



Lake & Watershed Associates; PO Box 65; Turner, ME 04282

2025 Thompson Lake Water Quality Assessment

Overview

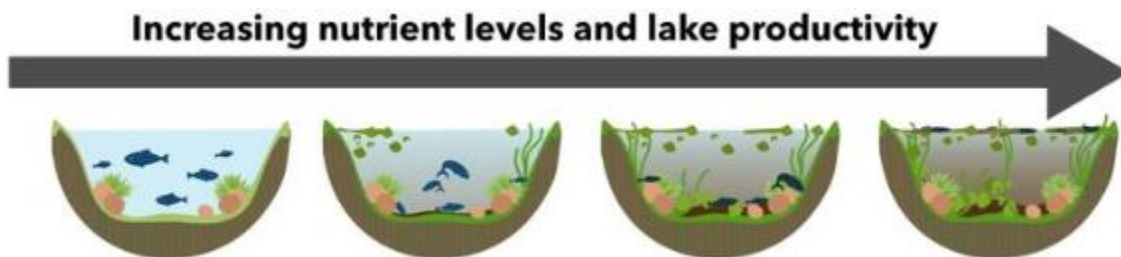
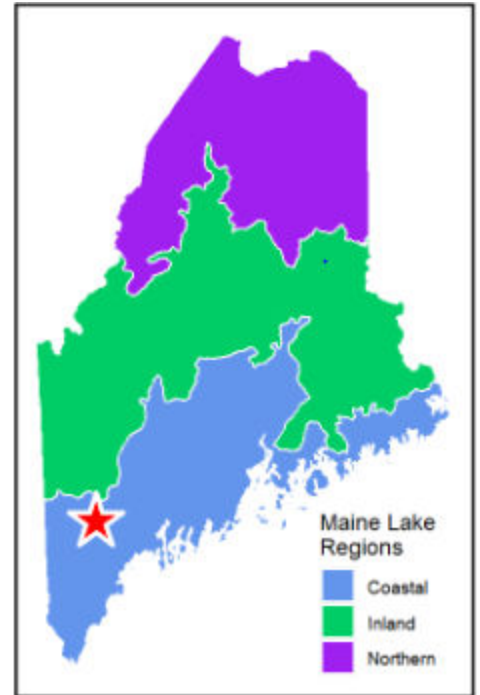
Baseline water quality monitoring of Thompson Lake was conducted by LWRMA staff from May through September, 2025 at monthly intervals. This report analyses and summarizes findings of the data gathered during the period. Substantial additional data were gathered from May through October by Certified Volunteer Lake Monitor, Paul Cain whose data are included in this report.

Indicators of lake water quality are influenced by a number of natural hydrologic, geochemical and morphological factors, including the shape, depth and orientation of the lake basin, as well as development/disturbances within the watershed. Weather and climate also have a significant bearing on the seasonal, annual and long-term variability of lake water quality. The identification of long-term trends in the overall health of a lake requires extensive data gathered over a period of time in order to be able to detect true changes with confidence.

The weather during the spring, summer and early fall of 2025 was very wet and unusually cool, which resulted in lake water temperatures throughout Maine that were among the coolest in two decades (Source: MDEP). But from July through September, conditions changed dramatically, resulting in drought conditions varying from moderate to severe throughout the State.

Thompson Lake is classified by the Maine Department of Environmental Protection as a Coastal Deep Lake, based on three broad geographic area groupings of lakes with similar hydrogeomorphic characteristics and conditions. This classification system can be helpful in anticipating and interpreting the conditions of the bodies of water within each region.

Three primary “trophic state” indicators are used to characterize overall biological/ecosystem productivity in Maine’s lakes: Secchi transparency (water clarity); and the concentrations of the nutrient phosphorus and the algal pigment chlorophyll-a in the water. All three are indicators that relate to the concentration of planktonic algae – tiny plants that exist throughout the lake that are at the base of the lake food chain/web, and which influence the overall “productivity” of the lake ecosystem.. Higher concentrations of phosphorus can lead to greater algae growth and reduced water clarity. As algal density increases in a lake, the water becomes less clear, and dissolved oxygen levels during the summer months may decline over time. Additional indicators are measured to add context, and support the trophic state indicators. Water Color, a natural factor that can influence the relationship between the trophic state indicators, is taken into account in the annual assessment.



Overall, Thompson Lake was only slightly less clear than the historical average for the lake in 2025, based on Secchi disk readings taken from May through October. Epilimnetic core samples for total phosphorus, which is the primary factor influencing algae abundance in most lakes, and chlorophyll-a, which is a direct measurement of the density of planktonic algae in the lake were very slightly lower than the historical averages for Thompson. Lake ecosystems are highly dynamic. Because of this, trophic state indicators may not appear to be in alignment with each other because samples are taken under “instantaneous” conditions – at a single point in time in an ecosystem that is in a continuous state of flux.

Statistical analysis of three decades of data for the three trophic state indicators shows a decline in water clarity in Thompson Lake during the past decade. However, the decline is small, and historical data for the past several decades show a distinct cyclical nature in the water clarity of the lake. Both phosphorus and chlorophyll data during the three decade period are quite variable, and no distinct trend is evident.

Water temperature and dissolved oxygen (DO) profiles taken from May through September showed typical moderate to strong thermal stratification through the period. Dissolved oxygen loss in the deepest stratified layer was relatively minimal, and was consistent with conditions documented in past years. Some oxygen loss occurs even in the most clear and nonproductive lakes during the summer stratification period. It is likely that Thompson remained stratified through the month of October, and possibly well into November, given the relatively warm air temperatures during the period. Oxygen loss in the deepest stratified area would have continued to take place until the lake mixed in late fall. But given the rate at which DO loss occurred during the previous months, it is unlikely that oxygen would drop to the point where it would pose a threat to Thompson Lake's valuable coldwater fishery.. Furthermore, oxygen levels would likely have remained well above the critical "anoxia" level that can act as a trigger to release phosphorus from the bottom sediments. At some point in the future, temperature and dissolved oxygen profiles should be taken later in the fall to verify these assumptions.

*Continued climate warming has the potential to significantly negatively impact Maine's lakes over time. Shorter periods of ice cover, record high summer water temperatures, a longer growing season for algae and other lake plants, and an increase in severe weather, ranging from soil-eroding rain events to extended periods of drought may adversely affect lake ecosystems. Ongoing efforts to protect the lake through **aggressive watershed conservation** initiatives will continue to be essential to the continued long term health of Thompson Lake.*

Potential Influences on Lake Water Quality in 2025

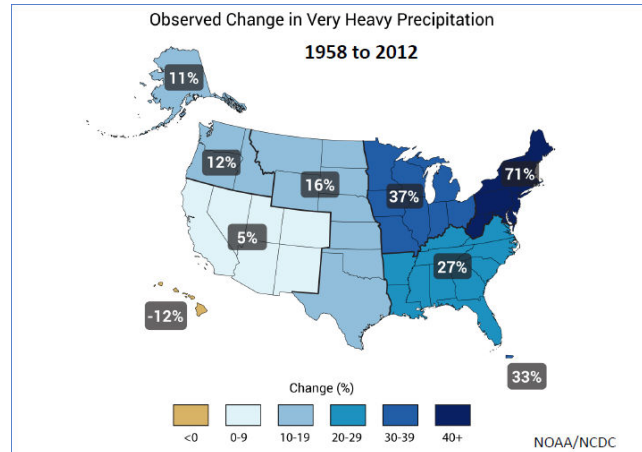
Lake water quality may be influenced by a wide range of both natural, environmental and anthropogenic factors. The effect of these influences typically has a significant bearing on the variability of indicators used to assess water quality, and on lake ecosystem characteristics and functions.

