

Full Domestic Analysis Fact Sheet

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The table below lists the parameters covered in the Full Domestic Analysis which are important for both health and aesthetic reasons. **Bold parameters pose a potential health risk and underlined parameters have individual fact sheets included separately.**

The Environmental Protection Agency (EPA) sets primary drinking water standards for health reasons and secondary standards for aesthetic reasons. These standards only apply to public water supplies but are useful guides for private well owners.

<u>Alkalinity</u> -	the ability of water to compensate for changes in pH. Higher alkalinity means water is less likely to experience big changes in acidity. <i>(See the Alkalinity, pH, and Total Dissolved Solids Fact Sheet for more information)</i>
Aluminum -	a naturally occurring metal generally found in concentrations from 0.014 to 0.290 mg/L in ground water. The EPA secondary standard for aluminum is 0.050 to 0.2 mg/L because high concentrations can cause coloring of water.
Calcium -	a naturally occurring metal essential in the human diet and common in ground water with concentrations ranging from zero up to several hundred mg/L. Calcium concentration alone is not of concern but along with magnesium, calcium is a major contributor to the hardness of water which can cause scaling problems in pipes and hot water heaters. <i>(See the Hardness Fact Sheet for more information)</i>
Chloride -	a common natural salt in ground water. The EPA secondary standard for chloride is 250 mg/L; higher concentrations can cause a salty taste.
<u>Coliform</u> , - <u>Total</u>	a type of bacteria which should not be present in ground water; indicates potential contamination. <i>(See the Coliform and E. coli Bacteria Fact Sheet for more information)</i>
<u>Coliform</u> , - <u>E-Coli</u>	a type of bacteria found in feces of warm blooded animals which indicates fecal pollution. If E. coli is positive in a sample, the water is unsafe to drink without treatment. (See the Coliform and E. coli Bacteria Fact Sheet for more information)
Conductivity -	a measure of how easily electric current will pass through a water sample. This measurement is related to and often used to estimate total dissolved solids. It is also used to estimate the tendency of water to corrode metal.
Fluoride -	a naturally occurring nonmetal which promotes dental health at concentrations between 0.7 and 1.5 mg/L, but can cause cosmetic and health problems at high concentrations. The EPA primary standard for fluoride is 4 mg/L because high concentrations can cause bone disease. However, a recent National Research Council report suggests that the 4 mg/L standard may not be low enough to protect against bone problems and severe dental fluorosis in children. The EPA has also set a secondary standard at 2 mg/L due to risk of dental fluorosis above this concentration. Dental fluorosis is a brownish staining of the teeth associated with formation of tooth enamel. For concentrations below 0.7, talk to your dentist about supplemental fluoride for children. For concentrations above 1.5 mg/L talk to your dentist about possible need for alternative water sources or treating water for children.
<u>Hardness</u> -	primarily caused by compounds of calcium and magnesium in water and can result in scaling in pipes/water heaters; it also decreases the lather and effectiveness of soaps and detergents. <i>(See the Hardness Fact Sheet for more information)</i>
Magnesium -	a naturally occurring metal important in human diet and common in ground water. Magnesium concentration alone is not of concern but along with calcium, magnesium is a major contributor to the hardness of water which can cause scaling problems in pipes and hot water heaters. <i>(See the Hardness Fact Sheet for more information)</i>
Manganese -	a naturally occurring metal important in the human diet. The EPA secondary standard for manganese is 0.05 mg/L; high concentrations can cause black to brown color, black staining, and a bitter taste.
<u>Nitrate</u> -	can occur naturally, from septic tanks/wastewater treatment, or from agricultural practices and causes oxygen deficiency in infants under 6 months of age; nitrates move easily in ground water so increasing nitrate levels can be an early warning that other contaminants are moving toward a well. (See the Nitrate plus Nitrite as N Fact Sheet for more information)
<u>pH</u> -	the measure of acidity of water. pH is related to the ability of water to corrode pipes and release metals into water. <i>(See the Alkalinity, pH, and Total Dissolved Solids Fact Sheet for more information)</i>
Potassium -	a common salt in ground water, essential in the human diet. Concentrations can be expected to range from 0.5 to 8 mg/L.
Sodium -	a common salt in ground water which can impart a salty taste at concentrations over 250 mg/L. Sodium can contribute to hypertension and high levels in drinking water should be noted by people on low sodium diets.
SAR-	(Sodium Adsorption Ratio) is the amount of sodium relative to calcium and magnesium in the water; high SAR can damage soil and reduce crop productivity.
Sulfate -	a common salt in ground water which can impart a salty taste. High quantities can cause gastrointestinal distress in people unaccustomed to the water.
<u>TDS</u> -	(Total dissolved Solids) is the sum of all minerals, metals, and salts dissolved in water. High quantities can cause gastrointestinal distress in people unaccustomed to the water. <i>(See the Alkalinity, pH, and Total Dissolved Solids Fact Sheet for more information)</i>
Zinc -	a naturally occurring metal essential to the human diet. The EPA secondary standard for zinc is 5 mg/L; high concentrations can cause a metallic taste.

