

Dissolved Oxygen

What is *dissolved oxygen* and why do we test for it?

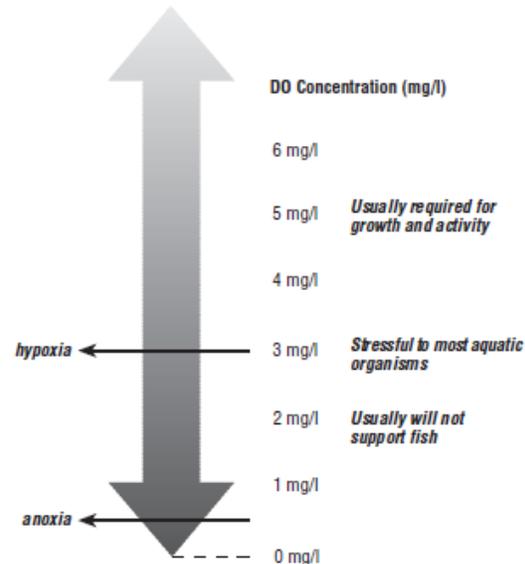
Oxygen is something that is essential for nearly all life to function – whether it is on land, in the ocean, or even Biscayne Bay. Because of the important role that oxygen has in maintaining life and the health of the ecosystem, it is one of the more important water quality indicators that are tested as part of the Biscayne Bay Water Watch (BBWW) program.

The level of oxygen that is in the water – also called dissolved oxygen (DO) – is a measure of how many oxygen molecules are present in a sample. Oxygen can enter the water in a number of ways including: diffusion and natural aeration (where atmospheric oxygen enters the water due to contact with waves and the water's surface), photosynthesis (from seagrasses, algae, and phytoplankton), and from human routes of entry (such as mechanical aeration, runoff, and pollution). DO concentrations are affected by physical, chemical and biological factors and vary according to the time of day, season, temperature and salinity. Due to the interaction of these factors, dissolved oxygen levels can range from less than 1mg/L to levels greater than 20mg/L.

As temperature decreases, the solubility of oxygen in the water increases (which means that colder water can hold more oxygen and conversely that warmer water requires less oxygen to reach 100% saturation). Salinity also affects the amount of dissolved oxygen in the water and as salinity levels increase, dissolved oxygen levels typically fall. Therefore, seawater naturally holds less DO than fresh water. As a result of factors such as temperature, salinity, and water stratification (layers of different density water) dissolved oxygen levels often do not reach 100% and at times can go above 100% when there is a lot of photosynthetic activity by plants.

Hypoxia: Deficiencies in oxygen (below 3 mg/l)

Anoxia: Depletion of oxygen (below 0.5 mg/l)



Dissolved oxygen in the water. A minimum DO concentration of 5 mg/l is usually necessary to fully support aquatic life.

Image credit: EPA. *Volunteer Estuary Monitoring: A Methods Manual*

Dissolved oxygen is important for the survival of almost everything in the Bay – from fish and invertebrates, to plants, and even beneficial bacteria! While their individual oxygen need is different (from low levels such as 1mg/L all the way to 15mg/L), all of these creatures need oxygen to breath and maintain normal metabolic functions. Most animals and plants require DO levels greater than 5.0 mg/l to grow and reproduce normally. When levels of dissolved oxygen drop below species specific threshold levels, organisms become stressed. In hypoxic conditions, many species will move and immobile species may die. Anoxic conditions will result in total mortality for those organisms that require oxygen to survive.

By measuring dissolved oxygen levels, we begin to understand what the health of the Biscayne Bay ecosystem looks like – and we can be on the lookout for situations indicative of an algal bloom. As a participant in the BBWW, you will be measuring the dissolved oxygen levels of your samples using a LaMotte Dissolved Oxygen Test Kit which uses a technique called the “Winkler method” which is covered in the training sessions and described in detail in the BBWW training manual and instruction booklet that was provided.