Lakes Environmental Association

2021 Water Testing Report

Chapter 3—High-resolution Temperature Monitoring

Introduction to High-resolution Temperature Monitoring

LEA began using in-lake temperature sensors to acquire high-resolution temperature measurements in 2013. The sensors, which are also interchangeably referred to as HOBO sensors, are used to provide a detailed record of temperature fluctuations within lakes and ponds in our service area. High-resolution temperature data allows for a better understanding of a water body's thermal structure, water quality, and the possible influence of climate change.

Each year, we attempt to capture the entire stratified period within the temperature record, from when stratification begins to form in the spring to when the lake mixes in the fall. Stratification refers to the separation of lake waters into distinct layers and is a natural phenomenon that has important consequences for water quality and lake ecology. See Chapter 1, page 7 of the Water Testing Report for more information about stratification.

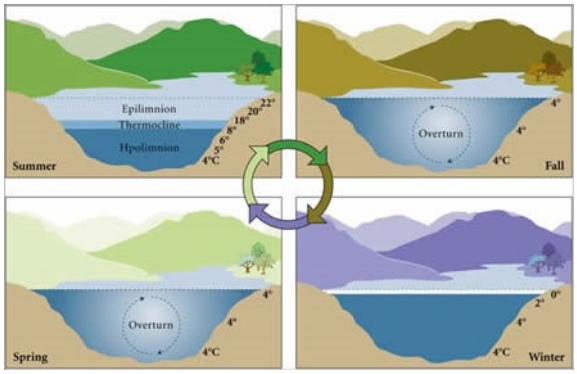
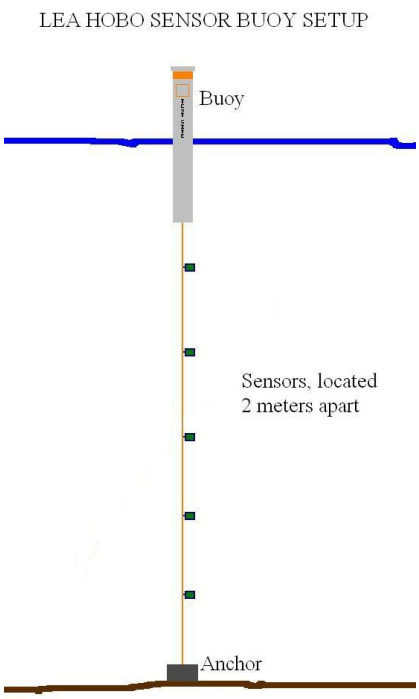


Diagram of Seasonal Stratification and Lake Mixing
Young, M. (2004). *Thermal Stratification in Lakes*. Baylor College of Medicine, Center For Educational Outreach.

Water temperature is critical to the biological function of lakes as well as the regulation of chemical processes. Lake temperature and stratification are greatly influenced by the weather. Air temperature, precipitation, and wind speed and direction can all affect water temperature and stratification patterns from year to year. Lake size, depth, and shape also greatly impact stratification timing and strength. The larger the difference in temperature between the top and bottom layers of the lake, the stronger the stratification is.



With funding and support from local lake associations, LEA has deployed temperature sensors at seventeen sites on thirteen lakes and ponds. Sensors are attached to a floating line held in place by a regulatory-style buoy and an anchor. The sensors are attached at 2-meter intervals, beginning one meter from the bottom and ending approximately one meter from the top. Each buoy apparatus is deployed at the deepest point of the basin it monitors. The setup results in the sensors being located at odd numbered depths throughout the water column (the shallowest sensor is approximately 1 meter deep, the next is 3 meters, etc.).

Temperature sensors are programmed to record temperature readings every 15 minutes. LEA has for many years used a handheld YSI meter to collect water temperature data however this method is time consuming, resulting in only eight temperature profiles per year. While temperature sensors require an initial time investment, once deployed, the sensors record over 15,000 profiles before they are removed in the fall. This wealth of data provides much greater detail and clarity than the traditional method ever could. Daily temperature fluctuations, brief mixing events caused by storms, the date and time of stratification set up and breakdown, and the timing of seasonal high temperatures are all valuable and informative events that traditional sampling can't accurately measure.

2021 Monitoring Season

2021 began with shallow snow pack and dry conditions. Spring ice-out occurred on most lakes in early April. Temperature sensors were deployed in mid-May. Shallow snow pack prior to ice-out, coupled with dry conditions, contributed to low water levels and mild drought conditions, which persisted through mid-July.

Early season air temperature fluctuations resulted in many lakes distinctly warming in late May, visibly cooling in early June, re-warming in late June, and cooling again in early July. Surface water temperatures followed a more typical warming pattern from mid-July through August before beginning to cool in early September.

A HOBO temperature sensor

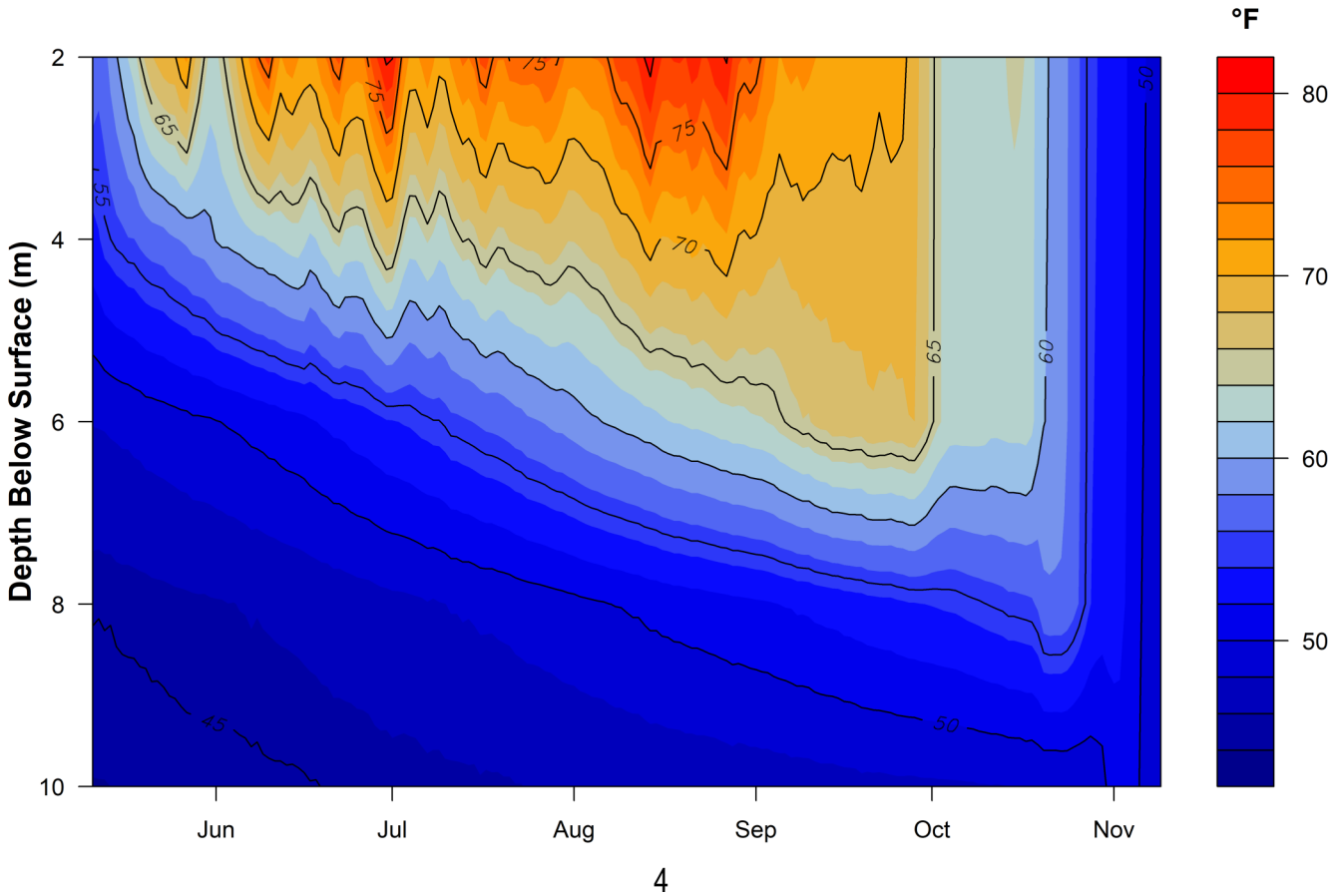
The National Weather Service reported record high air temperatures in June, which resulted in a few of LEA's lakes recording their warmest surface water temperatures in June. The National Weather Service also reported record low temperatures and record high precipitation levels in July. July's wet conditions saw the end of drought conditions for our area. Peak water temperatures generally occurred in mid to late August; however, the late August temperature peak was often within two degrees of readings from June.

High-resolution Temperature Monitoring: How to Read the Graphs

Temperature monitoring summaries on the following pages include a temperature map for each lake, displaying all the data collected in the 2021 season. Temperature maps were generated using daily mean temperature values, which help determine temperature across depth and time. Temperature is represented by colored contours, where the red to blue color range corresponds to a high to low temperature range. The vertical bar on the right side of the temperature map indicates the temperature each color represents in degrees Fahrenheit (°F). The horizontal axis shows the months sensors were deployed, while the left hand vertical axis shows sensor depth (meters) below the water's surface.

Temperature stratification shows up as areas of the plot where colors change in the vertical direction and contour lines are tilted more towards horizontal (from June through early November). The area where temperature changes most rapidly with depth is often referred to as the thermocline. Vertical contour lines indicate mixed conditions, and areas of a single color from top to bottom (such as late-October into November) indicate completely mixed conditions. Warm, stratified conditions stand out as darker red areas. Large gaps between lines means there is a large temperature difference between depths.

During stratification, the shallower waters do not easily mix with the deeper waters. It is only when the temperature of the upper water cools down that the lake can fully mix. You can see this process happening on each graph: the temperatures near the surface get cooler and the deeper waters get warmer as the barrier between the two layers weakens and the waters begin to mix. The lines converge one by one until the temperature is the same at each depth. This is known as lake turnover or de-stratification.