Annual weather fluctuations and trends in temperature, wind, and precipitation may significantly influence short and long-term conditions that occur within individual lakes. The extent to which each of these powerful weather and climate forces affects a lake is dependent on both the natural characteristics of the lake, and the degree to which the lake and watershed have been altered through development. Natural characteristics include, but are not limited to the bathymetry (depth profile) the shape of the lake basin, the ratio of surface area to the lake volume, and orientation of the lake basin to prevailing winds, as well as the geography, soil geochemistry, and hydrologic features of the watershed. Wetlands within the watershed can also have a bearing on overall water quality through the contribution of decayed plant material, which produces humic compounds and carbon through dissolved organic compounds. The combined effect of these factors can explain differences between otherwise similar bodies of water, and the ways in which each ecosystem functions.

Foremost among the influences of weather on Maine's lakes are precipitation and temperature, both of which are becoming intensified through the process of climate warming. In recent years, unusually warm ambient temperatures throughout the year have resulted in significantly higher

summer lake water surface temperatures (mid 80's F in southern and central Maine), later formation of ice cover in the fall/winter, and earlier "ice out" in the spring. The overall reduced period of ice cover on lakes is already causing Maine lakes to be warmer throughout the year (Source: Maine DEP), although significant variability does occur from year to year. Lake ecosystems are highly sensitive to changes in water temperature.

Precipitation events are becoming more extreme, resulting in greater volumes and erosive velocities of stormwater runoff, which is the primary means by which sediment particles from eroded soil and the nutrient phosphorus are transported to lakes. According to records from NOAA and NCDC, heavy precipitation events in the U.S have increased significantly in the last several decades, with the greatest increase occurring in the New England area (see adjacent image).



Multiple years of moderate to severe drought have occurred throughout much of Maine during the past two decades. Among other impacts, drought reduces the inflow of water to lake basins from their watersheds, resulting in low water levels, which can cause the desiccation of sensitive, beneficial aquatic plants and other habitat in littoral areas. Drought may also increase shoreline erosion, and through evaporation, the concentration of various substances in the lake, including nutrients.

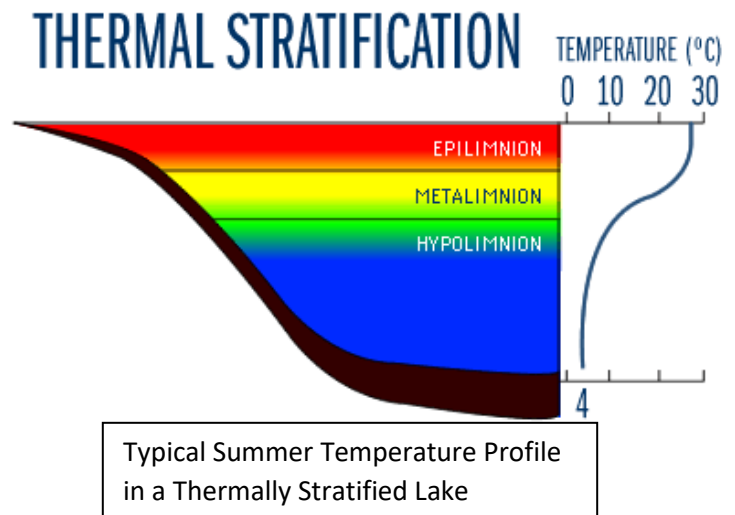
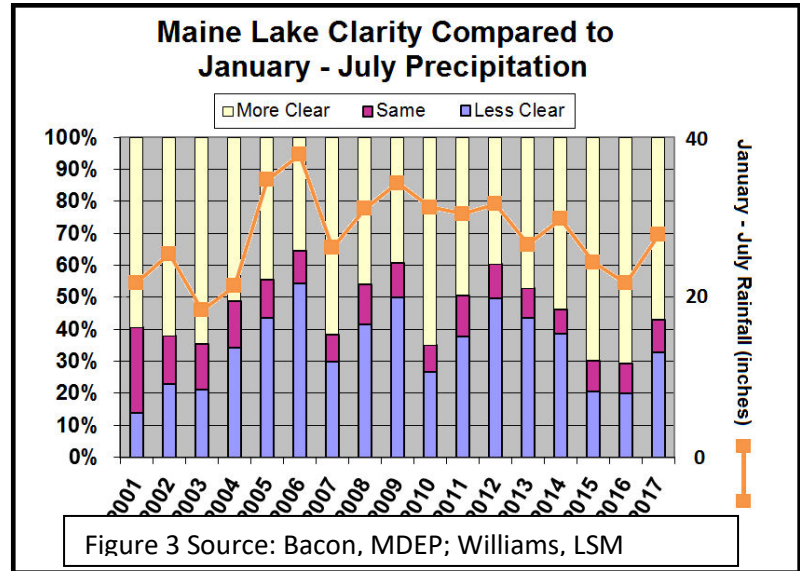
Periods of drought have increasingly been punctuated by localized extreme precipitation events, during at which time high-velocity, erosive stormwater runoff from watersheds can reach lakes, carrying with it elevated concentrations of soil particles and phosphorus. In recent years, unusual algal blooms that have been observed and documented in a number of Maine lakes have been determined to have been triggered by the combined effects of extreme weather on vulnerable lake ecosystems.

While clear lake water is generally an indication of a healthy lake ecosystem, that generalization may not always be the case in the era of climate change. Many Maine lakes tend to be clearer during drier years, ostensibly due to reduced stormwater runoff and phosphorus exported from their watersheds.

An observational analysis of the Secchi transparency (water clarity) of Maine lakes from 2001 through 2017 (Linda Bacon/MEP; and Scott Williams/LSM) showed that a significant number of Maine lakes tended to be clearer during drier years (white areas of bars in adjacent image). Precipitation

averages from January through July are illustrated by the brown points on each bar. However, significant numbers of lakes (purple and blue areas of bars) do not follow the trend, and are either unchanged, or less clear during dry years, suggesting that while drought may be influencing apparent improving water clarity for some lakes in Maine, based on deeper Secchi disk readings, and lower concentrations of phosphorus and planktonic algae, other lakes may actually be less clear, due to evaporation, lower water levels, changes in thermal stratification and increasing algae growth due to warmer temperatures, greater dissolved oxygen loss, and the possible release of phosphorus from bottom sediments.. It is becoming increasingly important to take the influence of weather extremes associated with climate change into account when assessing annual water quality.

Extended periods of thermal stratification typically result in a greater loss of dissolved oxygen in the lake water column. When dissolved oxygen levels drop to a critical level, phosphorus in the lake sediments may be released to the overlying water, depending on the sediment geochemistry of individual lakes. The “pulse” of phosphorus associated with this internal release process may result in an increase in planktonic algal growth, and reduced water clarity, especially during the warm summer and early fall period.



