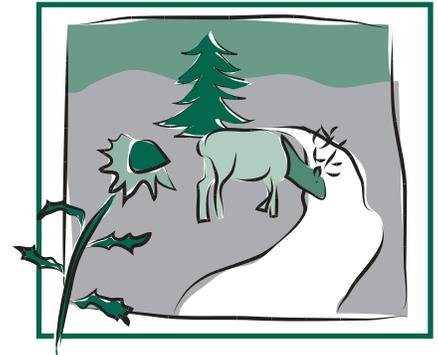


Emergency Water Supplies and Treatment

Fact Sheet No. 6.704

Natural Resources Series | Water



by R. Waskom*

Access to safe drinking water is essential. The human body can survive for weeks without food, but only a few days without water. An interruption of water supplies could occur due to a natural disaster such as a hurricane, earthquake, tornado, or a severe winter storm. The contamination of a community's water supply due to terrorist activity is a remote possibility that also warrants consideration.

You can prepare yourself and your family by taking some simple precautions.

- Have a supply of clean drinking water stored in the event of an emergency
- Understand how to access water from hidden sources inside your home
- Realize the potential outdoor sources for drinking water.
- Learn how to purify water correctly.

Stocking Water

In preparing for an emergency, store at least a three-day supply of water for each member of your family. In cases such as a natural disaster or an act of terrorism resulting in the contamination of your community's water supply, having a two-week stock of clean water is advisable. A normally active person needs to drink at least two quarts of water each day, but that amount can vary. Children, nursing mothers and ill people may need more, and during summer you should double the amount of water stored. You will also need additional water for food preparation and hygiene. Storing at least one gallon of water per person, per day is recommended when preparing for an emergency. An adequate supply of water for pets should also be included.

You can store tap water in thoroughly washed plastic, glass, fiberglass, or enamel-lined metal containers. Never use a container

that has held toxic substances, because small amounts may remain in the container. Plastic containers, such as soft drink bottles or one-gallon water jugs are best. You can also purchase large food-grade plastic containers or drums that are specifically made to hold water.

Fill the clean containers with tap water or with well water that has been treated by adding two drops of chlorine bleach per gallon. Seal the water containers tightly, label and store them in a cool, dark place. Replace the water every six months. When storing the water in a basement, keep the water supply on shelves and not on the ground. In the event of a flood, stormwater entering the basement could contaminate the stored water. If the floodwater continues to rise, move the stored water to a higher level.

Commercially bottled water can be purchased at most retail establishments. Check the label for an expiration date. If none is given, bottled water with the IBWA or NSF seal should have a shelf life of at least one year. To improve the taste of water that has been stored for a long time, pour it from one clean container to another clean container several times, to put air back into it.

You can also store water for an extended period in the freezer. If you lose electricity, the frozen water will help keep foods in the freezer frozen until the power is restored. Leave 2 to 3 inches of air space at the top of the container to keep it from breaking as the water expands during freezing. Water will expand by 9% when frozen, so you must leave about 90 – 100 ml of headspace in a one-liter bottle to avoid breakage. Some glass containers may break regardless of the air space provided.

After opening a stored container, practicing sanitary measures are important when using the water to keep it safe and to control exposure to bacteria. To reduce the chance of water contamination, do not open more containers than are needed at the time. If electric power is available, store opened

Quick Facts

- The human body can survive for weeks without food, but only a few days without water.
- In preparing for an emergency, store at least a three-day supply of water for each member of your family.
- You can minimize the amount of water your body needs by reducing activity and staying cool.
- Water can be purified for drinking by filtering and then either boiling or adding household bleach.

*R. Waskom, Colorado State University Extension water resources specialist and director of the Colorado Water Resources Research Institute. 6/2011



containers in a refrigerator at or below 40 degrees Fahrenheit or 4.4 degrees Celsius. If refrigeration is not available and containers are stored at room temperature, be extra careful to avoid introducing bacterial contamination into the bottled water. Use water in opened containers within one or two days.

