Water quality determines PLANT HEALTH

Water.

H_2O. Such a simple molecule yet so important. Even in the backyard garden, the water used can make a huge difference in flowers, shrubs, trees, grasses, and fruit and vegetable plant growth and development.

Though variable, treated city water is usually of good quality.

What if a surface source of water like a pond or stream is used? What about well water? These water sources vary tremendously in quality, and it's important to know what's in the water used for irrigating landscape and interior plants.

What makes water quality poor?

Many types of contaminants can reduce water quality for use on plants. One thing to remember is the parameters are different for plant use than for human consumption. For example, there are U.S. Environmental Protection Agency limits on nitrates in drinking water, but this is not the case for water used to irrigate plants. Nitrates contain nitrogen – one of the elements essential for plant growth and development.

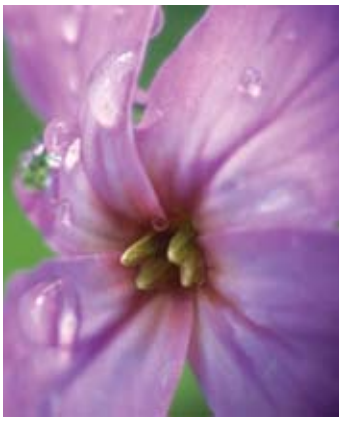
Particles in the water can make water quality dubious, especially for drip irrigation systems. Bits of dirt, metal, and algae can clog emitters on drip irrigation tubing rendering them useless.

Various chemicals that naturally occur in water can be potentially harmful to plants, depending on the amount present. Bicarbonates are often found in the form of calcium bicarbonate or magnesium bicarbonate. Irrigation water high in these types of bicarbonates leaves behind insoluble calcium carbonate – otherwise known as lime – when water evaporates. High carbonates also increase sodium hazard (discussed below).

High levels of dissolved salts can create havoc with horticultural plantings. Salts are chemical compounds that dissolve into two components in water. One component is positively charged (such as calcium, potassium, magnesium, or sodium). The other component is negatively charged (such as phosphate, nitrate, sulfate, or chloride). Common dissolved salts in water include gypsum (calcium sulfate), halite (sodium chloride), and calcite (calcium carbonate). Fertilizer salts can end up dissolved in water supplies if overapplied to plants. Any fertilizer not taken up by the plant can be carried down into ground water or may be washed into surface water sources.

Recommended Levels of Some Components of Irrigation Water

- **EC** (electrical conductivity) should be less than 2.0 deciSiemens/meter
- Sodium should be less than 3 milliequivalents per liter (meq/l)
- **SAR** (sodium adsorption ratio) should be less than 10



Dissolved salt levels in water are measured indirectly through electrical conductivity, or EC. Water high in EC can cause poor plant health due to nutritional imbalance problems. Water uptake by the plant can also be decreased.

High levels of sodium can damage horticultural plants. The SAR, or sodium adsorption ratio, is a very important number to have from a water analysis (see sidebar). This ratio tells the amount of sodium in the water relative to calcium and magnesium. When too much sodium is present, plants take up sodium rather than calcium, magnesium, and potassium, which can lead to unhealthy plants due to deficiencies of these critical nutrients.

Measurement of water pH is typically of lesser importance in determining water quality. What is lurking in the water is usually more important than to know the acidity or alkalinity of the water being used. Most well water has pH levels between 7 and 8.5 (sometimes higher), and surface water (from rivers or streams) is often somewhat on the acidic side, around 6.5.

What happens to plants irrigated with poor-quality water?

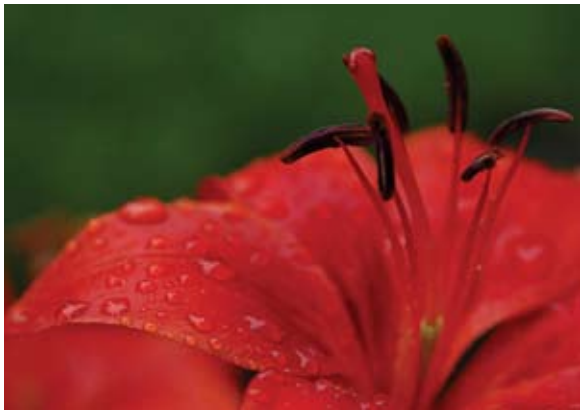
Irrigating with poor-quality water causes nutritional imbalances and can also cause burning of root and leaf tips. Water high in bicarbonates when evaporated usually leaves behind a white residue. This is a common issue with houseplants. Residues may collect on foliage, blocking sunlight and decreasing photosynthesis rates. This will result in poor plant growth and lower yields of fruit and vegetable plants. Also, high bicarbonate levels in combination with calcium and/or magnesium will often precipitate – form insoluble solids that remain in the soil. When this happens, two important and essential plant nutrients (calcium and magnesium) are no longer available to the plant.

High sodium in the water can lead to "sodic" soils. Sodic soils form when water with high levels of dissolved sodium evaporates. The sodium left behind can make the soil form a sticky layer water cannot penetrate. It also creates nutritional problems when plants take it up instead of calcium, magnesium, and potassium. The result is deficiency in calcium, magnesium, and/or potassium.

