



# ***DIRTY WATER?***

## ***Identifying Bad Water Quality Problems***

THE QUALITY OF THE WATER you are feeding your plants is directly correlated to the quality of your harvest. Give your plants pure H<sub>2</sub>O and they will produce healthy and bountiful crops. Start with bad water and you will not only have problems in the early stages of plant growth but can also expect problems to accumulate throughout the life cycle of your plants, resulting in unspectacular fruits and flowers.

Most serious gardeners realize the crucial role pure water plays as the basis for a proper nutrient formula. Some haul pure water from the water store, whereas others are blessed with great quality water straight from their tap. Many use some form of water filtration, whereas many simply use suspect water out of their tap without really knowing its quality.

***by Richard Gellert***



Knowledge is the key when it comes to this highly important component of a garden, whether it's indoor or outdoor, hydroponics or dirt farming. Knowing the quality of your water can be the magic bullet to achieving optimum results every

time. Having intimate knowledge of the ppm (parts per million) of your water will reveal many secrets and show you the path towards ultimately superior results.

## How Dirty is Your Water?

There is a myriad of substances that can end up in the water you are feeding your plants. The paramount indication of water quality for gardening is hardness. Hardness is the amount of dissolved calcium and magnesium and it makes up the majority of the ppm of your water. Now, it is true that both of these components are critical for plant growth, but only in the precise quantities required. Beyond a certain amount of hardness, your plants can show nutrient lockout problems. There are other minerals that can be in abundant quantities in water that can also impede proper plant growth. Too much iron, manganese, lead, copper, or zinc can lead to lockout and deficiency problems.

Chlorine and chloramines effectively kill any living microbiology. You are drastically lowering the abundance of living

components in your compost teas, bio-extraction solutions, mycorrhizae blends, or beneficial bacteria and fungi products. Even beneficial and predatory nematodes can be harmed by chlorinated water and be rendered ineffective. There are a plethora of newly available microbiological products available to the grower today. Removing chlorine and chloramines from your water is critical when working with living systems. The bio-organics revolution has begun and pure water is paramount to successful results.

There are some truly nasty things that can be found in some water sources. Fecal coliform, pesticides, herbicides, asbestos, cryptosporidium, giardia, bacteria, endocrine disrupters, pesticides phosphates and nitrates are, unfortunately, all too common in certain water sources. Getting your water tested, especially if it's non-municipal water, is of utmost importance to determine what levels of these pollutants are present. Fortunately there are technologies available today to deal with even the dirtiest of water problems.

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Most growers have ppm pens or monitors that can tell them the quality of their water. This is a good starting point, but knowing the hardness (calcium and magnesium) of the water is important, to see how much of the ppm is the hardness and how much is other contaminants. There is a myriad of other substances that can be read by a ppm pen. Sources for ppm in your water include agricultural runoff, urban runoff, industrial wastewater, sewage, and natural sources such as leaves, silt, plankton, and rocks. Piping or plumbing may also release metals into the water and add to the ppm.

On the right is a guide to identifying certain water problems:

### When is Your Water too Dirty?

Let's look at a possible scenario. Say you test your water and learn that the ppm is 300 and the hardness (calcium and magnesium) is 11 grains or 188 ppm (1 grain of hardness is equal to 17.1 ppm hardness).

Because you're on well water you surmise the other 112 ppm are other minerals, such as iron, and possibly sulphur. The water tastes great to you and your friends and everyone believes it would be great water to garden with. It's time to transplant some freshly rooted cuttings into larger containers. You know you are working with a variety of flowers that are sensitive to high ppm in their early stages. You want to keep your feed formula at around 400 ppm for the first week. At this point do you add 400 ppm of food to your water that is already 300 ppm or do you only add 100 ppm food? That's

VISUAL PROBLEMS	CAUSE
Yellow/brownish cast to water even after softening and/or filtering and does not clear up after standing for 24 hours.	Tannin (humic acid) in water. Comes from water passing through coal veins, peaty soils, and decaying vegetation.
Milky or cloudy water with many tiny air bubbles that may not dissipate upon standing	Excessive air in the water caused by the well pump sucking air or a malfunctioning pressure tank. Also can be caused by high amounts of bicarbonate precipitates resulting from an increase in pH
Green stains on sinks and other porcelain bathroom fixtures. Blue-green cast to water	Acidic water (pH below 6.8) reacting with brass and copper pipes and fittings
Soap curds and lime scum in washbasins and bathtubs. Whitish scale deposits around plumbing fixtures	Hard water caused by calcium and magnesium

SMELL PROBLEMS	CAUSE
Fishy, musty, or earthy smell. May also smell like methane gas	Decaying organic matter commonly associated with surface water supplies
Rotten egg odor only from hot water	Sulfates present in the water reacting with the magnesium anode which causes hydrogen sulphide gas. Can be corrected by removing the anode or replacing it with an aluminum anode

TASTE PROBLEMS	CAUSE
Metallic taste	High acidity or concentration of manganese, iron or possibly other metal
Chemical or plastic taste	Chemical contaminants, pesticides, or agricultural runoff



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the dilemma — you can never accurately control the amounts of critical inputs your plants need to feed properly.

