2024 Saddleback Lake Water Quality Report

Rangeley Lakes Heritage Trust
CONSERVE | RESTORE | STEWARD

Survey History:

There are two sample stations on Saddleback Lake where monitoring occurs. Station 1 represents the deepest portion of the lake and reaches 14ft, while station 2 reaches 9ft. Monitoring has occurred on Saddleback Lake since 1974 and provides us with important information on water temperature, dissolved oxygen, water clarity, and water chemistry parameters including phosphorus. Collecting and observing this data helps us understand not only the current state of Saddleback Lake, but also how it has been changing in recent years with rising temperatures, shorter winters, and increased development and runoff.

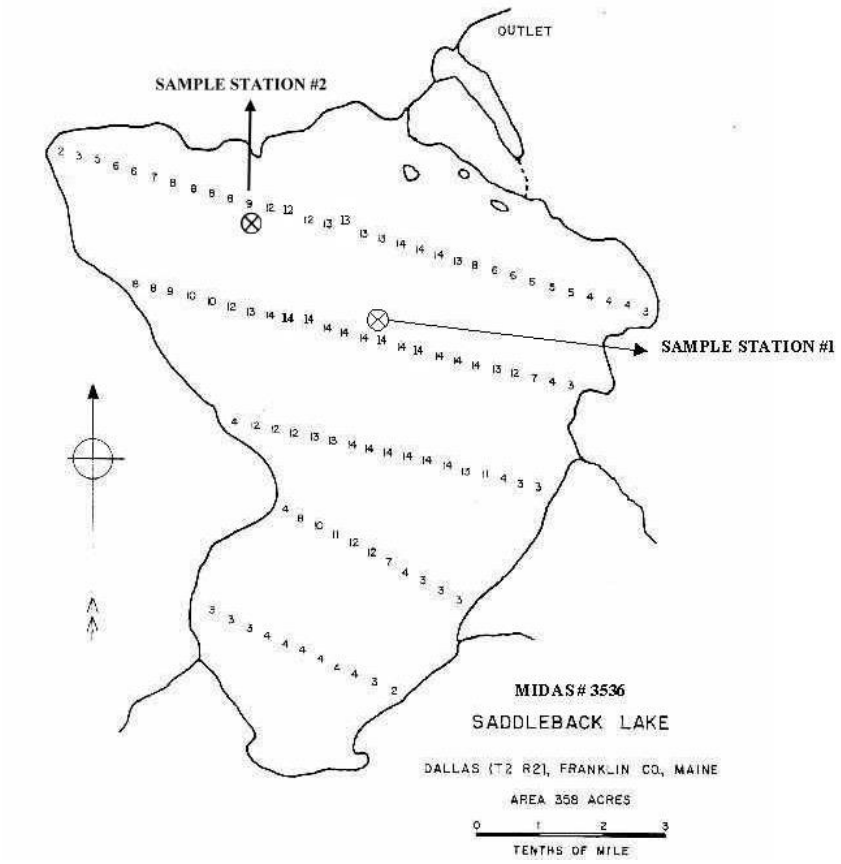

Figure 1: Map of the sample stations on Saddleback Lake. Via Lake Stewards of Maine

A common trend occurring in ponds and lakes is a tendency to become warmer and more polluted due to climate change and lakefront development. Warmer waters are not able to hold as much oxygen as colder waters. When oxygen levels drop too low, lakes are not able to support fish, plants, and other aquatic life. Increased pollution due to runoff of fertilizers, herbicides,

human and pet waste, and other man-made materials can cause increased algae, decreased oxygen, and decreased water transparency. Although these are all common trends statewide, they are not all necessarily the same trends that are being observed on Saddleback Lake.