It is rarely wise to ration water, particularly for children and elderly. Drink the amount you need today and try to find more for tomorrow. You can minimize the amount of water your body needs by reducing activity and staying cool.

Indoor Water Sources

When your stocked water supply is exhausted, water can be found inside your home in several areas. Indoor water sources include water in your hot-water tank, pipes and ice cubes. As a last resort, you can use water in the reservoir tank of your toilet (NOT the bowl), but purify it first using one of the methods described below.

Hot-water tanks are the best source of indoor water because they hold an average of fifty gallons of water. To use the water in your hot water tank, first turn off the gas at the intake valve or turn off the electricity at the circuit breaker, or unplug the unit. Place a clean pail or bucket under the drain at the bottom of the tank to retrieve the water. The drain may look very similar to an outdoor water faucet. **Remember**, the water coming from the tank can be scalding hot. Turn off the water intake valve (usually located above the water heater) and open a hot-water faucet at one of your sinks. This provides a vent so that water can flow from the tank. Only after the water at the main water supply valve and the water intake valve of the hot water tank are turned back on and the hot water tank is filled with water, should the gas or electric be turned on to the hot water heater.

To use the water in your pipes, let air into the plumbing by turning on a faucet at the highest level in your house. Then use a clean container to obtain water from the lowest faucet in the house.

Before using any indoor water sources, be sure the water in your home is safe to drink. If water is not coming into your home, or you hear reports of broken water or sewage lines or that your community's water supply is otherwise contaminated, shut off the water coming into your home

at the main water shut-off valve. To locate the main shut-off valve, look on either side of the water meter for the pipe coming up through the floor at the lowest level of your house. The shut-off valve may be on this line. If you are unsure where the main water shut off valve is, the local water utility company can come and locate it for you at no charge. Locate the water shut-off valve before an emergency so that you are not caught off guard.

Never use the water in your pipes or hot water heater if there is any chance that contaminated water may have entered your home. Using contaminated water for washing and bathing is also not recommended, but it may be used to flush toilets.

If floodwater enters the house from outdoors or comes up through the basement drain or toilets, never try to use the water, even after attempting to purify it. The water could be contaminated with sewage, oils, industrial, and/or hazardous wastes.

If your water supply comes from a well, you may have a pressure tank that can supply a small amount of water in an emergency. If the power is out and you have a generator, you can continue to access water from the well. If the wellhead has been contaminated with floodwater, the water from the well should not be used for drinking, cooking, or bathing until the well is purged and disinfected.

If your home is equipped with a water treatment system, such as reverse osmosis (RO), activated carbon or a water softener unit, the water coming from the unit may still not be drinkable in some instances. The safety of the water will depend on the contaminant concentration, chemical properties of the contaminant, the type and condition of the treatment system, and operating conditions. For instance, a reverse osmosis unit cannot effectively remove some solvents and other volatile organic chemicals.

No one piece of treatment equipment removes all contaminants, although using several different types of treatment systems together may be effective. Using an activated carbon filtration and/or sediment filtration is necessary to remove silt particles or chlorine that otherwise may foul the RO membrane if it is used alone. Other treatment systems used in

conjunction with RO can also remove certain pesticides and organic solvents.

Even if your water treatment system is capable of purifying contaminated water coming into your home, it may be in your best interest to prevent the water from passing through the treatment system. Once a water treatment system becomes contaminated, cleaning or replacing components could present a serious exposure hazard. For example, RO is effective in removing Anthrax spores, but maintenance on the unit afterwards may be deadly.

Outdoor Water Sources

Once your indoor water is exhausted, some outdoor water sources can be used in an emergency. Outdoor water must be treated before using because it can be contaminated by a variety of microorganisms, including bacteria and parasites that cause diseases such as dysentery, cholera, typhoid, and hepatitis. If it is possible that the water is contaminated with chemical, biological, and radiologic agents, never use the water. In this case, the water purification treatments listed below will not make the water safe to drink.

