2024 Haley Pond Water Quality Report

Rangeley Lakes Heritage Trust
CONSERVE | RESTORE | STEWARD

Survey History:

There are two sample stations on Haley Pond that represent the deepest sections on the water. Station 1 is the deepest hole and reaches 23ft, while station 2 reaches 12ft (Figure 1). These stations have been monitored since 1970 and provide 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 Haley Pond, but also how it has been changing in recent years with rising temperatures, shorter winters, and increased development and runoff.

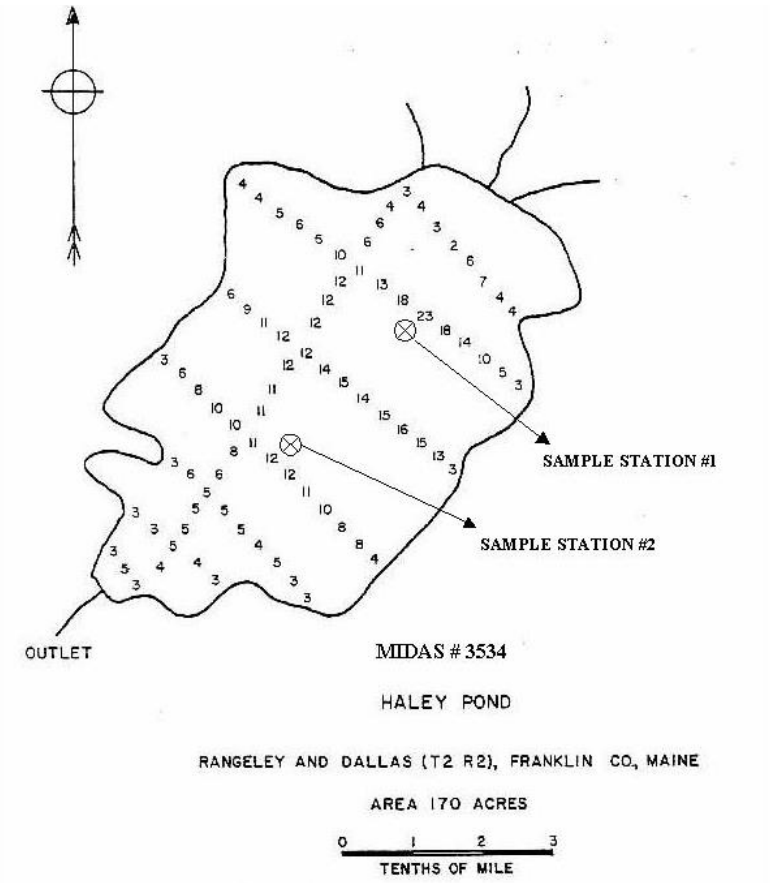

Figure 1: Map of the sample stations on Haley Pond. Via Lake Stewards of Maine

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 necessarily the same trends that are being observed on Haley Pond.

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 who live on the pond or RLHT interns who have a way to access the station twice a month 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 Haley Pond, station 2 only has four years of temperature and dissolved oxygen data. There is a reasonable amount of secchi data to determine trends at this station, but that is the only parameter with significant data. Due to the lack of information no significant temperature, DO, or phosphorus trends were able to be distinguished from this station. Therefore, Station 1 will be the primary station used in this report as sufficient data is available from that site for all parameters.

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. Low secchi readings

Haley Pond is experiencing increased water transparency. A moderate correlation shows that in the past 54 years transparency has increased by over 1m (Figure 2). A weak correlation shows that in as short as 4 years station 2 has also seen a slight increase in transparency of less than .5m (Figure 3). Increased transparency is a positive sign of increasing water health. Clearer waters expand the littoral zone allowing more plants to grow and improve the health of fish and loons by allowing more light penetration and visibility. It is important to note that Haley Pond is a fairly shallow pond where the secchi disk can often touch the bottom (especially at station 2). This suggests that unless water levels are high water transparency will not increase at station 2.