High EC levels mean there are elevated levels of dissolved salts in the water, which can lead to nutritional problems, burned roots and leaves, and even plant death. Few of our horticultural plants are very salt tolerant, so dissolved salt levels should be kept to a minimum.

How do I know the quality of my water?

The only way to know is to have water tested by a reputable laboratory (see page 22). Costs vary. Make sure the laboratory tests for plant consumption and not human consumption. These are two very different things. Many land-grant universities offer water testing services as do many private laboratories. University of Wyoming does not provide water testing services for the public, but the Wyoming Department of Agriculture Analytical Services does (see page 22).



What do I do if I have poor quality water?

There are several things that can be done if forced to use poor-quality water. First is to select plants that will tolerate the problem, whether it is high salts, high sodium, or whatever. Salt-tolerant plants suitable for Wyoming include asparagus,

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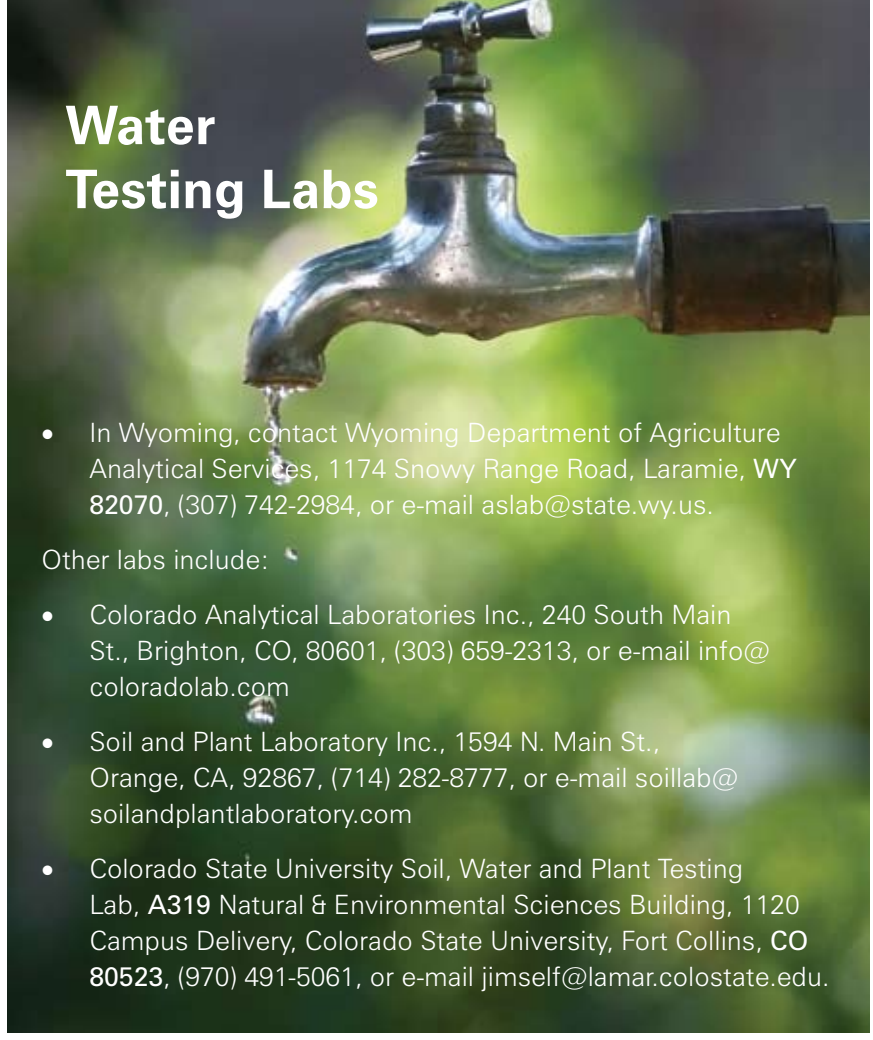
caragana, junipers, beets, and squash. Salt sensitive plants include lindens, carrots, onions, apples, chokecherries, and raspberries.

Secondly, if the problem is salts and not sodium, leach the soil. This means periodically applying more water than needed to dissolve salts in the root zone and carry them away from the plants.

Third, is it possible to switch water sources? For example, collect and use rainwater when possible.

Fourth, there are methods to clean poor water quality (deionization, distillation, reverse osmosis), but these require special equipment. Softened water is never recommended for horticultural plants indoors or out. It is very high in either sodium or potassium.

For assistance in understanding and interpreting water test results, contact a local University of Wyoming Cooperative Extension Service office.



Water Testing Labs

- In Wyoming, contact Wyoming Department of Agriculture Analytical Services, 1174 Snowy Range Road, Laramie, **WY 82070**, (307) 742-2984, or e-mail aslab@state.wy.us.

Other labs include:

- Colorado Analytical Laboratories Inc., 240 South Main St., Brighton, CO, 80601, (303) 659-2313, or e-mail info@coloradolab.com
- Soil and Plant Laboratory Inc., 1594 N. Main St., Orange, CA, 92867, (714) 282-8777, or e-mail soillab@soilandplantlaboratory.com
- Colorado State University Soil, Water and Plant Testing Lab, **A319** Natural & Environmental Sciences Building, 1120 Campus Delivery, Colorado State University, Fort Collins, **CO 80523**, (970) 491-5061, or e-mail jimself@lamar.colostate.edu.