

Why is my Lake that Colour?

The clarity and colour of a lake are two of the qualities of most interest to cottagers, residents and visitors to a lake. There are many reasons a lake will be a certain colour or even seasonally change colour. The growth of algae is a common reason a lake may take on a certain colour. Commonly, algae or cyanobacteria (see the articles on our website for more information on these organisms) will turn water various shades of blue or green. However, some green algae will produce vibrant pink lakes in the presence of varying amounts of salt. Orange, black and tea-coloured water are other commonly seen colours.

Water colour is influenced by a number of factors most often acting in combination with each other. Many people assume pollution plays a large role in determining the colour of a lake. However, research has shown more often a lake's colour is a result of natural events, chemical processes, and geology. For example heavy rains or spring runoff may wash organic and inorganic substances from the land. The substances may dissolve and dye the water or become nutrients for algae to rapidly reproduce and form colourful blooms. Wind events may stir up fine particles of sand, silt and clay from the bottom. These particles can stay suspended for some time colouring the lake by reflecting or absorbing sunlight.

Whether substances entering a lake are dissolved or suspended in the water, both are critical factors in determining a lake's colour. When you look at a lake to determine its colour you are looking at the apparent colour. The simplest example of *apparent* colour would be looking at the *apparent* blue water of a lake in sunshine turn an *apparent* colour of grey or even black as storm clouds move in. If this method of determination of a lake's colour was used scientifically to describe a lake it would be useless. So, scientists use true colour to determine a lake's colour

at a particular time. To determine *true* colour the water sample is first filtered to remove all suspended particles including algae. Dissolved substances are not removed. Then a spectrophotometer passes a beam of light through the sample and a detector is used to determine the amount of the light beam that is absorbed or transmitted. This gives scientists accurate numbers which can be converted to determine *true* lake colour when the sample was taken.

The actual substances, whether from living organisms, organic remains or inorganic material, and whether suspended or dissolved that are most commonly related to lake colour are numerous. Here are some.

Blue water lakes are often considered the most desirable because they are perceived as having less human impact and being the least polluted. They typically are in areas of fast draining soils or sand, have low algal growth, and support few fish unless the lakes are stocked. The blue colour is due to sunlight (a combination of the rainbow colours) being selectively absorbed or scattered. Shorter wavelengths of light (blue) penetrate deeper into water, scatter and create the deep blue we see. Water depth and lake bottom substances also play a role.

Blue green or green lakes most often are the result of algae or cyanobacteria (blue green algae) blooms. These lakes are often thought of as polluted since the blooms are frequently, but not always, the result of human forestry or agricultural activities, septic systems poorly working, or fertilizers getting into the lake. The high productivity of green lakes usually enables them to support more fish, but the poor water quality conditions can lower dissolved oxygen levels in hot summer

months or during the winter. These conditions can cause fish kills where oxygen drops too low for fish to survive.

Yellow-brown coloured lakes are most often the result of microscopic protists such as the protozoa, diatoms or other microscopic life you may have seen under the microscope in school. Again, many of these organisms thrive when substances are rapidly released in to a lake. Commonly, brown lakes are surrounded by forests or wetlands. Forests provide dark organic material that dissolves in lake water. (Think of a teabag in water.) This dissolved organic material stains the water brown or yellow preventing light from deep penetration in the water. Because of this and due to the fact these lakes may be acidic (again think of the teabag), fish and other organisms can have a difficult time surviving.

Besides the lake colours mentioned above, lake colours can be the most intense pinks, reds, turquoise and a range of other colours. A Google search will allow you to see some of these remarkable phenomena.

Sources

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