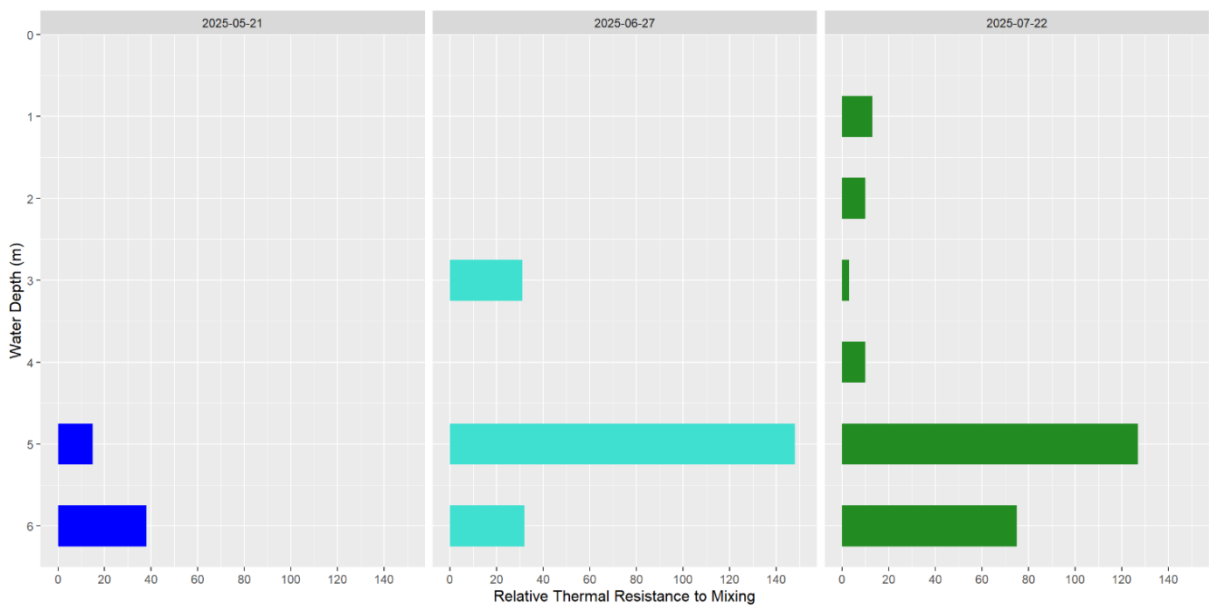


Figure 8. RTRM values in Middle Twin Lake during 2025.

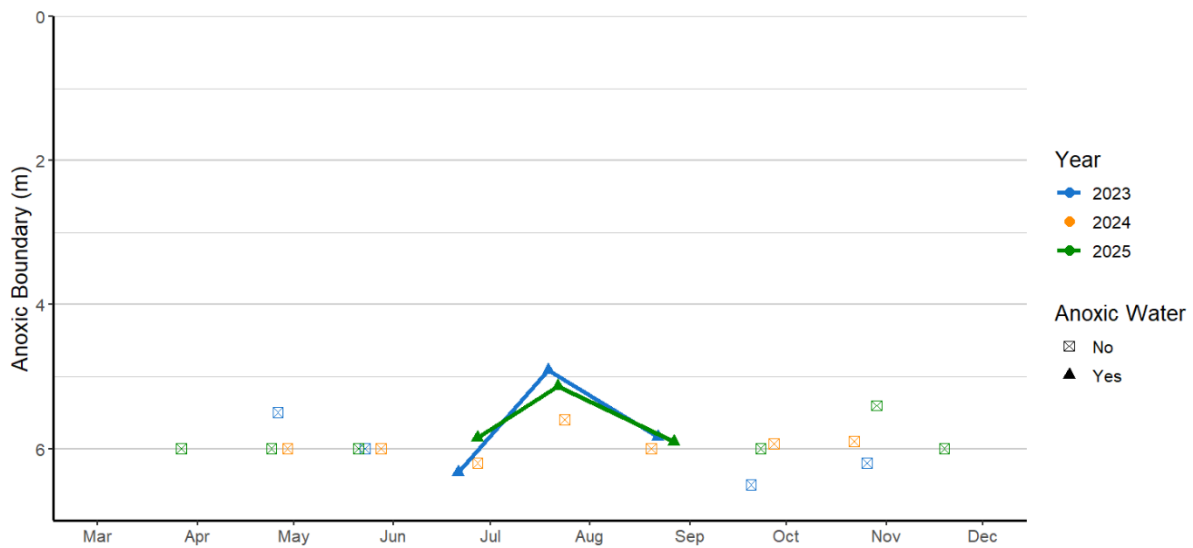


Figure 9. Middle Twin Lake anoxic boundary depths, 2023-2025.

West Twin Lake Water Temperature and Dissolved Oxygen

West Twin Lake remained well mixed for the entire sampling season, with nearly consistent temperature values throughout the water column (**Figure 10**). The water also remained well oxygenated, with just a slight decrease in DO in the bottom water in June. NEAR has not recorded anoxic water in West Twin Lake over the three years of monitoring.

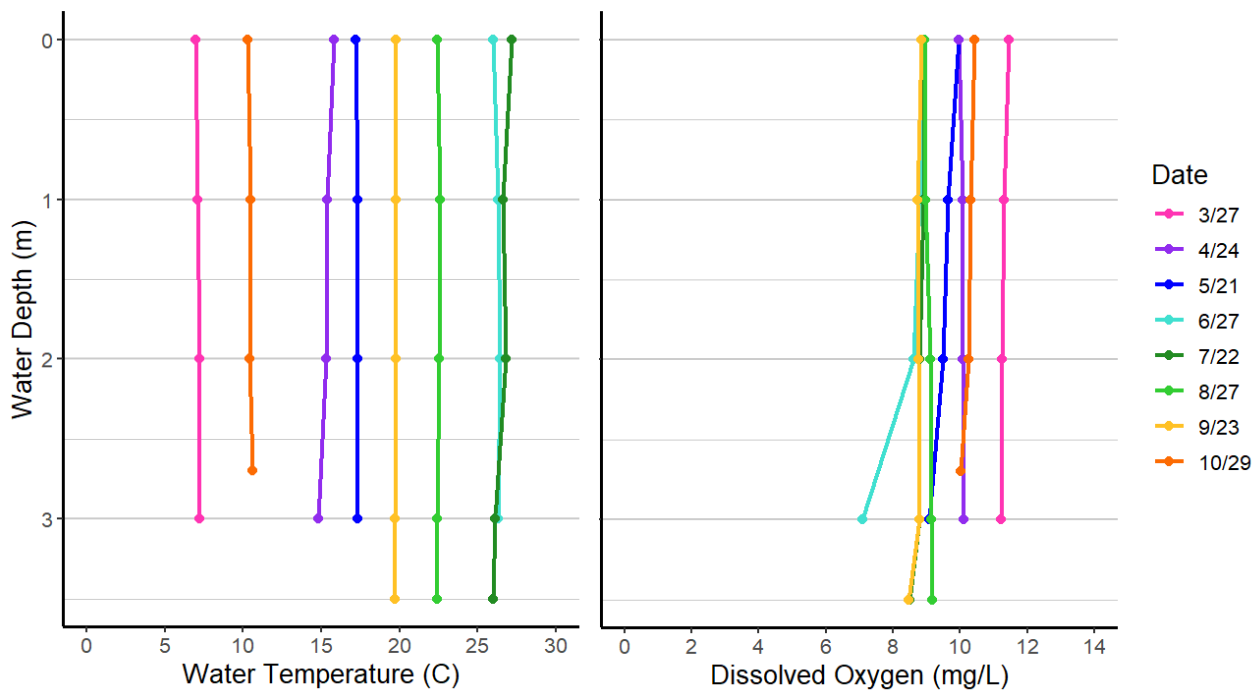


Figure 10. Dissolved oxygen and water temperature profiles in West Twin Lake in 2024.

Conductivity

Conductivity measures the quantity of dissolved ions in water that conduct electricity, increasing as dissolved salt content increases. Conductivity is usually governed by four cations: Calcium, Magnesium, Sodium, and Potassium, and three anions, Chloride, Carbonate, and Sulfate. These can be traced to either natural mineral sources from weathering of the landscape, human inputs from road salting and septic systems, or as released salts from anoxic bottom sediments.

The conductivity in East Twin is higher than most lakes in CT due to limestone in the surficial geology of the watershed. Canavan and Siver conducted a survey of 52 CT lakes between 1990 and 1993 for general limnological trophic status but included detailed a sample of mineral composition. They reported conductivity of East Twin Lake at $235\mu\text{S}/\text{cm}$, and nearby Wonoscopomuc with conductivity of $274\mu\text{S}$. NEAR has also found that Mudge Pond has conductivity $\sim 350\mu\text{S}$, and Indian Lake has a conductivity of $270\mu\text{S}$.

The conductivity of East Twin Lake ranged from $\sim 240\mu\text{S}/\text{cm}$ to $\sim 290\mu\text{S}/\text{cm}$ in upper waters, with elevated conductivity of $>300\mu\text{S}/\text{cm}$ in the bottom water in August and October (**Figure 11**). Surface water conductivity was lowest in East Twin, remaining around $250\mu\text{S}/\text{cm}$ during the sampling season (**Figure 12**). Middle and West Twin surface conductivity were very similar, both having vales that ranged from 250 to $300\mu\text{S}/\text{cm}$, with highest values occurring in the spring (**Figure 13**). Conductivity is higher in Middle and West Twin than in East Twin. This may partially be due to storm water from Salisbury School Campus draining to Middle Twin.

