Interpreting Well Water Quality Results

Common tests for private well owners

Using this fact sheet

This fact sheet is intended to help you interpret the results of commonly recommended analyses for drinking water from private wells in Wisconsin.

Some of these tests are important because they deal with health-related contaminants; the other tests will tell you about important characteristics of your well water, such as how hard or corrosive it is.

Bacteria - Coliform

Coliform bacteria are a microorganism found in surface water and soil. A sanitary well should not contain coliform bacteria. This test is used as an indicator of whether the well can produce sanitary water.

While coliform bacteria do not usually cause disease, their presence indicates a potential pathway for disease-causing organisms to enter your well. If human or animal waste is contaminating the water, gastrointestinal diseases, hepatitis, or other diseases may result.

If coliform bacteria were present, your water was also tested for *E.coli,* a type of fecal coliform found in human or animal waste*.* The presence of *E. coli* in a water sample is conclusive evidence of fecal contamination; representing a more significant health risk than the presence of coliform bacteria on its own.

What should you do if bacteria were detected?

Resampling is important to confirm it is a persistent bacteria problem and not a temporary occurrence or sample error.

If a second test confirms the original test:

1. Check your well for common sanitary defects:

- Well cap is loose or missing (well cap should be a vermin proof cap).
- Casing is cracked, rusted through, or does not extend 12 inches above grade.
- Inadequate grout (seal or fill around well casing).
- Inadequate backflow prevention on yard hydrants or outbuildings served by the well.

2. After correcting any visible defect, disinfect your well using the procedure outlined by the Wisconsin Dept. of Natural Resources or hire a licensed well driller or pump installer.

3. Test your water again after disinfecting the well to ensure well is bacteria free.

Your result is either:

ABSENT
No coliform bacteria are present. Your water supply is bacteriologically safe. No further action is needed. Professionals recommend testing your well annually for bacteria or sooner if you notice a change in taste, color or odor.

Or

PRESENT
Coliform bacteria are present; Consider retesting to confirm it is a persistent problem with the well and not a result of sampling error or a temporary occurrence.

Additional information about bacteria in wells:

Bacteria in groundwater may be the result of geologic conditions which do not allow for adequate filtration of water before reaching a well. An example would be areas where fractured bedrock aquifers are overlain by thin soils. If water suddenly changes color or odor following large rain events this could be the cause.

For wells consistently contaminated with bacteria, disinfection may not solve the problem. In this case, investigating the potential of a new well to produce sanitary water may be the best option.

Water testing and units of measure:

Many minerals and contaminants in water are often reported as a concentration. When comparing test results to water quality standards it is important to check that you are comparing values with the same unit of measure. Some labs report nitrate concentrations as parts per million (ppm) while some use the term milligram per liter (mg/L).

1 mg/L = 1 ppm

Hardness - Total

The hardness test measures the amount of calcium and magnesium in water. Calcium and magnesium are essential nutrients, but the amount present in drinking water is generally not a significant source of these nutrients.

While there are no health concerns associated with drinking hard water, it can cause lime buildup (scaling) in pipes and water heaters. It also can react with soap decreasing its cleaning ability, can cause a buildup of soap scum, and/or graying of white laundry over time. Some people that use hard water for showering may notice problems with dry skin.

Note: the water softening industry measures hardness in grains per gallon.
1 grain per gallon = 17.1 mg/L $CaCO_3$.

Acceptable Results:
Total hardness values near 150 mg/L are ideal. Water with a value less than 150 mg/L is considered soft, values greater than 200 mg/L are considered hard. Water naturally low in total hardness referred to as soft water may be corrosive. *A total hardness less than 20 mg/L more than likely indicates that your water has been treated using a water softener.*

Sources:
Primarily dissolved carbonate minerals from soil and rock materials. When carbonate minerals dissolve, they increase the amount of calcium and magnesium ions in water.

Alkalinity

Alkalinity is a measure of water's ability to neutralize acids. There are no health concerns related to alkalinity. Alkalinity and total hardness form from the same minerals and are generally close in value when they are both reported as mg/L $CaCO_3$.