At each location, annual readings of dissolved oxygen, secchi, and temperature have been recorded, as well as periodic phosphorus samples. This has historically been a task for volunteers and RLHT interns who have access to the stations during the summer. However, some years had a lack of volunteers or the resources to monitor the lake biweekly as suggested by the state and Lake Stewards of Maine. Therefore, the data is not entirely complete and has some gaps which could account for minor inconsistencies in the data.

Current Trends:

While there are 2 survey stations on Saddleback Lake, station 2 only has four years of data. This station only begun being monitored in 2021 and since then only two years have been monitored regularly. Due to the lack of information no significant trends were able to be distinguished from this station. Station 1 will be the only station used in this report as sufficient data is available from that site.

Water Transparency:

Water transparency readings are taken with a Secchi disk to determine the depth at which light can penetrate through the water. This tells us how clear or turbid the water is at any given time. Transparency also represents how abundant pollutants could be in the water. Murkier or turbid water typically has more runoff, while clearer water is less polluted. However, natural factors like rain, seasonal changes, and proximity to the shore can also cause secchi readings to be lower due to increased sediments in the water. A higher Secchi reading is preferable as it suggests that water is clear, unpolluted, and contains less runoff. Lower secchi readings suggest increased pollution and runoff.

Transparency levels are showing very little sign of change on Saddleback Lake. In the past 50 years levels have only slightly increased on the lake (Figure 2). Increased transparency is a sign of minimal runoff and pollution and suggest clearer waters and positive lake health. Clearer waters expand the littoral zone allowing more plants to grow and improves the health of aquatic life by allowing more light penetration and visibility. Although this increase is very slight, it still suggests that few pollutants are entering the water.

It is also important to note that Saddleback Lake is a fairly shallow lake and only reaches approximately 14ft (4.3m). When monitoring, the secchi disk often hits the bottom of the lake which limits the depth at which transparency can be measured. This suggests that light can often penetrate to the bottom of entire lake. This is a common trend seen in shallow lakes and is indicative of unpolluted waters.

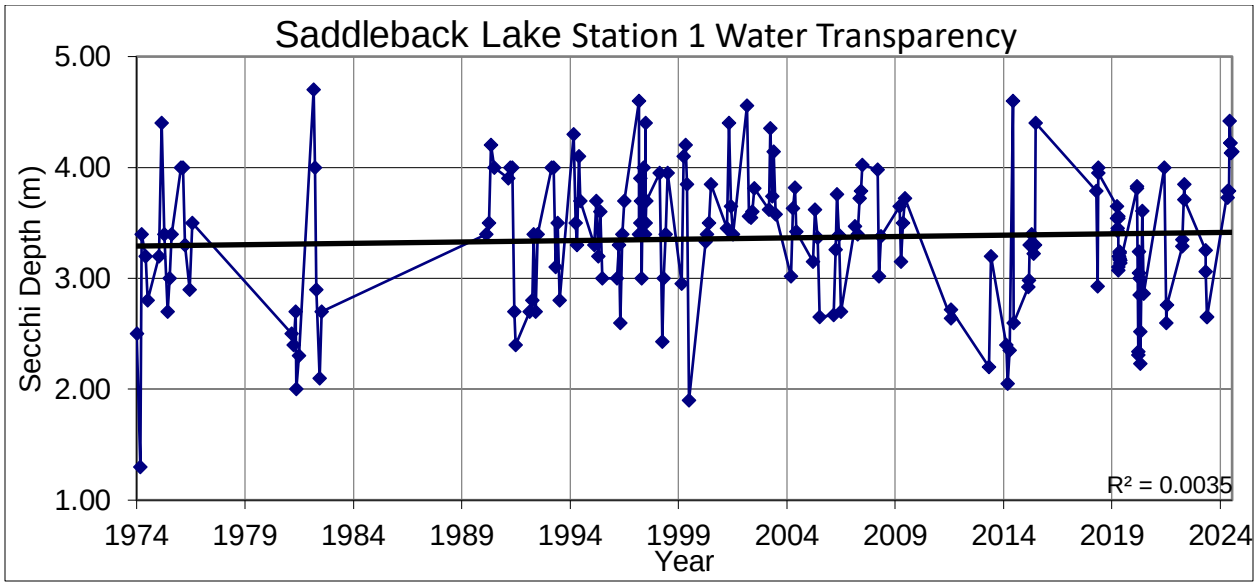

Figure 2: Water transparency from on Saddleback Lake with a weak correlation showing a slight increase in 50 years.

