ARKANSAS WATER RESOURCES CENTER

How to Collect Your Water Sample & Interpret the Results for the Domestic Analytical

Bradley J. Austin, Mike Daniels, and Brian E. Haggard
Arkansas Water Resources Center
University of Arkansas System Division of Agriculture

How to Collect Your Water Sample and Interpret the Results for the Domestic Analytical Packages

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Whether you rely on a municipal water source or a private well for your drinking water needs, having access to clean drinking water is important to everyone. The Arkansas Water Resources Center (AWRC) in cooperation with the UA Cooperative Extension Service, both of which are part of the U of A System's Division of Agriculture, offers several analytical packages to assess the quality of your water resources. This document is intended to provide guidance on collecting water samples for analysis and understanding the Domestic Water Report Form provided by the AWRC's Water Quality Laboratory (Lab). The AWRC Water Quality Lab is a state certified lab through the Arkansas Department of Environmental Quality; however, the certification does not cover drinking water. Therefore, the information contained within this fact sheet and your Domestic Water Report Form should be used as general guidance, and the reader is encouraged to seek advice from state Extension water quality specialist regarding the interpretation of individual reports and water testing results that may be of concern.

Why Should You Have Your Drinking Water Tested?

If you rely on a municipal water source, that is water treated by a water treatment plant, for your drinking and household water needs, chances are you do not need to have your water tested. The quality of the water leaving the water treatment plant is tested to ensure that it meets the standards set by the U.S. Environmental Protection Agency (EPA) in the Safe Drinking Water Act, before being distributed to the public. Your municipal water supply often will mail an annual water report that provides the results of water testing to its customers, often with one of their bills. However, out dated plumbing in older homes (pre 1987) may contaminate your water coming from the city. Additionally, changes in the taste, odor, and appearance of your water may be an indication of a problem that should be checked out by having your water tested (Zhang, PSS-2912).

It is important to have your private well water tested regularly.

Unlike municipal water sources, if you rely on a private well for your drinking water, then it is your own responsibility to monitor the water quality of the well. For the most part well water can be a clean, reliable source of water, but there are some common issues that may

require pre-treatment to help protect your plumbing. Ground water dissolves the surrounding rock resulting in higher levels of minerals such as calcium, magnesium, iron, and manganese than what is normally found in surface waters. While these minerals do not pose health risks, they do contribute to the hardness of your water and can form a scale inside of your pipes, eventually clogging them. Other common contaminants such as nitrate, fluoride, and arsenic may pose health risks if they occur above safe drinking water standards. Even if you have had your well water tested previously, your private well may become contaminated through improper disposal of chemicals and waste near private wells and through poor construction and or maintenance of nearby septic systems. For these reasons it is important to have your well water tested regularly.

Collection Of Water For Analysis

The AWRC Water Quality Lab requires 0.5 liters (roughly half a quart) to measure all of the parameters included in the domestic analytical package. You should properly label a clean sampling bottle with your site information; clean bottles can be obtained from the AWRC water quality lab or your local county Extension office, if needed. Here are some tips for collecting your water sample:

- Do not take the sample from a swing-type faucet if others are available. Inspect the faucet for leaks. Select another faucet if there is leaking.

- Remove faucet aerator.

- Disinfect the faucet with bleach or a flame.

- Run the water several minutes (up to 10 minutes) to clear the line if you are interested in the actual quality of the main source of water (groundwater, stream, river, or water from the main distribution lines of a public water system).

- Take the sample within 3 or 4 seconds after you turn the water on if your concern is the condition of your water pipes or storage tanks. (Some tests, such as maximum contamination for lead, require that water stand in the pipes overnight before being sampled. Follow the instructions provided by the lab.)

- Take the sample midstream. Do not breathe into or touch the inside of the collection bottle or the inside of the cap.

- If needed, store the sample in the refrigerator before taking it to the lab.

- Transport the sample in a cooler or ship in an insulated container.

- Submit the sample as soon as possible. Labs should receive samples within 48 hours at the latest. Samples may be submitted to your County extension office, but you will be responsible for the cost of shipping to the AWRC Water Quality Lab.

- Samples being submitted to the AWRC Water Quality Lab should include a completed AGRI-422 form.

Two separate water samples may be required to address water related problems due to plumbing and/or fixtures. One sample should be collected at the point of entry (well or water service) and another at point of use (faucet, pool and etc.). This sampling

method will help pinpoint problematic plumbing. When submitting multiple samples, make sure to properly label each sample bottle so that they can be distinguished from one another.

Because the concentrations of the variables in this analysis package may change over time in unpreserved water samples, it is important for the samples to arrive at the lab as soon as possible. You can reduce delays during shipping by avoiding submitting samples at times when they will reach the laboratory on a holiday or weekend. Many of the parameters are stable for 14 days to 6 months once they have been filtered and preserved by the Water Quality Lab, a list of holding times is provided in Table 1. The AWRC water quality lab generally completes the analysis of your water sample within two weeks, returning results to clients within three to four weeks.

