COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY • COLLEGE OF AGRICULTURE

TESTING PRIVATE WATER SOURCES

Prepared by the Water Quality Committee and ENRI Task Force Drinking Water Focus Group

Many Kentuckians depend on wells, springs, and cisterns as their main source of household drinking water. Unlike water that comes from public utilities, these sources are private. Public and private agencies do not test or treat private water sources on a routine basis, nor do they set treatment standards for them.

Individuals who use public water pay for regular testing and treatment programs as part of the cost of their water, while those using private water sources do not have this benefit. Therefore, it is up to private water users to ensure the safety of their drinking water by testing on a regular basis and treating the water if necessary.

The importance of a regular testing program should not be overlooked. A homeowner may see few outward signs of drinking water contamination until health problems develop since many contaminants have no odor or taste. Furthermore, many lending institutions require homeowners to demonstrate that their private water systems are free from problems before granting loans. The cost in time and money of a regular testing program is small compared to the peace of mind that it can bring.

Testing Recommendations

At least once a year	= minimum
Every six months	= suggested
Every six months	= strongly encouraged if problems are suspected and/or previously documented.

When to Test

It is important to test private water sources on a regular basis and to keep records. A regular testing system allows the homeowner to monitor changes in quality over time.

Water is supplied from two sources: groundwater and surface water. Because ground water can, and usually does, move underground, activities or occurrences miles away can affect a well or spring. Surface activities, such as building construction, agriculture, manufacturing, mining, and septic systems, are likely to affect surface waters very quickly. However, they can also affect groundwater sources over time. Only a routine water test has any chance of picking up some of these important changes in quality.

Although there is not a single "best time of the year" to test your water, late spring, such as May or June, is recommended because it coincides with many activities that could influence water quality, such as spring rains, agriculture, construction, and surface run-off. A spring test could be made part of a general "spring cleaning" routine. If agricultural conditions are a concern, a second recommended time is during October or November.

Recordkeeping is also important for homeowners. A monitoring program is not effective unless homeowners have written records to consult. Furthermore, any legal action on the part of a homeowner will require documented evidence of water quality changes. For example, if a homeowner believes the contractor of a new housing

development has adversely affected the groundwater, he or she must have records of "before" and "after" water tests to support the case. Tests for court cases carry more credence if they are collected by unbiased third parties, such as a certified laboratory or the local health department. A table is included at the back of this publication for your records.

In general, a homeowner should test a private water source using the following criteria:

- Have a basic water test performed at least once a year.
- Have specific tests done for problems such as odor, taste, or staining that have been observed.
- Do specific tests for problems if contamination is suspected from surface activities, such as leaking fuel tanks or intensive agriculture.
- Test before selection and installation of any water treatment devices.

Understanding Drinking Water Standards

The Environmental Protection Agency (EPA) of the United States government is authorized to set two types of drinking water standards. The first, called ***Primary Standards***, are set for contaminants that pose a health risk.

Primary Standards

Primary standards are based on the agency's best knowledge of acceptable daily intakes of a contaminant a person could consume over the course of a lifetime without suffering any adverse health effects. Based on this information, **Maximum Contaminant Levels (MCL)** are set for each contaminant. If the MCL for a contaminant is not yet set, the EPA issues a **Health Advisory Level (HAL)** that is based on best available knowledge.

Secondary Standards

The EPA also sets ***Secondary Standards*** **(SMCL)** for contaminants that do not pose a health threat but can result in problems that interfere with the quality of drinking water, such as staining, odor, and taste. Secondary standards serve as guidelines rather than requirements.

These Primary and Secondary Standards are used by the EPA in testing public water supplies and are also recommended levels for private water sources.

Basic Household Water Test

A basic water quality test for household drinking water should be conducted on at least an annual basis, even if no known problems exist. This very basic test should include the following, but this is by no means a comprehensive list of tests.

BASIC HOUSEHOLD WATER TEST

The following tests should be run:

- Total Coliform Bacteria
- Acidity (pH)
- Total Dissolved Solids
- Hardness
- Nitrate

Total Coliform Bacteria

Using the EPA guideline, look for the presence of any coliform bacteria in the water (1 colony forming unit (cfu) per 100 cc).