Dissolved Oxygen:

Dissolved Oxygen (DO) readings are taken with a meter that is slowly lowered from the surface to the bottom of the lake in 1m increments. DO levels will fluctuate from the surface to the bottom for a host of reasons including water temperatures, decomposing matter, light penetration, and photosynthesis abilities. In the summer, it is expected that DO will be lower at the bottom of a body of water. If DO levels are too low throughout the entire column for long periods of time aquatic life will not be able to survive. According to the US EPA when dissolved oxygen levels drop below 5mg/L the waters become stressful to fish and aquatic life. When levels drop below 3mg/L they can no longer support fish, and below 1mg/L is considered a hypoxic dead zone where nothing can survive. When excess nutrients such as phosphorus and nitrogen enter the water or temperatures rise, DO levels will decrease.

Saddleback Lake is experiencing decreasing DO levels. In the past 50 years a moderate correlation has shown a decrease of approximately 1.5mg/L (Figure 3). Decreasing DO is not ideal for lake health and can lead to stressful aquatic habitats. DO is highly affected by water temperatures and is likely decreasing due to rising water temperatures as seen in the section below. Although DO levels on Saddleback Lake have not yet reached the stressful threshold of 5mg/L, it is likely that temperatures will continue to increase causing DO levels to continue to decrease. If levels decrease past this threshold, it may be difficult for aquatic wildlife to survive.

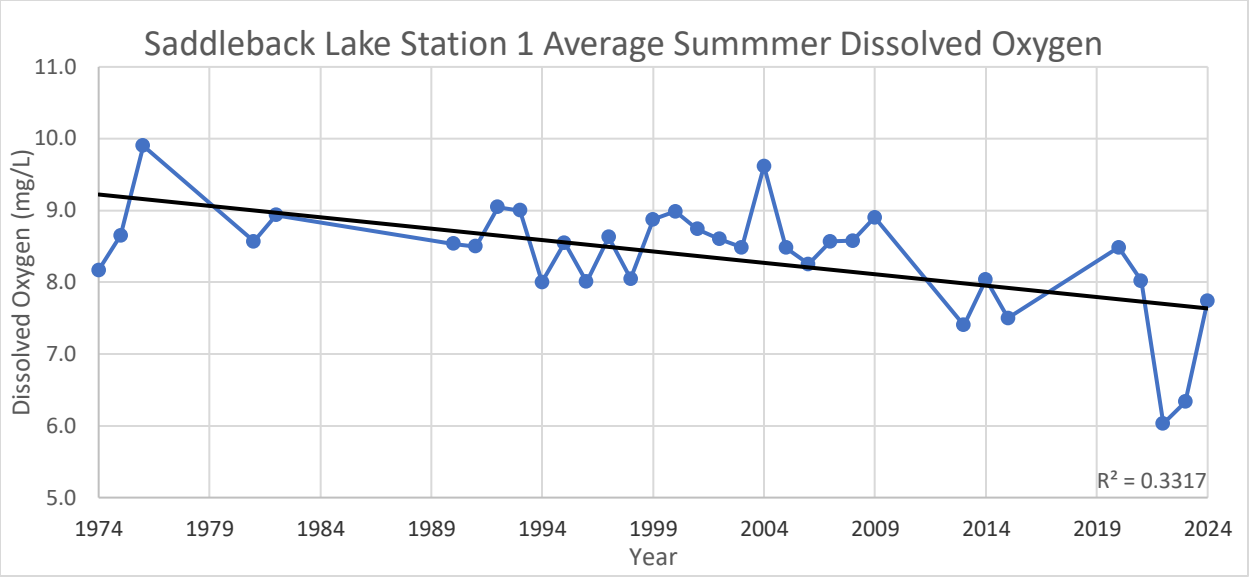

Figure 3: Average summer DO levels from June to September on Saddleback Lake with a moderate correlation showing a decrease of approximately 1.5mg/L in 50 years.