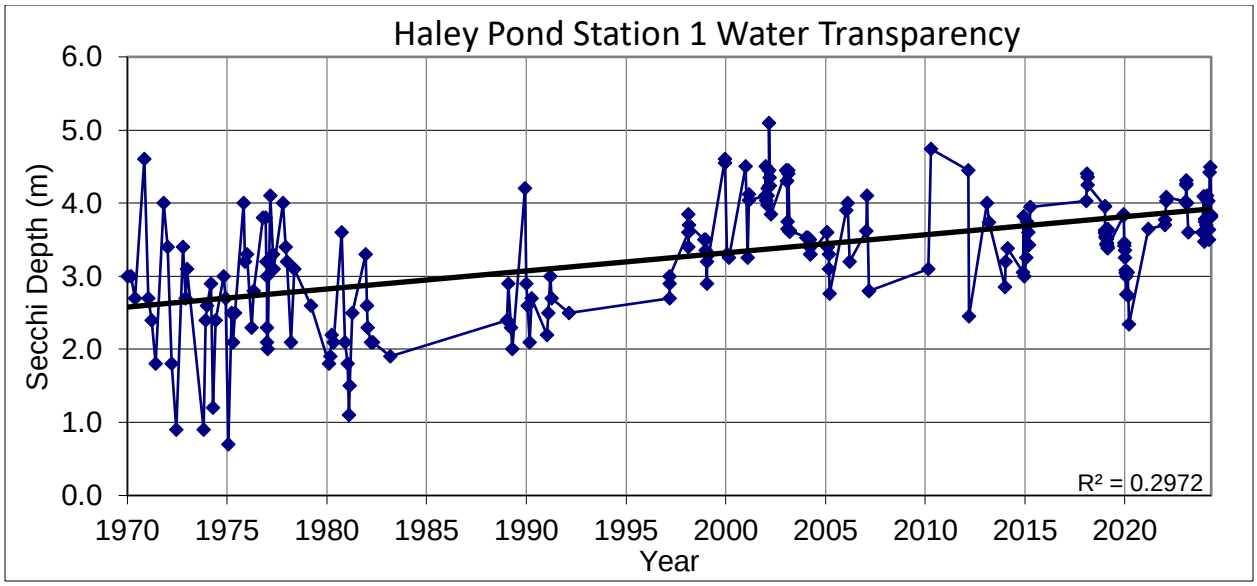

Figure 2: Water transparency on Haley Pond Station 1 with a moderate correlation showing an increase of more than 1m in over 50 years.