Acceptable results:
The value should be roughly 75% to 100% of the total hardness value in an unsoftened sample. Water with low levels of alkalinity (less than 150 mg/L) is more likely to be corrosive. High alkalinity water (greater than 150 mg/L) may contribute to scaling. If total hardness is half or less the alkalinity result, it may indicate that your water has passed through a water softener. If alkalinity is significantly less than total hardness it may signify elevated levels of chloride, nitrate or sulfate.

Conductivity

Conductivity measures the amount of dissolved substances (or ions) in water; but does not give an indication of which minerals are present. Changes in conductivity over time may indicate changes in your overall water quality.

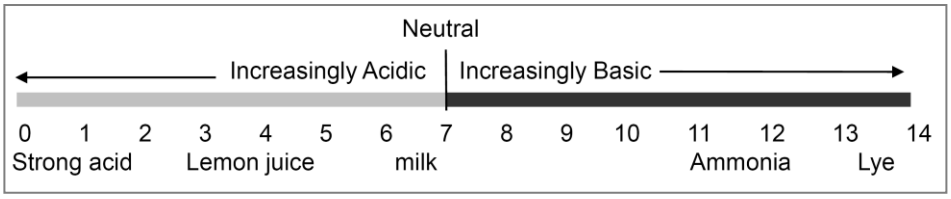
Acceptable results:
There is no health standard associated with conductivity. A normal conductivity value measured in umhos/cm is roughly twice the total hardness as mg/L $CaCO_3$ in unsoftened water samples. If conductivity is significantly greater than twice the hardness, it may indicate the presence of other human-influenced or naturally occurring ions such as chloride, nitrate, or sulfate.

pH

The pH test measures the concentration of hydrogen ions in a solution. The concentration of hydrogen determines if a solution is acidic or basic. The lower the pH, the more corrosive water will be.

Acceptable results:
There is no drinking water standard for pH but corrosive water is more likely to contain elevated levels of copper or lead if these materials are in your household plumbing. Typical groundwater pH values in Wisconsin range from 6.5 to 8.5.

Sources: Low values are most often caused by lack of carbonate minerals in the aquifer.

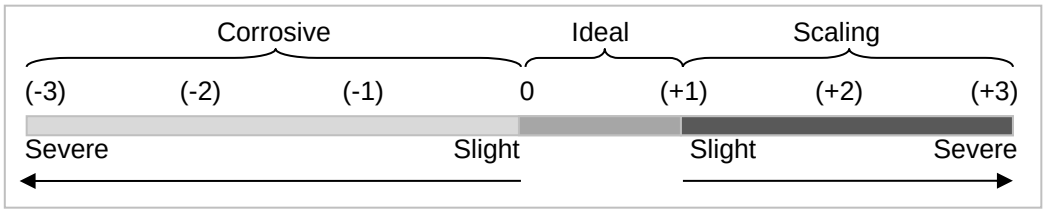


Saturation Index

The saturation index is a measure of water's ability to corrode or form scale. It is calculated using values from pH, alkalinity, total hardness and conductivity tests. A negative value indicates water is likely corrosive, while a positive value indicates a tendency for water to form scale (calcium carbonate),

Corrosive water will corrode unprotected metal plumbing. Corrosion of metal plumbing can have health implications if it causes elements like lead, copper, and zinc from pipes and solder to dissolve into drinking water. Symptoms of corrosive water may include pinhole leaks in pipes or green stains in sinks.

Some scale formation can act as a natural protection against corrosion but too much will plug pipes and water heaters decreasing their efficiency. Water softeners are an effective form of treatment to prevent scale build-up.



Acceptable results:
This is a test for overall water quality, there is no health standard associated with the saturation index. Values between 0 and 1 are considered desirable.

If your water is softened:
Please note that because total hardness is used to calculate the saturation index and softening removes hardness from the water, the saturation index is not accurate for softened or partially softened water.

Corrective Action for Hard or Corrosive Water

If you are experiencing problems with hard water:

- Consider softening water using a water softener. Softened water removes calcium and magnesium and replaces it with another cation (usually sodium). Many people choose not to soften the cold-water tap used for drinking and cooking.