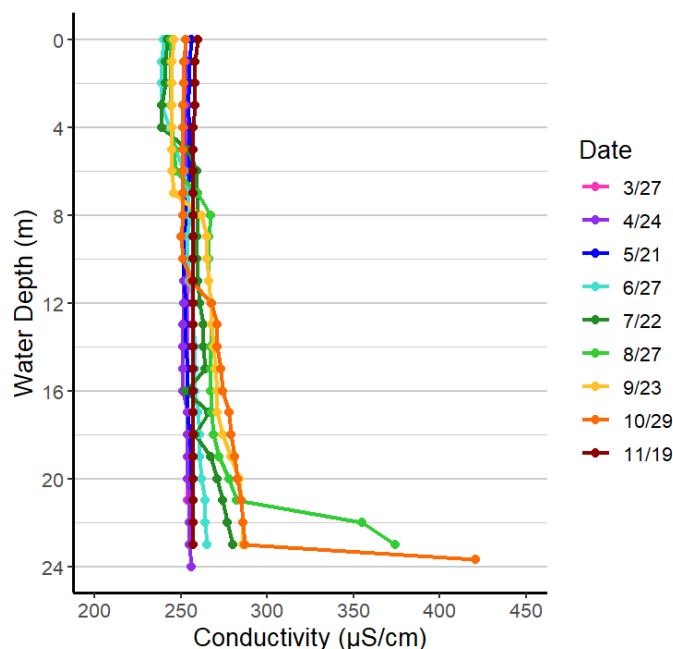


Figure 11. Conductivity profiles in East Twin Lake in 2025.

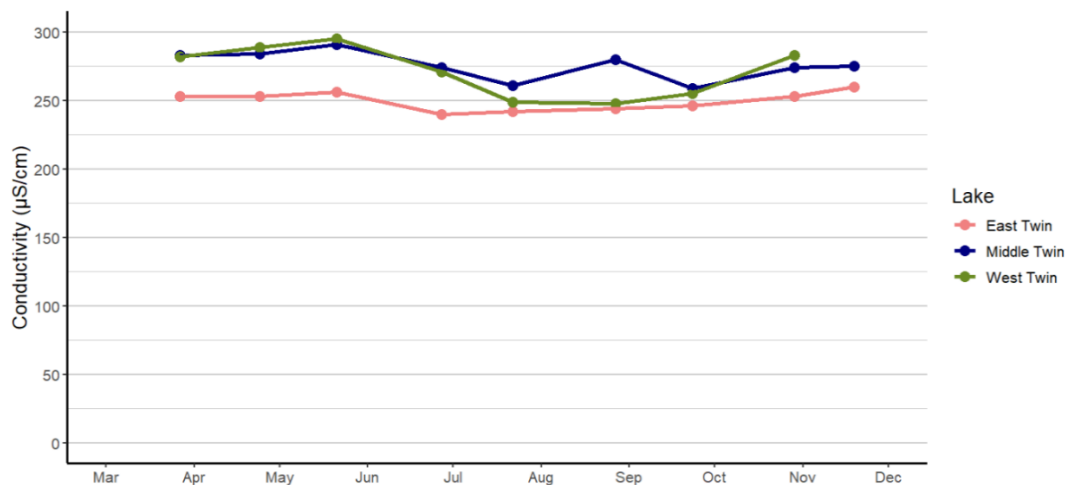


Figure 12. Conductivity at the surface of each lake in 2025.

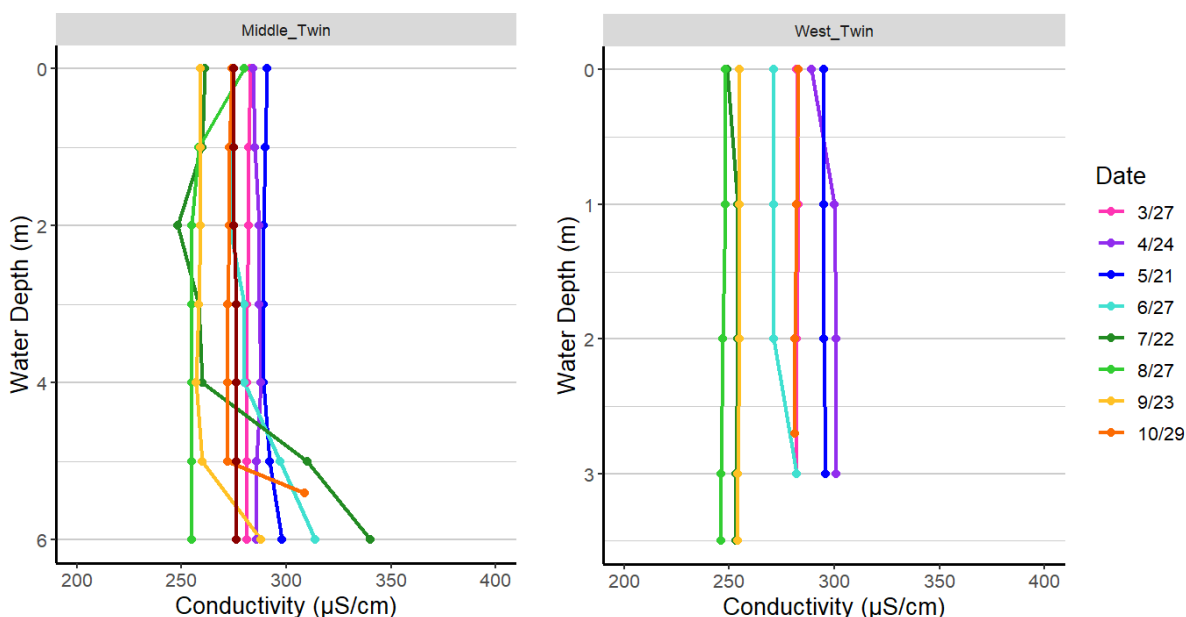


Figure 13. Conductivity profiles in Middle Twin Lake and West Twin Lake in 2025.

Nutrients

Total Phosphorus

East Twin

Surface water total phosphorus (TP) concentration in East Twin Lake was excellent, ≤ 10 ppb, for most of the season (**Table 1**). However, TP was much higher in March (~ 25 ppb), and modestly higher in May (12ppb) and October (13ppb) (**Figure 14**). Middle water concentrations were either similar to or slightly higher than the top water, ranging from 9ppb to 26ppb. Bottom water TP remained low through July but then increased to 90ppb in August and to ~ 140 ppb in September and October. This is consistent with the anoxic conditions in the bottom water during these months. TP was back to low levels in November. The increased TP in March appears to be in

upper waters only, without affecting bottom water, suggesting a watershed source. The water at 10m experienced a MOMax during June, July, and August, which could have been responsible for increased TP in middle water in those months. Bottom water TP increases don't appear to affect water at 10m and may not transfer much higher into the water column than 20m. All accumulated TP was gone by November. Maximum bottom water TP concentration was 140ppb, slightly higher than 2024 (125ppb), but not as high as 2023 (156ppb). However, these values are relatively low for internally released TP (**Figure 15**).

Table 1. East Twin Lake 2025 total phosphorus (ppb) concentrations.

	3/27	4/24	5/21	6/27	7/22	8/27	9/23	10/29	11/19
Top (1m)	25	8	12	9	6	10	9	13	10
Middle (10m)	23	9	13	14	16	15	10	26	10
Bottom (23m)	18	12	9	15	15	90	139	140	11

Middle Twin

TP concentration in Middle Twin was slightly higher than East Twin, with an average of 15ppb, as opposed to 11ppb in East Twin. Top and middle depth concentrations were similar throughout the season except for possibly September, when bottom water was slightly elevated (**Table 2**). Bottom TP averaged 20ppb, less than half the 50ppb found in East Twin.

Table 2. Middle Twin Lake 2025 total phosphorus concentrations.

	3/27	4/24	5/21	6/27	7/22	8/27	9/23	10/29	11/19
Top (1m)	11	11	14	11	8	18	16	19	20
Middle (3m)	15	12	12	16	12	18	23	15	11
Bottom (6m)	28	17	15	19	22	19	28	21	11

West Twin

TP in West Twin Lake was generally excellent, <10ppb, except for slightly elevated concentrations, >10, <20ppb in March, September, and November, and one higher value of 24ppb in May (**Table 3**).

Table 3. West Twin Lake 2025 total phosphorus concentrations.

	3/27	4/24	5/21	6/27	7/22	8/27	9/23	10/29	11/19
Middle (1.5m)	18	8	23	9	8	9	16	8	18

Between Lake Samples

Water flows from East Twin Lake to Middle Twin Lake via a small shallow channel approximately 230 feet long. The channel passes under two bridges, first an abandoned railroad bridge on the shore of East Twin Lake, and second a bridge for Between the Lakes Road on the shore of Middle Twin Lake. Between the two bridges, the stream is a 3-5ft wide channel of about 2-3ft deep. Water samples were collected at the midpoint between these two bridges "Bridges". About mid-way between the two bridges is a shallow connection to a 1 ac pond to the east. The pond is generally overwhelmed with emergent wetland plants and water lilies. The railroad bridge superstructure is composed of large square stone blocks that form a near perfect rectangular box-weir for measuring water flow. NEAR measured water flow on Sept 20, 2023 and estimated ~3cfs at that time, but is probably a good estimate of baseline flow because the water depth on that date, 33 inches, was a typical condition based on our experience passing under this bridge. We have experienced much higher water flow. NEAR expects to measure water flow during each of our 2026 lake visits.