The following are potential sources of outdoor water:

- Streams, rivers and other moving bodies of water
- Ponds and lakes
- Natural springs
- Rain and snow

Possible Terrorist Based Water Contamination

Recent fears of terrorist attack have changed public perception about the need for emergency preparedness. Finding alternative sources of water is difficult and purifying the water is time consuming under the best circumstances. Preparing an adequate stock of safe drinking water takes only a small amount of effort and money and can insure your family is ready for most emergencies.

For more information, visit:

- <http://water.epa.gov/drink>
- www.cdc.gov/nceh/ehs/
- www.redcross.org/preparedness/cdc_english/foodwater-2.asp

If you are using an outdoor water source, avoid collecting water with floating material, an odor, or dark color. To purify water collected from outdoor sources, both filtration and boiling is required before drinking the water. Be aware that chlorine is not effective or only somewhat effective in controlling *Cryptosporidium* and *Giardia* found in surface water. Boiling is usually the best way to remove these two pathogens. Another method uses filters labeled as “absolute one micron filters,” or those labeled as certified by an American National Standards Institute (ANSI) - accredited organization to ANSI/NSF Standard 53 for “Cyst Removal”.

Rain or melting snow dripping from the gutters or downspouts of a house can be collected in containers such as a barrel or plastic tank with a lid. Water collected in this manner will need to be treated before use with the Water Purification Treatment listed below.

Water Purification Treatment

1. After collecting the water in a container, let any suspended particles settle to the bottom and gently pour the clear water off the top into a second container. Filter this water using a clean piece of cloth or coffee filter to remove any remaining particles.
2. To disinfect by boiling, bring the water to a rolling boil and boil for a least 1 minute. Boil longer at high attitudes or if the water is from a source suspected to have *Giardia* or other protozoa (5 minutes boiling time is recommended at 10,000 feet above sea level). Boiling will kill disease-causing microorganisms present in water, but will concentrate non-volatile chemical contaminates, so it is unwise to boil for longer than necessary.
3. Let the water cool at least 30 minutes. You can re-oxygenate the water by pouring the water back and forth

between two clean containers. This will improve the taste.

4. To disinfect by chlorination, use ordinary household chlorine bleach. Sodium hypochlorite with a concentration of 5.25% to 6% should be the only active ingredient in the bleach. There should not be any added soap or fragrances. One major bleach manufacturer has also added sodium hydroxide as an active ingredient, which will not pose a health risk for water treatment. Add 16 drops ($\frac{1}{4}$ teaspoon) of liquid chlorine bleach per gallon of water, or 8 drops per 2-liter bottle of water. Stir to mix. If you do not have a dropper, use the following table to measure the correct amount of bleach.

8 drops = $\frac{1}{8}$ teaspoon

16 drops = $\frac{1}{4}$ teaspoon

32 drops = $\frac{1}{2}$ teaspoon

5. Let the water stand 30 minutes to give the chlorine time to kill the microorganisms present. This method is not guaranteed to be effective against certain encysted protozoa.
6. If it smells of chlorine, you can use it. If it does not smell of chlorine, add 16 more drops of chlorine bleach per gallon of water (or 8 drops per 2-liter bottle of water), stir, let it stand 30 minutes, and smell it again. If it smells of chlorine, you can use it. If it does not smell of chlorine, discard it and find another source of water. The only agent used to purify water should be household liquid bleach. Other chemicals, such as iodine or water treatment products sold in camping or surplus stores that do not contain 5.25 percent sodium hypochlorite are not recommended.
7. If the chlorine taste in the water is too strong after disinfection, pour it from one clean container to another several times. This will drive some of the chlorine off as a gas, lowering the level of chlorine in the water and improving the taste.