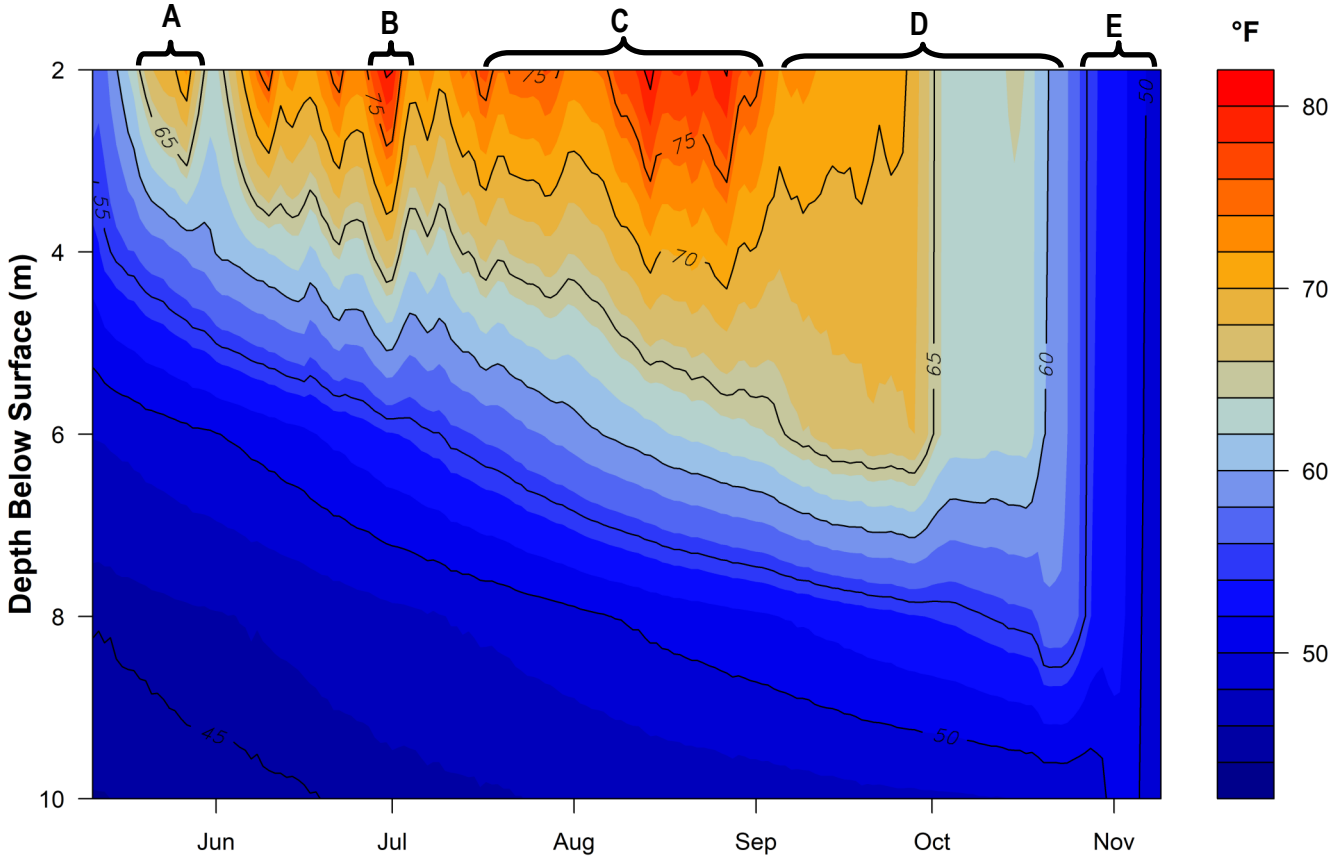


Back Pond

The water column of Back Pond was weakly stratified when sensors were deployed on May 11. By mid-June, Back Pond had stratified into distinct layers. Surface water temperatures increased late May, cooled in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Back Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Back Pond's shallower waters began to cool in September and by November were sufficiently cooled to allow full mixing on November 4. Due to equipment malfunction, data from the 7-meter sensor is incomplete; however, we were able to infer likely temperature gradients from the sensors above and below the broken sensor.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show Back Pond's temperature peak (28.3°C/ 83.0°F) on June 30, followed by a second cooling period.
C. Surface water temperature increases from mid-July through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are sufficiently uniform to facilitate full mixing.



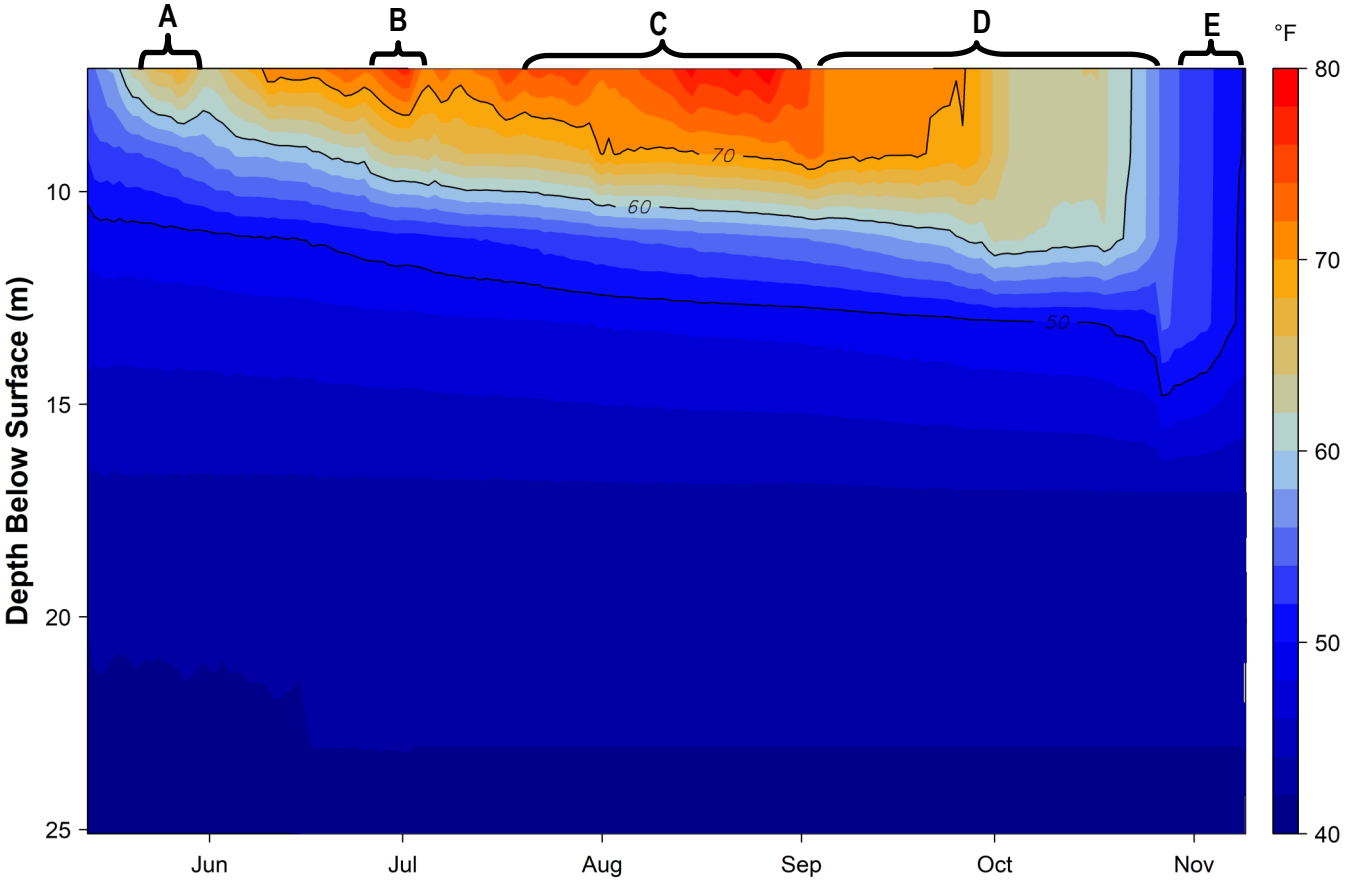
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/11/2021	83.0	11/4/2021	11/9/2021

Bear Pond

The water column of Bear Pond was weakly stratified when sensors were deployed on May 13. By mid-June, Bear Pond had stratified into distinct layers. Surface water temperatures increased in late May, cooled in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Bear Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Bear Pond's shallower waters began to cool in September through November. Full mixing had not yet occurred when sensors were retrieved on November 9. Due to equipment malfunction, data from the 19-, 17-, and 15-meter sensors are incomplete; however, we were able to infer likely temperature gradients from the sensors above the broken sensors.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (27.6°C/ 81.6 °F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



