

WHAT THE NUMBERS MEAN

When taking water samples it is extremely important to read instructions to make sure that you are reporting the correct reading (*example: ammonia vs. ammonia-N or nitrate vs. nitrate-N*)

Ammonia: Toxicity increases with increasing pH and temperature. A pH/temperature chart in conjunction with a simple calculation is necessary to determine the toxic un-ionized ammonia. It is best to report ammonia as nitrogen because it is more comparable with other nitrogen compounds.

Ammonia (NH₃) = Unionized (toxic form)

Ammonia-Nitrogen (NH₄⁺) = Ionized ammonia (also referred to as Ammonium)

- RWQCB Basin Plan objective for un-ionized ammonia is 0.025 mg/l
- Ammonia levels greater than ~0.1 mg/l usually indicate polluted waters
- Ammonium-Nitrogen concentrations should not exceed 0.5 mg/l

Conductivity: A measure of waters potential to conduct an electric current. The higher the conductivity the more dissolved minerals the water contains. Excess salts in soil and water inhibit water uptake and become toxic to that organism. Animal wastes, poor subsurface drainage and some fertilizers contain high levels of salt. RWQCB Objective for central coast is undetermined.

- The *recommended* drinking water standard is less than 900 µmhos/cm

Agricultural Suitability for Irrigation Water

Constituents	Class I Excellent to good	Class II Good to injurious	Class III Injurious to unsatisfactory
Total Dissolved Solids (TDS) ppm	Less than 700	700 to 2,000	Greater than 2,000
Electrical Conductivity (µmho/cm)	Less than 1,000	1,000 to 3,000	Greater than 3,000
Chloride Ion Concentration ppm	Less than 175	175 to 350	Greater than 350
Boron ppm	Less than 0.5	0.5 to 2.0	Greater than 2.0

CA Dept. of Water Resources

Dissolved Oxygen: DO levels fluctuate seasonally and over a 24-hour period. It varies with water temperature and altitude. Cold water holds more oxygen than warm water and water holds less oxygen at higher altitudes. RWQCB objective for Dissolved Oxygen is 7.0 mg/l for cold water fishes and 5.0 mg/l for warm water species.

Nitrate (NO₃⁻): Nitrates stimulate the growth of aquatic plants that can lead to reduced oxygen levels. High nitrate levels occur in areas of extensive agriculture, animal feedlots and septic waste systems. Nitrate in irrigation water has much the same effect as soil-applied fertilizer nitrogen. Nitrate in water

can be considered useable nitrogen, and, along with a conversion factor can be incorporated into grower's fertilizer program. 1 ppm NO₃-N in water = 0.6 lbs of useable nitrogen in 1 acre-foot of applied water.

- The SWRCB Drinking Water Standard for Nitrate (as NO₃⁻) is 45 mg/l
- The SWRCB Drinking Water Standard for Nitrate-nitrogen (NO₃-N) is 10 mg/l
- A Nitrate-nitrogen reading greater than 2.25 mg/l in surface water is considered to be detrimental to the aquatic environment
- Nitrate (as NO₃⁻) should not exceed 100 mg/l for livestock consumption

Pathogens: Disease-causing organisms can result in minor illnesses such as skin rash, eye and ear infections and upset stomachs. Coliform bacteria can be generated from livestock, domestic animals, faulty septic systems, sewer line failure, wildlife, and decaying plant material.

- Fecal Coliform = concentration based on a minimum of 5 samples for any 30-day period shall not exceed 200 Most Probable Number (MPN)/100 ml
- Total Coliform = RWQCB attention level is set at 10,000 MPN/100 ml for fresh water

pH: pH affects many chemical and biological processes in water. Low pH allows toxic elements and compounds to become mobile and available to aquatic plants and animals.