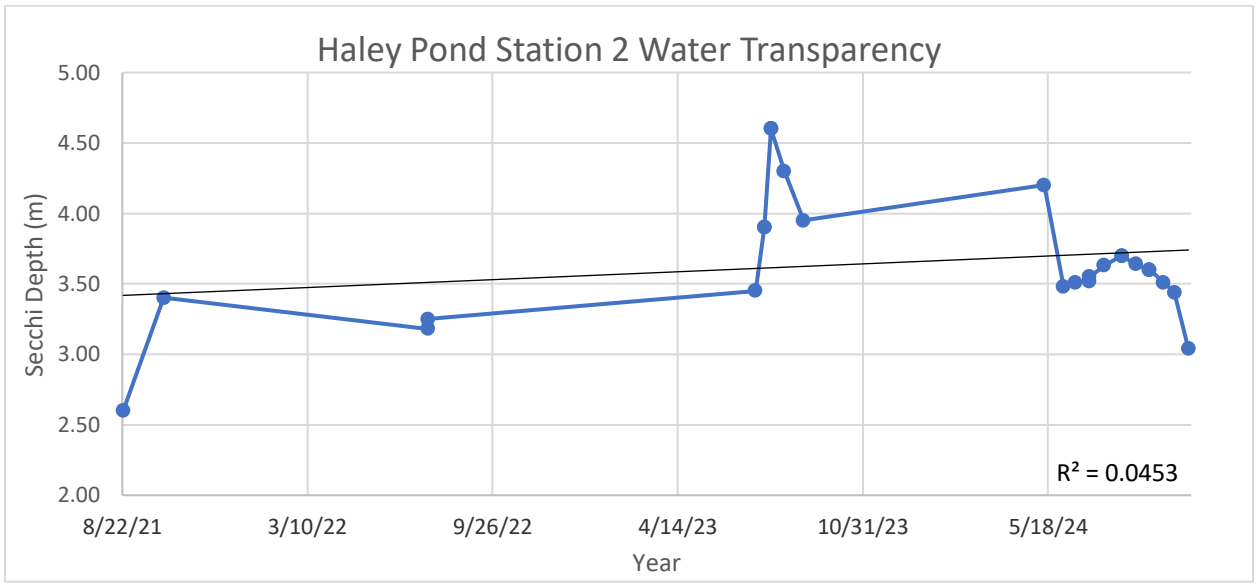

Figure 3: Water transparency on Haley Pond Station 2 with a weak correlation showing an increase of less than .5m in 4 years.

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.

It appears that DO levels on Haley Pond are decreasing. A weak correlation shows that in the past 54 years the average summer DO has decreased by more than .5mg/L (Figure 4). In recent years it appears that the reported summer average neared the stressful threshold of 5mg/L, and in 2005 average DO passed this threshold at 4.825mg/L. If levels continue to decrease it is possible that stressful conditions could become common on the pond. DO is heavily influenced by temperatures and are likely decreasing due to the rising temperatures on the pond. Temperatures are expected to continue to rise and therefore DO levels will likely continue to decrease.

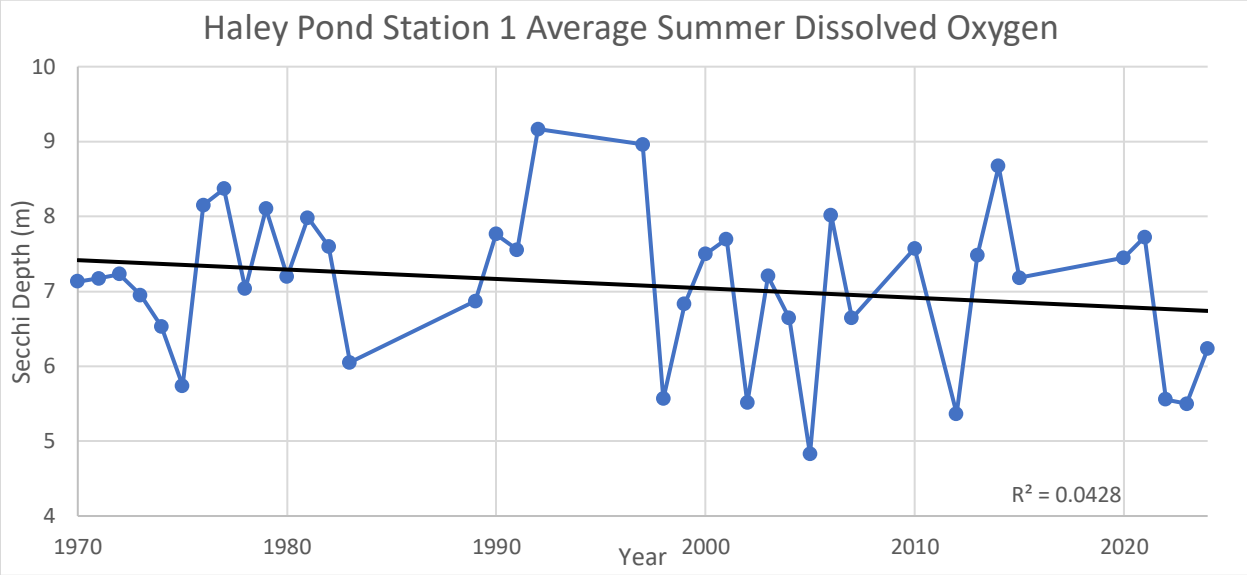

Figure 4: Average summer DO levels from June to September on Haley Pond station 1 with a weak correlation showing a decrease of more than .5mg/L in over 50 years.

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 Haley Pond is experiencing similar trends.

Temperatures appear to be increasing on Haley Pond. A moderate correlation shows that in the past 54 years the average summer temperature on the pond has increased by approximately 6°F (Figure 5). These rising temperatures are likely caused by rising air temperatures and shorter winters. While these trends are not beneficial for the pond's health, they are unfortunately very common in the region. These rising temperatures are likely the cause of the decreasing DO trends that the pond is also experiencing. Continuous rising temperatures and decreasing DO could lead to harmful environments to aquatic life like fish, birds, plants, and more. While it is

difficult to control air and water temperatures, there are a few actions that can be taken as discussed in the suggestions section below.