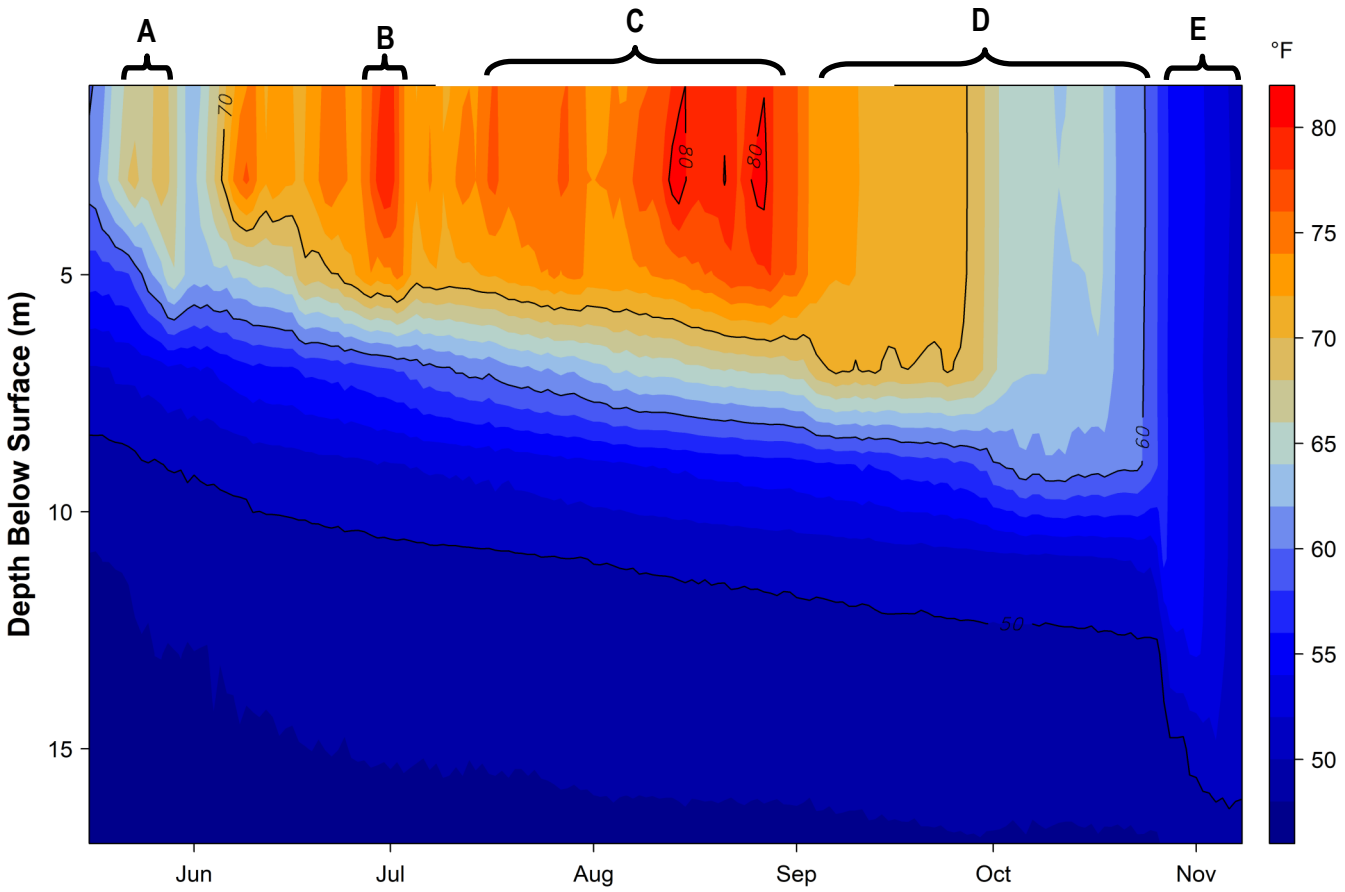
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/13/2021	81.6	After Retrieval	11/9/2021

Hancock Pond

The water column of Hancock Pond was weakly stratified when sensors were deployed on May 16. By mid-June, Hancock Pond had stratified into distinct layers. Surface water temperatures increased in late May, cooled in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Hancock Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Hancock Pond's shallower waters began to cool in September through November. Full mixing had not yet occurred when sensors were retrieved on November 8.

The following events can be seen in the graph below:

A. May data show an early season warm period followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (28.1°C/ 82.5°F) and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



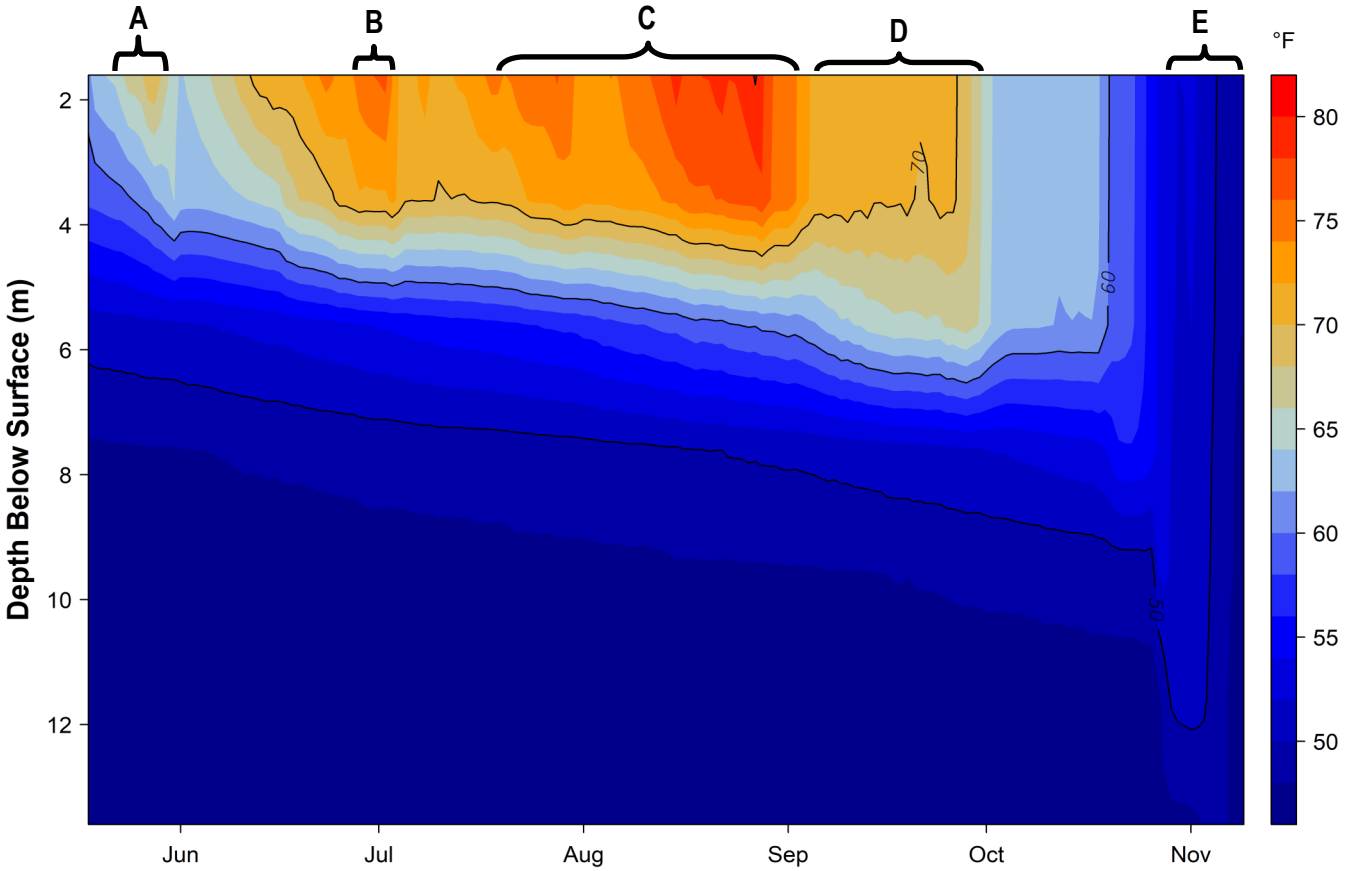
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/16/2021	82.5	After Retrieval	11/8/2021

Island Pond

The water column of Island Pond was weakly stratified when sensors were deployed on May 18. By mid-June, Island Pond had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Island Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Island Pond's shallower waters began to cool in September through November. Full mixing had not yet occurred when sensors were retrieved on November 9.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 27 (27.6°C/ 81.6 °F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



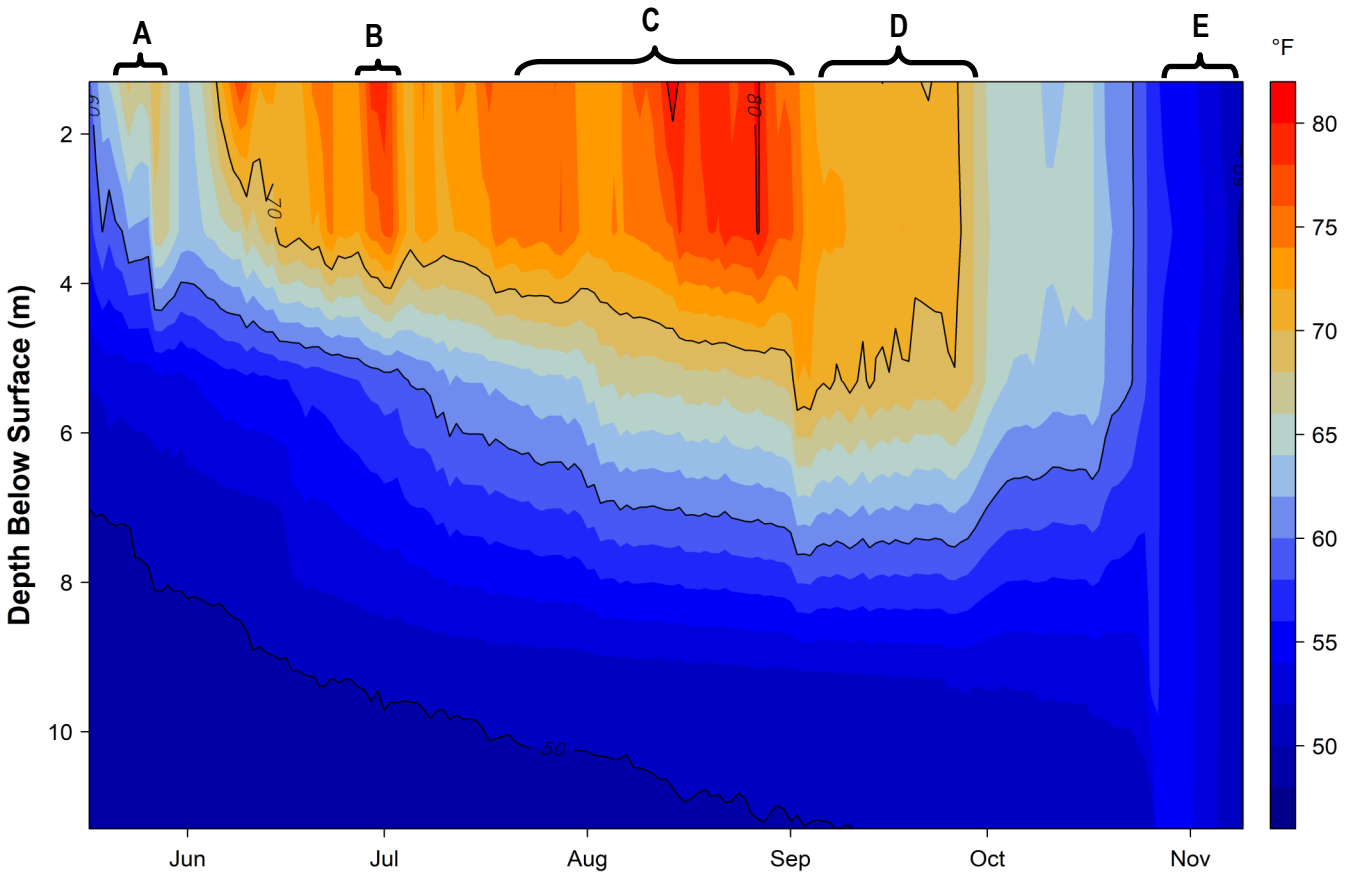
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/18/2021	81.6	After Retrieval	11/9/2021