- 6.5 to 8.5 = Ideal water condition
- 5.0 to 6.5 AND 8.5 to 10.0 = Caution level
- <5.0 OR >10.0 = Danger level

Phosphate (ortho) (PO₄³⁻): Monitoring phosphorus is challenging because it involves measuring very low concentrations down to 0.01 mg/l. Even such low concentrations can have a dramatic impact on streams. Phosphate can cause algal blooms that lead to reduced oxygen levels. Less sensitive methods should be used only to identify serious problem areas.

- RWQCB target value for Orthophosphate as P is 0.12 mg/l and 0.37 for Orthophosphate as PO₄
- Natural levels of orthophosphate usually range from 0.005 to 0.05 mg/l

Temperature: The rates of biological and chemical processes depend on temperature. Temperature affects the oxygen content of water, rate of photosynthesis by aquatic plants, metabolic rate of organisms.

- Max. weekly average temp for (juvenile) fish growth = 66°F for Rainbows & 64°F for Sockeye Salmon
- Max. weekly average temp for spawning = 48°F for Rainbows & 50°F for Sockeye Salmon
- Max temp for survival of short exposure (juveniles) = 75°F for Rainbows & 64°F for Sockeye

Total Dissolved Solids: A measure of dissolved minerals in a water sample. High levels can contribute to lower crop yields. The recommended drinking water standard is 500 mg/l. See Conductivity above.

- Total Dissolved Solids = 150 to 1400 mg/l (central coast objective depending on waterbody)

Conversion Factors

μ = micro

1 μ mho/cm = 1 μ Siemen/cm

1 ppm (part per million) = 1 mg/l (milligram per liter)

1 ppb (part per billion) = 1 μ g/l (microgram per liter)

Convert Nitrate-Nitrogen ($\text{NO}_3\text{-N}$) to Nitrate as NO_3 = multiply by 4.43

Convert Ammonia ion to Ammonia-Nitrogen = divide ion reading by 1.3

Convert Ammonia-Nitrogen to Ammonia ion = multiply by 1.3

Convert mg/l PO_4^{3-} to mg/l P = multiply by 0.326

Convert mg/l P to mg/l PO_4^{3-} = multiply by 3.07

Fahrenheit to Celsius = $^{\circ}\text{F} - 32$, multiply this number by 0.557 = $^{\circ}\text{C}$

Celsius to Fahrenheit = $^{\circ}\text{C} \times 1.8$, add 32 to this number = $^{\circ}\text{F}$

Convert ppt to ppm = multiply by 1000

Convert ppm to ppt = divide by 1000

Convert ppb to ppm = divide by 1000 (1 ppb = .001 ppm)

Convert ppm to ppb = multiply by 1000 (.001 ppm = 1 ppb)

Purchasing Test Kits & Other Equipment

Test kits and electronic meters used to measure different concentrations among selective ions is highly variable, therefore, it will be important for you to know what degree of accuracy you are striving to achieve before selecting a product. Prices will vary over time.

Contact Information for Suppliers of Water Quality Testing Equipment

(BM) Ben Meadows 1-800-241-6401 or <http://www.benmeadows.com>

(GI) Gallard Industries 1-800-645-3044 or <http://gallard.com>

(Ohmicron) 1-800-544-8881 (immunoassay kits for pesticides) or www.sdix.com (pesticide chart)

Pricing for Water Quality Tests (not a comprehensive list of tests and companies)

Nitrate Test Strips (NO_3^-)

BM= #4JF-7830 \$52 for 100 Tests (EM Quant)

Phosphate Test Strips

GI= #91320 \$36⁵⁰ for 30 tests

pH Test Strips

BM= #3JB-2153 \$10⁷⁰ per 100

Water Quality Mini-Kit

BM= #3JB-95228 \$30 for 8 different tests

Thermometer

BM= #3JB-111052 \$6 each

Imhoff Cone (1000 ml)

BM= #3JB-224920 \$20⁷⁰ each

Imhoff Cone Stand (can use plumbers tape or a sliver of 4" PVC pipe tacked to a wall)

BM= #3JB-224921 \$25⁹⁰