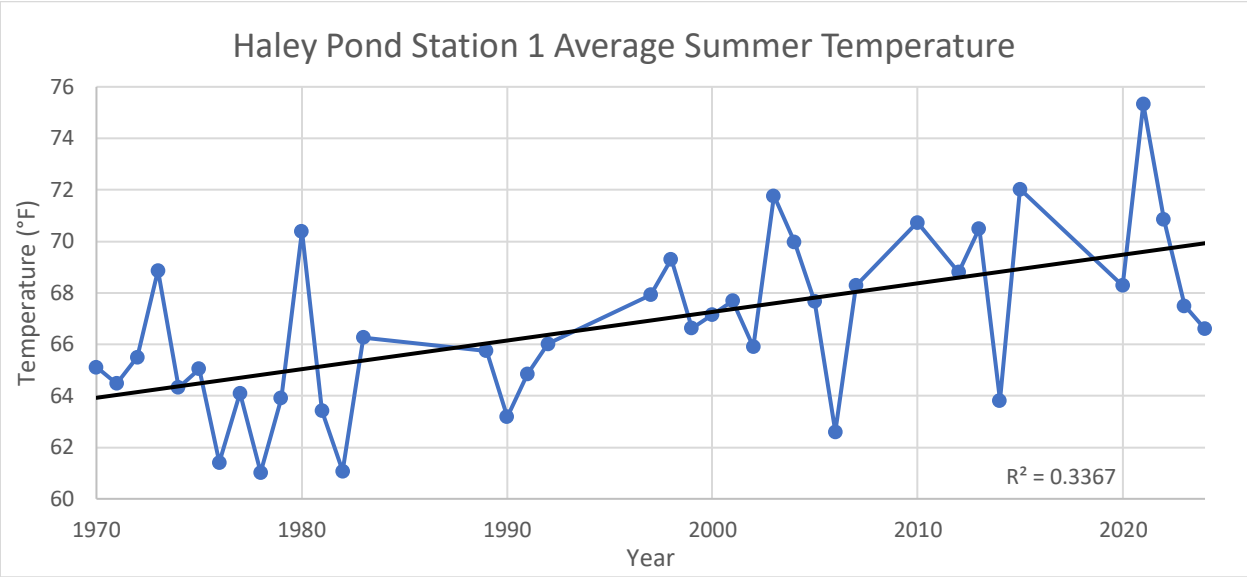

Figure 5: Average summer temperature from June to September on Haley Pond with a moderate correlation showing an increase of approximately 6°F in over 50 years.

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.

Total phosphorus levels appear to be decreasing on Haley Pond. A weakly correlated trend shows that in the past 52 years phosphorus has decreased by approximately 0.02mg/L (Figure 6). Haley Pond has experienced several spikes in phosphorus throughout the years. Many of these surges passed both the 0.03mg/L and 0.05mg/L threshold for healthy bodies of water, resulting in long term phosphorus rich waters. These spikes were likely caused by runoff of chemicals, fertilizers, or sewage from the nearby town. However, it appears that in recent years the pond has begun to recover to lower phosphorus levels, despite another large spike up to 0.07mg/L in 2012. Thes trends suggest that Haley Pond is exposed to high runoff and pollution events that could cause excess plant growth, possible harmful algae blooms, and habitat degradation. It appears these high levels have decreased in recent years, but it is crucial to maintain low phosphorus inputs by reducing runoff.