Keoka Lake

The water column of Keoka Lake was weakly stratified when sensors were deployed on May 17. By mid-June, Keoka Lake had stratified into distinct layers. Surface water temperatures increased in late May, cooled in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Keoka Lake's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Shallower waters began to cool in September through November. Full mixing had not yet occurred when sensors were retrieved on November 9. Due to equipment malfunction, data from the 5-meter sensor is incomplete; however, we were able to infer likely temperature gradients from the sensors above and below the broken sensor.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (28.6°C / 83.4°F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



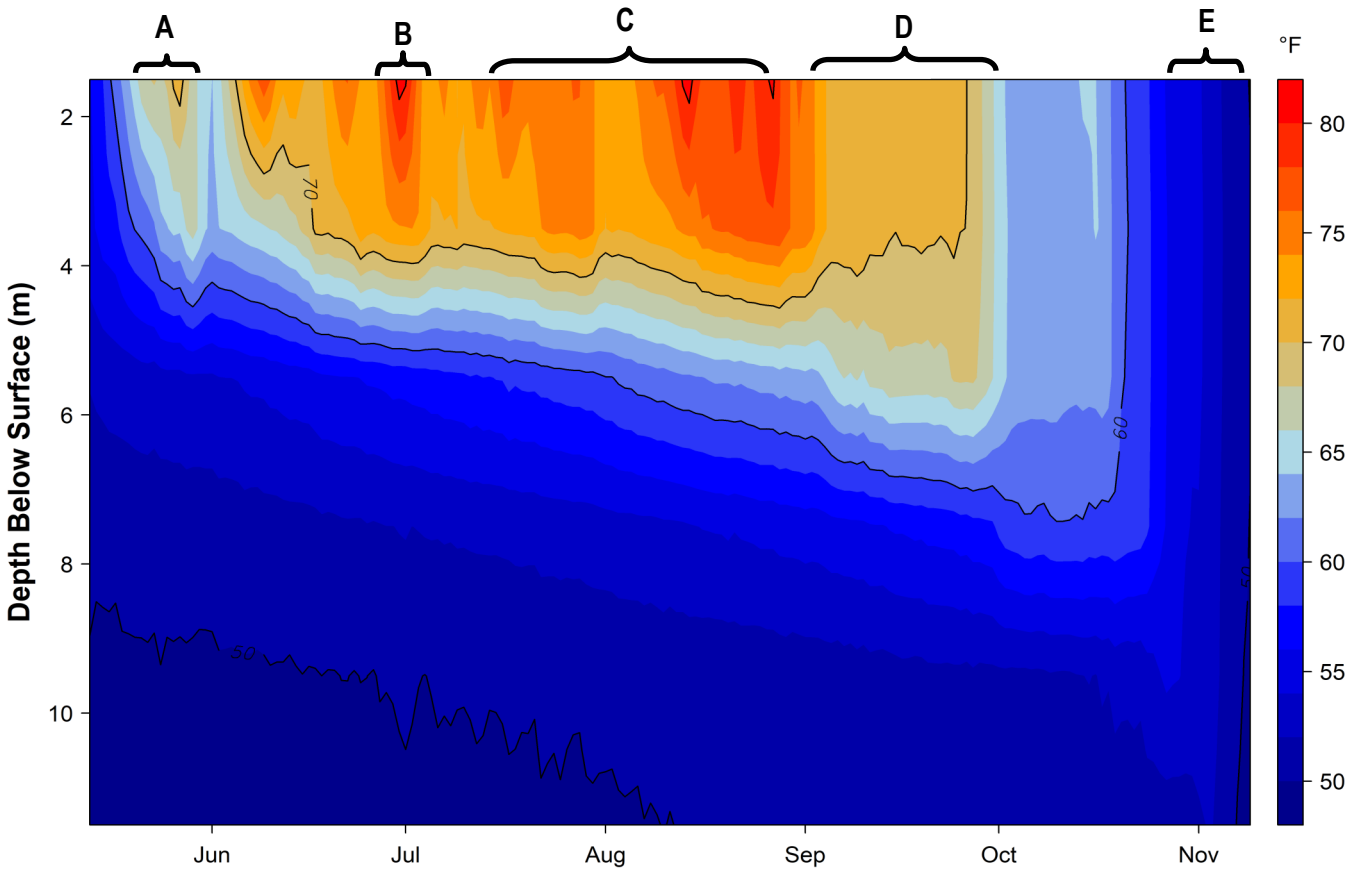
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/17/2021	83.4	After Retrieval	11/9/2021

Keyes Pond

The water column of Keyes Pond was mildly stratified when sensors were deployed on May 13. By mid-June, Keyes Pond had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Keyes Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Keyes Pond's shallower waters began to cool in September through November. Full mixing had not yet occurred when sensors were retrieved on November 9.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (28.1°C / 82.6°F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



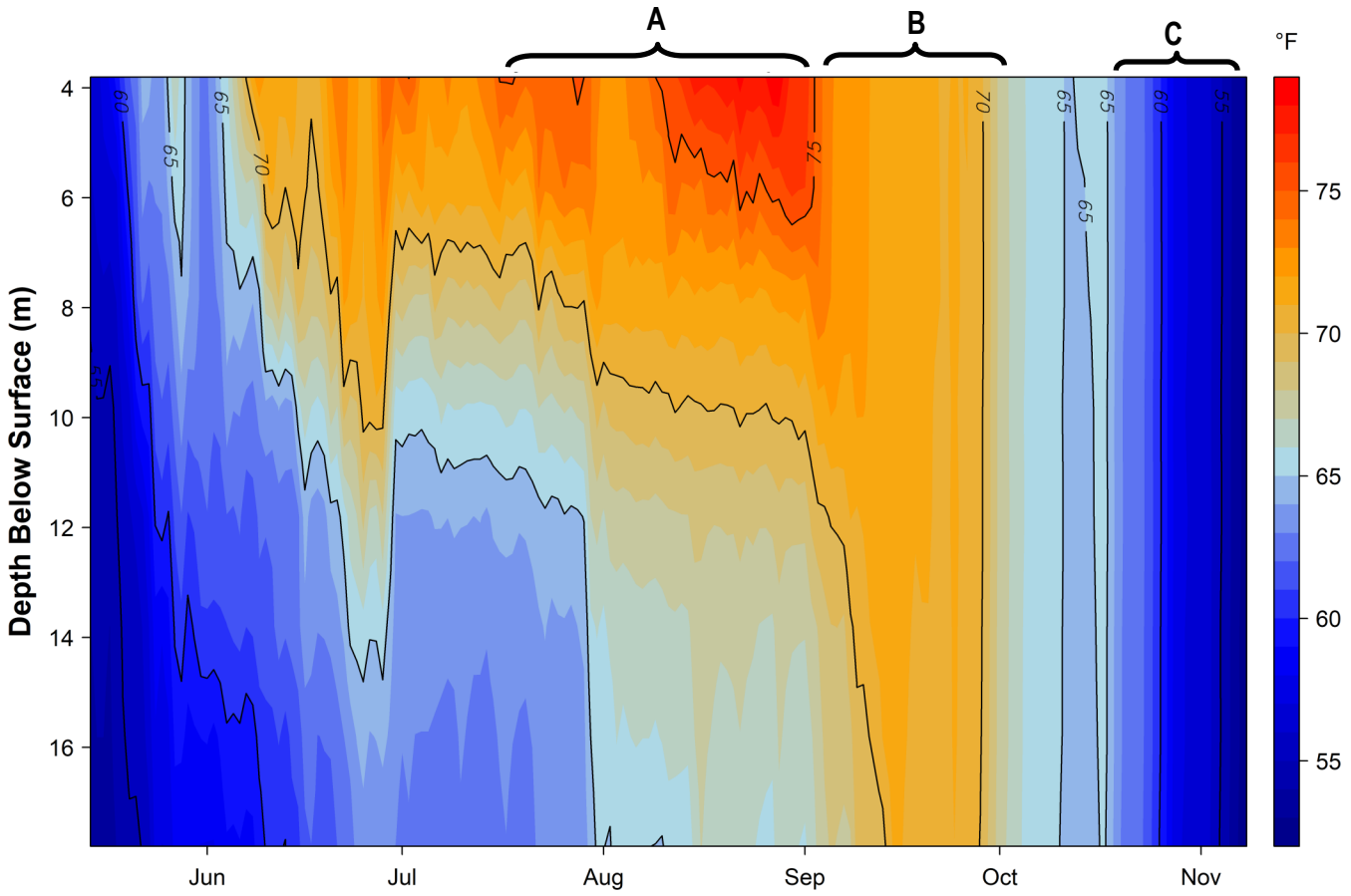
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/13/2021	82.6	After Retrieval	11/9/2021

Long Lake (Middle Basin)

The water column of Long Lake's middle basin was weakly stratified when sensors were deployed on May 14. By mid-June, the middle basin had stratified into distinct layers, but this stratification was not strong. This weaker stratification is likely the result of the lake's long length, which runs parallel to the most dominant north-west wind direction. This large length of open water (fetch size) allows for the build-up of large surface and internal waves. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. Due to large waves, strong and sustained winds in the summer could break down the lake's stratification. The unusually warm bottom waters seen in mid-September could be a result of this and could allow for nutrient-rich bottom waters to mix with upper waters during algae growing season The middle basin's deeper waters began to cool in September and by November were sufficiently cooled to allow full mixing on October 24. Due to equipment malfunction, data from the surface water sensor is incomplete and was omitted from this analysis.