A small group of lakes that may actually be clearer during wet years are those that are highly productive, and which experience frequent algae blooms. These lakes may benefit from the diluting effects of precipitation, because phosphorus concentrations in the body of water are already higher than incoming levels in stormwater runoff.

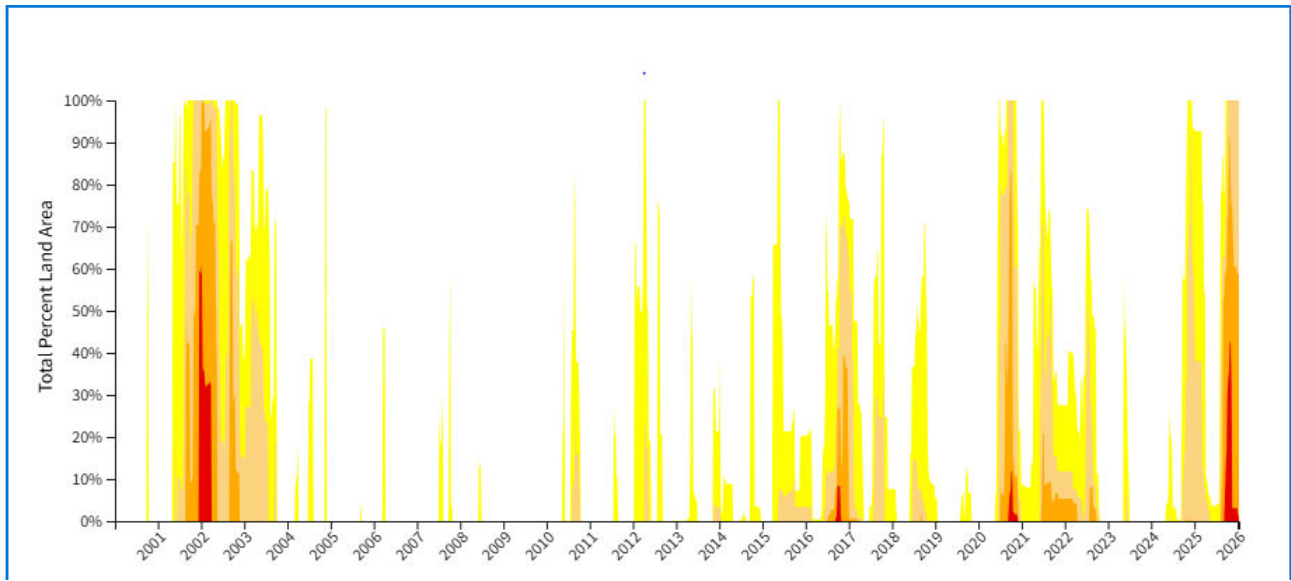
Climate warming, and the associated extreme weather events may compound (and confound) the complexity of tracking, predicting and characterizing lake water quality. Although in some cases it may be possible to predict the manner in which individual lakes will respond to climate change, the process through which warming effects complex lake ecosystems may not always be evident in advance of the changes.

Potential Weather Influences in 2025:

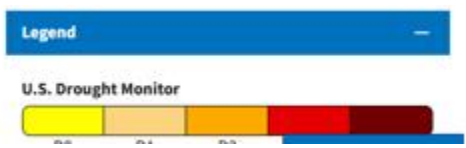
Summer weather conditions in 2021 and 2022, were extremely dry. But the spring and summer of 2023 was one of the wettest on record for much of the State of Maine. This was followed by a relatively dry early spring and mid- summer period in 2024, and very dry conditions in the late summer and early fall. *The weather during early May and June, 2025 was wet and unusually cool, and Maine lake surface temperatures were among the lowest in 20 years (Source: MDEP). However, by the middle of summer, conditions were warmer and relatively dry. By late summer, much of the State of Maine was experiencing moderate to severe drought. Lake levels were generally low during the period, as water tables dropped, and evaporation occurred.*

The effects of drought on lakes may be cumulative, depending on the amount of time that it takes (on average) for the volume of water in a lake to be replaced, or “flushed” (not to be confused with “turning over”, or mixing). Because this natural process is relatively slow, depending on the natural flushing rate of individual lakes, a dry year may continue to influence lake water quality and ecological effects for a year or more following the period of drought. Drought-related effects may be cumulative, depending on the duration and severity of drought conditions.

The image below (Source: Drought.gov) illustrates the extent of drought in 2021 and 2022, as well as the abrupt change in conditions in 2023, followed by a return to relatively dry conditions in 2024 and 2025. The color box in the lower left begins with “abnormally dry” in yellow, to more extreme conditions in the far right boxes. Note that many years since the severe drought period of 2001-2003, have experienced significant drought conditions.



The U.S. Drought Monitor (2000-present) depicts the location and intensity of drought across the country. Every Thursday, authors from NOAA, USDA, and the National Drought Mitigation Center produce a new map based on their assessments of the best available data and input from local observers. The map uses five categories: Abnormally Dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought (D1-



Summary of 2025 Findings for Thompson Lake:

The following summary information is the result of “baseline” sampling and assessment that was conducted from May through September by LWRMA staff. Additional Secchi transparency (water clarity) data were gathered through late October by certified volunteer lake monitor, Paul Cain, and are also included in this report..

Water quality monitoring/sampling was conducted at the “deep hole” (Station 01), which is the approximate location of the deepest point in Thompson Lake, the area in the lake where the greatest volume of historical data has been obtained.

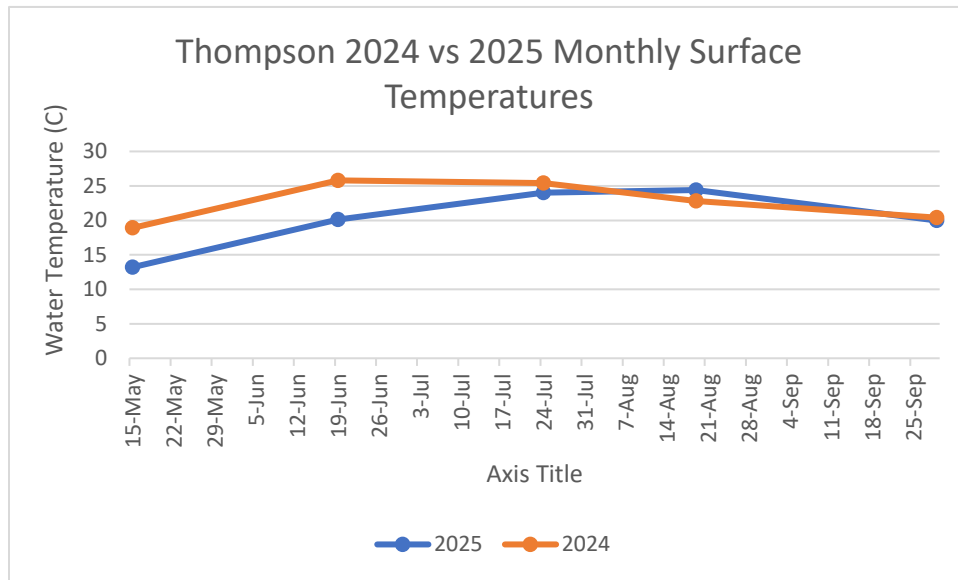
For most Maine lakes, August and early September sampling is generally considered to be the most critical period of the year because potentially stressful conditions in the lake associated with several months of warm weather are typically most evident. However, in order to confidently detect both short-term changes (such as an impending algal bloom), as well as long-term trends, greater sampling frequency is required over a period of several months (May through September or October). Historical data sources referenced are from the Maine Department of Environmental