Temperature:

Temperature readings are taken with the same meter as DO and are measured in 1m increments from the surface to the bottom of the lake. In the summer, temperatures will typically be higher at the surface and cooler at the bottom. Rising temperatures in a lake can directly impact fish and other aquatic wildlife, increase the production of algal blooms, decrease DO levels, and in extreme cases lead to dead zones where no life can survive. Lake temperatures have been increasing across New England for decades, and Saddleback Lake is experiencing similar trends.

Saddleback Lake is experiencing rising water temperatures. In the past 50 years a moderate correlation has shown an increase of over 6°F (figure 4). This increase is likely caused by rising air temperatures and shorter winters. Rising temperatures are not ideal for lake health and are likely leading to decreased DO levels. Since Saddleback Lake is fairly shallow it is more vulnerable to warming temperatures than deeper lakes in the region. Its shallow depth allows mixing to occur throughout the entire water column constantly stirring up and circulating warm waters to all depths of the lake. As discussed in the transparency section, light is often able to penetrate to the bottom of the lake warming waters through the entire column. Water and air temperatures are difficult to control and will most likely continue to warm in the coming years.

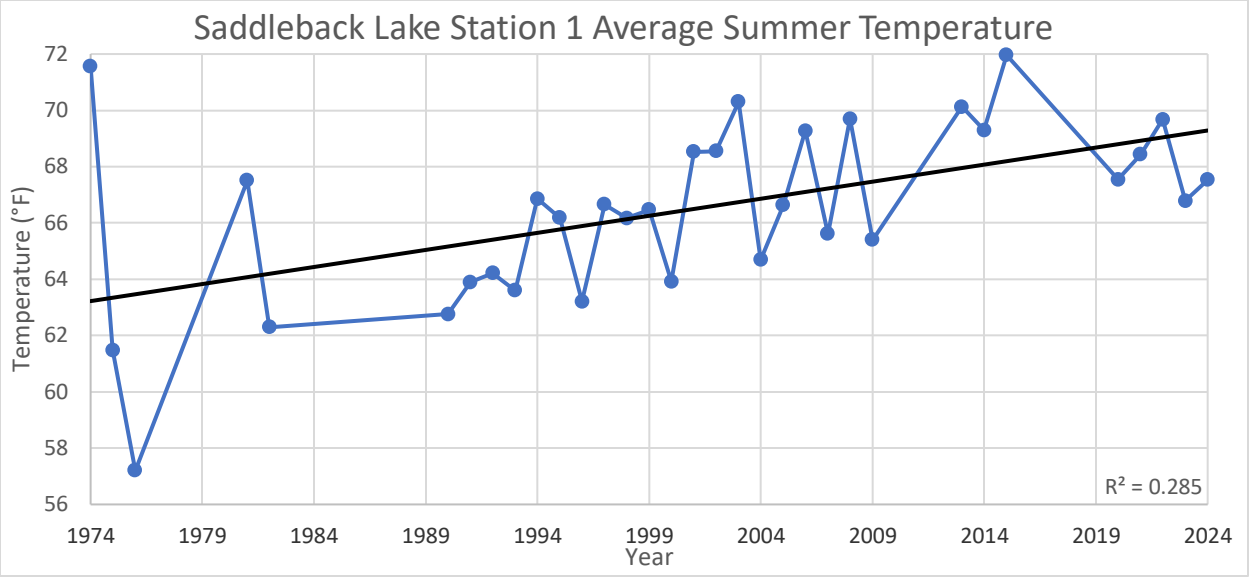

Figure 4: Average summer temperature from June to September on Saddleback Lake with a moderate correlation showing an increase of over 6°F in 50 years.