The following events can be seen in the graph below:

A. Surface water temperature increases in mid-July, peaks on August 27 (26.8°C / 80.2°F), and stays warm through early September.
B. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
C. Temperatures throughout the water column are sufficiently uniform to facilitate full mixing.



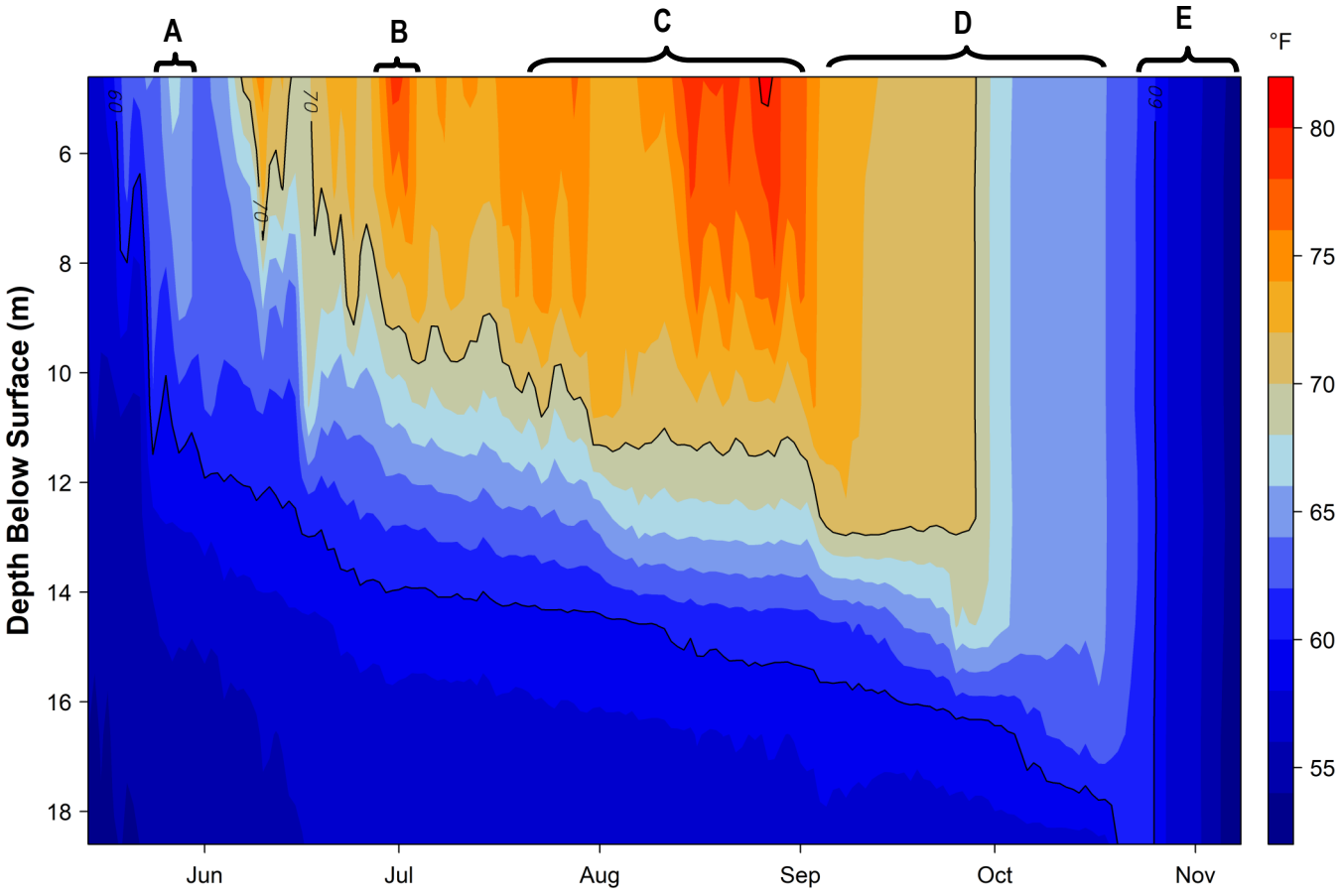
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/14/2021	80.2	10/24/2021	11/8/2021

Long Lake (South Basin)

The water column of Long Lake's south basin was weakly stratified when sensors were deployed on May 14. By mid-June, the south basin had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in the south basin's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. The south basin's shallower waters began to cool in September and by November were sufficiently cooled to allow full mixing on October 25.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 26 (28.1°C/ 82.6 °F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are sufficiently uniform to facilitate full mixing.



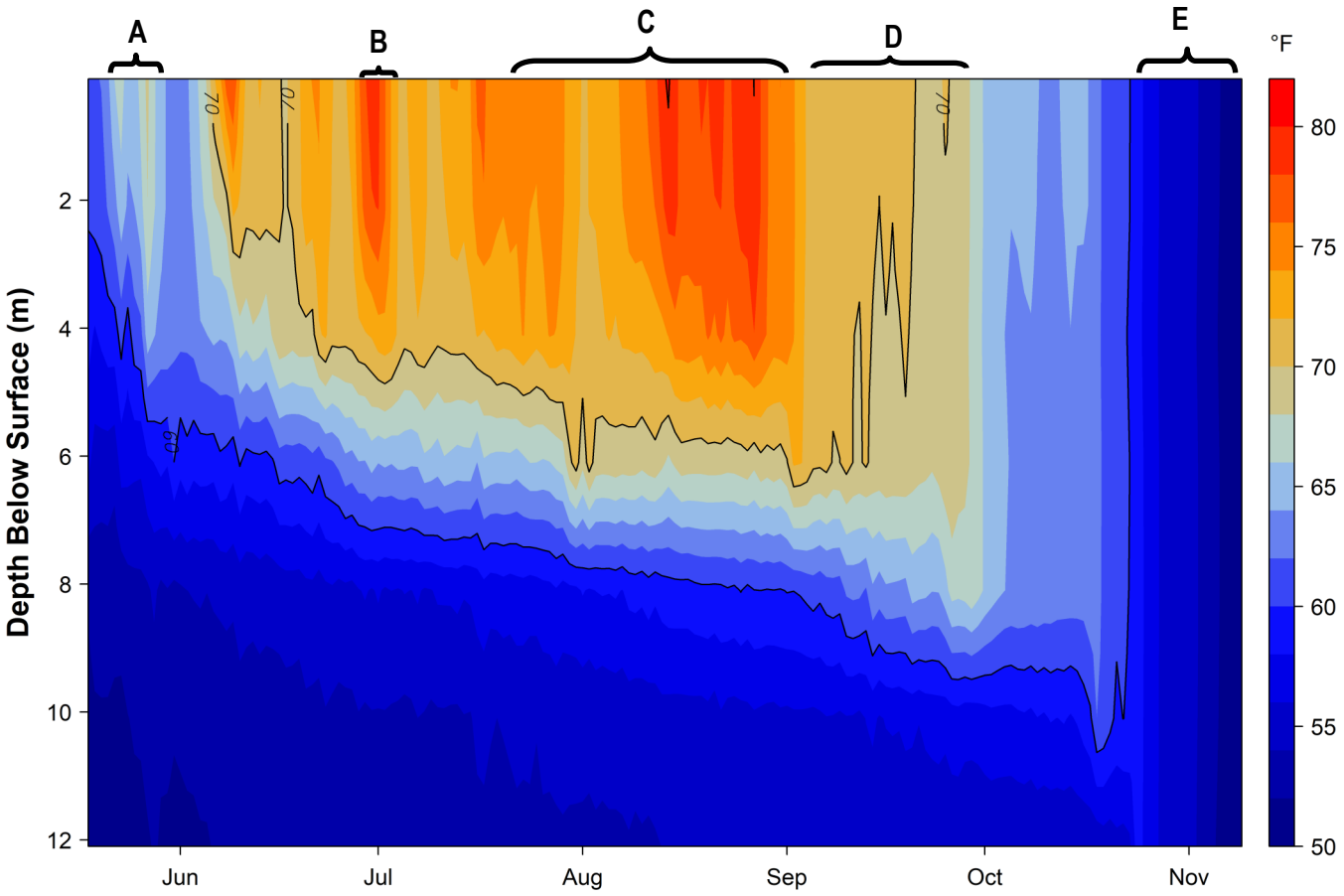
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/14/2021	82.6	10/25/2021	11/8/2021

McWain Pond

The water column of McWain Pond was weakly stratified when sensors were deployed on May 18. By mid-June, McWain Pond had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in McWain Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. McWain Pond's shallower waters began to cool in September and by November were sufficiently cooled to allow full mixing on October 24.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (27.7°C/ 81.8°F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are sufficiently uniform to facilitate full mixing.