A total coliform bacteria test provides a general indication of how safe the water is from microorganisms. Coliform bacteria come from many sources and do not pose a health threat in and of themselves. However, they are generally present in fecal waste of humans and animals and thus serve as a good indicator of the presence of other harmful bacteria and viruses. These disease-causing microorganisms can lead to diarrhea, vomiting, and cramps. Death cannot be ruled out as a possibility for the very young, the very old, or persons with other health complications. This test **must** be received by the lab within 24 hours after the sample is collected. The testing lab will provide sterilized bottles to the homeowner at no additional charge.

pH *Look for a value between 6.5 and 8.5.*

The pH scale measures the acidity of the water. It ranges from 0 to 14, with a value of 7 being neutral. A pH value greater than 8.5 is alkaline, which may cause the water to have an unpleasant taste and can cause scaling on pipes and faucets. A value below 6.5 is acidic and can cause corrosion in pipes. When the pH value falls below 4.5, it generally indicates mineral acids from mining activities. Knowing the pH of your water is important when choosing a water treatment device because some devices require neutral water.

Total Dissolved Solids *Look for a value of less than 500 mg/l.*

The total dissolved solids in your water are another general indicator of water quality. Testing for these measures the presence of organic (such as decayed vegetation) and inorganic (such as mineral and metals) materials dissolved in the water. A test for total dissolved solids only measures the presence of materials in water; it does not indicate which materials are present. However, a regular test of total dissolved solids can show important changes in the water, indicating that some new substance is getting into the water supply. A high total dissolved solids level or a change in the level from previous tests should be investigated further.

Hardness *A level less than 7 grains/gal or 121 mg/l is desirable*.

Water hardness is a measure of the amount of minerals in the water, specifically calcium and magnesium. It is measured either as grains per gallon or milligrams per liter (17.17 mg/l is equal to 1 grain per gallon). Water measuring more than 7 grains/gal or 121 mg/l is considered "hard." Although "hard" water is considered a nuisance or aggravation, it does not pose a health threat. However, it can reduce the effectiveness of cleaning products, cause mineral buildup on sinks and pipes, and interfere with the effectiveness of water treatment devices.

Nitrate *Look for a level of total nitrate + nitrite of less than 10 mg/l.*

Nitrate is a common substance occurring in most soils. Excessive nitrate in water sources can come from many human activities, such as the use of fertilizers for agriculture, home, and garden; animal feed lots; septic systems; and sewage sludge. Excessive nitrate can be harmful to people, particularly babies under six months of age. While nitrogen is often tested as total Nitrate+Nitrite (NO_3+NO_2), it can also be measured as Nitrate (NO_3), Nitrate-Nitrogen (NO_3-N), or Nitrite (NO_2). The EPA sets the following safe levels, or maximum contaminant levels (MCLs), for the various forms of nitrogen.

Name	Symbol	MCL
Nitrate	NO_3	44 mg/l
Nitrate-Nitrogen	NO_3-N	10 mg/l
Nitrite	NO_2	1 mg/l
Nitrate+Nitrite	NO_3+NO_2	10 mg/l

Understanding Test Concentration Levels

Typically, testing laboratories give a report of the concentrations of contaminants as parts per million (or billion), or as amounts per liter. However, different laboratories may use different measures of concentration in their reports. The following table will help you understand how concentrations are expressed.

Most Tests	ppm parts per million mg/l milligram per liter Note: ppm = mg/l ppb parts per billion l microgram per liter Note: ppb = l
Tests for Hardness	grains per gallon mg/l milligrams per liter Note: 17.17 mg/l = 1 grain per gal
Tests for Coliform Bacteria	cfu = colony forming unit per 100 cc tnc = too numerous to count

Testing for Additional Water Problems

Health-Threatening Problems

Other water quality problems that may affect your water source are not discussed in this publication. For example, total coliform is not a perfect indicator of the actual or potential presence of some harmful organisms, especially protozoa such as Giardia and Cryptosporidium. These are most often found in surface water, which may be contaminated

by human or animal waste. There are specific tests for Giardia and Cryptosporidium.

Water quality problems that pose a health threat can typically be traced to some surface or subsurface activities. You may feel that your water is being threatened by certain activities or situations even if you don't see any changes in your water supply. These activities/situations include such things as mining, fuel tank storage, construction, landfill operation, and intensive agriculture. These tests can be expensive, so they are not recommended on a regular basis. Consider them only if you strongly suspect contamination. Table 2 at the end of the publication lists activities that may affect water quality and recommended laboratory tests.