If you are experiencing problems with corrosion of household plumbing:

- Install a water treatment device (neutralizer) designed to make water less corrosive.
- Install plastic plumbing that will not develop pinhole leaks or leach metals.
- Water allowed to contact unprotected metal plumbing for extended periods can dissolve unsafe levels of copper and/or lead. If levels of copper or lead in drinking water are a concern, run water for a few minutes before using for drinking or cooking.

Did you know your well water is groundwater?
Groundwater is water occupying void spaces between soil particles or cracks in rock below the land surface. It originates as precipitation which infiltrates into the ground. The type of soil and bedrock groundwater flows through determines your well water's pH, saturation index, or the amount of hardness or alkalinity. The type of soil and bedrock in a region also determines how quickly contaminants can reach groundwater. Human activities are often responsible for elevated levels of contaminants such as nitrate and chloride.

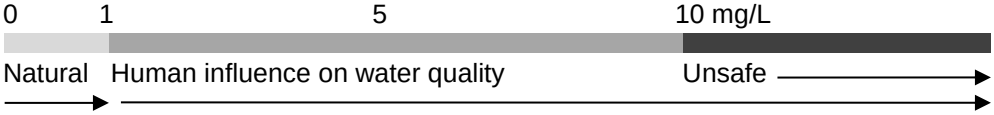
Nitrogen-Nitrate

Nitrate is a chemical commonly found in agricultural and lawn fertilizer. It is also formed when waste materials such as manure or septic effluent decompose.

Interpreting results:
The drinking water standard for nitrate-nitrogen is 10 mg/L. Water with greater than 10 mg/L of nitrate-nitrogen should **not** be consumed by infants less than 6 months of age, pregnant women, and women who are trying to become pregnant. This includes baby formula made with this water. This guidance is based on concerns related to methemoglobinemia also called blue-baby disease, a condition in infants which inhibits the bloods ability to carry oxygen. If not caught early and treated, this condition can be fatal. Some studies suggest that high nitrate water may be linked to birth defects and miscarriages.

The WI Dept. of Public Health recommends people of all ages avoid long-term consumption of water with nitrate concentrations greater than 10 mg/L.

Sources:
Fertilizers, septic systems, animal wastes, land spreading of bio-solids. The natural level of nitrate in Wisconsin's groundwater is less than 1 mg/L. Elevated nitrate levels can be an indicator of other potential contaminants. If nitrate levels are elevated, you may want to consider testing for pesticides if you know that they are used nearby.



Corrective Action for Nitrate
If possible, eliminate the contamination source. Unfortunately, it may take years to observe any reduction in nitrate levels and short-term solutions are usually necessary:

- Extending the casing depth, lowering the depth of the existing well, or drilling a new well *may* result in water with lower nitrate concentrations.
- Use bottled water for drinking and cooking.
- Use a water treatment device that is effective at reducing nitrate such as: Reverse osmosis (RO), distillation and anion exchange. When purchasing a water treatment device, only purchase those with approval from the Wisconsin Department of Safety and Professional Services. Dealers should be able to provide a copy of the product approval letter.

Chloride

In most areas of Wisconsin, chloride concentrations are naturally low (usually less than 15 mg/L). Higher concentrations may indicate contamination from fertilizer, septic systems, road salt, animal waste or other wastes. Chloride is not toxic, but some people can detect a salty taste when high levels are present.

Acceptable results:
Chloride has no health standard. Levels less than 10 mg/L are desirable. Levels more than 250 mg/L may cause a salty taste or corrosion of some metals. Water with high chloride may also have elevated sodium content.

Sources:
Septic systems, road salt, fertilizer, animal waste, landfills, or naturally occurring mineral deposits.

Additional Information, search online for:

"UWSP Wisconsin Well Water Quality Viewer" – Interactive mapping tool that allows you to search for water quality information in your area

"Wisconsin Department of Natural Resources – What's Wrong with My Water?"

Diagnose water quality concerns by taste, color, or odor problems that you are experiencing.

"Wisconsin DNR Groundwater Data" – You may be able to ***locate a copy of your well construction report*** at no cost by using some of the available online search tools

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