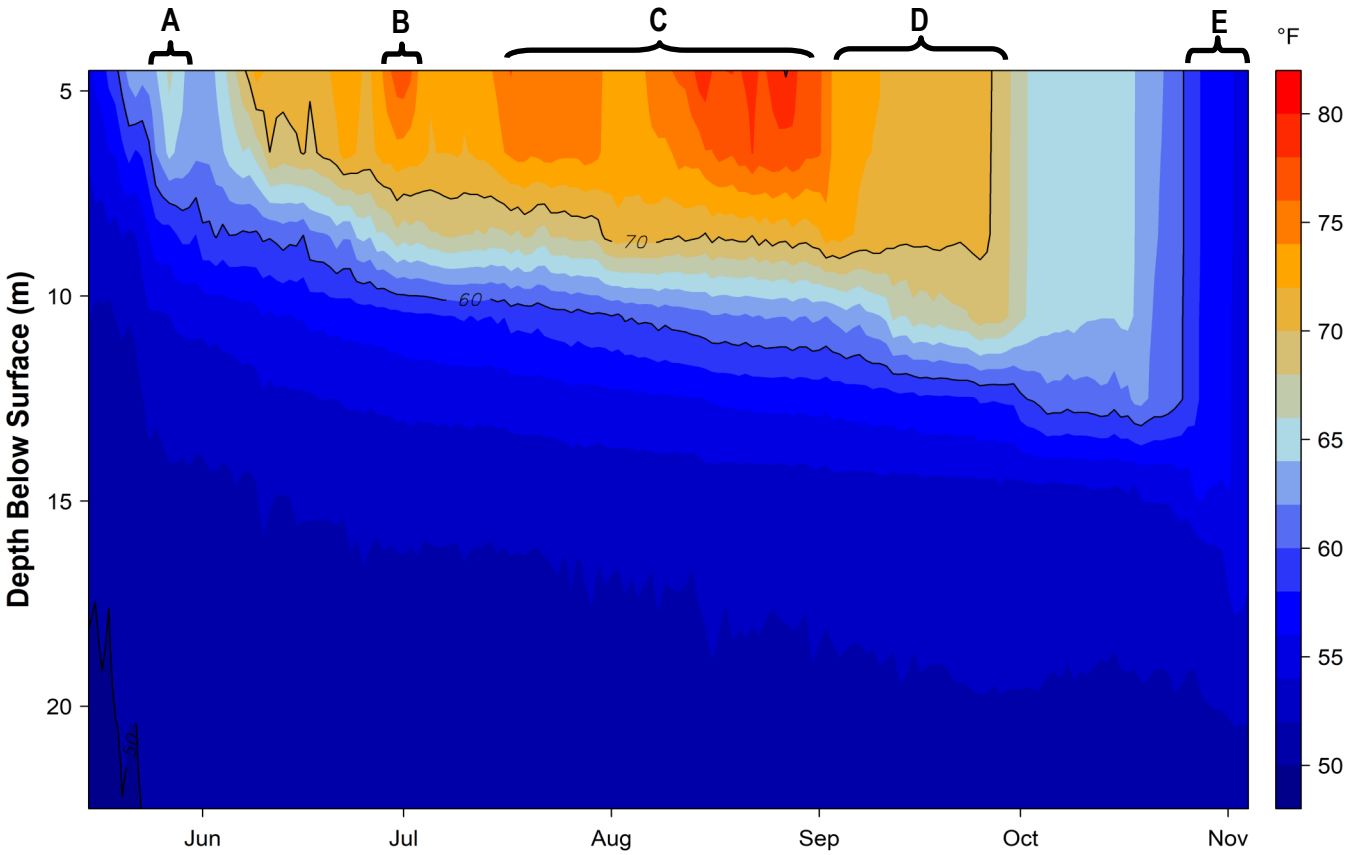
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/18/2021	81.8	10/24/2021	11/9/2021

Moose Pond (Middle Basin)

The water column of Moose Pond's middle basin was weakly stratified when sensors were deployed on May 15. By mid-June, the middle basin had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in the main basin's deep waters, creating large temperature differences between shallow and deep waters. Large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. The main basin's shallower waters began to cool in September through November . Full mixing had not yet occurred when sensors were retrieved on November 4.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (27.4°C/ 81.3°F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



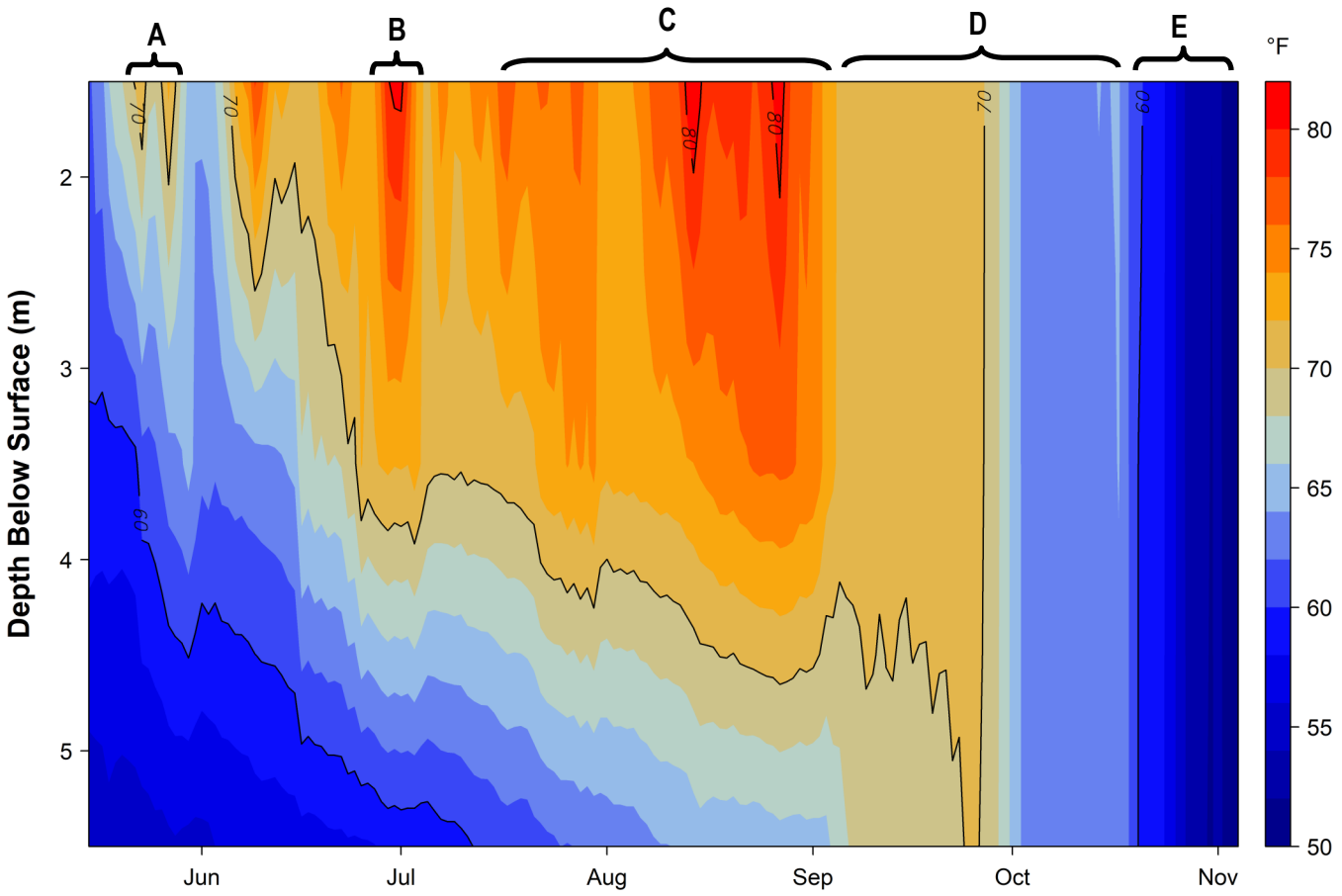
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/15/2021	81.3	After Retrieval	11/4/2021

Moose Pond (North Basin)

The water column of Moose Pond's north basin was weakly stratified when sensors were deployed on May 15. By mid-June, the north basin had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. The unusually warm bottom waters seen in September could allow for nutrient-rich bottom waters to mix with upper waters. This could provide algae with an additional food source. The north basin's shallower waters began to cool in early September and were sufficiently cooled to allow full mixing on October 23.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (28.4°C/ 83.2°F), and stays warm through early September.
D. Warming deep waters resulted in an early mixing throughout the water column in late September, which persisted as water cooled.
E. Temperatures throughout the water column are sufficiently uniform to facilitate full mixing.



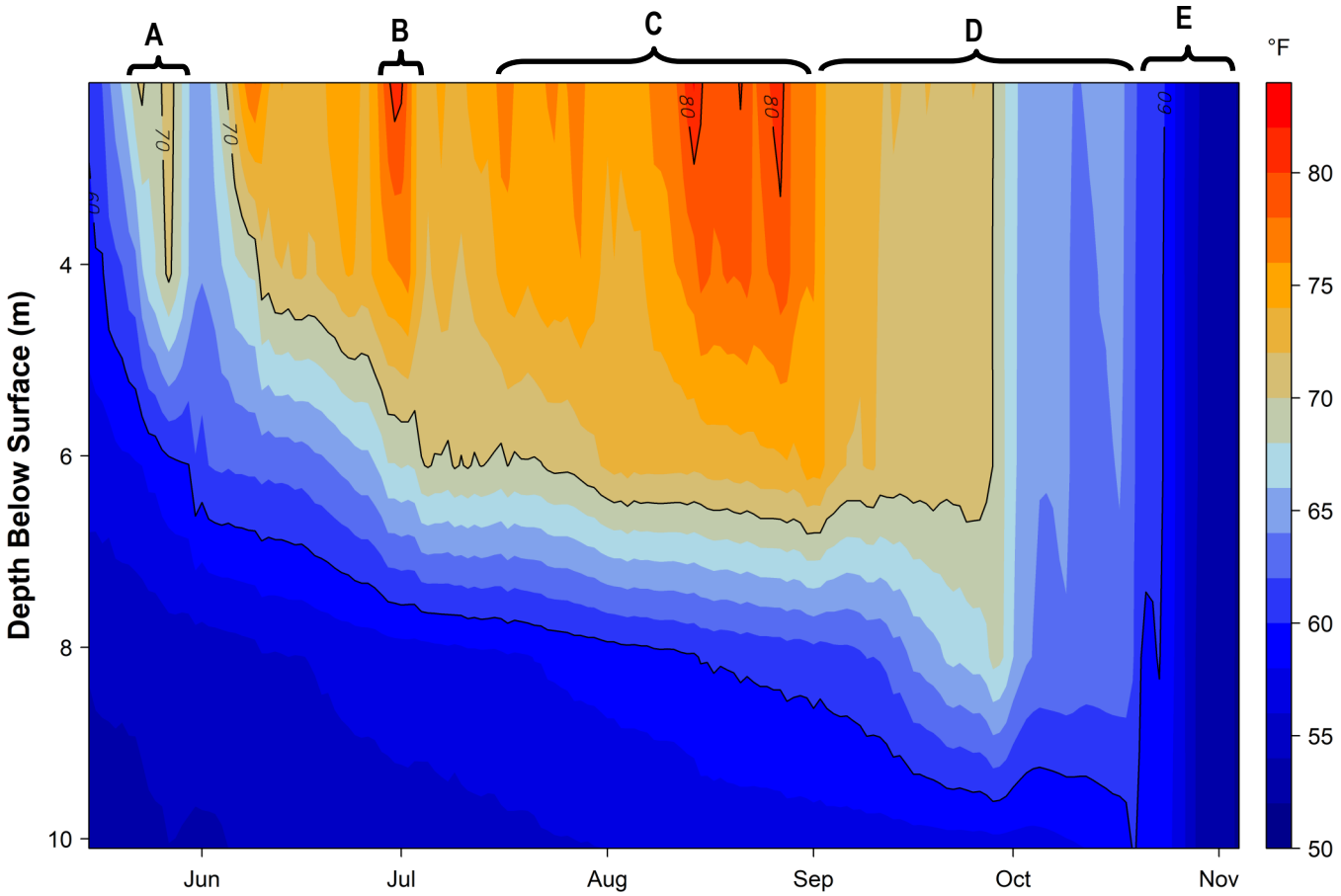
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/15/2021	83.2	10/23/2021	11/4/2021