Water flows from Middle Twin to West Twin across a shallow ridge formed by the base of the railroad bridge. The “Causeway” is approximately 250 feet wide by 1 foot deep, with slightly deeper water near the west side. Samples were collected close to the west side. The spillway from Middle Twin to West Twin has a cross-sectional area of ~250 square feet opposed to the 30sqft between East and Middle. This means that a similar TP concentration at both sites, say 8 ppb, under similar water flow of 0.1ft/sec, translates to 0.7kgTP/sec through the bridges and 5.7kgTP/sec across the causeway. This represents significant loading to Middle Twin Lake that is not coming from East Twin Lake.

The water quality at these sampling points should resemble the conditions found at the main lake stations in East and Middle Twin. TP concentrations at Bridges East should resemble the concentrations found at East Twin Lake Station 1, and concentrations at the Causeway should resemble those of the Middle Twin Lake station. This was true for East Twin and the Bridges, in that the differences were not significant on 5 of the 7 dates, on two dates, August and September, the concentration of Bridges water was significantly higher than East Twin Lake station 1. The differences in concentration between Middle Twin Lake and the Causeway were generally not significantly different from each other, although beginning in September, Middle Twin station had higher concentrations, becoming significantly higher in October and November. Differences between the Causeway and the West Twin station were often insignificant but on two dates significant difference did occur (**Table 4, Figure 16**).

Table 4. Lake 1m and between lakes (Bridges and Causeway) 2025 total phosphorus concentrations.

	27-Mar	24-Apr	21-May	27-Jun	22-Jul	27-Aug	23-Sep	29-Oct	19-Nov
East Twin 1m	25	8	12	9	6	10	9	13	10
Bridges		8		11	8	42	22	11	10
Middle 1m	11	11	14	11	8	18	16	19	20
Causeway		8	13	14	9	19	11	7	6
West Twin	18	8	8	23	9	8	9	16	8

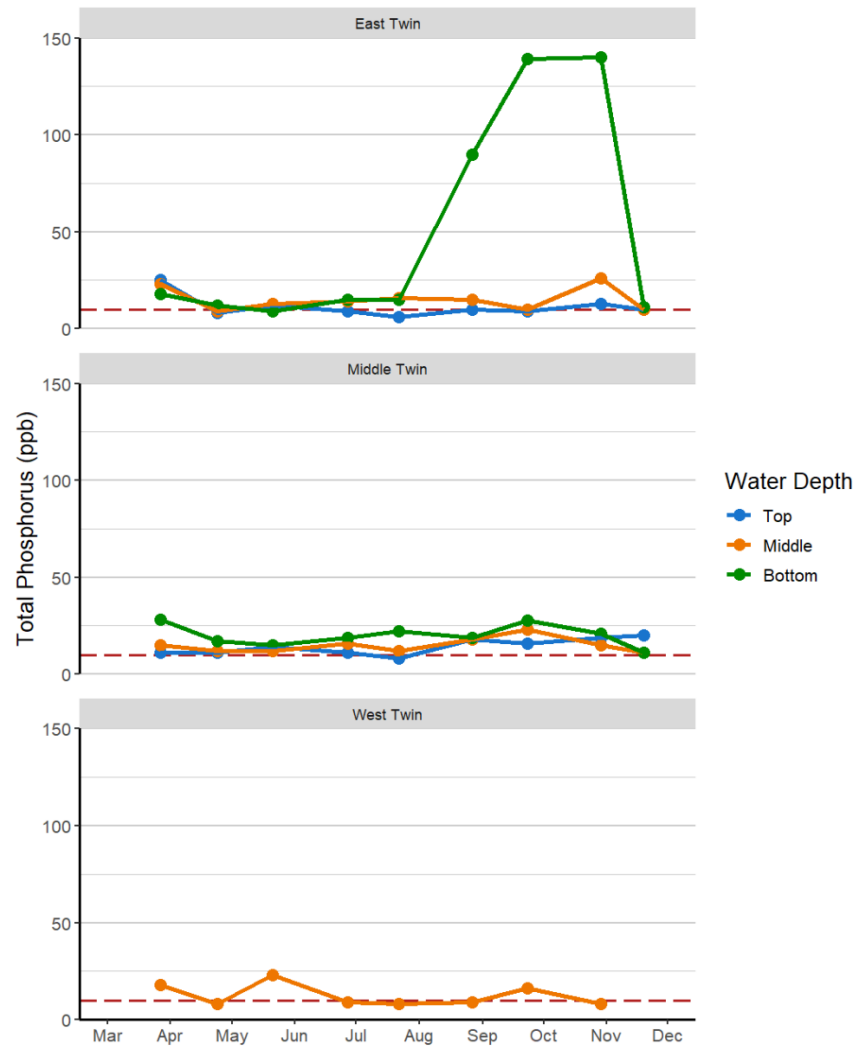


Figure 14. Twin Lakes 2025 total phosphorus concentrations.

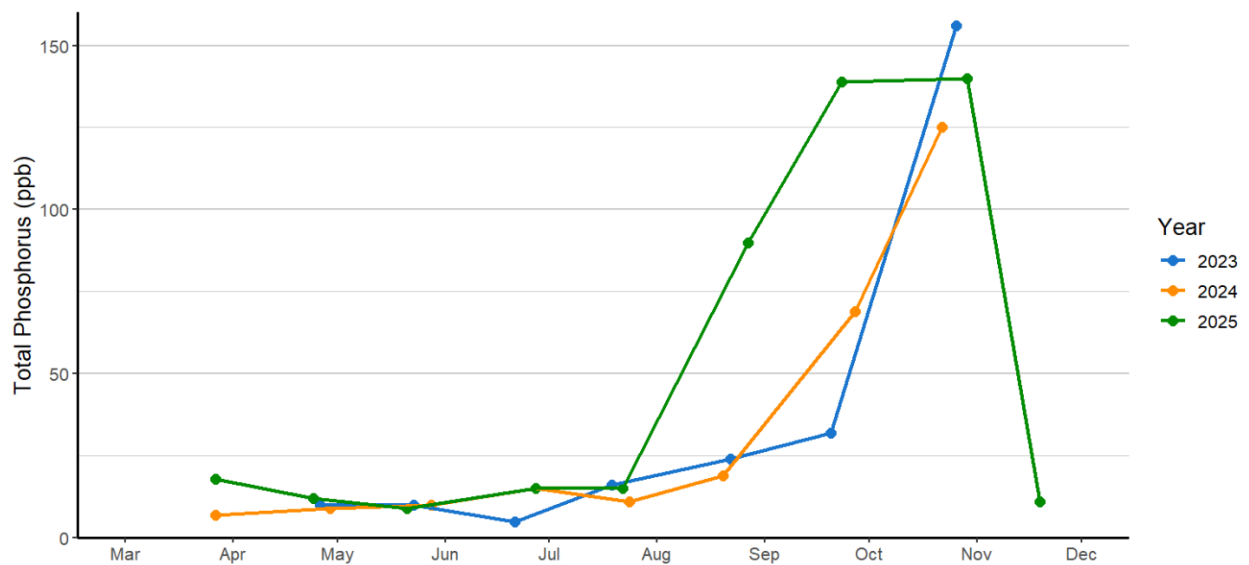


Figure 15. East Twin Lake bottom water total phosphorus concentrations, 2023-2025.

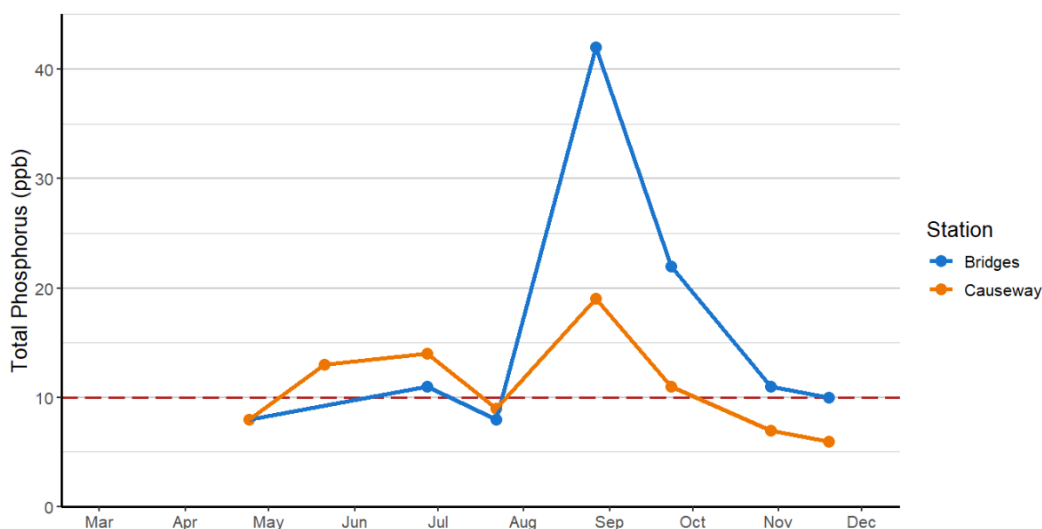


Figure 16. Total phosphorus concentrations at the Causeway and Bridges.

Total Nitrogen

Total nitrogen (TN) should ideally remain below 200ppb in the surface water. In 2025, surface water TN ranged from ~300-350ppb in East Twin and ~300-450ppb in Middle Twin (**Figure 17, Figure 18**). The water samples collected from the middle of the water column had similar concentration to the surface in both lakes. One middle column water sample was collected from West Twin. Concentrations here ranged from ~300-500ppb (**Figure 19**).