Phosphorus:

Phosphorus tests are taken during the summer at the surface of the lake. A small sample of water is collected and sent to the Maine Health and Environmental Testing Laboratory. Phosphorus is a nutrient that occurs naturally in soils and sediments and is vital for plant growth. However, too much phosphorus can lead to excessive bacteria and algae growth commonly known as algal blooms. These blooms can decrease water clarity and even produce harmful toxins for humans and animals. Phosphorus is very commonly found in fertilizers and sewage which can easily flow from lakefront gardens, yards, or faulty septic's and into a body of water. The USEPA suggests that in order to maintain healthy lake levels phosphorus should remain below 0.05mg/L, however other sources suggest maintaining levels below 0.03mg/L is best. We test for this nutrient in the water to understand how much runoff is entering the lake and if there is any potential for harmful algal blooms and decreased lake health.

Phosphorus levels on Saddleback Lake are showing healthy decreasing trends. In the past 46 years a weakly correlated trend shows that phosphorus levels have dropped very slightly by approximately .0025mg/L (Figure 5). In the 70's and early 80's there seemed to be slightly higher levels of phosphorus on the lake. In 1981 these levels reached their highest at 0.024mg/L. These highs likely indicate some runoff or pollution that could have been entering the water during this time. It is important to note that these phosphorus readings did not reach harmful levels. In recent years it appears that the lake has slowly recovered by yielding phosphorus tests with lower readings. This suggests that the lake is now experiencing healthy phosphorus trends indicating minimal runoff and pollution.

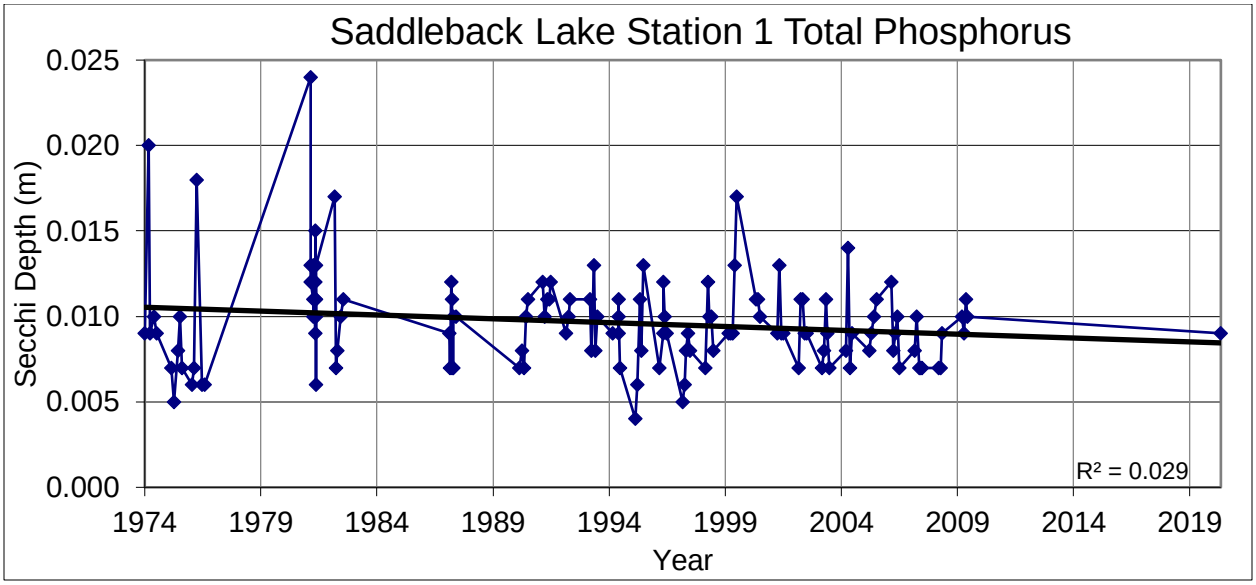

Figure 5: Total Phosphorus on Saddleback Lake with a weak correlation showing a very minor decrease in over 45 years.