Thompson Lake
MIDAS 3444

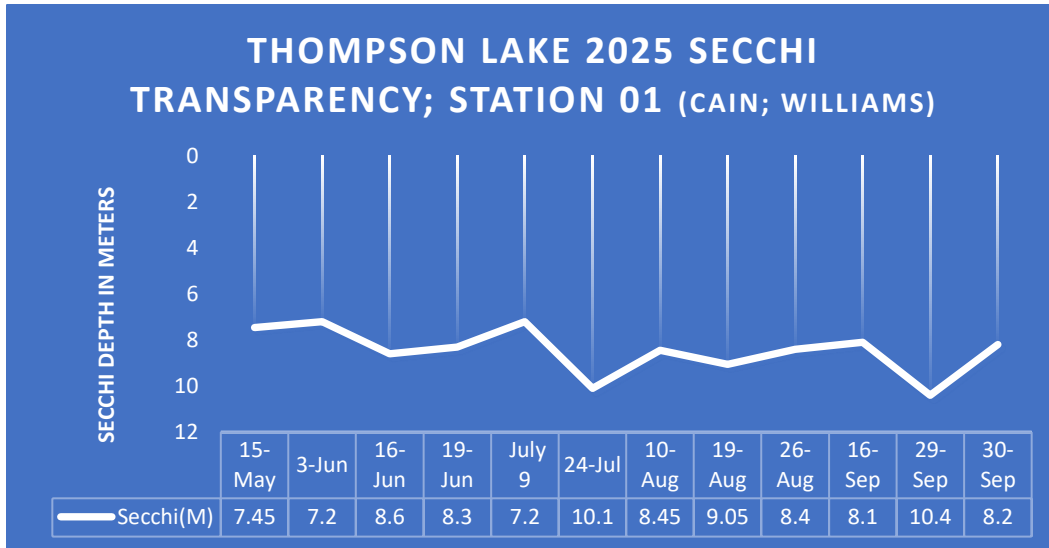


Protection, Lake Stewards of Maine (www.lakesofmaine.org), and LWRMA field records and reports.

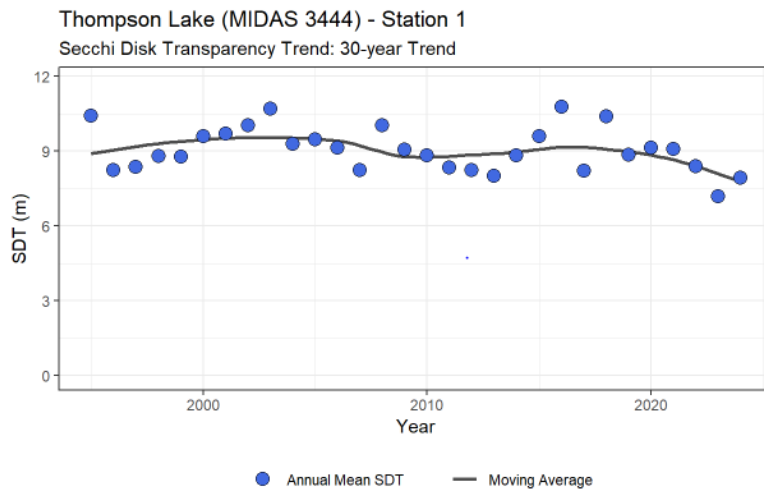
Water Temperature: Weather during the early spring and summer (June 15) period was unusually wet and cold, resulting in some of the lowest lake surface temperatures in 20 years (Source: MDEP), and in sharp contrast to warm early summer temperatures in recent years. The chart below compares 2024 and 2025 surface temperatures on Thompson lakes through the five month monitoring period.



Secchi transparency –The distance one can see down into the water from the surface, varied throughout the monitoring period from the low (least clear) reading of 7.17 meters on June 26 to the (deepest/clearest) reading of 10.4 meters on September 29. A reading on July 24 was the next clearest at 10.1 meters. The average for the monitoring period was 8.3 meters, compared to the historical average of 9.0 meters for Thompson Lake. The drought conditions that started in mid summer, and which extended into the late fall, likely had a positive influence on improving water clarity during the period, as illustrated in the chart below. Significant variability within the five month period is not uncommon.

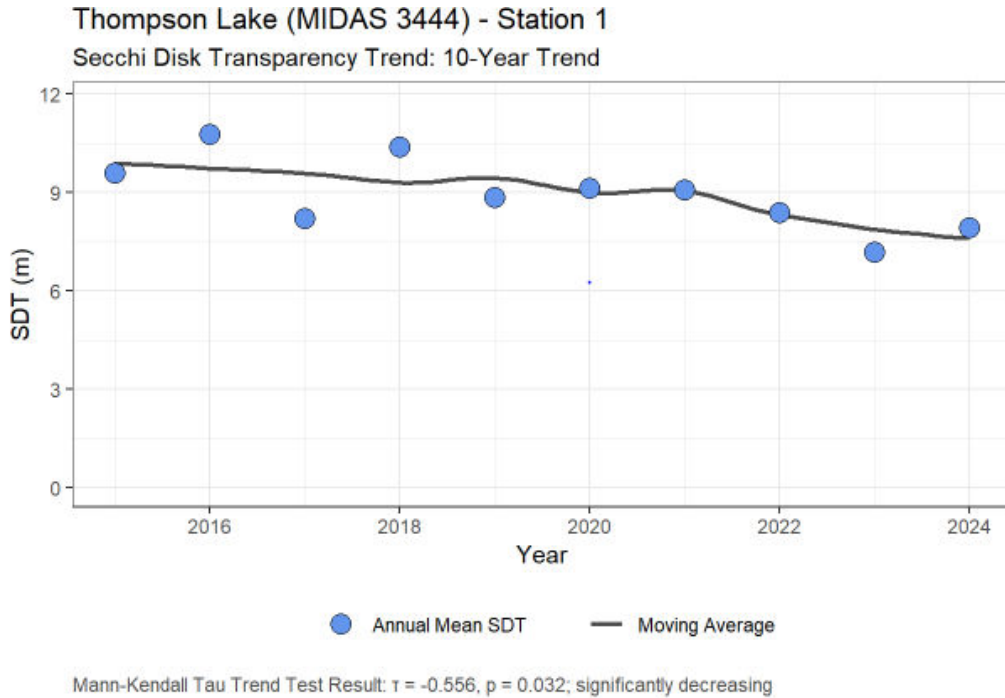


The following three charts illustrate statistical and historical water clarity data for Thompson Lake. The first is an analysis of three decades of water clarity (Secchi Transparency) data. This period indicates that conditions were either stable, or too variable to determine a trend during the period. (Source: Maine DEP)