For the most accurate results, water samples should be submitted to the AWRC Water Quality Lab as soon as possible.

Interpreting Results

Specific drinking water standards are determined by the U.S. EPA and are separated into two main groups, primary drinking water standards and secondary drinking water standards. Primary standards are set for contaminants that when consumed can harm human health. These standards set a limit on the amount of each contaminant that can be present in the drinking water supplied by a public water system; this limit is called the maximum contaminant level (MCL). The secondary drinking water standards pertain to contaminants that do not harm human health. Secondary standards were developed to regulate contaminants that may cause undesirable taste, odor, color, corrosion or staining (Dozier and McFarland, 2006). Table 1 provides a list of acceptable concentrations for each of the parameters analyzed in the domestic water analytical packages. It separates the standards into primary and secondary drinking water standards. Some of the parameters analyzed in the domestic analytical package have both primary and secondary standards but the majority of parameters listed only have one or the other.

Below are some general guidelines for determining if the parameters tested in your water sample are acceptable for drinking water.

Table 1: Water quality guidelines for your drinking water and sample holding times. Values with a (1°) next to them are EPA primary drinking water standards while values with a (2°) next to them are secondary drinking water standards and values without either are general guidelines.

Parameter	Maximum Acceptable Level	Preservation	Holding (days)
pH	6.5 - 8.5 [2°]	None	2
Electrical Conductivity (µS/cm)	775	None	28
Total Dissolved Solids (mg/L)	500 [2°]	None	7
Alkalinity (mg/L as CaCO3)	50-100	None	14
Hardness (mg/L as CaCO3)	< 120	Acidify	180
Fluoride (mg/L)	4.0 [1°]; 2.0 [2°]	None	28
Chloride (mg/L)	250 [2°]	None	28
Sulfate (mg/L)	250 [2°]	None	28
Nitrate-nitrogen (mg/L)	10 [1°]	None	2
Calcium (mg/L)	---	Acidify	180
Magnesium (mg/L)	---	Acidify	180
Sodium (mg/L)	20 [2°]	Acidify	180
Iron (mg/L)	0.3 [2°]	Acidify	180
Manganese (mg/L)	0.05 [2°]	Acidify	180
Copper (mg/L)	1.3 [1°]; 1.0 [2°]	Acidify	180
Aggressive Index	>12	None	2

1 **pH:** The pH of a water sample indicates how acidic (values below 7) or alkaline (values above 7) your water is. The acceptable range for pH is between 6.5 and 8.5 (Table 1). Metal components of water distribution systems through cities and within your home may be corroded if the pH is below 5.5 or above 8.5, resulting in increased dissolved metals in your water. Samples should be analyzed for pH within 48 hours of collection for the most accurate results.

2 **Electrical conductivity (EC):** Electrical conductivity is a measure of how well your water sample conducts electricity, and is related to the salt content or the amount of dissolved ions in the water sample. The maximum acceptable level of conductivity for your drinking water is 775 microsiemens per centimeter (µS/cm; Table 1); however, there are no specific EPA drinking water standards for electrical conductivity. This variable is naturally stable in most water samples, and collected samples should be analyzed within 28 days.

3 **Total Dissolved Solids (TDS):** This is a general term defining the sum of all inorganic matter dissolved in water. The secondary maximum contaminant level for TDS is 500 mg/L. Electrical conductivity and TDS are often related to one another in water. TDS should be analyzed in water samples within 7 days after collection.

4 **Alkalinity:** Alkalinity is a measure of how well water buffers or prevents large rapid changes in pH. While there are no specific standards set by the EPA for alkalinity, the desirable range for sufficient buffering capacity is from 50 – 100 mg/L measured as calcium carbonate (mg/L as CaCO3; Table 1). Total alkalinity of your water sample should be measured within 14 days of collection.

5 **Hardness:** Hardness refers to the amount of calcium and magnesium dissolved in the water sample, with iron and manganese also contributing, but to a lesser extent. No EPA standards for hardness exist though values less than 120 mg/L CaCO3 are considered acceptable (Table 1). Overly hard water (>120 mg/L as CaCO3) is just as safe to drink as water less than 120 mg/L CaCO3; however, water above this threshold is undesirable for the purposes of cooking and cleaning as well as will cause a buildup of lime scale in hot water heaters and other plumbing (Zhang, L-296). Once your sample is processed and preserved in the Lab, it is stable for 6 months.

6 **Fluoride (F):** Fluoride is a trace element found in waters at concentrations ranging from 0.1 to 1.5 mg/L. Fluoride is a common supplement in municipal water sources added to drinking waters with concentration around 1 mg/L promoting dental health. However, concentrations above 2.0 mg/L can cause discoloration of teeth, and even higher concentrations (>4 mg/L; Table 1) may cause skeletal damage and bone disease. Fluoride should be analyzed in your water sample within 28 days of collection.

