Nutrient Units Primer

SUNA Operating Principle

Nutrient units are used to express the amount of something (usually moles or mass) relative to the volume it is in. As simple as this seems, units should not be taken lightly because simple mistakes made frequently by trained analysts cost significant time and money.

Many researchers and oceanographers use the units of µM, or micromoles per liter, a unit that is independent of mass and useful for stoichiometric calculations.

Most freshwater monitoring programs and many researchers use units of milligrams per liter, due to the literature record and regulatory requirements. This unit is almost always expressed as milligrams of relevant atoms per liter; for example, milligrams of phosphorus (P) per liter or milligrams of nitrogen (N) per liter, rather than milligrams of phosphate or nitrate per liter. This unit is used as means of easily keeping track of total nutrient loading. Because mg/L is a mass based unit and the mass of P and PO4 (or N and NO3) are different, the distinction is very important to avoid mistakes.

Milligrams per liter is also often commonly referred to as ppm, or parts per million, which is the mass of P relative to mass of water (assuming density of 1 g/mL regardless of conditions).

CYCLE Sensor

The Cycle-PO_4 sensor measures soluble reactive phosphate and reports units in µM (micromolar) or mgP/L (milligrams of phosphorus per liter). The Cycle-PO_4 also can report in milligrams phosphate per liter (mg/L or mgPO_4/L). MgPO_4/L is not commonly used in environmental analysis (standards, such as the Hach 0.5 mg/L standard, are sometimes in this unit).

SUNA V2 Sensor

The SUNA V2 sensor measures dissolved nitrate + nitrite and reports units in µM nitrate (micromolar) or mgN/L (milligrams of nitrogen per liter). SUNA optics do not distinguish signals from nitrite and nitrate and the sensor is only calibrated to output in nitrate. SUNA V2 **does not** report milligrams of nitrate per liter (mg/L or mgNO_3/L).

mg/L ~ ppm
µg/L x 1000 = mg/L
mg/L x 1 x 10-6 = g/mL
nM x MW x 1E-9 x 1E3= mg/L
mg/L PO43- x MW-P/MW PO43- = mg/L PO43--P
M PO43- x MW-P X 1E3 = mg/L PO43--P
M = mol/L ; MW = g/mol

Table 1. Example unit equivalencies