

EMERGENCY WATER STORAGE & PURIFICATION GUIDELINES

<http://www.fema.gov/plan/prepare/water.shtm>

How Much Water do I Need?

You should have at least a three-day supply of water and you should store at least one gallon of water per person per day. A normally active person needs at least one-half gallon of water daily just for drinking.

Additionally, in determining adequate quantities, take the following into account:

- Individual needs vary, depending on age, physical condition, activity, diet, and climate.
- Children, nursing mothers, and ill people need more water.
- Very hot temperatures can double the amount of water needed.
- A medical emergency might require additional water.

How Should I Store Water?

To prepare safest and most reliable emergency supply of water, it is recommended you purchase commercially bottled water. Keep bottled water in its original container and do not open it until you need to use it. Observe the expiration or “use by” date.

If You are Preparing Your Own Containers of Water

It is recommended you purchase food-grade water storage containers from surplus or camping supplies stores to use for water storage. Before filling with water, thoroughly clean the containers with dishwashing soap and water, and rinse completely so there is no residual soap. Follow directions below on filling the container with water.

If you choose to use your own storage containers, choose two-liter plastic soft drink bottles – not plastic jugs or cardboard containers that have had milk or fruit juice in them. Milk protein and fruit sugars cannot be adequately removed from these containers and provide an environment for bacterial growth when water is stored in them. Cardboard containers also leak easily and are not designed for long-term storage of liquids. Also, do not use glass containers, because they can break and are heavy.

If storing water in plastic soda bottles, follow these steps:

Thoroughly clean the bottles with dishwashing soap and water, and rinse completely so there is no residual soap. Sanitize the bottles by adding a solution of 1 teaspoon of non-scented liquid household chlorine bleach to a quart (1/4 gallon) of water. Swish the sanitizing solution in the bottle so that it touches all surfaces. After sanitizing the bottle, thoroughly rinse out the sanitizing solution with clean water.

Filling Water Containers

Fill the bottle to the top with regular tap water. If the tap water has been commercially treated from a water utility with chlorine, you do not need to add anything else to the water to keep it clean. If the water you are using comes from a well or water source that is not treated with chlorine, add two drops of non-scented liquid household chlorine bleach to each gallon of water. Tightly close the container using the original cap. Be careful not to contaminate the cap by touching the inside of it with your finger. Place a date on the outside of the container so that you know when you filled it. Store in a cool, dark place. Replace the water every six months if not using commercially bottled water.

Guidelines for Managing Water Supplies

Essentials

1. **Allow people to drink according to their needs.** Many people need even more than the average of one-half gallon, per day. The individual amount needed depends on age, physical activity, physical condition, and time of year.

2. **Never ration water unless ordered to do so by authorities.** Drink the amount you need today and try to find more for tomorrow. Under no circumstances should a person drink less than one quart (four cups) of water each day. You can minimize the amount of water your body needs by reducing activity and staying cool.
3. **Drink water that you know is not contaminated first.** If necessary, suspicious water, such as cloudy water from regular faucets or water from streams or ponds, can be used after it has been treated. If water treatment is not possible, put off drinking suspicious water as long as possible, but do not become dehydrated.
4. **Do not drink carbonated beverages instead of drinking water.** Carbonated beverages do not meet drinking-water requirements. Caffeinated drinks and alcohol dehydrate the body, which increases the need for drinking water.
5. **Turn off the main water valves.** You will need to protect the water sources already in your home from contamination if you hear reports of broken water or sewage lines, or if local officials advise you of a problem. To close the incoming water source, locate the incoming valve and turn it to the closed position. Be sure you and other family members know how to perform this important procedure.
 - To use the water in your pipes, let air into the plumbing by turning on the faucet in your home at the highest level. A small amount of water will trickle out. Then obtain water from the lowest faucet in the home.
 - To use the water in your hot-water tank, be sure the electricity or gas is off, and open the drain at the bottom of the tank. Start the water flowing by turning off the water intake valve at the tank and turning on the hot water faucet. Refill the tank before turning the gas or electricity back on. If the gas is turned off, a professional will be needed to turn it back on.

