

SAMPLING AND TESTING

Potable (drinking) water must be tested to ensure that the water is safe to drink. The water source originally is tested for many contaminants to ensure that it is safe to drink. Small water systems that are disinfected must be tested for chlorine residual. All USDA Forest Service potable water systems must be tested for bacteria a minimum of once a month. All public water systems must be tested annually for nitrate and nitrite. Additional tests may be required for larger systems. Figure 80 shows water being tested for chlorine residual. Figure 81 shows a typical chlorine test kit.



Figure 80—Chlorine residual test.

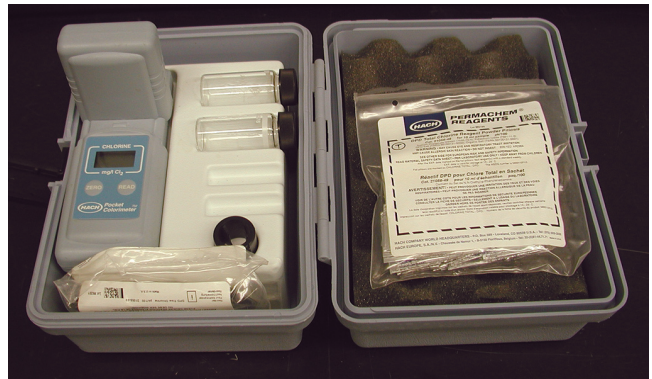


Figure 81—Chlorine test kit.

Broken or leaking water lines, cross connections, or debris in storage tanks can cause unhealthy drinking water.

Figure 82 shows a valve leaking under water. A loss of water pressure can suck the muddy water into the distribution system.



Figure 82—Leaking valve under water.

Figure 83 shows a hydrant without an atmospheric vacuum breaker. A loss of water pressure can cause water in the hose to be sucked into the distribution system. Threaded hose bibs must be equipped with an atmospheric vacuum breaker as shown in figure 84.



Figure 83—Missing atmospheric vacuum breaker.

The water source may become contaminated. Leaking vault toilets too close to a well may contaminate the ground water. Improperly abandoned wells may cause ground water contamination. Improperly sealed wells and springs can cause water contamination.

Figure 85 is a spring source contaminated with insects, rust, and leafy debris. An ill-fitting lid and deteriorated gasket caused the contamination. Figure 86 shows a rodent being removed from a water tank.



Figure 85—This spring had insects, rust, and debris in the water.



Figure 84—Atmospheric vacuum breaker.



Figure 86—Tank contaminated by a dead rodent.

Regulatory Issues

The EPA regulates all public drinking water systems by 40 CFR 141 National Primary Drinking Water Regulations. State regulations also must be met. (figure 87).

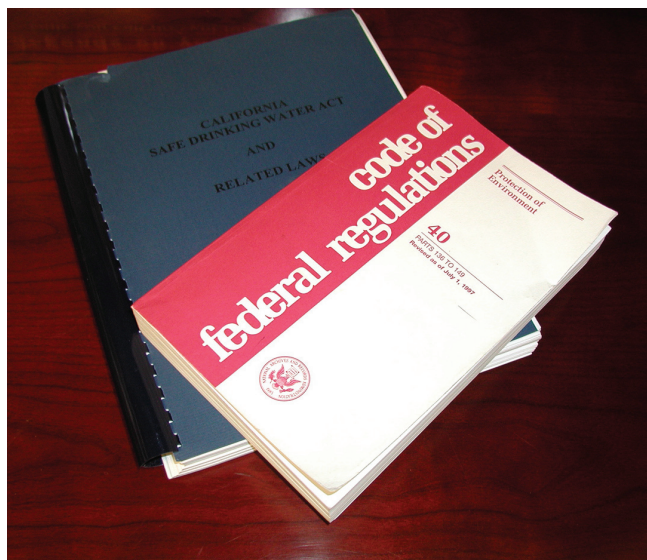


Figure 87—Regulations.

All USDA Forest Service owned and operated water systems are regulated by FSM 7400, Chapter 20. Forest Service manuals are available at the following Web site:
<http://fsweb.wo.fs.fed.us/directives/fsm/7400/> .