Moose Pond (South Basin)

The water column of Moose Pond's south basin was weakly stratified when sensors were deployed on May 15. By mid-June, the south basin had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in early July, and increased again in August. During the summer months, little temperature change was seen in the south basin's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. The south basin's shallower waters began to cool in early September and by late October were sufficiently cooled to allow full mixing on October 26.

The following events can be seen in the graph below:

A. May data show an early season warm period followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (28.8°C/ 83.9°F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are sufficiently uniform to facilitate full mixing.



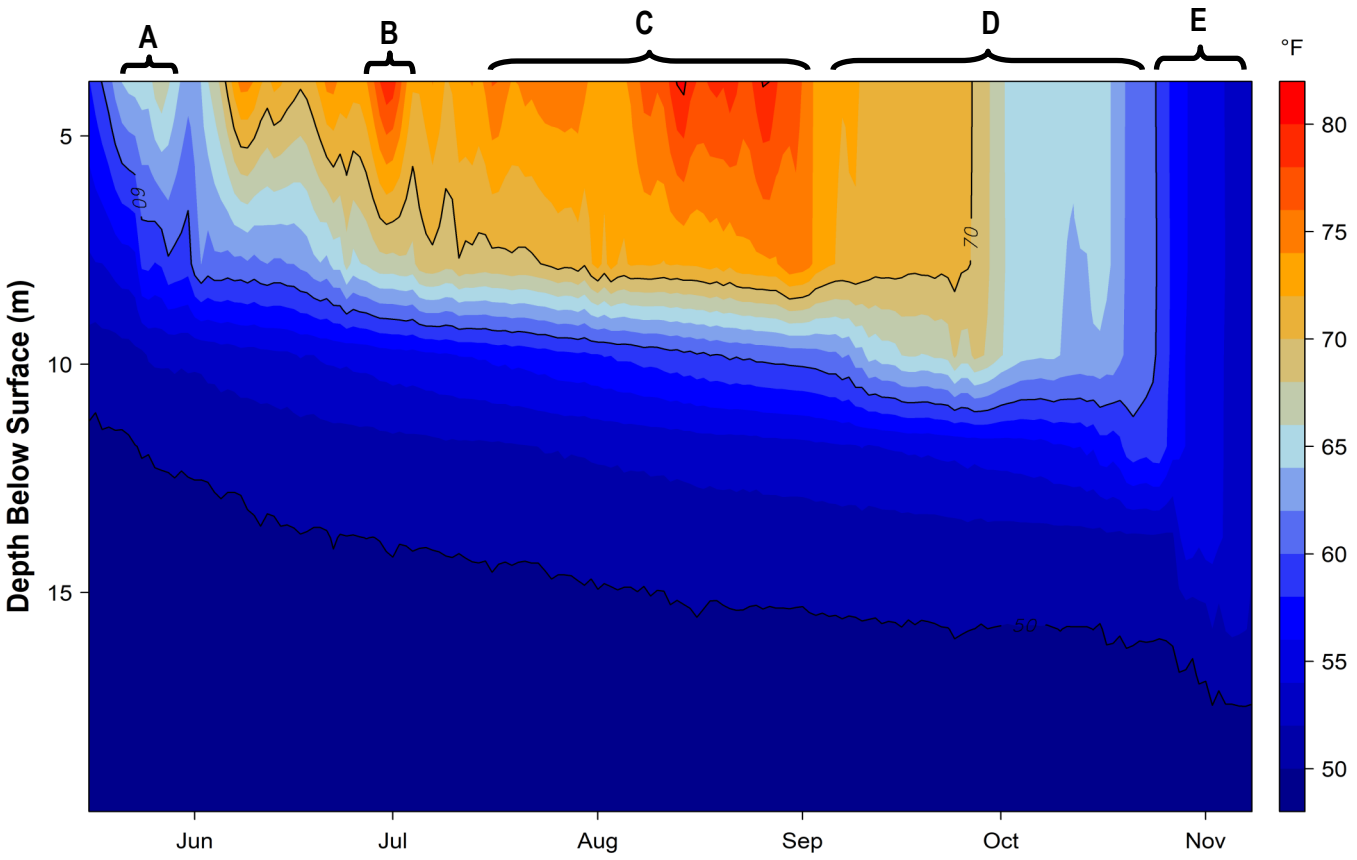
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/15/2021	83.9	10/26/2021	11/4/2021

Peabody Pond

The water column of Peabody Pond was weakly stratified when sensors were deployed on May 13. By mid-June, Peabody Pond had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Peabody Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Peabody Pond's shallower waters began to cool in October through November. Full mixing had not yet occurred when sensors were retrieved on November 8.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 13 (28.1°C/ 82.5°F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



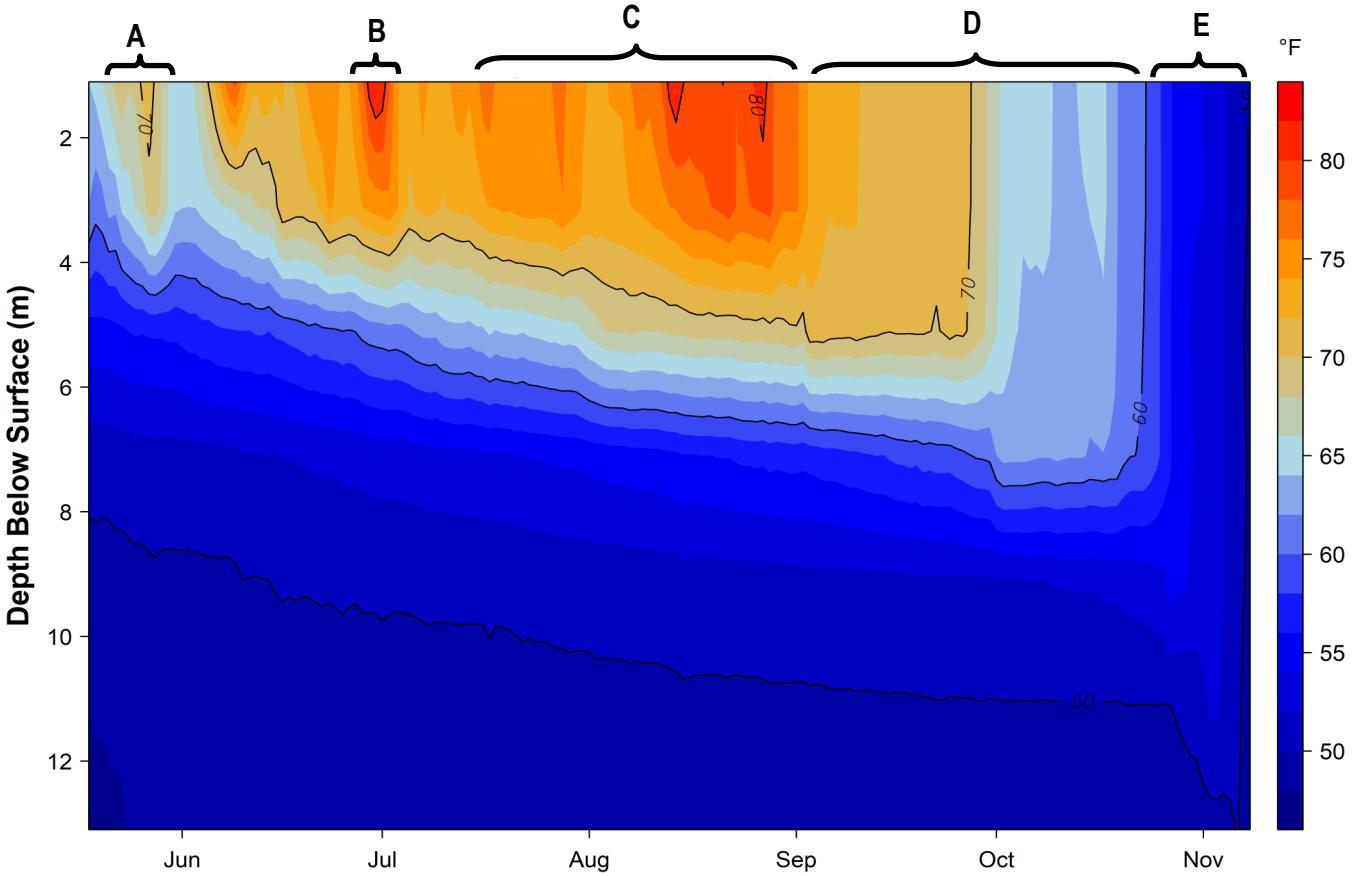
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/13/2021	82.5	After Retrieval	11/8/2021

