e-GRO Alert

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Interpreting a Laboratory Water Test

The Cleanwater3 interpretation tool makes it easier for growers to understand water test results from an analytical laboratory.

Irrigation water is one of the most critical inputs when growing crops. Well, municipal, rain, and pond water can all be used to irrigate crops and all have their advantages and disadvantages as irrigation sources. Ground water also varies widely with where in the country your growing operation is located based on the geology of the site. For example, in Michigan the bedrock is limestone which causes ground water to be highly alkaline as it dissolves carbonates and bicarbonates from the surrounding rock. High alkalinity can be a problem for growing crops because the pH of the substrate tends to increase over time making nutrients unavailable to the plants. If you are seeing irrigation water challenges or crop symptoms (Figure 1) from irrigation water, the next step is to get your irrigation water tested by an analytical laboratory.

Figure 1. Classic iron deficiency in calibrachoa. Photo: Heidi Lindberg.

Upon receiving the water sample test results, it can be confusing as to what they mean. There is an excellent interpretation tool that all growers should know about called "WaterQual" developed by Drs. Rosa Raudales and Paul Fisher as a part of CleanWater3 Specialty Crops Research Initiative. Once you receive your water quality test back from a lab, you can simply plug in the values and the online tool which will generate an interpretation.

For example, a grower who was seeing nutrient deficiency symptoms sent in their water to be evaluated (Figure 2).

Figure 2. Example of a water test from a Michigan well.

Sample Description: Well Water

	Sample Results		Desired Level
ph [H++]	7.55		5-7
EC (mmhos/cm) *	0.92		-1 mmho/cm
Alkalinity	394.00		< 100,<2meq
Hardness	478.71		--
CO2, ppm	22.11		--
SAR	0.24		< -
MAJOR CATIONS	**ppm**	**meq**	**ppm****
Calcium(Ca)	119.65	5.97	< 120
Magnesium(Mg)	43.70	3.59	< 24
Potassium(K)	1.09	0.03	< 10
Sodium(Na)	11.92	0.52	< 50
Ammonium(NH4-N)	0.00	0.00	< 8
MAJOR ANIONS	**ppm**	**meq**	**ppm****
Nitrate(NO3-N)	2.30	0.16	< 2
Phosphate (PO4), ppm	0.00	0.00	
Chloride(Cl)	37.60	1.06	< 20
Sulfate(SO4)	101.30	2.11	< 90
Chromium(Cr)	0.00	0.00	--
TRACE ELEMENTS	**ppm**		**ppm****
Nickel (Ni)	0.00		--
Aluminum(Al)	0.00		-<5.0
Iron(Fe)	0.00		-<4.0
Manganese(Mn)	0.11		-<1.0
Zinc(Zn)	0.00		-<0.3
Copper(Cu)	0.00		-<0.2
Boron(B)	0.02		-<0.05
Molybdenum(Mo)	0.00		-<0.001
Silicon (Si), ppm	6.38		

* Results expressed as mmhos/cm is equal to results expressed as mS/cm or dS/m.
** Desirable nutrient water levels, <= "Less Than". See www.mmilabs.com for more information on upper limit nutrient levels in irrigation water.

Comments:

The water quality interpretation tool can be found under the tools tab of the www.cleanwater3.org website (Figure 3). Growers can enter all the information from the lab test and it will generate an interpretation (Figure 4).

Figure 3. Screenshot of the water quality evaluation tool on the cleanwater3.org website.