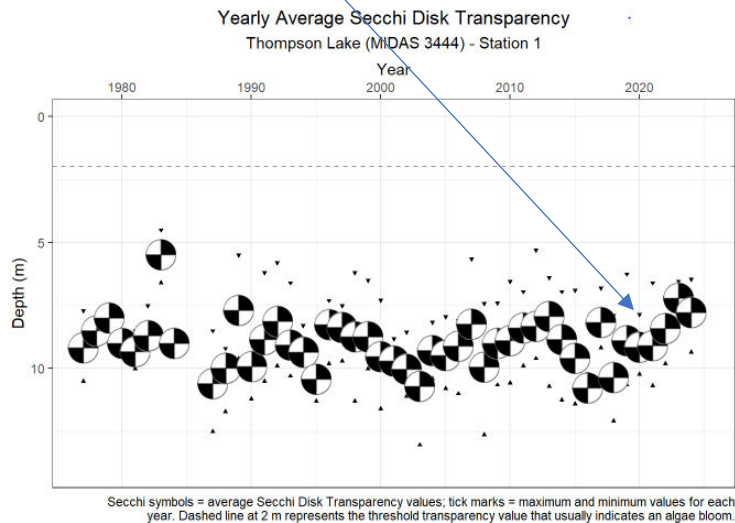


Mann-Kendall Tau Trend Test Result: $\tau = -0.191$, $p = 0.143$; stable or too variable to determine trend

However, the second chart (below) illustrates data for the ten year period from 2014 through 2024, during which water clarity has statistically significantly decreased (become less clear). This trend certainly bears watching,

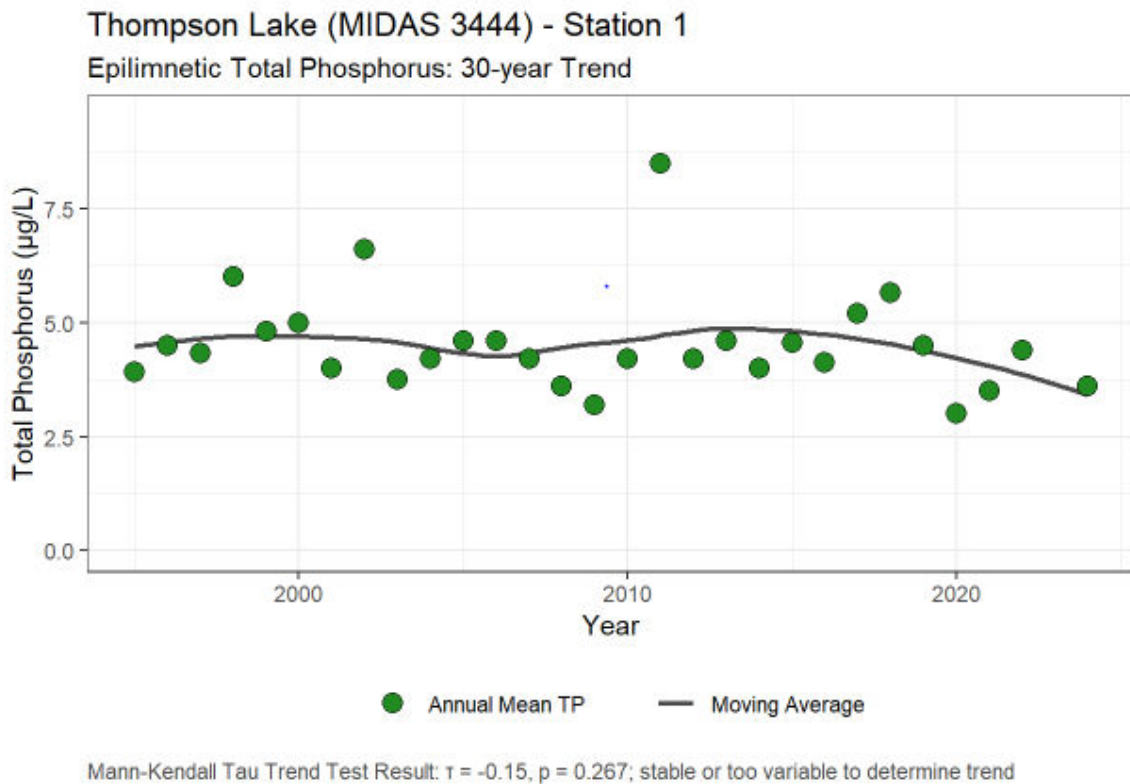


The third chart below illustrates the history of Secchi disk readings over a period of more than four decades, in which the cyclical variability of annual data is shown. It remains to be seen whether or not the current negative trend continues, or improves over the next few to several years, as it has several times during the four decade period. Weather and climate are likely to have been major influences in the cycles.



Total Phosphorus: Total Phosphorus (TP=combined organic and inorganic) integrated water column (epilimnetic core) samples taken monthly during the five month period varied from 3 to 5 parts per billion (ppb), and averaged 3.8 ppb, compared to the historical average of 4.8 ppb. TP samples were not taken near the bottom of the deep sampling station because dissolved oxygen levels remained well above the anoxic threshold (2.0 ppm, or lower) that could trigger the release of phosphorus from the bottom sediments.

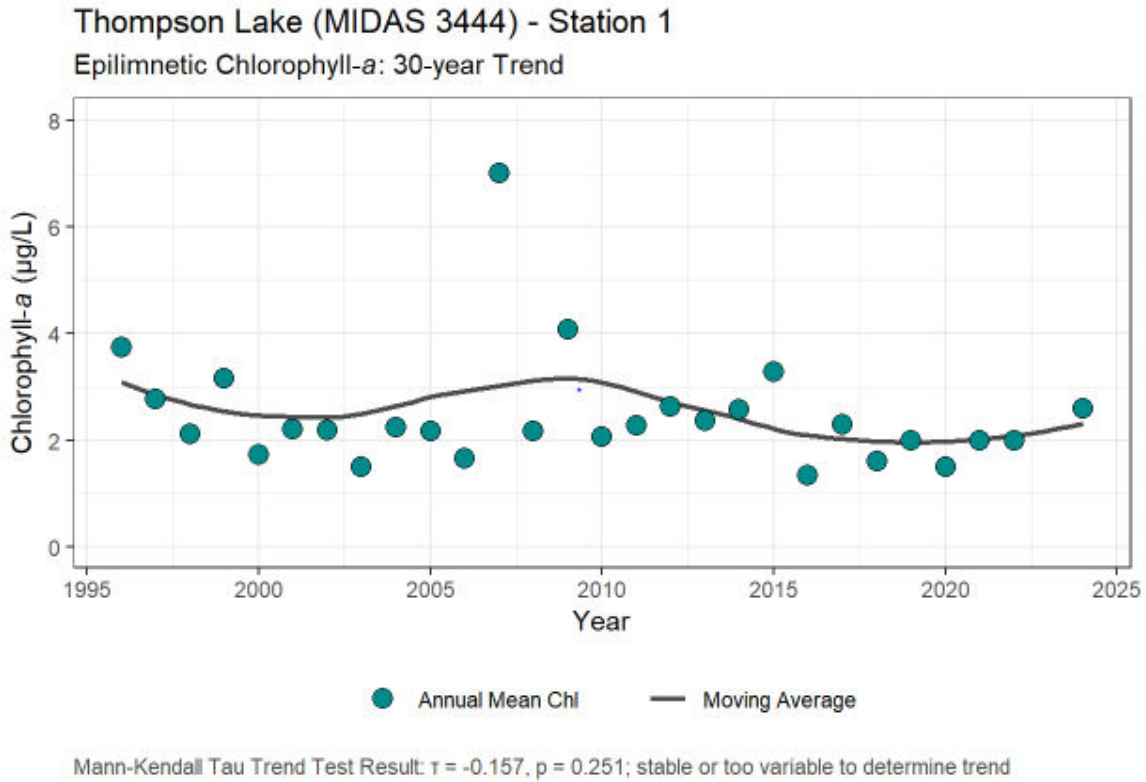
Phosphorus levels in the lake over time have been “stable, or too variable to detect a significant trend” during the past three decades, including the past decade, as illustrated in the chart below.



