



## Virginia Household Water Quality Program: Total Dissolved Solids (TDS) in Household Water

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Private water sources such as wells and springs are not regulated by the U.S. Environmental Protection Agency (EPA). Although private well construction regulations exist in Virginia, private water supply owners are responsible for providing maintenance for their water systems, monitoring water quality, and taking the appropriate steps to address problems, should they arise.

The EPA public drinking water standards are good guidelines for assessing your water quality. “Primary drinking water standards” apply to contaminants that can adversely affect health and are legally enforceable for public water systems. “Secondary drinking water standards” are nonregulatory guidelines for contaminants that may cause nuisance problems such as bad taste, foul odor, or staining.

Testing your water annually and routinely inspecting and maintaining your water supply system will help keep your water safe. For more information, visit the [Virginia Household Water Quality Program website](http://www.wellwater.bse.vt.edu) (www.wellwater.bse.vt.edu).

### Introduction

Water is often called the universal solvent. As water moves underground or over land, it dissolves a variety of compounds including minerals, salts, and organic compounds. The concentration of “total dissolved solids” (TDS) in a water sample is a measure of the dissolved compounds in the water small enough to pass through a 2-micrometer sieve. For comparison, one human hair is approximately 100 micrometers in diameter. A TDS test measures the amount, but does not identify the individual compounds or their sources.

Natural sources of dissolved solids in groundwater include bedrock and salt deposits; any soluble mineral that comes into contact with the groundwater may be a source. Saltwater intrusion may contribute to the TDS concentration of groundwater in coastal areas. Additional sources of dissolved solids include on-site sewage systems; runoff and wastewater from urban, industrial, or agricultural areas; runoff from roads

treated with de-icing compounds; and wastewater from mineral extraction activities such as coal mining and natural gas drilling.

### Problems Associated With Total Dissolved Solids

Because TDS is a measure of all dissolved compounds in water and is not a specific measure of any one contaminant, the EPA includes TDS in their secondary drinking water standards but does not regulate TDS levels in public drinking water systems. While the EPA recommends that the TDS concentration in drinking water not exceed 500 milligrams per liter (mg/L) to preserve the aesthetic quality and palatability of water, some well water consumers may find TDS levels less than the 500 mg/L EPA recommended level problematic. The specific level at which TDS becomes an aesthetic or palatability issue varies for individuals.

TDS is also used as an indicator of general drinking water quality. Elevated TDS concentrations may indicate the presence of potentially harmful drinking water contaminants that are regulated under the EPA's primary drinking water standards, including nitrates, metals, and agricultural or industrial chemicals.

Public water systems are required to meet these standards, but private well owners are responsible for their own water testing. **Thus, the EPA recommends that well owners test total dissolved solids levels annually.** If a well owner's annual testing program reveals a significant increase in the water's TDS compared to a prior year, the owner may wish to obtain additional testing to ensure the water is free of dangerous contamination.

Different compounds in TDS can result in different household problems. Some possible components of TDS and associated nuisance problems include:

- **Calcium and/or magnesium:** Typically associated with hard water, high calcium or magnesium levels often result in decreased effectiveness of soaps and detergents, soap scum and mineral residue on plumbing fixtures and cookware, and scale buildup in pipes, water-using appliances, and hot water heaters.
- **Sodium and/or chloride:** These constituents can make water taste salty and can corrode or damage pipes and water heaters over time. High sodium levels in drinking water may also be a concern for people on low-sodium diets.
- **Iron and/or manganese:** The presence of iron or manganese can cause a metallic taste or stain plumbing fixtures, and these minerals can accumulate in pipes, water filters, and water heaters, resulting in reduced efficiency and life span.
- **Sulfur compounds:** Sulfate and other sulfur compounds in household water can have a laxative effect on humans and animals not accustomed to it. They can also create a salty or bitter taste, reduce

the efficiency of detergents, and cause corrosion of pipes and water heaters. The presence of some sulfur compounds in water can produce unpleasant odors.

## Testing for Total Dissolved Solids

A qualified laboratory can analyze your water for TDS. The Virginia Household Water Quality Program maintains a [list of certified laboratories](#) on its "Resources" page ([www.wellwater.bse.vt.edu/resources.php](http://www.wellwater.bse.vt.edu/resources.php)).

## Treatment Options

Choosing an appropriate treatment method will depend on the specific compounds present in the dissolved solids in your water. For more information relating to total dissolved solids, see the following websites:

- [Virginia Household Water Quality Program](http://www.wellwater.bse.vt.edu/resources.php) ([www.wellwater.bse.vt.edu/resources.php](http://www.wellwater.bse.vt.edu/resources.php))
- [Virginia Cooperative Extension \(VCE\)](http://pubs.ext.vt.edu/category/home-water-quality.html) (<http://pubs.ext.vt.edu/category/home-water-quality.html>)

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## Resources

Oram, Brian. 2007. *Total Dissolved Solids: Sources of Total Dissolved Solids (Minerals) in Drinking Water*. Wilkes University, Environmental Engineering and Earth Sciences Department, Center for Environmental Quality. [www.water-research.net/totaldissolvedsolids.htm](http://www.water-research.net/totaldissolvedsolids.htm).

The Virginia Household Water Quality Program, offered through Virginia Cooperative Extension (VCE), periodically conducts county-based household water sampling clinics where you can learn about the quality of your water supply, proper water supply system maintenance, and, if needed, possible water treatment options. Please contact your [local Extension office](https://ext.vt.edu/offices.html) (<https://ext.vt.edu/offices.html>) or visit [www.wellwater.bse.vt.edu](http://www.wellwater.bse.vt.edu) for more information.

Sigler, W. Adam and J. Bauder. *Alkalinity, pH, and Total Dissolved Solids*. Montana State University. Retrieved online: [https://waterquality.montana.edu/well-ed/interpreting\\_results/images-files/Alkalinity\\_pH\\_TDS.pdf](https://waterquality.montana.edu/well-ed/interpreting_results/images-files/Alkalinity_pH_TDS.pdf).

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World Health Organization. 2022. *Chemical fact sheets: Total Dissolved Solids*. Retrieved online: <https://www.who.int/publications/m/item/chemical-fact-sheets--total-dissolved-solids>.

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