Bottom water TN was particularly elevated in East Twin in September and October due to internal loading of nutrients in the presence of anoxic water during these months. Due to internal loading, ammonia (NH_3) made up just over half of the total nitrogen concentration in bottom water during September and October (**Figure 20**).

Total nitrogen concentrations were slightly higher in the middle of the water column in East Twin Lake in 2025 compared to the prior two years. TN in the bottom water reached a similar maximum seasonal concentration but, like TP, TN reached higher concentrations earlier in the season compared to 2023 and 2024.

TN concentrations in Middle Twin were comparable to the prior two years, though TN in the surface and bottom water was slightly higher in the spring and fall.

TN concentrations collected from the middle of the water column in West Twin were comparable to the prior two years.

Total oxygen loss did not occur at the bottom of West Twin and only minimal anoxia occurred at the bottom of Middle Twin, so severe internal loading was not observed at these stations.

TN in the Causeway surface grab sample ranged from ~300-400ppb during the sampling season (**Figure 21, Table 5**). TN at the Bridges was low to moderate for most of the season but elevated to 584ppb in August.

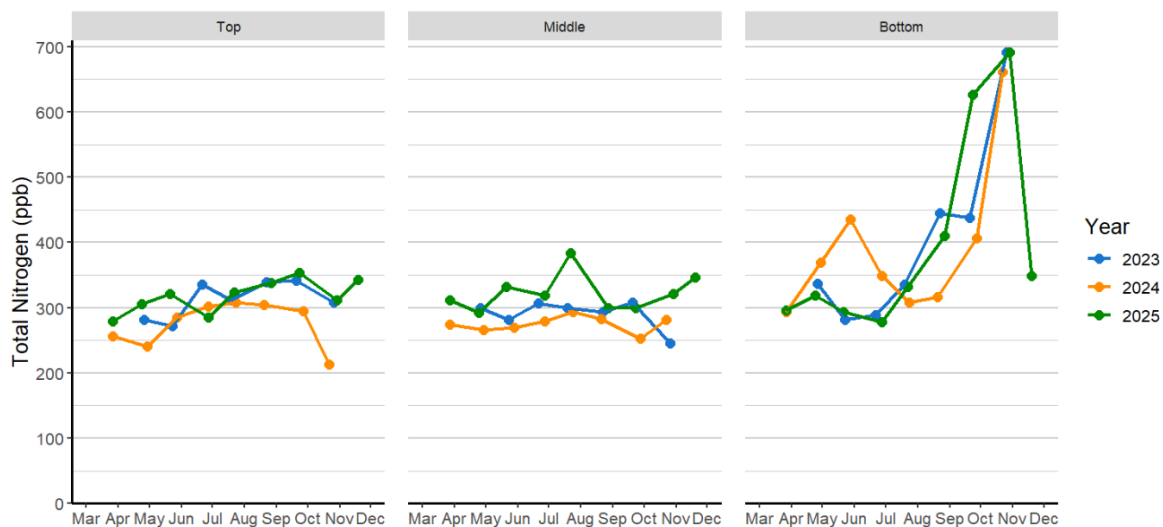


Figure 17. Total nitrogen concentrations in East Twin Lake, 2023-2025.

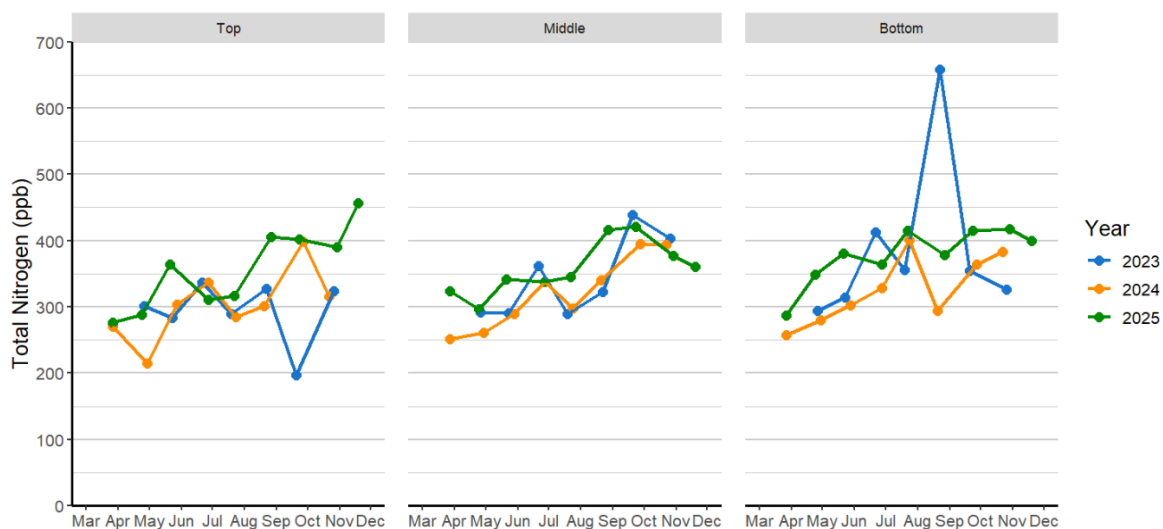


Figure 18. Total nitrogen concentrations in Middle Twin Lake, 2023-2025.

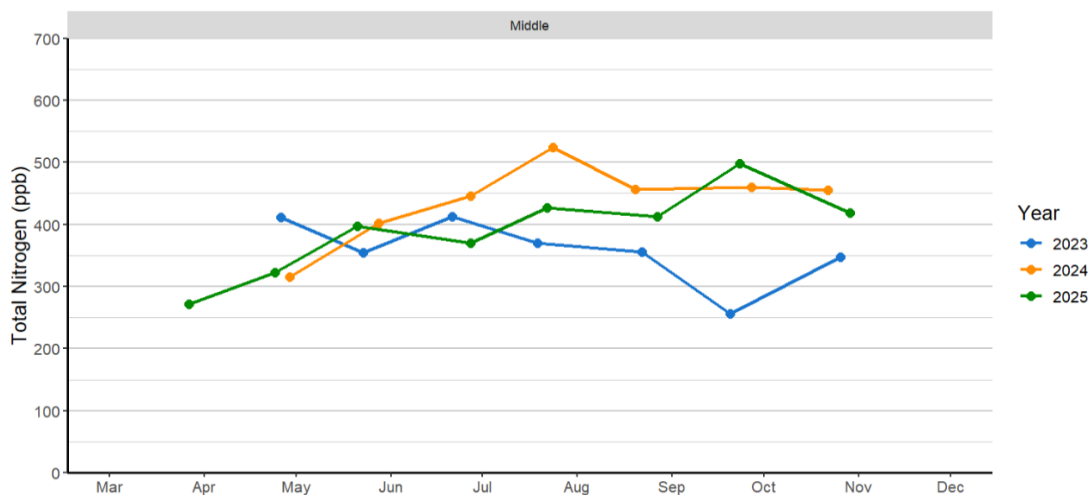


Figure 19. Total nitrogen concentrations in West Twin Lake, 2023-2025.

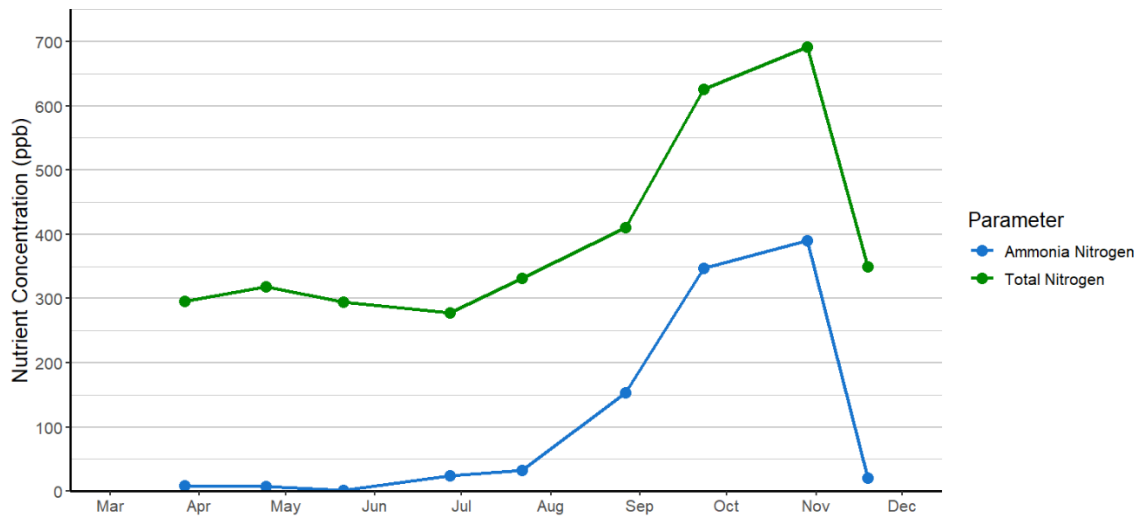


Figure 20. East Twin 2025 bottom water total nitrogen and ammonia concentrations (ppb).