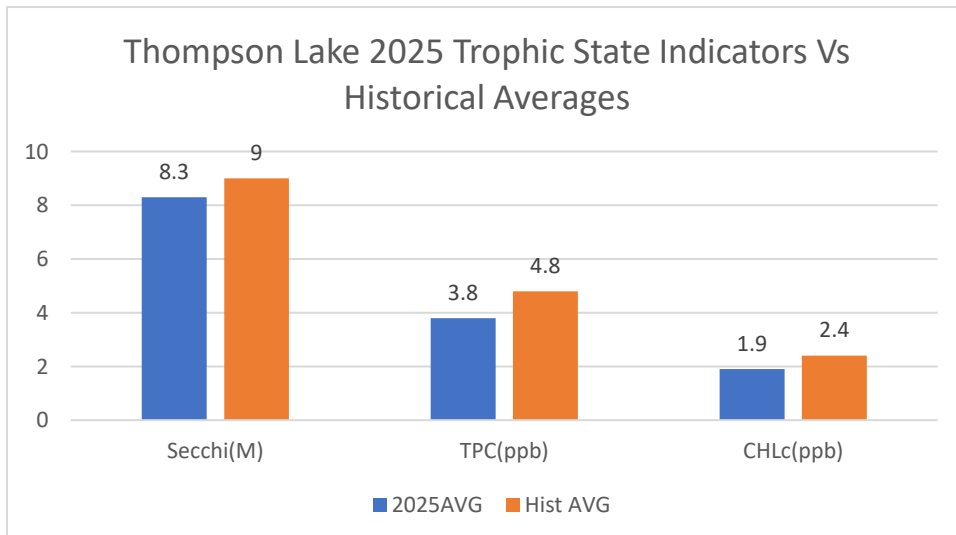
Chlorophyll-a (CHL-a) The water column core concentration of chlorophyll-a, a measure of planktonic algal density in the lake water column, varied from 1.3 to 2.7 ppb during the five month period, averaging 1.9 ppb, compared to the historical average of 2.4 ppb. The low concentrations through the summer were generally consistent with very good water clarity readings.

The 2025 chlorophyll values were among the lowest during the past three decades. No statistically significant trend is evident in the variability that has been documented over the past three decades.

Note that the 2025 annual averages do not appear on the graphics for the three trophic state indicators above because the MDEP had yet not updated the 2025 data as of the date of this report.



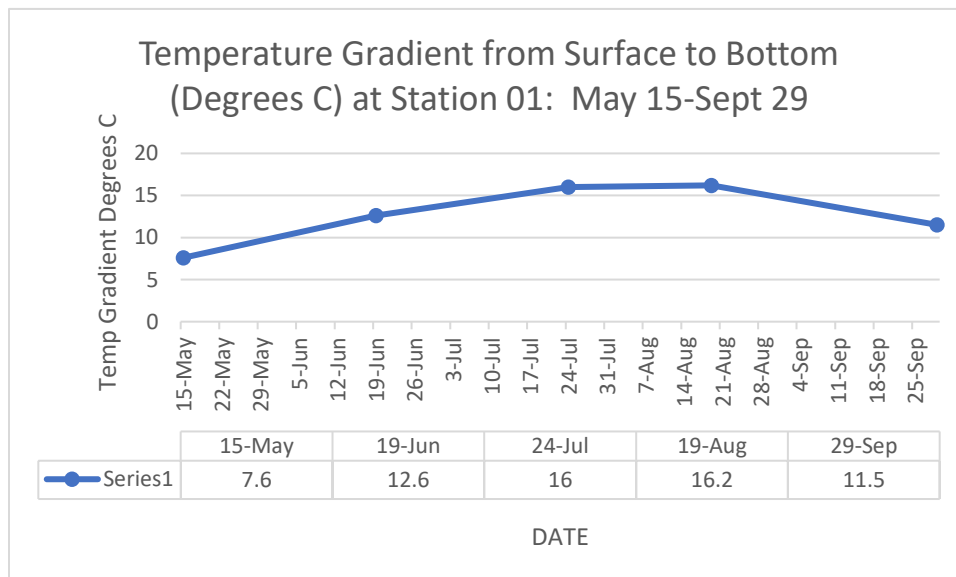
The graphic below illustrates the 2025 average values for the three trophic state indicators, compared to the historical values for Thompson Lake.



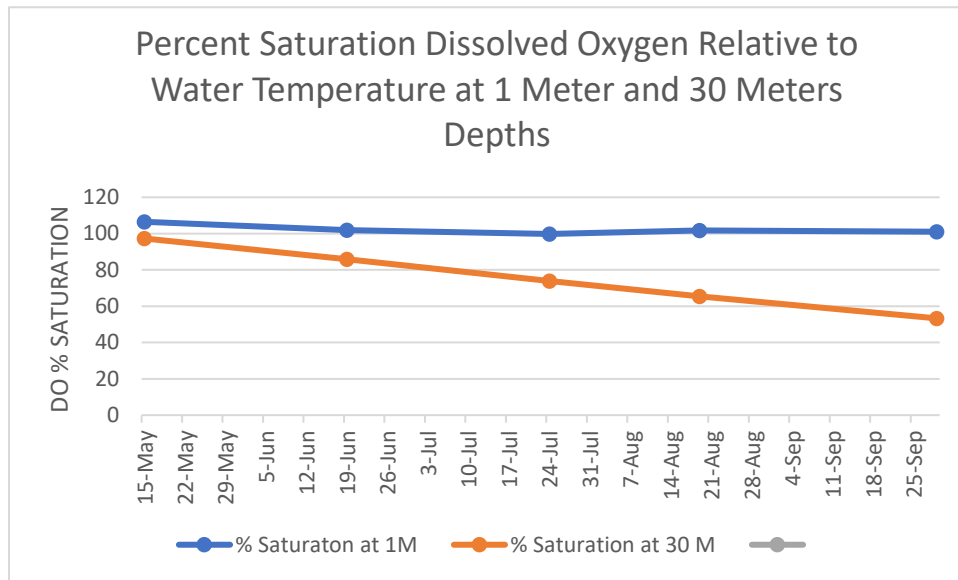
Natural Lake Color Samples to determine natural color were collected from the integrated core sample. Color is measured to determine the relative concentration of humic compounds in lake water. Such compounds typically leach from wetland vegetation, and from decaying leaves from hardwood trees and other organic matter along the shoreline. High concentrations of natural color in lakes (generally greater than 25 CPU) can significantly influence water clarity, and disrupt the normal relationships between water clarity, phosphorus, and chlorophyll.

Historical color levels in Thompson Lake have averaged 10 Standard Platinum Cobalt Units (SPU). The 2025 samples averaged 20 SPU, higher than typical for Thompson Lake, which may be the residual effect of heavy stormwater runoff from the watershed in 2023, following two years of drought and warm conditions in 2020 and 2021. Thompson Lake has a relatively low flushing rate of 0.29/year, which means that it may take more than three years for the lake to purge high concentrations of humic compounds (aka: Dissolved Chromophoric Organic Compounds).

