

BE ON THE TEAM TO THINK DOWNSTREAM: DISSOLVED OXYGEN

WHAT IS DISSOLVED OXYGEN?

Dissolved oxygen, often referred to as DO, is the oxygen in water that is available to support aquatic organisms like fish and algae. The oxygen in the water can be directly dissolved from the air or produced by aquatic plants during photosynthesis. Many different environmental conditions can affect the amount of DO in the water, which is why DO indicates other pollution and environmental issues.

Shallow, stagnant water increases the risk of dissolved oxygen depletion. Photo by M.P. Hayes



WHAT AFFECTS THE PARAMETER?

The primary sources of DO are photosynthetic organisms and oxygen from the air, but there are many other factors that can affect the amount of DO in water including temperature, water flow, nutrient concentration, salinity and barometric pressure. For instance, high summer temperatures reduce the solubility of oxygen in water, thus depleting the oxygen. In addition, stagnant water bodies can also contribute to low dissolved oxygen levels. Nutrients such as nitrogen and phosphorus can enter waterways during runoff events, through fish feeding

and waste, and via the decomposition of organic matter such as plants and leaves. These nutrients accelerate microbial activity and deplete DO from the surrounding environment. While plants can help increase oxygen through photosynthesis, the clarity of the water column affects the rate at which plants can grow. Turbidity from erosion, sedimentation and algae growth can all decrease sunlight penetration for plants to complete the respiration process, reducing DO concentration.

WHERE DOES IT COME FROM?

In Louisiana, 18% of waterways are impaired because of dissolved oxygen. One of the main causes of DO impairment is excess nutrients for microbial conversions. The increased demand for oxygen from microbial communities reduces the DO concentration in the surrounding environment. The Louisiana Department of Environmental Quality uses the Water Quality Integrated Report to identify impairments and sources. The following sources were identified as causing DO impairments around the state:

- Natural landscape
- Agricultural
- Sanitary sewerage and septic systems
- Municipal point source discharge
- Silviculture harvesting
- Industrial and packaging plant discharge
- Introduction of non-native species (plants)

HOW DOES IT AFFECT THE SURROUNDING ENVIRONMENT?

Low dissolved oxygen levels can lead to hypoxic (low oxygen) or even anoxic (no oxygen) conditions, which cause stress, suffocation or death for aquatic life and disrupt ecosystems. Hypoxic conditions can cause dead zones that are areas of water with low to

no oxygen to support aquatic life. Low DO can have effects beyond the water by disrupting food webs and decreasing water quality by hurting terrestrial organisms in the ecosystem.

WHAT ARE TRADITIONAL MANAGEMENT PRACTICES?

There are many forms of best management practices for DO impairments. Balancing or mitigating nutrients from runoff and point source discharge to prevent excess nitrogen and phosphorus can help maintain proper DO concentration. This can be done by planting vegetation around waterways to act as buffers, ensuring proper treatment for point source

discharge and applying recommended amounts of fertilizer to residential or agricultural sites. Additionally, aeration from mechanical sources including fountains, submersed aerators and pumps can break the surface tension, allowing more water mixing which lets more oxygen diffuse into the water.

RESOURCES

<https://www.epa.gov/caddis/dissolved-oxygen>

https://www.epa.gov/system/files/documents/2021-07/parameter-factsheet_do.pdf

<http://www.deq.louisiana.gov/page/louisiana-water-quality-integrated-report>

<https://www.usgs.gov/special-topics/water-science-school/science/dissolved-oxygen-and-water>

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