Emergency Water Sources

Safe Sources

- Melted ice cubes
- Water drained from the water heater (if the water heater has not been damaged)
- Liquids from canned goods such as fruit or vegetable juices
- Water drained from pipes

Unsafe Sources

- Radiators
- Hot water boilers (home heating system)
- Water beds (fungicides added to the water or chemicals in the vinyl may make water unsafe to use)
- Water from the toilet bowl or flush tank
- Swimming pools and spas (chemicals used to kill germs are too concentrated for safe drinking but can be used for personal hygiene, cleaning, and related uses)

Emergency Water Treatment

Treat all water of uncertain quality before using it for drinking, food washing or preparation, washing dishes, brushing teeth, or making ice. In addition to having a bad odor and taste, contaminated water can contain microorganisms (germs) that cause diseases such as dysentery, cholera, typhoid, and hepatitis.

There are many ways to treat water. None is perfect. Often the best solution is a combination of methods. Before treating, let any suspended particles settle to the bottom or strain them through coffee filters or layers of clean cloth. Make sure you have the necessary materials in your disaster supplies kit for the chosen water treatment method.

There are three water treatment methods: Boiling, Chlorination, Distillation

These instructions are for treating water of uncertain quality in an emergency situation, when no other reliable clean water source is available, or you have used all of your stored water.

Boiling

Boiling is the safest method of treating water. In a large pot or kettle, bring water to a rolling boil for 1 full minute, keeping in mind that some water will evaporate. Let the water cool before drinking.

Boiled water will taste better if you put oxygen back into it by pouring the water back and forth between two clean containers. This also will improve the taste of stored water.

Chlorination

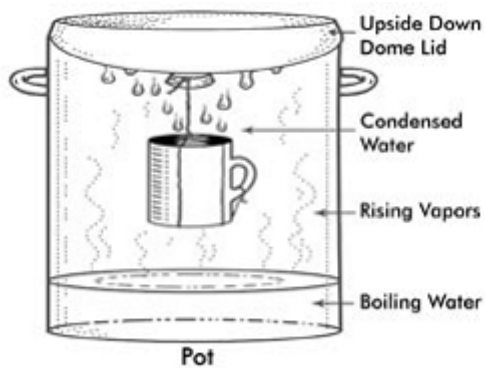
You can use household liquid bleach to kill microorganisms. Use only regular household liquid bleach that contains 5.25 to 6.0 percent sodium hypochlorite. Do not use scented bleaches, color safe bleaches, or bleaches with added cleaners. Because the potency of bleach diminishes with time, use bleach from a newly opened or unopened bottle.

Add 16 drops (1/8 teaspoon) of bleach per gallon of water, stir, and let stand for 30 minutes. The water should have a slight bleach odor. If it doesn't, then repeat the dosage and let stand another 15 minutes. If it still does not smell of chlorine, discard it and find another source of water.

Other chemicals, such as iodine or water treatment products sold in camping or surplus stores that do not contain 5.25 to 6.0 percent sodium hypochlorite as the only active ingredient, are not recommended and should not be used.

Distillation

While the two methods described above will kill most microbes in water, distillation will remove microbes (germs) that resist these methods, as well as heavy metals, salts, and most other chemicals.



Distillation involves boiling water and then collecting only the vapor that condenses. The condensed vapor will not include salt or most other impurities. To distill, fill a pot halfway with water. Tie a cup to the handle on the pot's lid so that the cup will hang right-side-up when the lid is upside-down (make sure the cup is not dangling into the water) and boil the water for 20 minutes. The water that drips from the lid into the cup is distilled.