Routine Sampling Checklist

Sample **ALL** USDA Forest Service owned and operated potable water systems once every full or partial month of operation for total coliform bacteria (BacT sample). Follow the site sampling plan for sample location. A State certified laboratory (lab) must be used for compliance samples. Use the container supplied by the lab to collect the water sample (figure 88). Label the sample container as soon as the sample is collected. The lab analysis must start within 30 hours of sample collection.



Figure 88—Sample container.

The following excerpt is taken from Forest Service Manual 7420.7

421.22a—Routine Sampling

“Perform microbiological testing for total coliform bacteria at a minimum frequency of one routine sample per month for every full or partial calendar month of operation for all systems. Consider each handpump a separate water system.

“This minimum frequency assumes that monthly tests are taken at approximately 30-day intervals. Take samples early in the month to allow sufficient follow-up time.

“A higher frequency of routine sampling is required by NPDWR and the State if the average number of daily users is greater than 1,000 persons per day.

“Take at least one special sample and ensure it tests total coliform-negative, before opening all seasonally operated systems. Special samples do not count in determining Maximum Contaminant Level (MCL) violations or in meeting the monthly sampling requirements.

“Develop a written sample sitting plan for each public water system with a distribution system. The sitting plan should be designed to ensure that the system is routinely sampled at varied representative locations and that contamination in any portion of the distribution system is eventually detected.

“Testing laboratories must be EPA and/or State approved. Collect and handle samples in compliance with laboratory requirements.

“Arrange for the lab to report results to the appropriate staff as soon as possible if a test result is total or fecal coliform-positive.

7421.22b—Follow-up Actions

“1. Public Systems. Whenever a routine sample result is total coliform-positive, take a set of four repeat samples within 24 hours of notification by the lab or State. Take the samples at locations as directed by the State, in accordance with the sample sitting plan, or as follows:

- a. One at the same tap where the contamination occurred.
- b. One at a downstream tap.
- c. One at an upstream tap.
- d. One within five service connections of the original sample.

“If the system has only one service connection (such as a handpump), sample according to State direction or collect a single 400-milliliter sample.

“For any routine sample that is total coliform-positive, perform five routine samples during the next month the system is open.

“2. Nonpublic Systems. Whenever a routine sample result is total coliform-positive, take one repeat sample within 24 hours of notification by the lab or State.

“3. All Systems. Temporary closure of a water system for the purpose of performing corrective action or seasonal closure does not relieve the responsibility for compliance with repeat sampling, additional routine sampling, reporting to EPA or the State, and public notification as set forth in the NPDWR and State regulations.

“At sites with water-carried sewage systems, if follow-up action is to close the system, the toilet supply may be left open if all points of drinking, including sinks and showers, can be isolated and shut off. Otherwise, shut off the entire system.

“In the case of a waterborne disease outbreak at a Federally owned water system, contact the Regional Environmental Engineer and the State for special provisions for public notification and monitoring.

“See exhibit 01 for follow-up actions to be initiated within 24 hours based on the results of repeat sampling.

**“7421.22b—Exhibit 01
Follow-up Actions For Microbiological Sampling**

“Based on the results of the repeat sampling, initiate the appropriate follow-up actions within 24 hours:

SAMPLE RESULT				
ROUTINE SAMPLES	REPEAT SAMPLE(S)	MCL VIOLATION	ACUTE VIOLATION	FOLLOWUP ACTION
TC-	None	No	No	None. Quality satisfactory.
TC+ FC-/EC	TC-	No	No	Public systems must have five routine samples taken the next month the system is open.
TC+ FC-/EC	TC+ FC-/EC	Yes	No	See Action 1.
TC+ FC-/EC	TC+ FC+/EC	Yes	Yes	See Action 2.
TC+ FC+/EC	TC-	No	No	Public systems must have five routine samples taken the next month the system is open.
TC+ FC+/EC	TC+ FC-/EC	Yes	Yes	See Action 2.
TC+ FC+/EC	TC+ FC+/EC	Yes	Yes	See Action 2.
Confluent Growth	None	No	No	Sample invalid. See Action 3.
TC = Total Coliform EC = E. Coli FC = Fecal Coliform + = Positive test results - = Negative test results				

7421.22b - Exhibit 01—Continued

“ACTION 1: MCL VIOLATION

“A. Public systems. Notify, consult, and coordinate with the State within 48 hours of being notified of the positive result. Take five routine samples the next month the system is open.