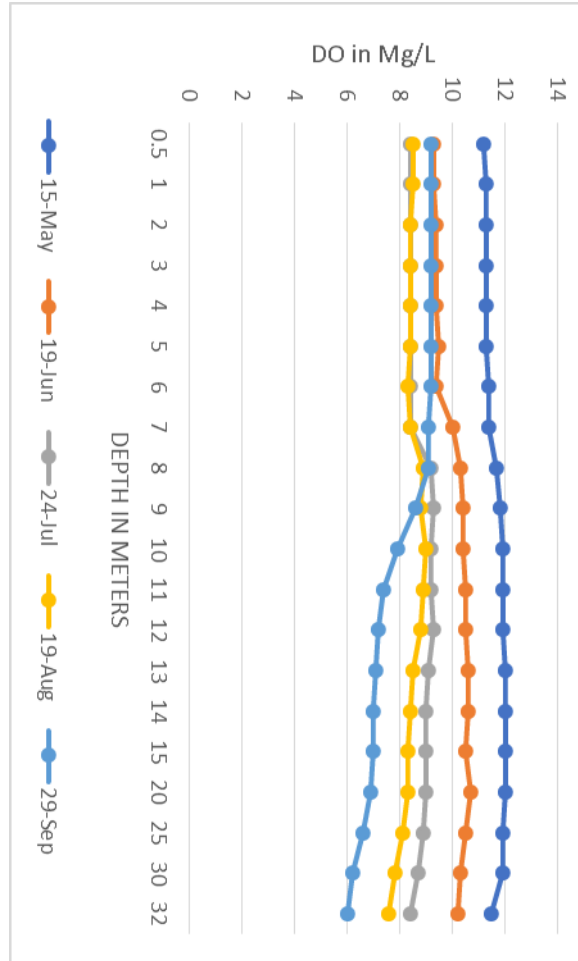
Thermal Stratification and Dissolved Oxygen: Thermal stratification of the water column at the deep sample station was well established by the middle of May, at which time the temperature gradient from the surface to the deepest reading (32 meters) was nearly 15 degrees C. For the next three months, the gradient increased steadily, as illustrated in the chart below. By September 29, shorter days and cool night temps had resulted in the slow cooling process of de-stratification. However, the temperature gradient continued to be well above the spring level.



Dissolved Oxygen (DO) at the surface was 100% saturated (+/-) relative to water temperature throughout the five month monitoring period. DO at the deepest depth (32 meters +/-), one meter from the bottom sediment slowly tapered off from close to saturation in middle May to approximately 53% on September 29. The actual reading at 33 meters on that date was 6.0 parts per million (Mg/L). The approximate DO threshold at which fish become stressed is 4-5 ppm. The chart below illustrates the slow loss of DO in the deepest area of the lake over the five month period.



The following graphic illustrates the changes in the concentration of dissolved oxygen in the water column at the deep sample station over the five month period.



Metaphyton (filamentous algae) screening was done throughout the shallow cove near the public boat access area for each visit to the lake. Very few, minimal masses were observed, and fewer than in several recent years.

Metaphyton is not considered to be invasive, and is common in lakes throughout Maine. However, based on observational reports, this form of algae has increased significantly in some lakes in recent years.

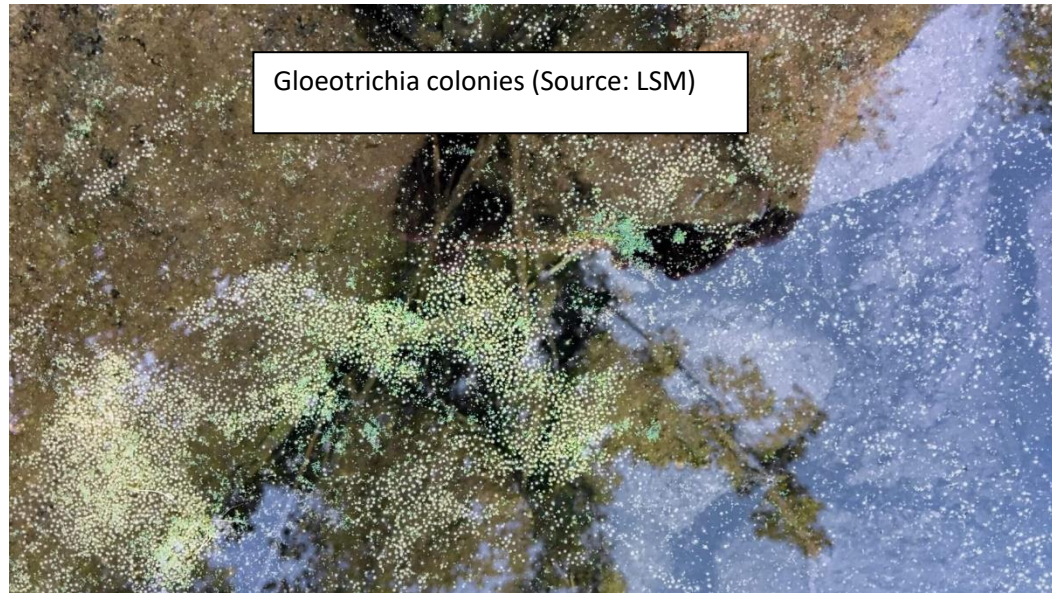


Example of Typical “Metaphyton” clouds (Not Thompson)

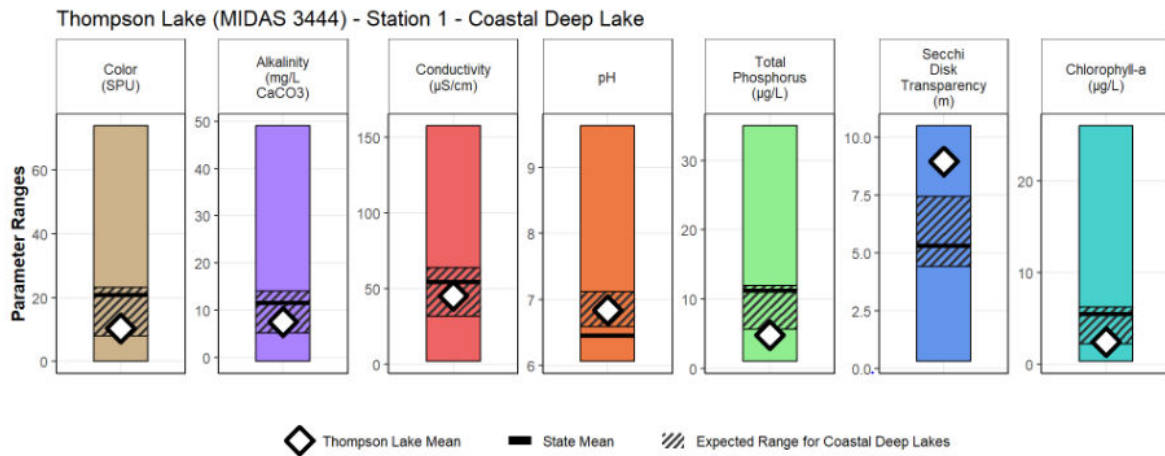
Some research initiatives have suggested that increasing metaphyton may be the result of trophic asymmetry that occurs as a result of early warming of shallow waters, due to climate warming,

We screened Thompson Lake for the colonial cyanobacteria (bluegreen algae) *Gloeotrichia echinulata* at the deep monitoring station, and at the public boat launch cove throughout the monitoring period. "Gloeo" colonies were observed at varying relatively low densities throughout the period. The highest density was documented on August 19. "Gloeo" has been documented in Thompson Lake during the late summer and early fall for more than four decades.