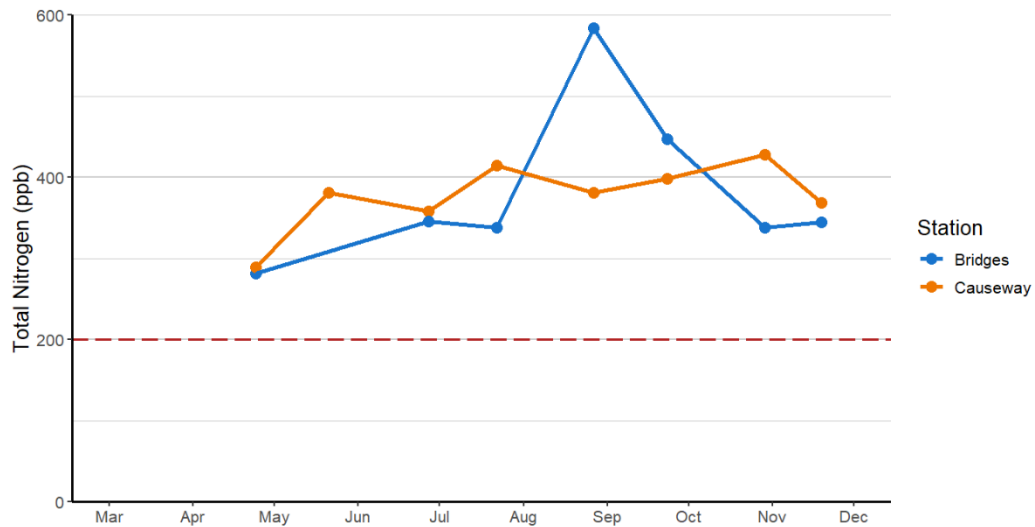


Figure 21. Total nitrogen concentrations at the Causeway and Bridges.

Table 5. Lake 1m and between lakes (Bridges and Causeway) 2025 total nitrogen concentrations

	27-Mar	24-Apr	21-May	27-Jun	22-Jul	27-Aug	23-Sep	29-Oct	19-Nov
East Twin 1m	279	305	321	285	323	338	354	312	343
Bridges		282		346	338	584	447	338	345
Middle 1m	276	288	364	311	317	406	402	390	456
Causeway		289	381	325	415	381	398	428	369
West Twin	272	322	397	370	427	413	498	419	

Plankton

The plankton in a lake are small plants and animals. The plants are photosynthetic organisms that are referred to as algae or phytoplankton. They are either single cells, filaments or chains of cells, or colonies of many cells. All cells, regardless of what shape of configuration, are smaller than 20µm. The animals are zooplankton, also called water fleas. They are predators on other zooplankton or small phytoplankton. Together, phytoplankton and zooplankton compose the base of the aquatic food chain.

Phytoplankton

The East Twin phytoplankton community consisted of Chrysophytes, Cyanobacteria, Diatoms, and Greens (**Figure 22**). Diatoms were present at low density in all months. Cyanobacteria were the most abundant group in April, May, and August through November. The cyanobacteria genera *Planktothrix* was dominant in the spring and fall, with *Planktolyngbya*, an extremely tiny cyanobacteria, dominant in August (**Figure 23**). However, cyanobacteria never reached the 20,000 cells/mL threshold for bloom conditions (**Table 6**). *Planktothrix* are known toxin-producers but *Planktolyngbya*, which reached highest concentration, are generally not toxin-producers. Both prefer very low light and strong stratification of the thermocline. These two groups are probably responsible for the MOMax between May and August in water between 7 and 12 meters. When the density of the water changes appreciably, these algae lose their tight control on their buoyancy and float to upper waters. Without a thermocline, the mixing depth for plankton is long, from top to bottom, with lots of time in the dark, so both these algae do well.

Plankton samples in April and May contained significant amounts of suspended solids of varying size between 0.5µm and 500µm. Very tiny particles 0.5µm were extremely abundant in East Twin in April (over 1,000,000 particles/mL) and in May (over 2,000,000 particles/mL) (**Figure 24**). The high density of particles was most likely responsible for the poor water clarity in those months.

Middle Twin had the same phytoplankton as East Twin, with the addition of a small number of Dinoflagellates in September (**Figure 25**). Cyanobacteria were the most abundant group from May through November. *Planktothrix* were abundant in the first half of the season but disappeared after August (**Figure 26**). *Raphidiopsis* was the only genus present in November. Some, but not all species within this genus are toxin producers. No samples in 2025 exceeded 7,000 cells/mL – well below the 20,000 cells/mL threshold. Both *Raphidiopsis* and *Planktothrix* are not typically bloom formers, the former almost impossible, while the latter is also highly unlikely because higher numbers in the upper water will be limited in duration.

The West Twin phytoplankton community was dominated by cyanobacteria from July through September (**Figure 27**). The September sample contained nearly 8,000 cells/mL of *Microcystis* (**Figure 28**). This is still considered low, but it is the highest concentration of cyanobacteria observed across the three lakes in 2025. *Microcystis* is one of the most common bloom-forming cyanobacteria, with 90% of blooms worldwide caused by *Microcystis* and/or *Dolichospermum*. *Microcystis* prefers to be near the surface, as opposed to *Raphidiopsis* and *Planktothrix* discussed above, and readily forms surface scums. A surface sample collected in July 2024 contained 108,000 cells/mL of *Microcystis*.

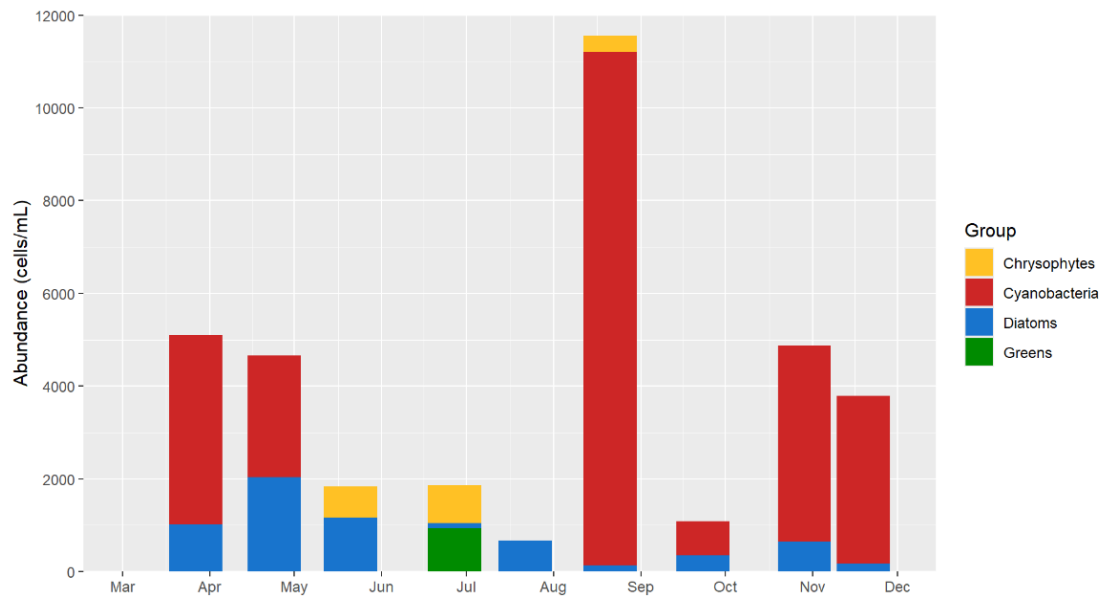


Figure 22. East Twin total algae counts.

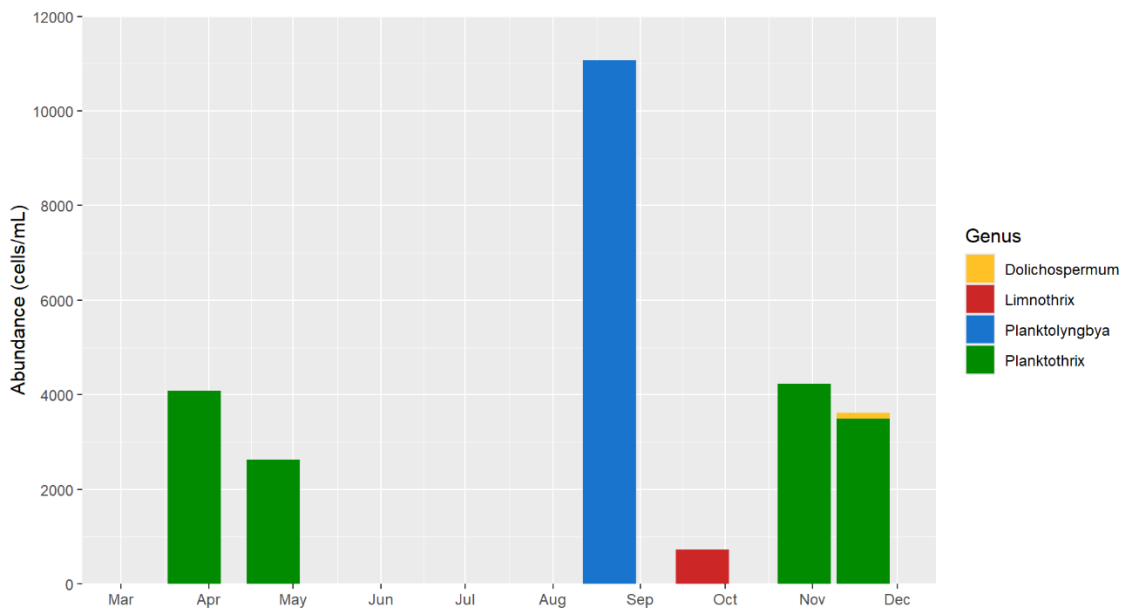


Figure 23. East Twin cyanobacteria genera counts.

