



Temperature and Flathead Lake

Have you ever jumped into Flathead Lake? How'd it feel? The temperature of a lake impacts people and the **animals** and **plants** that live there.

Temperature determines the number and types of **organisms** that might live in that lake. For example, lake trout are abundant in Flathead Lake and prefer colder temperatures, while fish like catfish prefer warmer waters and are not found in Flathead Lake. The temperature of Flathead Lake varies a lot throughout the year. Data collected from Flathead Lake shows how the water temperature of the lake changes over time and depth.



Swimmers take a dip in Flathead Lake. PC: Flathead Lake Biological Station

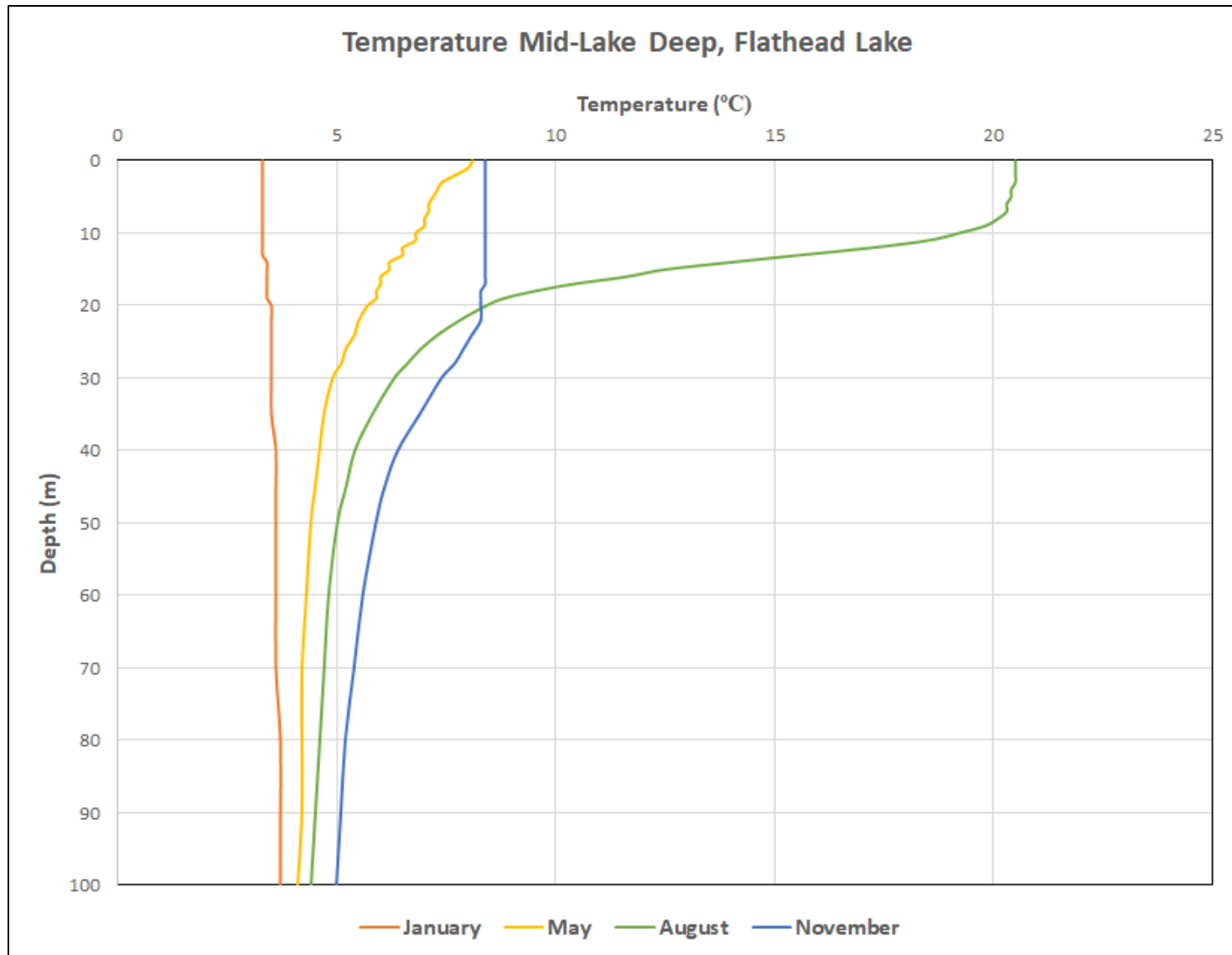




Virtual Research Cruise: Hydrolab® Activity

The following graph shows the temperature of Flathead Lake throughout a one-year period. Data is from the Mid-Lake Deep site (Graph 1). Mid-Lake Deep is nearly 100 meters deep (328 feet). Take a look at the graph to see how the temperature changes throughout the year and at different depths. Note that in these graphs 0 meters (the lake surface) is at the top of the graph.