Gloeotrichia echinulata is a colonial algae that forms tiny spheres which are visible to the naked eye. "Gloeo" has historically typically appeared in very low densities in many clear lakes like Thompson throughout Maine and New England during the late summer. In recent years, this algae has been documented at significantly higher densities in higher productivity lakes earlier in the summer. The presence of Gloeo in individual lakes has varied by lake and year. The causal influence(s) for the presence of this algae continue to be researched.



Thompson Lake in Comparison to Other Coastal Deep Lakes: The colored bar charts below were created by the Maine DEP to provide additional perspective for each of the lake water quality parameters indicated. The colored section of each bar shows the parameter ranges for most Maine lakes. The dark horizontal black line indicates the mean (average) value for all Maine lakes. The striped pattern shows the “expected range” for Coastal Deep Lakes – one of three categories of lakes determined by the Maine DEP. Thompson Lake is classified as a Coastal Deep Lake. *The white diamond indicates the mean (average) value for Thompson Lake for each indicator.*



Plot Legend: Solid color bars = parameter ranges for most Maine lakes; horizontal thick black line: mean value for all Maine Lakes; Striped pattern = expected range for Coastal Deep Lakes; white diamonds: mean values for Thompson Lake.

The graphics clearly illustrate Thompson Lake’s excellent water clarity, low total phosphorus and chlorophyll-a, relative to not only other Coastal Deep Lakes, but to all Maine lakes for which water quality exist.

New Maine DEP Lake Scorecards

The new Maine DEP Lake Scorecards were developed to help users answer the basic question: *“How is my lake doing?”*

The scorecard provides a great deal of information pertaining to the condition of individual lakes, including trend analysis of all available historical data. The best way to become familiar with the scorecard for your lake is to first attend a previously recorded online webinar, in which Jeremy Deeds (MDEP Aquatic Ecologist) clearly explains the criteria and parameters used in developing the scorecard. The link to the webinar is:

<https://www.lakestewardsofmaine.org/resources/videos/understanding-the-new-maine-dep-lake-scorecard-on-lakes-of-maine/>



Condition Assessments: ■ Good ■ Fair ■ Poor/At Risk

Maine DEP Lake Scorecard **NEW!**

The Scorecard summarizes many types of lake data into one color-coded graphic, based on current conditions or trends in the lake's health. The color is indicative of an overall condition assessment of each category: **blue = good**, **yellow = fair**, and **red = poor**. **Grey** indicates there is not enough data for an assessment.

A small number of lakes have more than one hydrologic basin, and there will be scorecards for each basin.

Click the Scorecard image or images below to open the **interactive** Scorecard and learn more about each of the categories and their respective parameters -- and to **get involved!**

Questions? Email: MaineDEPLakeScorecard@Maine.gov

To learn more about the scorecard and to have the opportunity to ask the DEP questions, watch this webinar:

[Understanding the New Maine DEP Lake Scorecard](#)

Condition Category	Water Quality Trends	Invasive Plants	Shoreland & Habitat	Lake Vulnerability
Good	Available data indicate that water quality is <i>stable or improving</i>	The lake may be at a <i>reduced risk</i> for a new aquatic invasive plant infestation	Shoreland and littoral habitat are likely only <i>minimally</i> impacted by shoreland activities	The lake may be <i>less vulnerable</i> to water quality changes than other lakes
Fair	Available data indicate that water quality may be <i>declining</i>	The lake may be at a <i>moderate risk</i> for a new aquatic invasive plant infestation	Shoreland and littoral habitat are likely <i>moderately</i> impacted by shoreland activities	The lake may be <i>moderately vulnerable</i> to water quality changes
Poor/At Risk	Available data indicate that water quality may be <i>strongly declining</i>	The lake may be at a <i>higher risk</i> for a new aquatic invasive plant infestation	Shoreland and littoral habitat are likely <i>heavily</i> impacted by shoreland activities	The lake may be <i>highly vulnerable</i> to water quality changes
Unknown	There isn't enough information available to determine Water Quality Trends	There isn't enough information to determine the threat of a new aquatic plant infestation due to lack of available data.	There isn't enough information to determine the condition of the shoreland and littoral habitat due to lack of available data	There isn't enough information to determine the vulnerability of the lake to water quality changes due to lack of data

Explanation of Lake Scorecard Condition Categories

The Scorecard for Thompson Lake highlights areas of both strength and vulnerability for the lake, including the positive water quality for the three trophic state indicators, Secchi transparency (SDT), Phosphorus and Chlorophyll. The blue rating for “Algae Blooms” indicates that the lake has not experienced known algae blooms, based on the Secchi transparency data.

The Lake Vulnerability section shows a mixture of ratings, including “good” for consistently high concentrations of dissolved oxygen, but a “poor or at risk” rating for runoff pollution from watershed development. Sediment Chemistry is rated fair, due to sufficiently high levels of iron and aluminum to bind with phosphorus at this point in time – but possibly at risk as development pressure stresses water quality, and phosphorus levels rise in the lake over time

“Shoreland and Habitat” shows a “Fair” rating for Shoreland Development, despite moderate to heavy development density of the Shoreland area. This is because of the very good work that TLEA has done in recent years to identify and resolve issues pertaining to watershed development that threaten the lake. However the “Poor or at Risk” rating for “Littoral Habitat” indicates that Shoreland development has degraded littoral structure and habitat over time.

The “Fair” rating for “Invasive Aquatic Plants Risk Condition” is similar to ratings for most lakes, due to the risks associated with the presence of public boat access. The “Poor or at Risk” characterization for “Infestation Assessment” is due to the known infestation of an invasive aquatic plant in Thompson Lake (M. heterophyllum). If recent IAS screening surveys have been done, that does not appear to be reflected in the rating.

Summary

Thompson continues to be one of Maine’s “clearest and cleanest lakes”, as documented in the lengthy period of time during which the health of the lake has been monitored. But Thompson is vulnerable, due to moderate shoreline development, as well as development in its large watershed, which encompasses portions of five communities.

The outstanding work undertaken by TLEA to raise public awareness of threats to the lake, and to work with landowners and towns to identify and resolve threats is the most powerful and effective strategy for ensuring the long term health of Thompson Lake.

Climate warming has the potential to exacerbate virtually all known threats to Maine’s lakes. Shorter periods of ice cover, record high summer water temperatures a longer growing season for algae and other lake plants, and an increase in severe weather, ranging from soil-eroding storm events to extended periods of drought may adversely affect lake ecosystems in a number of ways. In recent years many Maine lakes have exhibited signs of stress that are very likely the result of the multiple stresses of extreme weather in a warming climate. It is likely that we do not yet have sufficient knowledge of, or data to fully understand the ways in which Maine’s lakes are changing.

Prepared by LWRMA Limnologist, Scott Williams