Table 6. WHO guidance values for the relative probability of health effects resulting from exposure to cyanobacteria.

Relative Probability of Acute Health Effects	Cyanobacteria Density (Cells/mL)
Low	< 20,000
Moderate	20,000-100,000
High	100,000-10,000,000
Very High	> 10,000,000

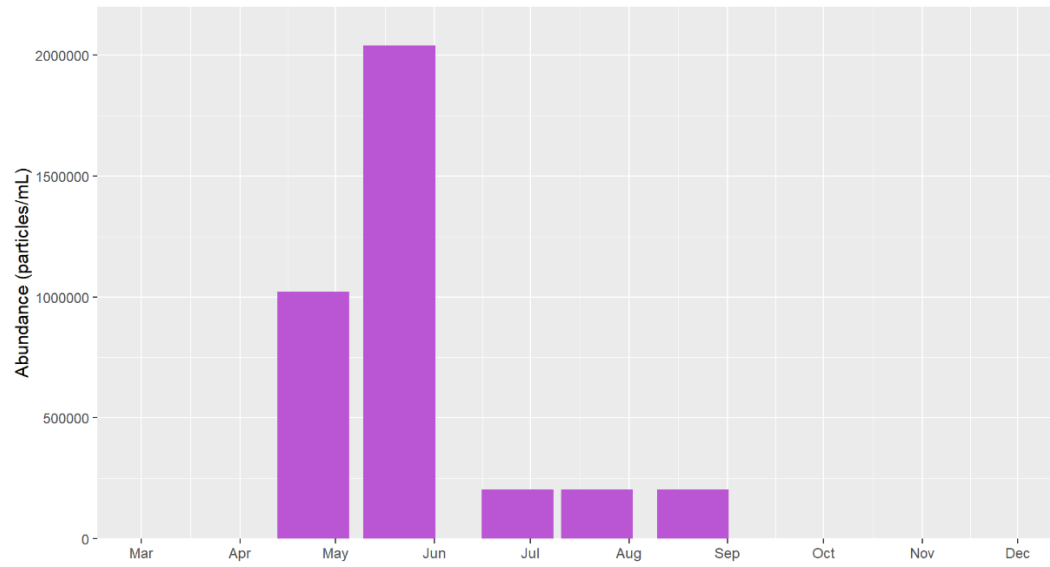


Figure 24. East Twin suspended solids.

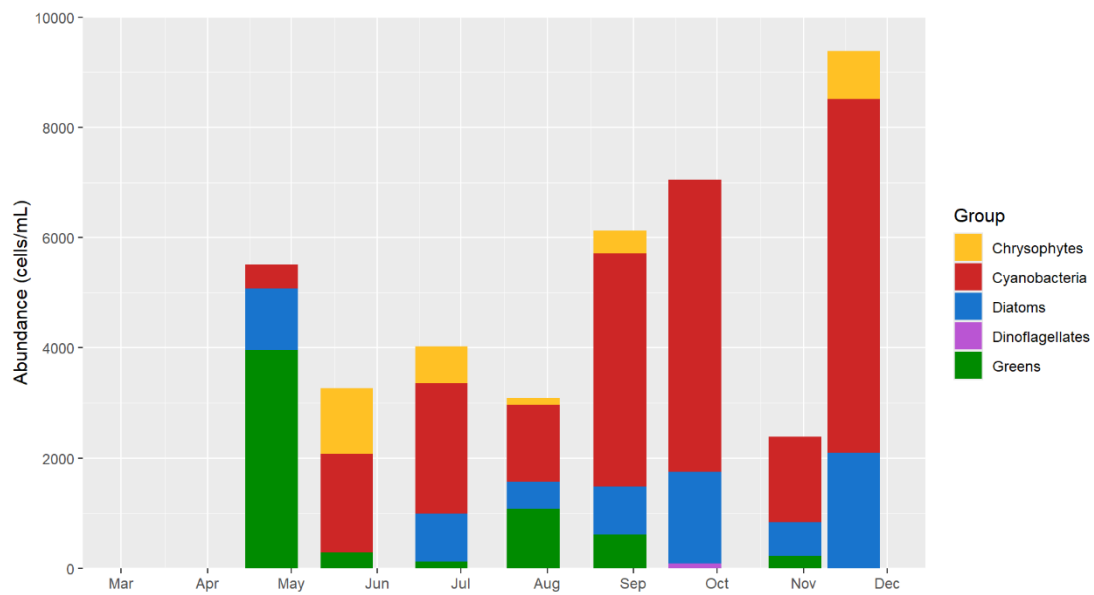


Figure 25. Middle Twin total algae counts.

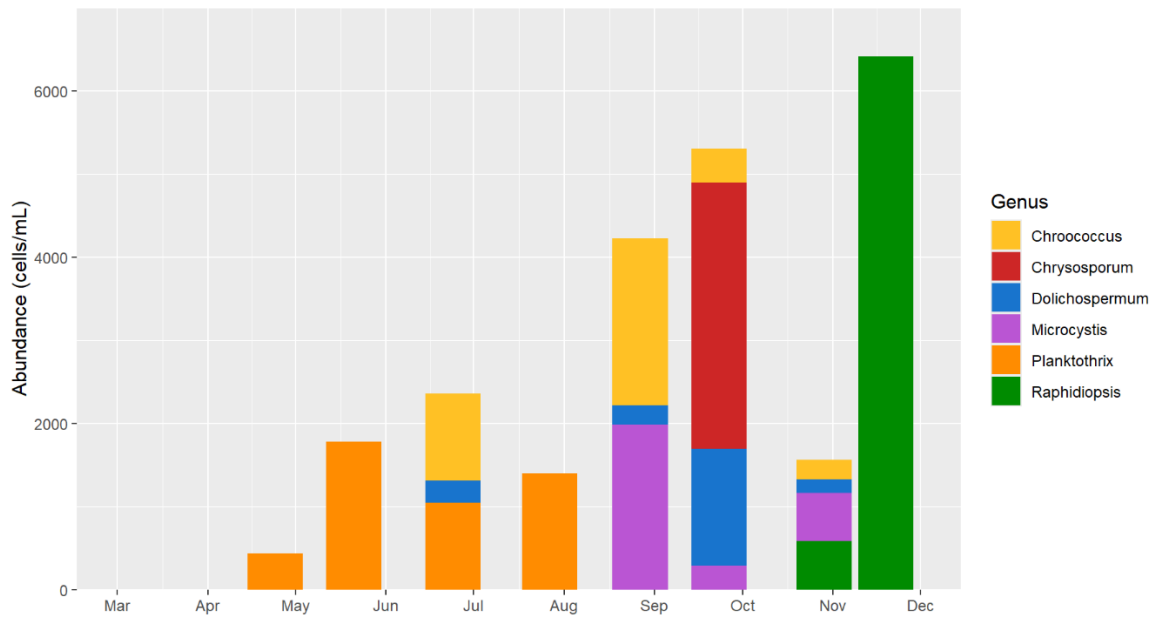


Figure 26. Middle Twin cyanobacteria genera counts.

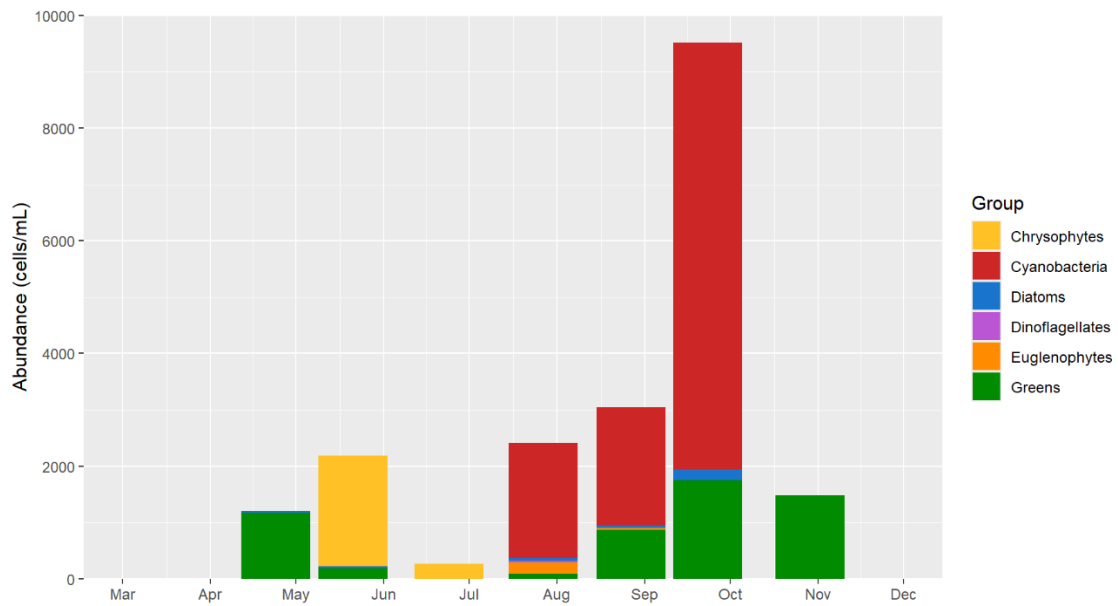


Figure 27. West Twin total algae counts.