“B. Public and non-public systems. Notify users within 14 days according to appropriate State or NPDWR notification procedures including: posting, hand delivery, or media (newspaper, radio, or television), depending on the classification of the system and corresponding State direction. For non-public systems where State or EPA regulations have not established public notification procedures, notify users by posting signs at the facility, visitor information site, District Office, or any other site deemed appropriate. For systems serving resident populations, make notification by letter, in addition to posting signs.

“1. Administrative systems. Search for the source of contamination by doing a condition survey (FSM 7421.14). Take corrective action when the source of contamination is found. Take daily special samples until two consecutive special samples are TC negative. If three samples are TC positive (routine, repeat, and one special sample), issue a temporary boil water notice or close the system. The temporary boil notice shall include water used for drinking, food preparation, and bathing. Boiling water shall be a temporary measure (not to exceed 30 days).

If the need for boiling will exceed 30 days, obtain appropriate engineering approval. Rescind the notice or open the system only after the problem has been corrected and two consecutive daily special samples are TC negative.

“2. Recreation systems. Search for the source of contamination by doing a condition survey (FSM 7421.14). Take corrective action when the source is found. Take daily special samples until two consecutive special samples are TC negative. If three samples are TC positive (routine, repeat, and one special sample), close the system. At sites with water-carried sewage systems, the toilet supply may be left open if all points of drinking, including showers and sinks, can be isolated and shut off. Otherwise, shut off the entire system. Open the system only after the problem has been corrected and two consecutive daily special samples are TC negative.

“ACTION 2: ACUTE VIOLATION

“A. Public systems. Notify, consult, and coordinate with the State within 48 hours of being notified of the positive result. Take five routine samples the next month the system is open.

“B. Public and non-public systems. Notify users within 72 hours according to appropriate State or NPDWR notification procedures including: posting, hand delivery, or media (newspaper, radio or television), depending on the classification of the system and corresponding State direction. For non-public systems where State or EPA regulations have not established public notification procedures, notify users by posting signs at the facility, visitor information site, District Office, or any other site deemed appropriate. For systems serving resident populations, make notification by letter, in addition to posting signs.

1. Administrative systems. Issue a temporary boil water notice or close the system. The temporary boil notice shall include water used for drinking, food preparation, and bathing. Boiling water shall be a temporary measure (not to exceed 30 days). If the need for

boiling exceeds 30 days, obtain appropriate engineering approval. Search for the source of contamination by doing a condition survey (FSM 7421.14). Take daily special samples. Rescind the notice or open the system only after the problem has been corrected and two consecutive daily special samples are TC negative.

2. Recreation systems. Close the water system. At sites with water-carried sewage systems, the toilet supply may be left open if all points of drinking, including showers and sinks, can be isolated and shut off. Otherwise, shut off the entire system. Search for the source of contamination by doing a condition survey (FSM 7421.14). Take corrective action when the source is found. Open the system only after the problem has been corrected and two consecutive daily special samples are TC negative.

“ACTION 3: CONFLUENT GROWTH

“The sample is invalid. Take another routine sample at the same location within 24 hours of being notified of the invalid result. If the second sample has confluent growth, search for the cause and correct it. Continue sampling until a valid sample is obtained. If the valid sample is TC positive, follow actions as outlined in FSM 7421.22b.”

Checklist:

___ 1. Test **ALL** seasonally operated USDA Forest Service water systems for coliform before the system is opened. If the system tests positive for coliform, do not open the system until the source of contamination is located and corrected.

___ 2. Test all public water systems annually for nitrate and nitrite.

___ 3. Submit, or have the laboratory submit all required tests on public water systems to the State.

Proper Microbiological Sampling Techniques

Proper sampling techniques are extremely important in obtaining accurate water quality information. Poor sampling techniques may lead to test results indicating bacteriological contamination of your water when the water is actually safe. Consistently good sampling techniques will save time and money.