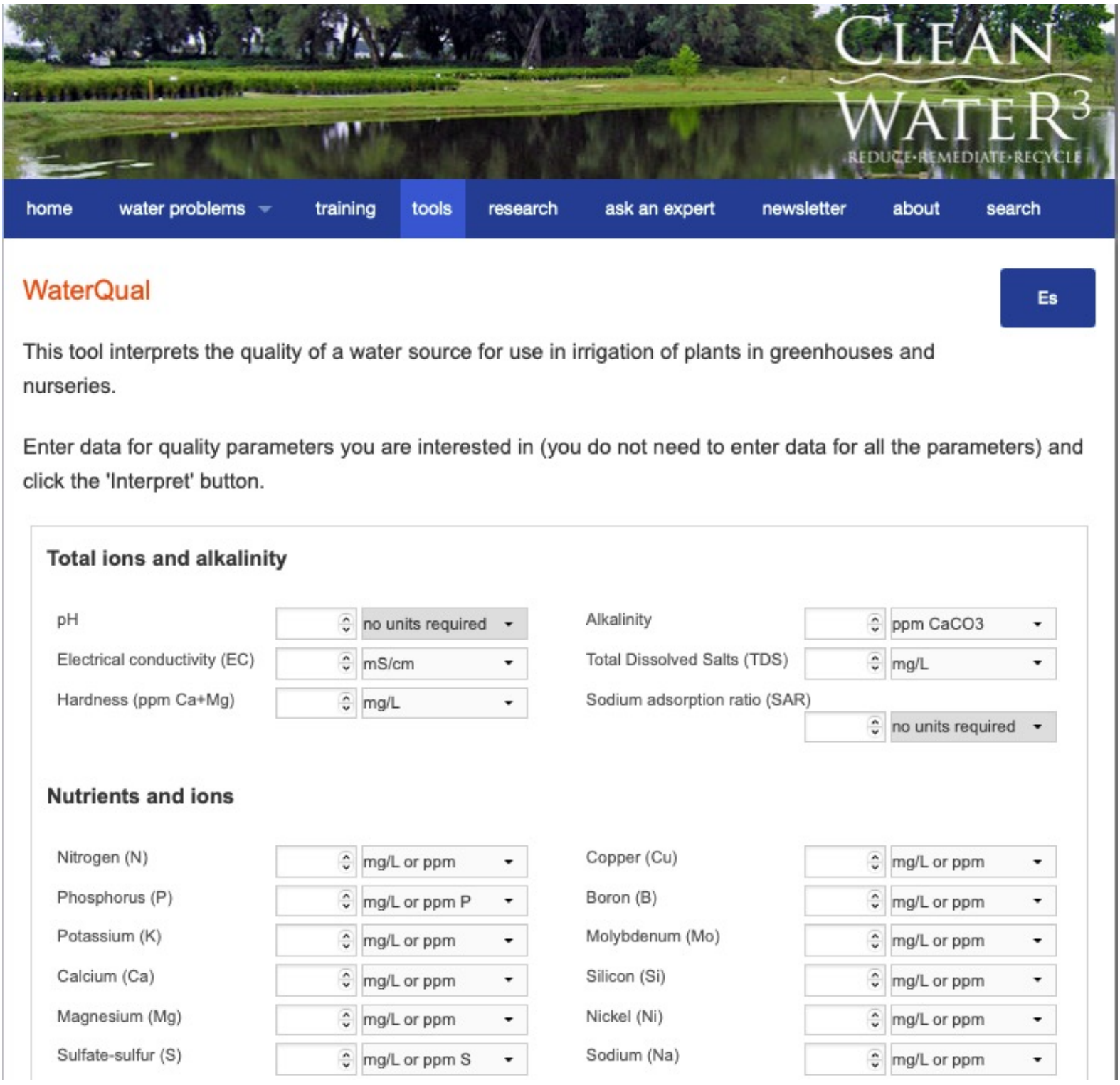

Figure 4. Partial result of the water interpretation using the water quality tool.

Measurement	Test value	Result	Explanation of result
pH	7.55	High (>7)	*Interpreting the pH and alkalinity results together*
Alkalinity	394 ppm $CaCO_3$	High (>150.01ppm $CaCO_3$)	pH and alkalinity levels this high means some pH adjustment (addition of acid) will be required in the spray tank with certain agrichemicals - check the pesticide label. Acidification is needed for hydroponic growers to lower pH to 6. For irrigation of containerized plants, injection of acid is recommended to reduce alkalinity and avoid an increase in substrate-pH over time. You may also need to include ammonium or urea nitrogen at 40% or above of total N in fertilizer to help avoid a rise in pH when using hydroponics or a container substrate.
Electrical conductivity (EC)	.92 mS/cm	Moderate (>0.76 mS/cm)	A moderate to high level of dissolved ions. Likely to lead to salt accumulation in the substrate or recirculating solution, resulting in hard stunted growth and root damage. During mist propagation or overhead watering, may lead to salt burn on foliage. Manage with reverse osmosis, blending with a more pure water source such as rain water, leaching during irrigation, or periodic replacement of recirculating solution. Further water testing is needed to determine which ions are present, including fertilizer nutrients, alkalinity, chloride, or sodium.
Hardness (ppm Ca+Mg)	478 mg/L	High (>300.1 mg/L)	Ca and Mg levels this high are likely to produce residues on plant leaves, reduce efficacy and solubility of agrichemicals, clog irrigation equipment, and cause scaling and buildup on greenhouse boilers. Treatments such as reverse osmosis and acid injection are recommended.

The water interpretation tool highlights that with a high pH, alkalinity, and hardness, the grower will need to treat their water in order to prevent the pH from climbing in their substrate, prevent clogging of irrigation equipment, and leaving salt residues on leaves. In addition to this tool, the CleanWater3 website has other helpful information and tools. To learn more about water quality issues, I highly recommend the "Water Quality and Treatment" online course through Greenhouse Training Online at https://hort.ifas.ufl.edu/training/ The next course will be offered in 2026.

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www.e-gro.org

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