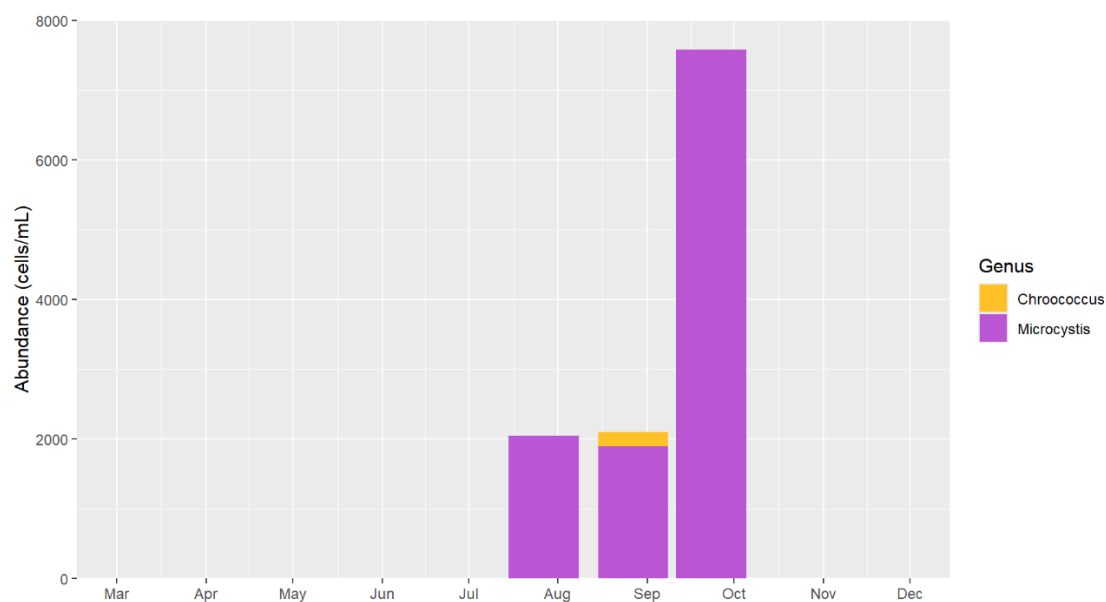


Figure 28. West Twin cyanobacteria genera counts.

Zooplankton

The East Twin zooplankton community was dominated by rotifers in 2026 (**Figure 29**). Cladocera, Copepod nauplii, and Cyclopoids were also present. All zooplankton in East Twin were small, the majority less than 0.4mm, indicating heavy predation by fish (**Figure 30**).

Zooplankton samples were collected from Middle Twin in May, July, and September (**Figure 31**). Rotifers were dominant in May and September, with a more even spread in July. Cyclopoids, which were not observed in the East Twin samples, were present in all three Middle Twin samples. Middle Twin contained some larger-bodied zooplankton, with some calanoids and Cladocera greater than 1mm in July (**Figure 32**).

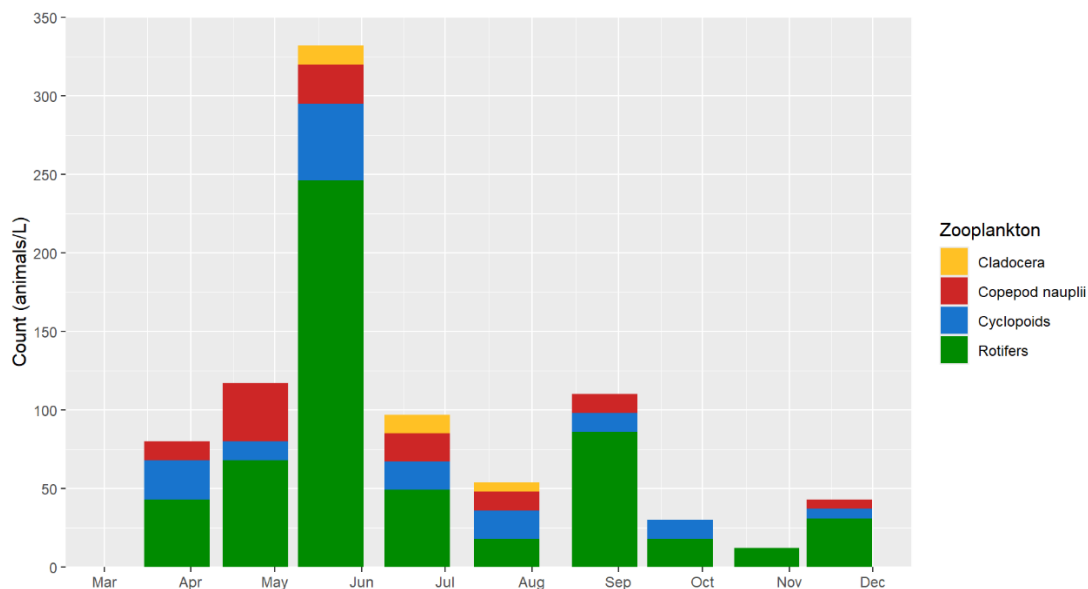


Figure 29. Zooplankton count (animals per liter) in East Twin in 2025.



Figure 30. Zooplankton numbers by size classes in East Twin in 2025.

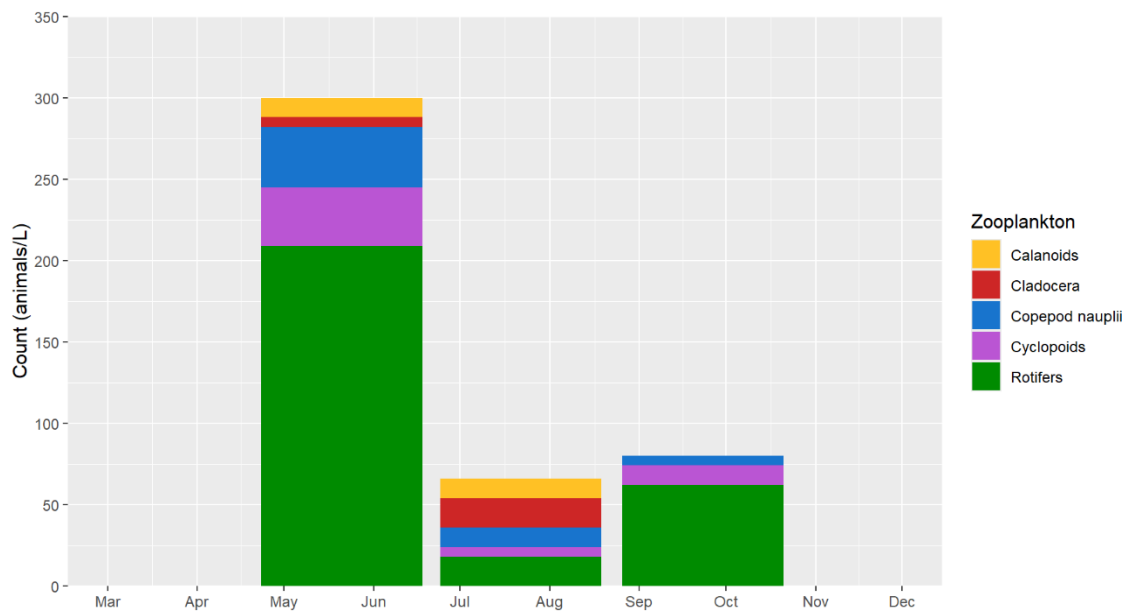


Figure 31. Zooplankton count (animals per liter) in Middle Twin in 2025.