Suitability of Water for Livestock

The following parameters are commonly tested for determining suitability of water for livestock. In general, livestock are sensitive to all the same contaminants that humans are but their tolerances are often much higher. For a more complete list of parameters that may effect livestock health or productivity, see the **WELL EDUCATED Suitability for Livestock Fact Sheet**.

Alkalinity in mg/L of

>1,000 Values over 1,000 mg/L are considered unsatisfactory for Livestock.

Total Dissolved Solids mg/L

<1,000 Suitable for all classes of livestock
 1,000 - 2,999 Suitable for all classes of livestock; Poultry may experience mild diarrhea
 3,000 - 4,999 Suitable for livestock use except for poultry which may experience decreased performance and mortality.
 5,000 - 6,999 Can be used with reasonable safety for adult ruminants. Avoid use for pregnant or lactating cattle or baby calves. Not acceptable for poultry.
 >7,000 Not suitable for livestock use.

Nitrate - NO₃ (mg/L as N)

0 - 44 No harmful effects.
45 - 132 Safe if diet is low in nitrates and nutritionally balanced.
133 - 220 Could be harmful if consumed over long periods of time.
221 - 660 Cattle at risk; possible death losses.
661 - 800 Unsafe; high probability of death losses.
>800 Unsafe; do not use.

Sulfate (mg/L)

<1,500 Safe except possible mild diarrhea near upper limit.
 1,500 - 2,500 No harmful effects except some temporary diarrhea.
 2,500 - 3,500 Poor water for poultry; Very laxative in livestock, but symptoms usually disappear after a few weeks.
 3,500 - 4,500 Very laxative; not recommended for pregnant or lactating cows, cattle in confinement, horses, or sheep; Unacceptable for poultry.
 >4,500 Not recommended for use under any conditions.

Adapted from Montana State University; Beef Briefs; 10/23/2004; John Paterson and South Dakota State University Extension; Interpretation of Water Analysis for Livestock Suitability; March 2004; Nancy Thiech

Water Quality for Irrigation

Salinity and sodium adsorption ratio (SAR) are two of the primary aspects of water chemistry which determine suitability for irrigation. Salinity is a measure of the total salt in the water, determined by conductivity or total dissolved solids. The SAR is a ratio calculated using sodium, magnesium, and calcium concentrations in water. Irrigating with high salinity water can lead to soil salinity which will reduce the ability of plants to absorb water, causing crop stress. High SAR values can lead to damage of soil structure by reducing infiltration and aeration of soil. Effects of SAR on soil depend on salinity of the water and texture of the soil. The salinity table on the right gives some general risk guidelines based on crop sensitivity and the conductivity of the irrigation water. The SAR table at right gives some general risk guidelines based on SAR and conductivity of irrigation water. These relationships are complex and it is recommended to consult a professional for SAR values greater than 5. For more information see the **WELL EDUCATED Water Quality for Irrigation Fact Sheet**.

Salinity of Irrigation Water and Risk to Different Crops

Salinity (estimated by conductivity) (umhos/cm)	Sensitive Crops	Moderately Sensitive Crops	Moderately Tolerant Crops	Tolerant Crops
Less than 700	Low Risk	Low Risk	Low Risk	Low Risk
700 - 3,000	High Risk	Slight to Moderate Risk	Low Risk	Low Risk
3,000 - 6,000	Severe Risk	Severe Risk	Slight to Moderate Risk	Low Risk
Greater than 6,000	Severe Risk	Severe Risk	Severe Risk	Slight to Moderate Risk

SAR and Irrigation

If SAR = ↓	and Electrical Conductivity (umhos/cm) = ↓		
0 - 3	Greater than 700	200 - 700	Less than 200
3 - 6	Greater than 1,200	300 - 1,200	Less than 300
6 - 12	Greater than 1,900	500 - 1,900	Less than 500
12 - 20	Greater than 2,900	1,300 - 2,900	Less than 1,300
20 - 40	Greater than 5,000	2,900 - 5,000	Less than 2,900
Risk to Soil	Low Soil Impact Risk	Slight to Moderate Soil Impact Risk	Severe Soil Impact Risk

Adapted from Agricultural Salinity and Drainage; Blaine Hanson, Stephen Grattan, Allan Fulton; University of California, Davis; 1999

Additional Resources:

See additional fact sheets on underlined parameters

Handbook of Drinking Water Quality; John DeZuane; 1997

Suitability of water for Livestock Fact Sheet; MSU Extension Water Quality

<http://waterquality.montana.edu/docs/homeowners.shtml> (listed under "Drinking Water")

Classification of Water for Irrigation Fact Sheet; MSU Extension Water Quality

<http://waterquality.montana.edu/docs/homeowners.shtml> (listed under "Drinking Water")

Water Systems Council Fact Sheets

<http://www.watersystemscouncil.org/wellcare/infosheets.cfm>

Household Drinking Water Protection and Treatment; MSU Extension Service

<http://waterquality.montana.edu/docs/homeowners.shtml> (listed under "Drinking Water")