Starting with pure water, close to 0 ppm, allows you to add calcium and magnesium in the precise quantities required during each phase of growth. Every other part of the nutrient formula can also be specified to exact amounts. Being able to control precisely what makes up the ppm of your plant food will allow you to dial-in amazing results and have beautiful harvests every time. You won't have to worry about nutrient deficiencies or lockout problems by starting with pure water.

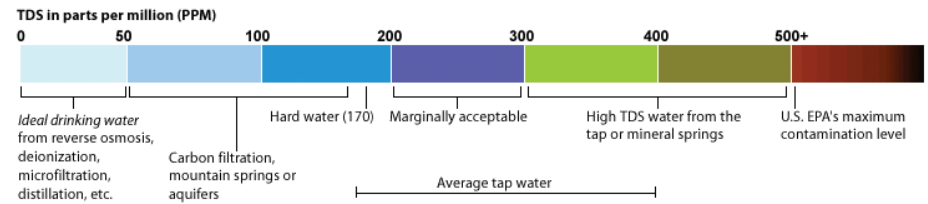
The EPA set a limit for the maximum ppm in water fit for human consumption to be 500. Below shows some common contaminants in water and their maximum allowed amounts in water. If you don't want to drink your tap water, why feed it to your plants?

The full list of all contaminants to be found in water and their maximum limits can be found at: <http://www.epa.gov/safewater/contaminants/index.html>.

Contaminant	Limits (mg/L = ppm)
Chloride	250 mg/L
Copper	1.0 mg/L
Iron	0.3 mg/L
Odor	3 threshold odor number
Silver	0.10 mg/L
Total Dissolved Solids	500 mg/L



The graph below shows the range in ppm of water quality:



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### Well vs. City Water

The water from your tap can originate from many sources: wells, springs, streams, municipal or city water. All these sources have potential water quality problems. One may think that well or spring water is great, and although it may be healthy for humans to consume, the mineral content is usually way too high to properly grow your prized plants. For instance, orchids and bonsai plants are very sensitive to excess minerals and chlorine.

Each source of water presents a different challenge when it comes to choosing a way to improve its quality. The type of water filtration system that is ultimately best for well water treatment may not be the same for municipal water users. While most well and spring sources require a water softener to remove excessive minerals or hardness, city dwellers need carbon to remove chlorine and chloramines.

### Reverse Osmosis – the Cure All?

For all intents and purposes a good reverse osmosis (RO) system will remove all contaminants from the water. Distillation will do the same thing but is costly and uses lots of energy. On the other hand, RO systems are affordable and do not require anything else but proper water pressure to make them do their thing. Knowing how to get the most out of your RO, as well as knowing its limitations, will allow you to use this wonderful piece of technology to grow the healthiest and highest-quality plants imaginable.

Typical RO systems designed for hydroponics and gardening will perform wonderfully as long as you know the quality of the water you are trying to purify and keep the systems maintained properly. These RO filters can handle a maximum of 1000 ppm feed water and about 10 grains of hardness (171 ppm calcium and magnesium). The closer to these numbers your untreated water is, the more frequently you will have to change the RO system's pre-filters and membranes.

More important, if your source water is approaching the upper limits and beyond of what an RO system can handle, some form of pre-treatment can be very cost effective. Most often a water softener is placed before an RO to remove all hardness. Then the RO membranes can perform at maximum efficiency, giving you very pure water that needs to be replaced less often. City-water users dealing with chlorine may want to use extra carbon and sediment stages before the RO to pre-treat the feed water and extend the life of the membranes.

Having a good understanding of your water quality is the key to repeated success with your crops. Knowing what technologies in water filtration you can employ to help you produce the purest water will reward you with superior quality. Hydroponics stores and some garden centres have several types of products available and can help steer you towards the right system for your needs. For maximum yields you need maximum purity. Take the plunge into pure water.

**MY**