Suggestions:

The trends discussed suggest that Saddleback Lake is not experiencing runoff and pollution concerns, however temperature and DO levels appear to show negative trends. Decreasing phosphorus and increasing transparency suggest minimal runoff and pollution entering the lake interfering with aquatic life. However, temperatures on the lake seem to be steadily increasing, causing DO levels to drop. It is likely that these trends will persist in future years which could cause stressful environments for aquatic fish, plants, plankton, and all wildlife that interacts with the lake. While it is difficult to control rising air and water temperatures, there are a few actions that can help reduce the impacts they have on the aquatic ecosystem.

Possibly actions to decrease lake temperatures:

Actions	Benefit	Location
Implement rain gardens and infiltration steps	-Allows stormwater to enter underground aquifers to cool instead of entering directly into the lake -Reduces the risk of erosion	Lakefront homes and properties
Maintain a native vegetative buffer at the shoreline	-Reduces the flow of stormwater directly into the lake -Reduces the risk of erosion	-Lakefront homes and properties -Shoreline around the entire lake
Plant mature trees along lake edge	-Directly shades and cools shallow waters along the lake -Helps reduce the flow of stormwater into the lake	-Lakefront homes and properties -Shoreline around the entire lake
Maintain narrow, shaded roadways	-Shades and cools the land around lake	Large and small roads surrounding the lake
Continuous monitoring of potential invasive plants	-Reduces the possibility of invasive plants entering the water body, disrupting the ecosystem, and	-Boat Launches -Littoral zone surrounding the lake

	contributing to warming temperatures.	
Maintain healthy and shaded tributaries	-Deposits cold water directly into lake -Improves fish habitat and movement	-Haley Brook -Geneva Bog Brook -Rock Pond Stream

Possibly actions to limit decreasing DO:

Actions	Benefits	Locations
Maintain a vegetative buffer and native forests surrounding the lake	-Intercepts stormwater and prevents large amounts of runoff from entering the lake -Reduces soil erosion	Lakefront homes and properties
Implement highly permeable soils	-Sandy and permeable soils increase filtration of stormwater before entering the lake	-Lakefront gardens -Lakefront lawns
Care for septic systems	-Reduces the risk of chemicals, bacteria, and viruses from entering the water	Lakefront homes and properties
Limit use of herbicides, pesticides, and fertilizers	-Prevents toxic chemicals from getting the chance to enter the water	-Lakefront homes and properties -Nearby farms
Maintain driveways and roads with less impervious surfaces	-Minimizes road chemicals entering the lake directly	-Lakefront homes and properties -Roads surrounding the lake
Consider becoming LakeSmart certified	-Allows waterfront properties to be individually analyzed -Provides feedback on how to improve your home lake impact	Lakefront homes

While any of these actions could be beneficial to the health of Saddleback Lake, there is no way for us to understand our impact without continued monitoring. The volunteer water quality monitoring program needs volunteers to continue taking annual readings at the sampling stations on the lake. Individuals can become certified to take Secchi and DO readings through Lake Stewards of Maine. With the information gathered, we can observe current trends and take immediate action if concerning trends are observed. For more information on joining the volunteer effort, or with any other questions, please reach out to headwaters@rlht.org.

Sources:

Lakes Environmental Association

United States Environmental Protection Agency-Climate Change Workbook

United States Environmental Protection Agency-Dissolved Oxygen

USGS-EPA Phosphorus levels

Maine Lakes

Lake Stewards of Maine