Graph 1





Questions:

Using Graph 1, answer the following questions:

- 1.) How does the temperature of Flathead Lake change with depth?
- 2.) What happens to the temperature of the lake in the deepest 10 meters (90 to 100 meters)?
- 3.) What causes the temperatures to change over the seasons?

Most **organisms** in Flathead Lake, like mayflies, are exothermic and gain heat from their environment. Mayflies are an aquatic insect that spends their larval life in freshwater. They are an important food source for fish, frogs, birds, and other insects. When hatching into adults, mayflies emerge from the top layers of the water. Mayfly larvae need temperatures between 7.8°C to 13.3°C to hatch.

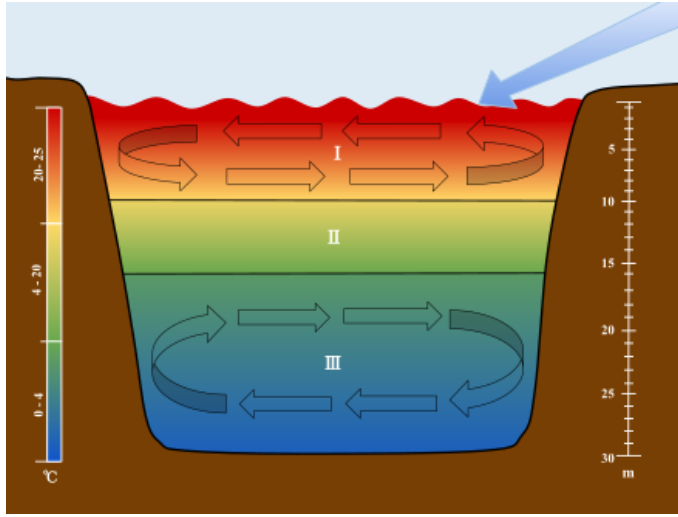
- 4.) During what months could mayfly larvae hatch?
- 5.) **Extra Credit:** What temperatures in ° Fahrenheit would mayfly larvae be able to hatch at? The conversion from °C to °F is:
 $^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32$. Round your answers to the nearest whole number.





Divided Waters

As summer begins in Montana, the waters of Flathead Lake become stratified. This means that water temperature changes across depth. This **thermal stratification** happens as the surface layers of the lake warm. Since warmer water is less dense than cold water it stays on top. This creates a barrier between cold, dense water and lighter, warmer water called a **thermocline**. But when lakes become stratified, its not just



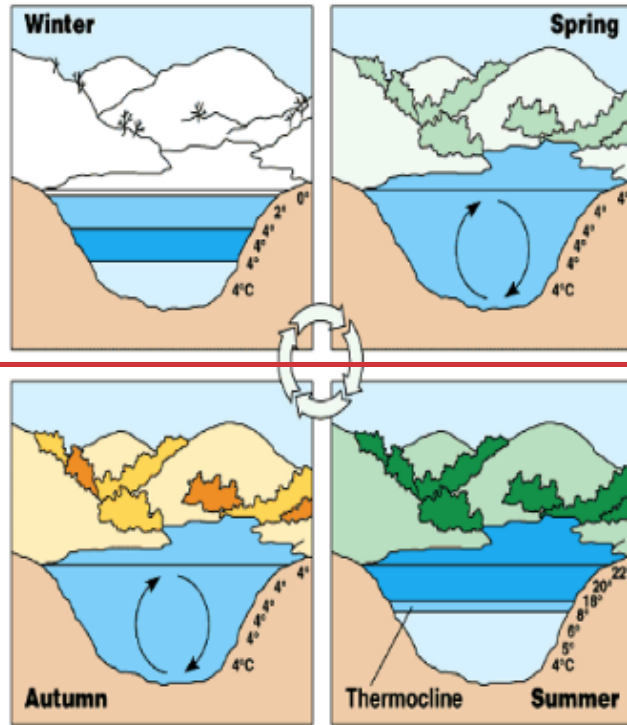
Lake stratification. PC: Wikimedia Commons
(CC BY-SA 4.0)

not just temperature that affected. The thermocline creates a divide between oxygen-rich water and oxygen-limited water. Most oxygen in a lake is produced by **phytoplankton** and remains in the top, warmer layers due to the lack of sunlight deeper in the lake. This results in limited oxygen in the deeper regions of the lake. As the year moves on and surface water temperatures start to decrease, the lake will lose its thermal stratification and the thermocline will disappear. Water, oxygen, and **nutrients** can now move throughout the entire lake.





