

## DISSOLVED OXYGEN FACT SHEET



**Definition:** Microscopic oxygen ( $O_2$ ) molecules that are mixed within water...dissolved oxygen is found in the spaces between water ( $H_2O$ ) molecules.

### Background:

- Aquatic animals and aerobic bacteria need  $O_2$  for respiration...*without* dissolved oxygen, fish would drown!
- Presence of dissolved oxygen is a positive sign, while its absence is a signal of severe pollution.

### Physical Influences:

- Temperature - dissolved  $O_2$  is normally greatest during the winter because cold water can hold more  $O_2$ ...(as temperatures drop, water molecules are spaced farther apart).
- Wet weather or melting snow increases flow, which results in greater mixing of atmospheric oxygen.

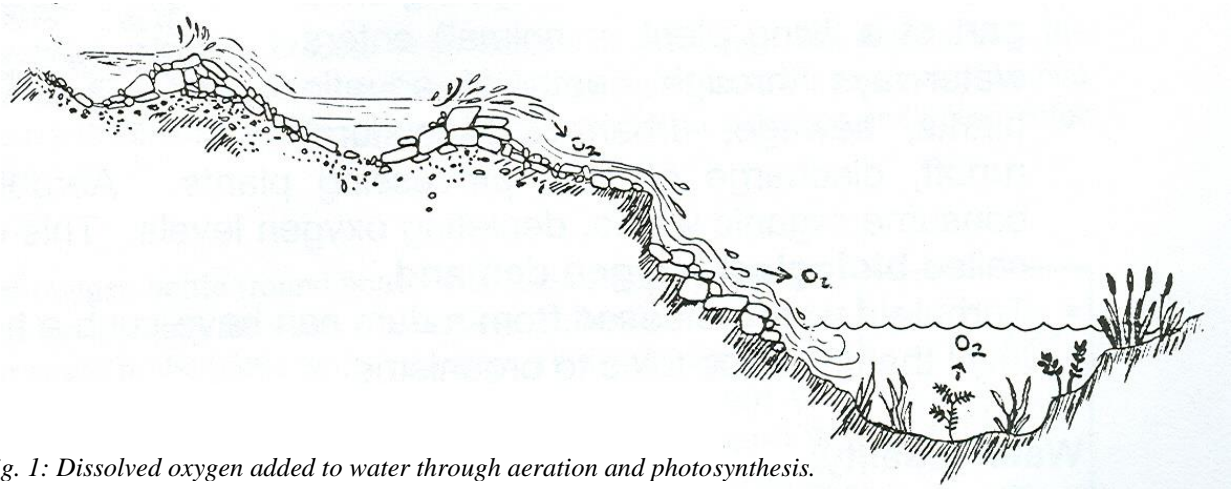


Fig. 1: Dissolved oxygen added to water through aeration and photosynthesis.

### Aquatic Life Influences

- Algae and aquatic plants deliver  $O_2$  to water through photosynthesis.
- Respiration/decomposition removes dissolved  $O_2$ .
- During growing seasons, dissolved  $O_2$  is highest in early afternoon when aquatic photosynthesis is maximal.

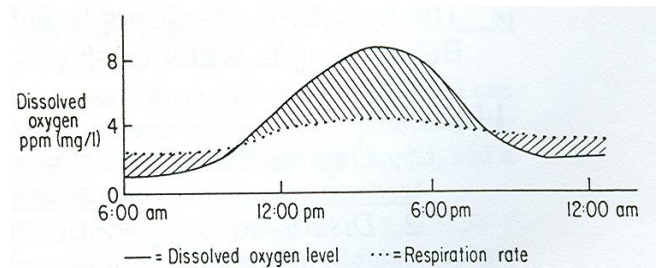
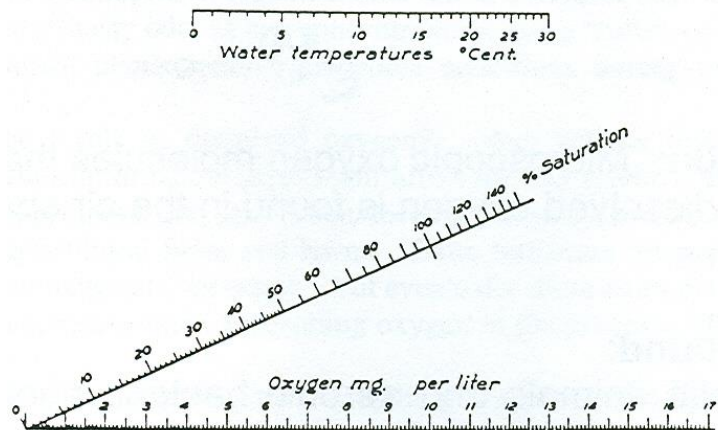


Fig. 2: Dissolved oxygen as it relates to plant respiration (source: Caduto, 1985 – Pond and Brook)

## Percent Saturation:

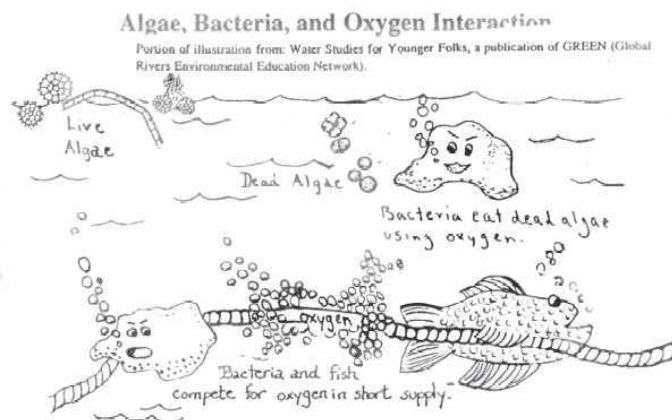
- The percentage of oxygen available in the water.

To determine percent saturation:  
Multiply your DO level (mg/L)  
by an atmospheric pressure  
correction factor  
Elev. 542-1094 = .98 factor  
Elev. 1094-1688 = .96 factor  
Find this corrected DO level on  
the bottom horizontal line and  
draw a straight line to connect to  
the water temperature (top line).



## Environmental Impacts:

- Temperature changes - any actions that change the temperature of the stream affect dissolved oxygen.
- Nutrient additions – from fertilizers encourage excessive plant growth (algal blooms), which eventually die and need to be decomposed by aerobic (oxygen using) bacteria. DO levels drop. This is **eutrophication**.
- Organic waste additions (anything once part of a living plant or animal) enter waterways through death of aquatic plants, sewage, urban & agricultural runoff, and discharge of food processing plants. Aerobic bacteria also consume organic waste, depleting oxygen levels. This use of oxygen is called **biological oxygen demand**.
- Turbulent water released from a dam can have such a high DO level that it can be toxic to organisms.



## Water Quality:

- The U.S. EPA considers healthy water to have 5 mg/L dissolved oxygen; below 4 mg/L water quality is considered poor.

## Links:

1. *Depicts* the effects that decreasing levels of DO have on wildlife  
<http://waterontheweb.org/under/waterquality/oxygen.html>
2. *Dissolved Oxygen*~describes why dissolved oxygen is important  
<http://www.epa.gov/volunteer/stream/vms52.html>
3. *Dissolved Oxygen in Lake Erie*~Shows DO levels since 1970  
<http://www.epa.gov/glnpo/lakeerie/dostory.html>