Effectiveness of Water Treatment Methods

Methods	Kills Microbes	Removes other contaminants (heavy metals, salts, and most other chemicals)
Boiling	yes	no
Chlorination	yes	no
Distillation	yes	yes

WATER PURIFICATION TABLE (non-FEMA)

WATER QUANTITY	BLEACH ADDED	IODINE ADDED
1 Gallon	8 Drops (clear water) 16 Drops (cloudy water)	12 Drops (clear water) 24 Drops (cloudy water)
5 Gallons	½ Teaspoon (clear water) 1 Teaspoon (cloudy water)	¾ Teaspoon (clear water) 1 ½ Teaspoons (cloudy water)
60 Gallons	1 ounce (clear water) 2 ounces (cloudy water)	

Evaporation Still

Two American scientists, Dr. Ray D. Jackson and Dr. Cornelius H. M. van Bavel of the U.S. Department of Agriculture, have developed an evaporation still that will extract water from the soil even if it appears quite dry.

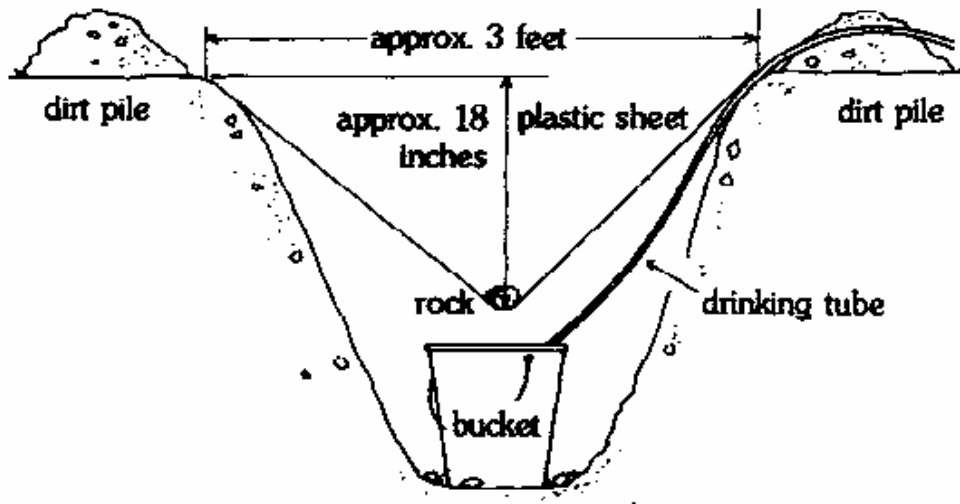
Materials

- A six-by-six-foot square piece of clear plastic
- A drinking tube
- A bucket or container to catch the water

Instructions

1. Dig a hole three feet deep and large enough at the bottom to hold the bucket or container.
2. Place one end of the drinking tube at the bottom of the bucket and put the bucket in the hole.
3. If possible, line the sides of the hole with shredded vegetation and slices of succulent plants.
4. Place the plastic over the hole, securing the edges all **around** with soil. Extend the drinking tube from the bucket under the plastic and up through the soil that holds the plastic in place. Wrap a towel or clean cloth around the end of the tube to protect it from soil and contamination.
5. Position a rock in the center of the plastic sheet two to three inches above and directly over the bucket.

Water can be sipped through the tube without dismantling the still. Two still will provide enough water for one person per day.



The evaporation still will produce water continuously. The plastic sheet will create a greenhouse effect in the still, accelerating the natural evaporation of water from the soil. When the water vapor hits the plastic sheet, it will condense and drip down into the cup. The tubing may be used to drink from the cup without disturbing the still. For added effectiveness, use a second cup to pour any available fluids, such as urine, into the pit.

The vegetation still

An easier method uses just a plastic bag. Gather enough succulent vegetation (big leaves, cacti stripped of their thorns, etc.) to mostly fill the bag. Mash it to break through the leaves' outer water-resistant cuticle. As in the evaporation still, a greenhouse effect will cause water to evaporate from the leaves. It will then condense on the plastic and run down into the bottom of the bag. The water in the bag will pick up chemicals from the leaves. These will give it a strong leafy flavor, and may include toxins, so make sure not to gather any poisonous plants.