

TEMPERATURE FACT SHEET

Definition: A numerical measurement in degrees Celsius (°C) or Fahrenheit (°F) of heat.

$$^{\circ}\text{C} = \frac{(^{\circ}\text{F} - 32.0)}{1.80}$$

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.80) + 32.0$$

Background:

- Many of the physical, chemical, and biological characteristics of a waterway are directly linked to the water temperature.
- The sun provides the energy needed to affect water temperatures, so shading influences temperature.
- The shallower the water, the quicker water temperature will change.
- Moving water (stream, rivers, especially riffles and rapids) is normally cooler than standing water, (ponds, lakes).
- Colder water holds more oxygen, hotter holds less.
- Higher temperatures increase aquatic organisms' metabolic rates...(increase oxygen need).
- Higher temperatures increase plant growth and decomposition rates.
- Different species have specific ideal temperature ranges.

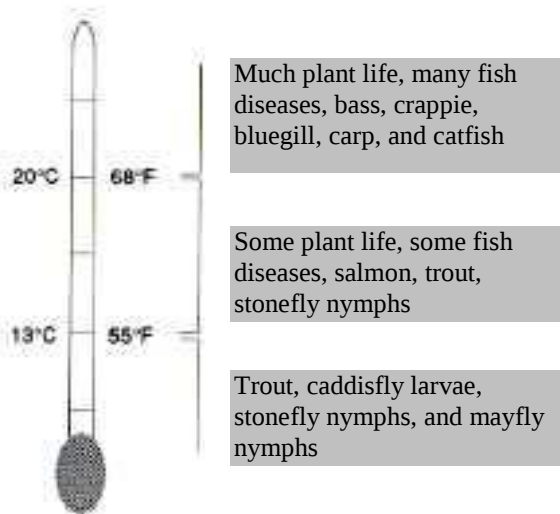
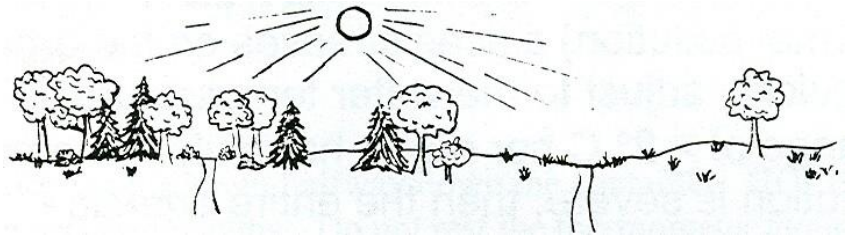


Fig. 1: The temperature tolerances of aquatic life.

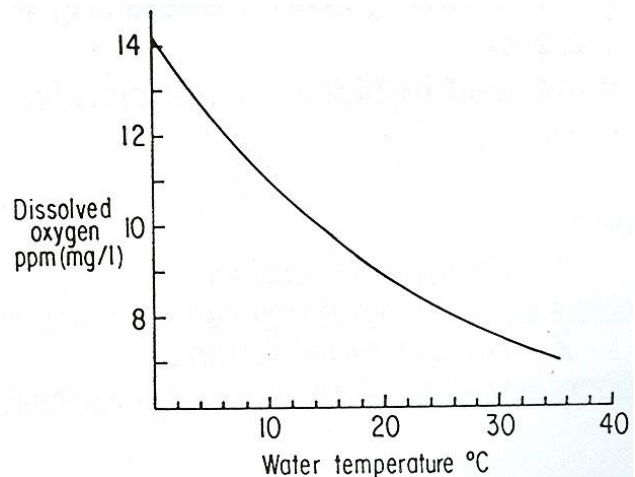


Fig. 2: Relationship between temperature and dissolved oxygen in pure water at sea level pressure.

Sources of figures 1 and 2: From or based upon Caduto, 1985. *Pond and Brook: A Guide to Nature In Freshwater Environments*.

Thermal Pollution

Definition: When relatively warmer or colder water enters a body of water, causing unnatural changes in the temperature of the body of water.

Why is this bad?

An aquatic organism's body temperature is directly linked to water temperature. Thus, the organism needs time to adjust to any change in water temperature. Sudden changes in water temperature (as in thermal pollution) places stresses on the organism too quickly to adjust to the water temperature, (Thermal change of $\geq 2^{\circ}\text{C}$ per day is harmful). If thermal pollution is severe, then the entire aquatic ecosystem can be destroyed.

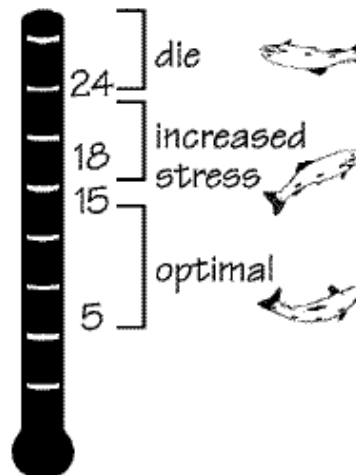


Fig. 3: The stress of increased temperature ($^{\circ}\text{C}$) on trout and salmon Illustration Source: www.busboy.sped.akons.edu/nkancm/stream/chemical/temphy.shtml

Origins of Thermal Pollution:

- Industries & power plants--- warm discharge water used to cool hot machinery.
- Stormwater---running off of hot urban surfaces such as pavement.
- Cutting of trees along waterways that shade the water from the sun.
- Increased turbidity, (water cloudiness)...Cloudy water absorbs the sun's rays.

Links:

1. Thermal Pollution

<http://www.rpi.edu/dept/chem-eng/Biotech-Environ/Environmental/THERMAL/ttel.html>

2. Temperature Change

<http://eesc.orst.edu/agcomwebfile/edmat/EC1489.pdf>

<http://www.epa.gov/volunteer/stream/vms53.html>

3. Temperature Effects on Fish

http://web.ics.purdue.edu/~jordanb/fish_temperature.htm