Water Temperature

What is water temperature?

Water temperature has a big effect on what types of fish and bugs are present in a lake or river. As you probably know, water can take a long time to warm up or cool down compared to the air. When water cools down to 0 degrees Celsius (0°C), ice begins to form and floats on top of warmer water; water at the bottom of a lake or river is typically 4°C (if it is not frozen). During the summer, the opposite occurs as warmer water floats on top of colder water. Many factors can affect water temperature. In small, calm lakes, water is usually warmer at the surface. In larger, windy lakes and in rivers, water gets mixed to deeper depths and they have more uniform temperatures. Shallower, smaller lakes and rivers change temperature more quickly than large lakes and rivers simply because less water has to be heated or cooled. Shorelines with more shading from vegetation are generally cooler than bare shorelines where more sunlight hits the water. Water temperature generally decreases as you go further north, as you go higher in elevation, and, of course, the closer you are to the winter season.

The picture below shows Lake Hazen (Ellesmere Island, NU) ice melting as temperatures increase during the spring.

Photo credit: Craig Emmerton

Why does water temperature matter?

Water temperature is important in lakes and rivers because it can determine where in the water certain plants and animals can live. For example, some fish can only live in colder water and will therefore live in deeper cold waters during the summer period. Life stages of certain fish may require different temperatures. For example, Northern pike eggs will die if water temperature is higher than 19°C but adult fish will not die until water temperatures are above around 30°C. Some plants and animals will become dormant if water temperatures drop very low but will grow extremely quickly during the warmer waters of the summer.

Climate change in the Arctic may affect water temperatures and therefore the distribution and survival of many fish. Lakes and rivers in the Arctic are expected to be ice-free for longer periods and become warmer. If temperatures become too warm during the summer in lakes and rivers, some fish species that cannot live in warm waters may disappear or be replaced by fish that can live in warmer waters.

Water temperature can also indicate effects of human activities. Quite often, water discharged from a sewage lagoon or from a tailings pond will be warmer than the water it is supposed to mix with in a lake or river. This can result in warmer temperatures in the 'receiving' water and affect fish and bugs.

How do we measure water temperature?

Water temperature can be measured by simple alcohol thermometers or by expensive sensors. Water temperature is recorded as "degrees Celsius" (°C) with 0°C being the freezing point of fresh water. Water temperature is best measured on site and directly in the water. Water temperature measurements in rivers do not generally need to be taken at several depths, but lake water temperature should be taken at several depths as lake water does not always mix completely from top to bottom as it usually does in rivers.

References/For More Information

Hach Company's H_2O University. 2007. *Important Water Quality Factors*. http://www.h2ou.com/h2wtrqual.htm#temp

Horne, A. J., and Goldman, C. R. 1994. Limnology, 2nd edition. McGraw-Hill, Inc. 576 pp.

Wetzel, R. G. 1983. Limnology, 2nd edition. Saunders College Publishing. 760 pp.