Non-Health-Threatening Problems

Other water problems may only be a nuisance and involve no health risk. Several additional tests may be performed if you suspect other problems.

Problems posing no health threat fall under secondary water standards. Common complaints include staining of fixtures and clothing, unusual taste or odor, discoloration, and deposits or pitting of metals. Selected tests can confirm a problem and assist in selecting a treatment device. Table 1 contains recommended tests for suspected nuisances based on your own observations of your water supply.

Table 1: Testing For Water Problems You Observe

Problem	Symptoms	Test For
Stained fixtures and clothes	red or brown	iron
	reddish-brown slime	iron bacteria
	black	manganese
	green or blue	copper
Off-color	cloudy	turbidity
	black	hydrogen sulfide, manganese
	brown or yellow	iron, tannic acid
Unusual taste and odor	rotten egg smell	hydrogen sulfide
	metallic taste	pH, corrosive index, iron, zinc, copper and/or lead
	salty taste	total dissolved solids, chloride
	septic, musty, or earthy smell	total coliform bacteria
	alkali taste	pH, total dissolved solids
	gasoline or oil	hydrocarbon scan
	soapy	surfactants
Corrosive water	deposits, pitting	corrosion index, pH, copper and/or lead

Water Testing Labs

Proper collection and handling of a water sample are critical to the quality of a water test. The procedures for the different tests vary, and the water testing labs provide containers and instructions for collection. Always follow the instructions of the testing laboratory.

To assure an accurate test, choose a state-certified laboratory to test the samples. For a free list of state-certified labs, call the Kentucky Division of Water, Drinking Water Branch at 502-564-3410, Ext. 580. You may also request information about certified labs through the EPA Safe Drinking Water Hotline at 800-426-4791. Your county Extension office can also provide you with a list of state-certified labs.

Once you receive your list, shop around. The prices for testing vary considerably, and some labs give a package price for the five basic tests (total coliform bacteria, nitrate, acidity, hardness, and total dissolved solids). Package prices may also be available if you choose additional tests for other suspected problems. The labs are not always consumer-oriented, but don't be intimidated. Tell them you are a private individual testing your private water source. Ask for prices on drinking water tests, and read them your list. Be sure to emphasize that the test is for drinking water because these labs also test other types of water. In some areas, the local health department performs the Total Coliform Bacteria test, so it might be wise to check with them as well.

For additional information related to drinking water standards and public water testing, contact your local county Extension office or one of the following resources:

Kentucky Division of Water, Drinking Water Branch: 502-564-3410.

Environmental Protection Agency, Safe Drinking Water Hotline: 800-426-4791.

Table 2: Testing For Suspected Contamination

If you suspect/observe or are concerned about	Request These Tests
Leaking fuel tank	hydrocarbon scan
Coal mining	total dissolved solids, iron, sulfates, acidity, pH, manganese and/or aluminum
Gas and oil drilling	total dissolved solids, chlorides, sodium, barium, lead, pH and/or strontium
Road salt	total dissolved solids, chloride and/or sodium
Landfills	total dissolved solids, pH, total organic carbon scan (TOC) and/or volatile organic carbon scan
Sludge utilization	total coliform bacteria, nitrate and/or metals (lead, cadmium)
Septic systems	total coliform bacteria, nitrate, surfactants and/or ammonia-nitrogen
Intensive agricultural use	total coliform bacteria, nitrate, pesticide scan, pH and/or total dissolved solids
Lead from pipes or faucets	pH, lead and/or corrosion index

RECORD OF HOUSEHOLD WATER TESTING

Date	Total Coliform Bacteria Max.-1 cfu per 100 cc	pH (6.5-8.5)	Total Dissolved Solids max.-500 mg/liter	Hardness max.-121 mg/liter	Nitrate max.-10 mg/liter	Other Name_____ MCL_____	Other Name_____ MCL_____	Other/ Comments

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Water Quality Committee/ENRI Task Force

The initial Water Quality Committee included Tom Ilvento, former Specialist, Rural Sociology; Linda Heaton, Specialist, Textiles and Environmental Issues, Home Economics Extension; and Joe Taraba, Specialist, Water Quality and Waste Management, Biosystems and Agricultural Engineering. Linda Heaton; Kim Henken, Extension Associate, Environmental and Natural Resource Issues; and Jenny Cocanougher, Extension Associate, Environmental and Natural Resource Issues, served on the ENRI Task Force Drinking Water Focus Group.

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