7 **Chloride (Cl):** Chloride should not be confused with chlorine (Cl2) which is a highly reactive compound and commonly used as a disinfectant in the water treatment process. Chloride is part of common salt (sodium chloride) and when in association with sodium may give water a salty taste in concentrations above 250 mg/L (Table 1). Chloride should be analyzed in your water sample within 28 days of collection.

8 **Sulfate (SO4):** Sulfate is a naturally occurring in most waterbodies both surface and groundwater. Drinking water containing concentrations below 250 mg/L are considered safe to drink. However, water containing sulfate in concentrations above 250 mg/L may have a bitter taste and have a laxative effect (Table 1). Sulfate should be analyzed in your water sample within 28 days of collection.

9 **Nitrate-Nitrogen (NO3-N):** Nitrate-nitrogen is the concentration of nitrogen in the sample in the form of NO3. The maximum allowable concentration for NO3-N in your drinking water is 10 mg/L (Table 1). Higher concentrations are often associated with nitrite which may cause methemoglobinemia (blue baby syndrome) in infants, so it should not be consumed by women who are pregnant or given to babies. Nitrate should be analyzed within 48 hours of your water sample being collected.

10 **Calcium (Ca) and Magnesium (Mg):** Calcium and magnesium are naturally occurring in most water sources and they come from dissolved rock such as limestone and gypsum. High concentrations of calcium and magnesium relate to hard water which can result in scale formation within your plumbing, thereby decreasing function. There are no set standards for calcium and magnesium, but see the section on hardness. Once your water sample is processed and preserved in the laboratory it is stable for 6 months.

11 **Sodium (Na):** Usually found in association with chloride, sodium occurs in water from the dissolving of rock and salts. Individuals on a low sodium diet should not consume water containing

sodium concentrations greater than 20 mg/L (Table 1). Even higher levels may contribute to the corrosion of copper pipes and other metal fixtures. Once your sample is processed and preserved in the laboratory it is stable   for 6 months.

12 **Iron (Fe):** The water sample is analyzed for concentrations of total dissolved iron and will not distinguish between unoxidized (ferrous) and oxidized (ferric) forms. Iron concentrations less than 0.3 mg/L, upon exposure to air water containing concentrations greater than 0.3 mg/L of iron may form rust that can stain laundry; even higher concentrations can cause unpleasant taste (Table 1). Once the water sample is processed and preserved by the laboratory, the holding time for analysis is 6 months.

13 **Manganese (Mn):** Manganese will generally occur in lower concentrations than iron. Manganese concentrations less than 0.05 mg/L are considered acceptable (Table 1). Higher concentrations may give water a grayish-black appearance and can stain plumbing fixtures and laundry and give water an unpleasant taste. Once the water sample is processed and preserved by the laboratory, the holding time for analysis is 6 months.

14 **Copper (Cu):** Copper generally enters your water due to corrosion of household   plumbing systems. Short term exposure of copper in concentrations above 1.3 mg/L may cause gastrointestinal distress, while longer exposure may cause liver and or kidney damage. Copper concentrations greater than 1.0 mg/L may give water an unpleasant taste. Once the water sample is processed and preserved by the laboratory, the holding time for analysis is 6 months.

15 **Aggressive Index (AI):** This is an indication of how corrosive your water is. It is calculated from the pH, hardness and alkalinity from your water sample and is a unit less parameter. This parameter is ranked opposite of what one might think. Water with a high AI value (values greater than 12) is not corrosive; while drinking water with a lower AI values (< 10; Table 1) are corrosive and may dissolve metal components

Summary

The list of parameters included in the domestic water report is by no means exhaustive. There are many parameters that the AWRC Water Quality Lab lacks the capacity to measure, such as disinfectants, disinfection byproducts, and radionuclides. Additionally, there are several parameters that the AWRC Water Quality Lab can test for but not at the level of precision and accuracy to detect metals such as arsenic, cadmium, and lead at the concentrations that cause problems when consumed. A full list of the national primary drinking water regulations can be found in (EPA 816-F-09-004). Testing your private well regularly can help ensure that you are providing the best quality drinking water possible and allow you to detect problems early so that you can work towards correcting them. This fact sheet is intended to provide information on acceptable concentrations of various elements and compounds for the domestic analytical package. If the water is being used for additional purposes, such as livestock or poultry production, it is important to take into consideration the recommended concentrations for these other intended purposes when managing your water resources. If you have specific questions regarding how your water quality presented in your domestic analytical report, contact Dr. Mike Daniels with the University Of Arkansas Cooperative Extension Service (mdaniels@uada.edu).

Literature Cited

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ARKANSAS WATER RESOURCES CENTER

U of A DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

UNIVERSITY OF ARKANSAS

Arkansas Water Resources Center
479.502.9843
awrc@uark.edu
1371 W. Altheimer Drive
DTAS 133
Fayetteville, AR 72704