Sand Pond

The water column of Sand Pond was stratified when sensors were deployed on May 18. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Sand Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Sand Pond's shallower waters began to cool in September through November. Full mixing had not yet occurred when sensors were retrieved on November 8.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show Sand Pond's temperature peak (28.3°C/ 83.0°F) on June 30, followed by a second cooling period.
C. Surface water temperature increases in mid-July, reaches a second peak on August 14 (28.3°C/ 83.0°F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



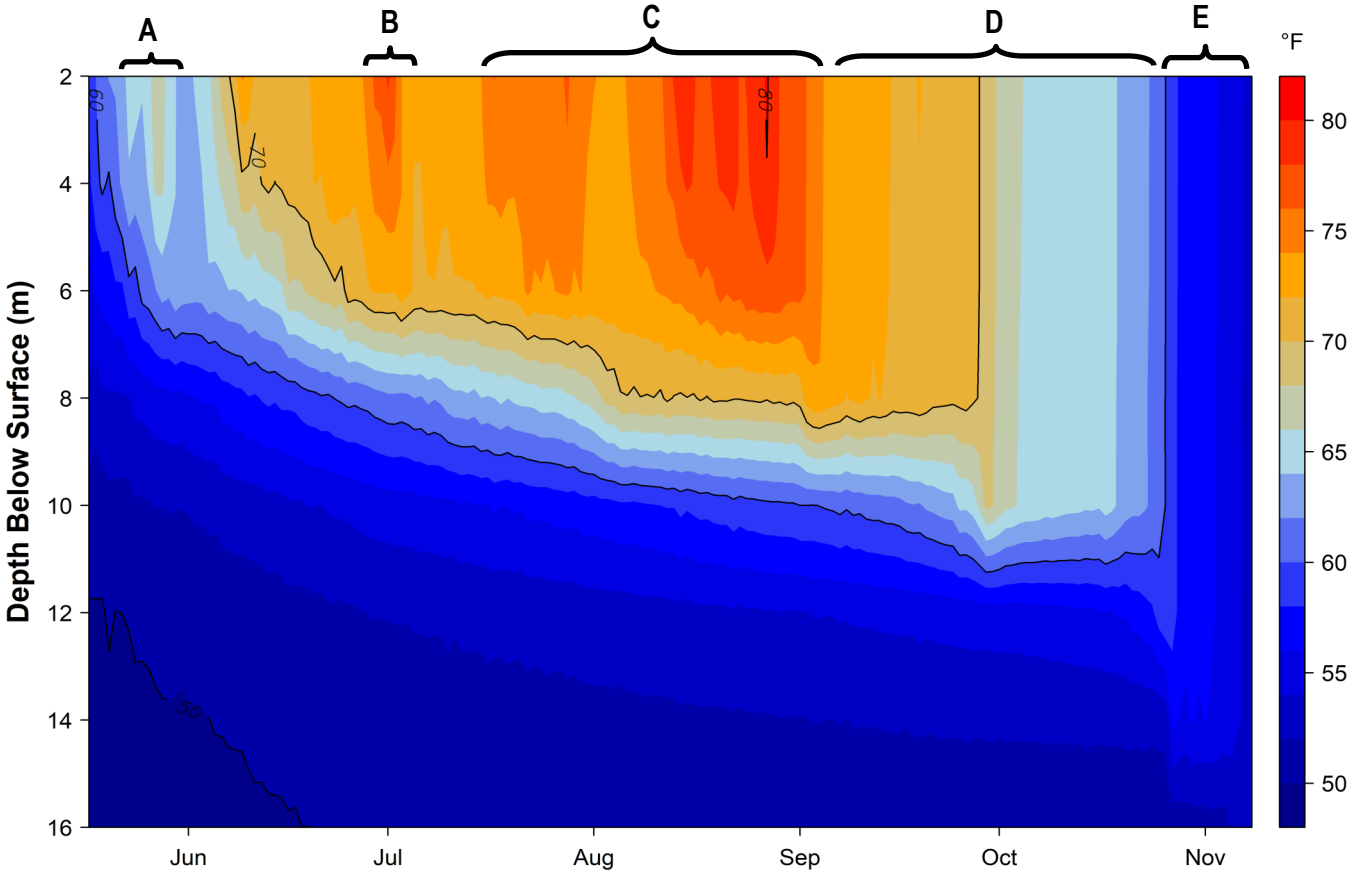
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/18/2021	83.0	After Retrieval	11/8/2021

Trickey Pond

The water column of Trickey Pond was weakly stratified when sensors were deployed on May 17. By mid-June, Trickey Pond had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. During the summer months, little temperature change was seen in Trickey Pond's deep waters, creating large temperature differences between shallow and deep waters. This large temperature difference limits cooler, nutrient-rich deep waters from mixing with warmer surface waters. When these two layers mix, it provides algae with an additional food source. Please note that the watershed can still contribute phosphorus to the lake, regardless of stratification. Trickey Pond's shallower waters began to cool in September through November. Full mixing had not yet occurred when sensors were retrieved on November 8.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 14 (27.6°C/ 81.6°F), and stays warm through early September.
D. Shallow waters mix with waters from the middle depths, pushing the thermocline deeper into the water column.
E. Temperatures throughout the water column are becoming more uniform but temperature differences in the deep waters indicate that full mixing has not yet occurred.



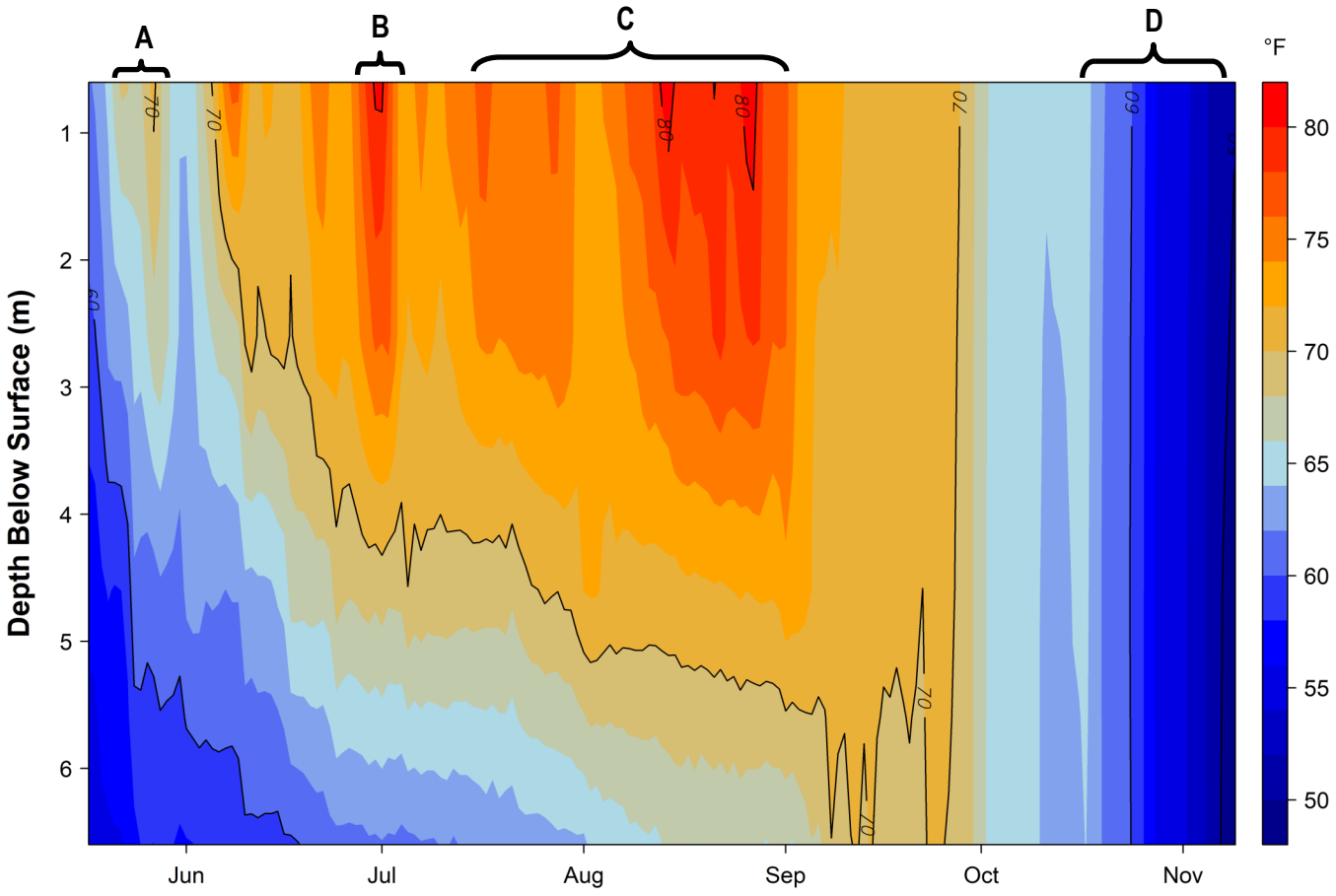
Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/17/2021	81.6	After Retrieval	11/8/2021

Woods Pond

The water column of Woods Pond was weakly stratified when sensors were deployed on May 17. By mid-June, Woods Pond had stratified into distinct layers. Surface water temperatures increased in late May, decreased in early June, increased dramatically in late June, cooled slightly in July, and increased again in August. The warm bottom waters seen in September could allow for nutrient-rich bottom waters to mix with upper waters during algae growing season. Waters throughout the water column began to cool in September and were sufficiently cooled to allow full mixing on October 18.

The following events can be seen in the graph below:

A. May data show an early season warm period, followed by a cool period.
B. Late June data show surface water temperature increases dramatically, followed by a second cooling period.
C. Surface water temperature increases in mid-July, peaks on August 27 (28.3°C/ 83.0°F), and stays warm through early September.
D. Temperatures throughout the water column are sufficiently uniform to facilitate full mixing.



Deployment Date	Peak Temperature (°F)	Full Mixing	Retrieval Date
5/17/2021	83.0	10/18/2021	11/9/2021