Virtual Research Cruise: Hydrolab® Activity



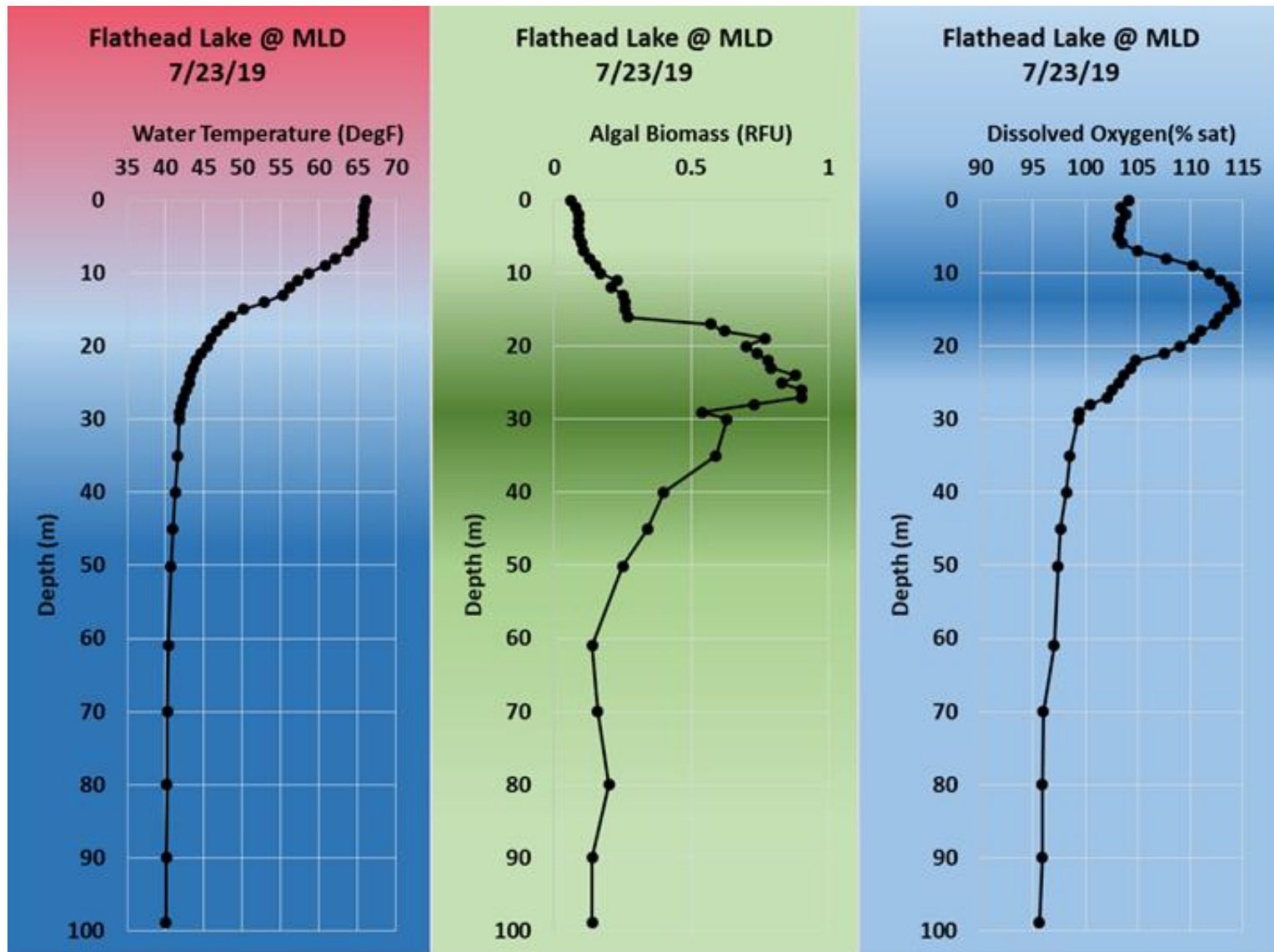
Lake stratification. PC: Wikimedia Commons (CC BY-SA 4.0)

The next series of graphs show the water temperature, **chlorophyll a** concentration, and dissolved oxygen content of the water at Mid-Lake Deep in Flathead Lake. Take a look to see how these three parameters relate.





Graph 2





Questions:

Using Graph 2, answer the following questions.

- 1.) How are the maximum amounts of dissolved oxygen and algal biomass related to water temperature?
- 2.) What happens to the amount of chlorophyll and amount of oxygen in the water column as you get deeper in the lake?