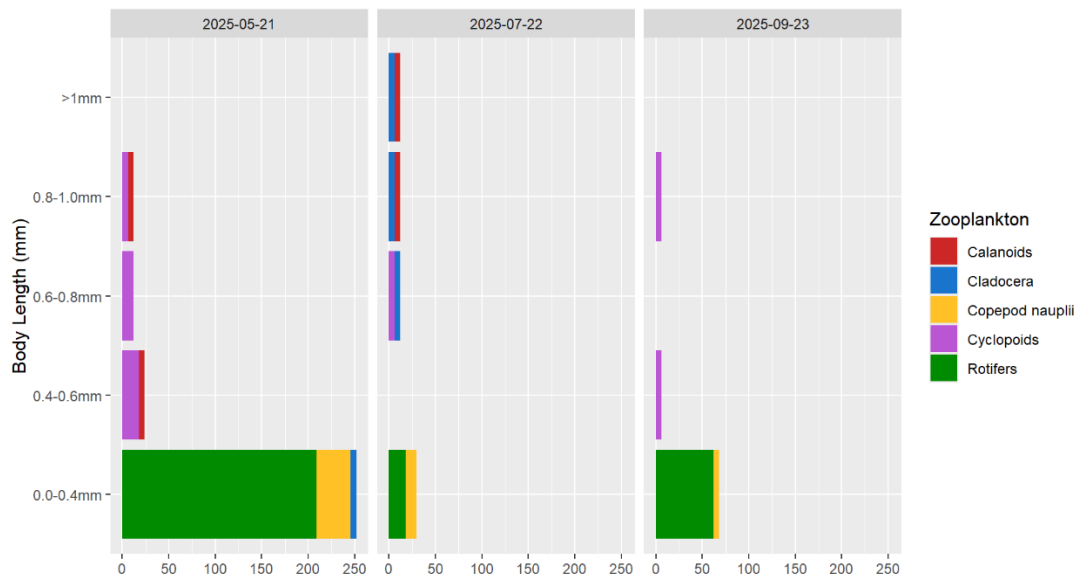
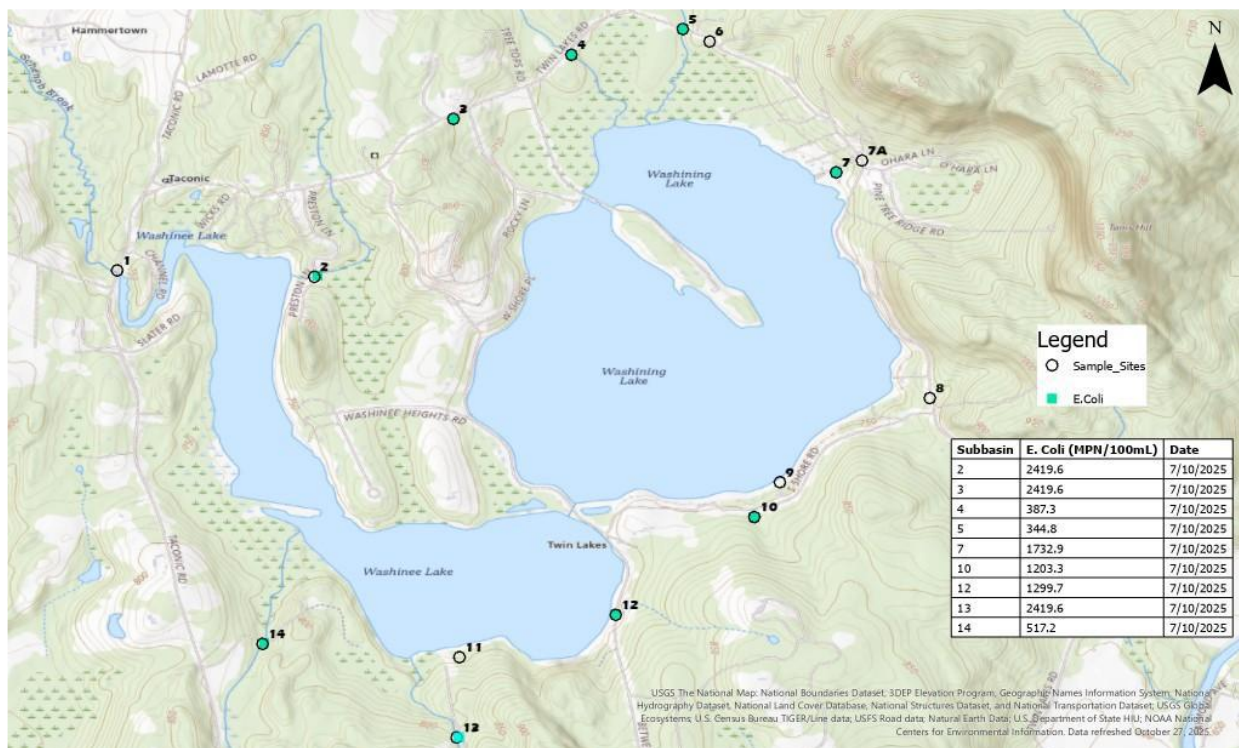


Figure 32. Zooplankton numbers by size classes in Middle Twin in 2025.

Inlet Phosphorus

The Housatonic Association conducted watershed runoff sampling in 2025. Fifteen sites were visited between 3 and 8 times between May and September (**Map 2**). Phosphorus results are reviewed here, although E-coil, pH, conductivity, salinity, ammonia, and surfactants were also measured. Streams represented by stations 3-10 flow to East Twin Lake, stations 11-14 flow to Middle Twin, and station 2 flows to West Twin.

Map 2. Housatonic Association inlet sampling locations.



The total phosphorus concentrations of the stream water tributary to East Twin Lake varied between a low of 10ppb and a high of 440ppb, with an average concentration of 32ppb, excluding the one outlier value of 440ppb (**Table 7**). However, samples collected from inlets #3, #4, and #5 were back from lake so don't represent TP actually flowing into the lake. The East Twin inlets had an average concentration of 32ppb. This is high enough to be concerned generally about the phosphorus load to the lake. Middle Twin inlets had generally lower TP concentrations, with an average of 17ppb. West Twin has one inlet, but it had the highest TP, with an average of 47ppb; this is a major concern. This stream had two dates with a concentration of 73ppb, a serious indication that water in this stream is contributing to the dense algae and plant growth in the northeast corner of West Twin Lake.

Table 7. Total phosphorus (ppb) concentration in inlets to East Twin, Middle Twin, and West Twin Lakes.

Lake	Inlet #	29-May	26-Jun	10-Jul	31-Jul	7-Aug	2-Sep	17-Sep	29-Sep
East Twin	3	24	13	60		50			
	4	24	10	25	35	43			
	5	41	45	45	53	73		20	34
	7	39	10	58	40	28	28	17	3
	8	61	10	15	440	30			
	9	22	10	23		10			
	10	10	98	20					
Middle Twin	12	10	10	23		10		10	
	13	22	13	45		18		10	
	14	17	10	35		15		10	
West Twin	2	24	30	73		73		35	

Conclusions & Recommendations

Water clarity varies considerably between the three lakes. East Twin is the clearest, with a seasonal average of 6.5m. Middle Twin has an average clarity of 4m, slightly better than half as good as East Twin. Secchi disk depth in West Twin has consistently been better than 3.5 meters, the depth at which it is seen resting on the bottom, so the true clarity value is unknown. A new station was added this year in East Twin, in deep water roughly 1,200 feet offshore of O'Hara's Landing. This station had average seasonal water clarity of 7.3m.

Water clarity in East Twin has shown to be poorest in the spring months of April and May with steady improvement through to October, while Middle Twin shows relatively steady clarity of ~4-5 meters, rarely as good as 5m or less than 4m, poorest clarity tends to occur in the fall months September to October.

East Twin had strong stratification between May and September, weak stratification in October, and no stratification in March, April, and November. The depth of the epilimnion was 3 meters in June, deepening through the season to 4m in July, 6m in August, and 7m in September. A weak thermal boundary existed in October at 12m. Middle Twin showed thermal boundaries only below 5m in May, June, and July; other months had isothermal conditions.

East Twin developed anoxia over-bottom in June, that is, the water just over the bottom sediments become devoid of dissolved oxygen. Dissolved oxygen loss crept upward as the season progressed – this anoxic boundary ascended slowly. Maximum ascent of anoxic water was 13.8m in October.

Based on the slope of the ascent of the boundary in Figure 5, the oxygen deficit rate appears low.

A strong MOMax developed in May and lasted until September between 6 and 12 meters. The increased DO in this layer of water was due to photosynthesis by the cyanobacteria *Planktothrix* and *Planktolyngbya*.

Very minor oxygen loss in Middle Twin and only over-bottom.

TP in East Twin was excellent in upper waters with most values <10ppb. Middle water was nearly as good. Bottom water showed modest internal loading in August, September, and October

In Middle Twin, TP was slightly higher but without high bottom TP concentrations. West Twin TP was generally excellent.

Samples between the lakes showed similar conditions to the three lakes on only two dates, with other dates showing differences. One event of extreme TP and TN loading was picked up at the Bridges Station.

TN in East Twin top water was generally within the range of 250 -350ppb with a weak increasing trend over the season. Middle water showed little variation, hovering around 300ppb, while bottom water TN increased to 700ppb by October, about half of which was ammonia.

The TN in Middle Twin varied between 300ppb and 400ppb in almost all samples. Only a few samples were appreciably higher than 400ppb. There was a weak trend of slowly increasing TN concentration during the season, with little internally derived N, other than one occasion in 2024.

In West Twin, TN averaged ~400ppb with values close to 500ppb common.

Cyanobacteria in East Twin Lake were mostly the metalimnetic genera *Planktothrix* and *Planktolyngbya*. These algae prefer dark water with high stability and show up in the epilimnion only by accident. Middle Twin had similar taxa with the addition of *Raphidiopsis*. West Twin was dominated by *Microcystis*, a known surface bloom former and toxin producer.

The TP concentrations in the streams flowing into each lake were generally poor. The goal of surface water TP in the lake is 10ppb, so inlet water should have no more than 10ppb, or if so, only for brief periods. A couple of inlet streams had high concentrations.

Recommendations for 2026 monitoring:

The following additions will be made to our monitoring plan:

- Measure the flow of water from East Twin to Middle Twin and from Middle to West Twin during each sampling visit.
- Measure iron at the bottom of East Twin in summer months.
- Measure Dissolved Inorganic Carbon at East Twin.
- Collect top, middle, and bottom water from the East Twin Additional station for total phosphorus analysis.
- Collect a grab sample from the West Twin outlet for nutrient analysis.
- Collect two samples at the Bridges, one from each end of the channel, because it appears nutrient loading is occurring between these two sites.
- Measure the cross-sectional area of the Causeway and the channel dimensions between the two Bridges.

- In the 2026 water quality monitoring report, we will calculate the TP and TN mass changes across the lakes and calculate dissolved oxygen deficit rates in East Twin.
- Possibly collect inlet samples for nutrient analysis.

Appendix

CT DEEP classification of CT lakes by phosphorus concentration.

	Category	T. Phosphorus (ppb)	T. Nitrogen (ppb)	Secchi Depth (m)	Chlorophyll- <i>a</i> (ppb)
1	Oligotrophic	0 -- 10	2 -- 200	6 +	0 -- 2
2	Oligo-mesotrophic	10 -- 15	200 -- 300	4 -- 6	2 -- 5
3	Mesotrophic	15 -- 25	300 -- 500	3 -- 4	5 -- 10
4	Meso-eutrophic	25 -- 30	500 -- 600	2 -- 3	10 -- 15
5	Eutrophic	30 -- 50	600 -- 1000	1 -- 2	15 -- 30
6	Highly Eutrophic	50 +	1000 +	0 -- 1	30 +