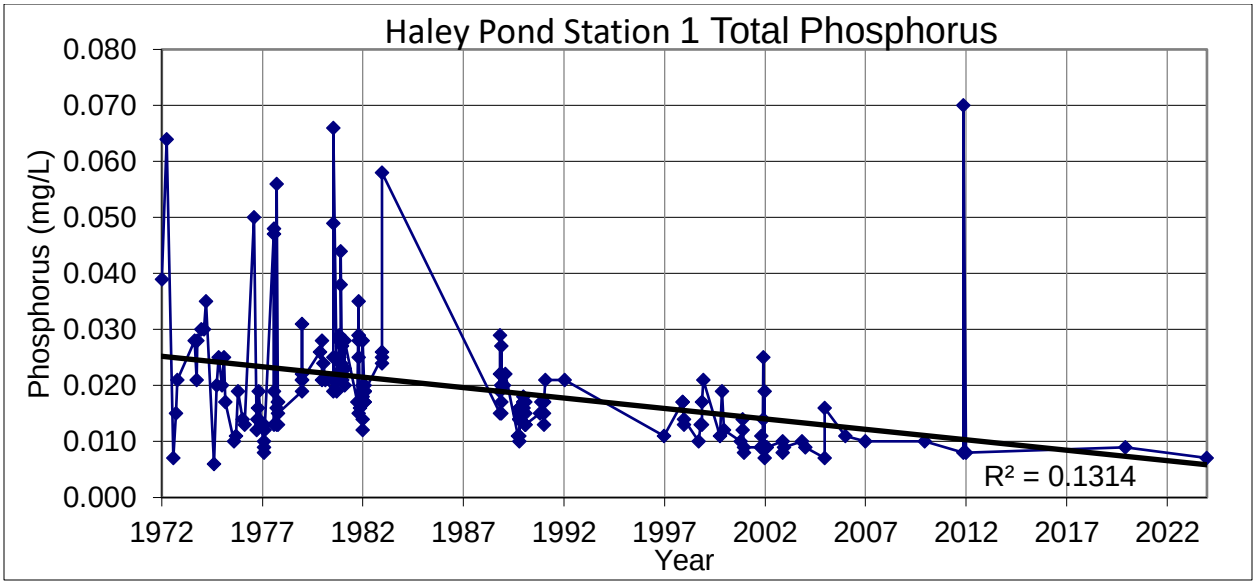

Figure 6: Total Phosphorus on Haley Pond with a weak correlation showing a decrease of approximately .002mg/L in over 50 years.

Suggestions:

The trends discussed suggest that Haley Pond is experiencing possibly harmful effects from increased temperatures, as well as recovering phosphorus levels. Increasing regional temperatures are causing water temperatures on the pond to increase, leading to low dissolved oxygen levels. These trends are expected to continue which could lead to stressful habitat for aquatic life on the pond. Below are a few actions that can be taken to help reduce the impact of rising temperatures on the pond.

As for phosphorus on the pond, these levels have been historically high. High phosphorus is not ideal for aquatic life. Recent trends seem to show recovery from these historic highs, but it is important to continue limiting runoff into the lake to reduce the risk it poses.

Possibly actions to decrease pond temperatures:

Actions	Benefit	Location
Implement rain gardens and infiltration steps	-Allows stormwater to enter underground aquifers to cool instead of entering directly into the pond -Reduces the risk of erosion	Waterfront homes and properties
Maintain a native vegetative buffer at the shoreline	-Reduces the flow of stormwater directly into the pond -Reduces the risk of erosion	-Waterfront homes and properties -Shoreline around the entire pond
Plant mature trees along pond edge	-Directly shades and cools shallow waters along the pond -Helps reduce the flow of stormwater into the pond	-Waterfront homes and properties -Shoreline around the entire pond
Use gravel or dirt for roadways instead of asphalt and concrete	-Reduces the cover of impervious surfaces surrounding the pond	Large and small roads surrounding the pond

	-Allows stormwater to enter the ground and cool instead of directly entering the pond -Diverts runoff from entering directly in the pond -Reduces impact of erosion	
Maintain narrow, shaded roadways	-Shades and cools the land around lake	Large and small roads surrounding the pond
Continuous monitoring of potential invasive plants	-Reduces the possibility of invasive plants entering the water body, disrupting the ecosystem, and contributing to warming temperatures.	-Boat Launches -Littoral zone surrounding the pond
Maintain healthy and shaded tributaries	-Deposits cold water directly into pond -Improves fish habitat and movement	-Small streams surrounding the pond

Possibly actions to decrease runoff:

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

While any of these actions could be beneficial to the health of Haley Pond, there is no way for us to understand our impact without continued monitoring. 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