- ☐ Ensure that the water in your sample is representative of the water you are providing for consumption.
 - ✦ Follow the sampling plan for the system, rotating among designated sampling ports as prescribed. Designated sampling ports should be faucets that are used frequently.
 - ✦ After any repairs, ensure that the system has been disinfected, flushed, and is operating normally before drawing samples.
- ☐ Sample early in the month to allow time for repeat samples if necessary.
- ☐ Use the right bottle the right way.
 - ✦ Use only clean sample bottles provided by the lab specifically for bacteriological sampling.
 - ✦ Do not rinse the bottle before sampling. A chemical placed in the bottles by the lab is necessary for correct test results.
 - ✦ Do not open the bottle before you are ready to take the sample.
- ☐ Ensure that sampling ports do not contaminate the water.
 - ✦ To ensure the best sampling ports (faucets), check for these features:
 - ✓ Nonswiveling spout.
 - ✓ No aerator or splash guard.
 - ✓ No leaks or drips.
 - ✓ Plain spout (no threads for attaching hoses).

- ✓ No vacuum breakers.
- ✓ No attached water purifiers or other assemblies.
- ✓ CLEAN and sanitized.
- ✓ Inside a building unless there are not any inside faucets.
- ✦ If the sampling ports do not meet all these requirements, do the following:
 - ✓ If there are aerators, splash guards, screw-on vacuum breakers, water purifiers, or other assemblies, REMOVE THEM before sanitizing, flushing the line, and drawing the sample.
 - ✓ If the spout is threaded or if you are not sure it is sanitary, apply a bleach or hypochlorite solution that contains at least 1 teaspoon bleach to 1 quart water to the end of the spout (may need to use a disinfected brush wetted with the bleach solution to make sure threads are clean and disinfected), then let the water run longer during flushing.
 - ✓ Because there is no mitigation possible for swivel spouts, for leaking or dripping faucets, or for built-in vacuum breakers, do not use these faucets.
- ☐ Flush the lines so that the sample represents the water in the main.
 - ✦ Run the water at full flow for 2 to 3 minutes.
 - ✦ When sampling from a mixing faucet, run the hot water for 2 to 3 minutes, then the cold water for 2 to 3 minutes.
 - ✦ When sampling from a handpump, pump water for at least 5 minutes to flush.
- ☐ Keep the sample bottle sanitary.
 - ✦ Keep a good grip near the bottom of the bottle.
- ✦ Do not stick your finger or anything else inside the bottle, on the threads, or in the lid.
- ✦ Do not set the lid down; hold it by the outside surface while you fill the bottle.
- ☐ Use a small water stream so it does not splash or overflow.
 - ✦ A stream about the diameter of your little finger is just right.
 - ✦ Gently fill the bottle, leaving a 1/2- to 1-inch air space.
 - ✦ Immediately replace the lid and tighten it so the bottle will not leak.
- ☐ Fill out the sample bottle lab label and accompanying form completely. Keep a copy for your permanent records.
 - ✦ The information accompanying the sample must include:
 - ✓ Date and time sampled.
 - ✓ Sampling location.
 - ✓ Name of person collecting the sample.
 - ✓ Type of sample (routine, repeat/check, or special/construction - terms may vary among jurisdictions).
 - ✓ Free chlorine residual, if system is chlorinated.
- ☐ Deliver the sample to the lab immediately. The sample must be tested within 48 hours to be valid, and many labs will not accept samples more than 30-hours old.
 - ✦ Be sure to send the lab form with the sample.
 - ✦ Keep the sample cool.
 - ✓ If mailing the sample, use a container provided or approved by the lab.
 - ✓ Only use sealed cold packs, do not use ice. Ice can melt, infiltrate the sample bottle, and contaminate the sample.

Remember that the goal is NOT to “get a passing test.” [The goal is to serve good water.](#) Bacteriological testing is just a tool that alerts you to potential system problems and helps you find and fix them.

Checklist

Every USDA Forest Service owned and operated water system:

- ☐ has a site sampling plan (see appendix B).
- ☐ uses an EPA or State certified laboratory to analyze samples.
- ☐ has a permanent folder that contains the results of all tests.
- ☐ is entered into INFRA

Primacy Agency Address:

Phone:

Laboratory Address:

Phone:

USDA Forest Service

Regional Office Sanitary Engineer:

Phone:
