

# COD

The chemical oxygen demand, or COD, is used as a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. For samples from a specific source, COD can be related empirically to BOD, organic carbon, or organic matter. The test is useful for monitoring and control after correlation has been established.

Oxidation of most organic compounds is 95 to 100 percent of the theoretical value. Ammonia, present either in the waste or liberated from nitrogen-containing organic matter, is not oxidized in the absence of significant concentration of free chloride ions (19th Edition, Standard Methods, 1995).

# Conductivity

Conductivity is a measure of how well water can pass an electrical current. It is an indirect measure of the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium, iron and aluminum. The presence of these substances increases the conductivity of a body of water. Organic substances like oil, alcohol, and sugar do not conduct electricity very well, and thus have a low conductivity in water.

Inorganic dissolved solids are essential ingredients for aquatic life. They regulate the flow of water in and out of organisms' cells and are building blocks of the molecules necessary for life. A high concentration of dissolved solids, however, can cause water balance problems for aquatic organisms and decrease dissolved oxygen levels (1991, Streamkeeper's Field Guide: Watershed Inventory and Stream Monitoring Methods) .



# Dissolved Oxygen

The amount of Dissolved Oxygen, or DO, in water is expressed as a concentration. A concentration is the amount of in weight of a particular substance per a given volume of liquid. The DO concentration in a stream is the mass of the oxygen gas present, in milligrams per liter of water. Milligrams per liter, or mg/L, can also be expressed as parts per million, or ppm.

The concentration of dissolved oxygen in a stream is affected by many factors:

- Temperature: Oxygen is more easily dissolved in cold water.
- Flow: Oxygen concentrations vary with the volume and velocity of water flowing in a stream. Faster flowing white water areas tend to be more oxygen rich because more oxygen enters the water from the atmosphere in those areas than in slower, stagnant areas.
- Aquatic Plants: The presence of aquatic plants in a stream affects the dissolved oxygen concentration. Green plants release oxygen into the water during photosynthesis. Photosynthesis occurs during the day when the sun is out and ceases at night. Thus in streams with significant populations of algae



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# Metals

The effects of metals in water and wastewater range from beneficial through troublesome to dangerous and toxic. Some metals are essential, others may adversely affect water consumers, wastewater treatment plants, and receiving waters. Some metals may be either beneficial or toxic, depending on concentration (American Public Health Association, 1995, 19th Edition, Standard Methods, 1995).

The primary mechanism for toxicity to organisms that live in the water column is by absorption to or uptake across the gills: this physiological process requires metals to be in a dissolved form. This is not to say that particulate metal is nontoxic, only that particulate metal appears to exhibit substantially less toxicity than dissolved metal (U.S. EPA).

Not all metals are acutely toxic in small concentrations. The "heavy metals" include copper, or Cu, iron, or Fe, cadmium, or Cd, zinc, or Zn, mercury, or Hg, and lead, or Pb, and are the most toxic to aquatic organisms. Some water quality characteristics which affect metal toxicity include temperature, pH, hardness, alkalinity, suspended solids, redox potential and dissolved organic carbon. Metals can bind to many organic and inorganic compounds which reduces the toxicity of the metal.

## **Nitrogen**

Nitrogen is important to all life. Nitrogen in the atmosphere or in the soil can go through many complex chemical and biological changes. It can be combined into