

KNW-171
WATER WARNINGS AND PURIFICATION

Water. It is something Americans rarely worry about, making national headlines when we do. The average human in good shape cannot last more than about a week without water, yet oddly enough, most large-scale disasters on the Gulf Coast are caused by too much water.

To understand what you need to know about water in a disaster situation, you need a short refresher on biology, chemistry, and the 3 very different warnings local or federal health officials may issue.

The different kinds of contaminants we will discuss in this training are:

1. Sedimentary
2. Biological
3. Chemical

We will start with a refresher on units of measure, as this will be very important to our understanding of contaminants. We are all somewhat familiar with the size of a millimeter. On a ruler that has centimeters on one side, they are the small tick marks. Ten (10) of them in one centimeter. That is small. There are 1 thousand microns in a millimeter, and there are 1000 nanometers in a micron.

Sedimentary particulate contaminants are nothing more than dirt, rust, or sand in your water and vary in size. None of these will harm you in any reasonable amount but are not fun to drink and can cause horrible stains on everything. Many filters will easily remove sedimentary contaminants.

Now for a refresher on biology. Microbes range in size from large 750 microns, that is almost a millimeter and is visible to the naked eye (*thiomargarita namibiensis*). Then we have giardia at 10-20 microns, cryptosporidium at 3 to 6 microns, e. coli at 1 micron, and then the viruses down in the nanometer range: COVID-19 at roughly 125 nanometers. The common flu is between 80 and 120 nanometers. None of these organic visitors are welcome in any of our drinking water.

Now a brief refresher on chemistry. Organic and sedimentary contaminants can be measured in microns, but chemical contaminants cannot, and can be virtually impossible to filter out without a secondary or tertiary chemical reagent to neutralize a large enough distribution of potentially harmful molecules. At the time of writing, there is no way to *filter* petrochemicals out of a drinking water supply, the water must be treated with other chemicals to render contaminants inert or filterable.

We will not discuss how contaminants get in your drinking water supply, there are too many vectors in a disaster situation to list here. We will however discuss what you can do about it, and what to listen for.

There are three warnings you will hear from local health officials or the CDC. They are:

1. Boil Water Advisory
2. Do Not Drink Water Advisory

3. Do Not Use Water Advisory

A “Boil Water Advisory” is something most of us are familiar with. This indicates a potential biological contaminant in the potable water supply. The CDC states boiling water at a rolling boil for 1 minute at sea level will kill most contaminants. You may use the water for showering, just don’t drink it.

A, “Do Not Drink Water Advisory” is a much more severe indication of a potential harmful chemical contaminant in the potable water supply. Boiling water will not remove chemicals from the water, and in many cases will instead distill and increase the potency of the toxins in the water making them even more dangerous and the water less drinkable. Use bottled water exclusively for everything.

Finally, the very rare, “Do Not Use Water Advisory” exists to warn us about radiological contaminants, or other chemical contaminants that are either extremely harmful in vaporous forms, or in any physical contact with the skin, lungs, or eyes. Again, use bottled water exclusively, do not mess around with this.

When any of these advisories are issued it is recommended to turn off your appliances with water or ice dispensers, your swamp coolers or misters, and your pool auto-filler until the Advisory has been cleared and you have an opportunity to flush your appliances and plumbing with an adequate amount of clean water. Remember, your hot water heater can hold 30 or more gallons of potentially bad water. Some dishwashers have a “sanitize cycle” that heats the water over 150 degrees Fahrenheit, and this is also sufficient to kill biological contaminants, but is completely inadequate to remove chemical contaminants from the appliance.

Filters. An Activated Charcoal or carbon filter will be rated in particulate removal anywhere from 50 microns (which will not stop any but the very largest microbes), to 0.5 microns- which effectively removes all bacteria but will not even slow down the average virus. Charcoal filters are suitable for filtering giardia out of remote campsite water supplies, but are wholly inadequate for disaster relief when it comes to virus removal.

A bit of a relevant sidebar- an N95 mask gets its “95” rating from its ability to trap 95% of all airborne contaminants larger than 0.3 microns in size (that’s 300 nanometers). An N99 mask traps 99%, and an N100 traps 99.97% of all 300 micron contaminants. “N” means Not Oil Resistant, “R” means Resistant To Oil, and “P” means Oil-Proof. Respect the P100. More on that in a different training session. Back to water...

A reverse-osmosis water filter is regarded by the CDC as the best form of water filtration, removing particulate contaminants down to 0.1 nanometers in size, including all biological and sedimentary visitors. It is important to understand that this filtration comes at a cost of efficiency. A reverse-osmosis (or RO) system must continuously flush water over the dirty side of the filter membrane to keep it clear, thus producing a concentrated flow of flushed contaminants typically routed down the sink drain.

Lastly, water softening systems that do not have cartridge filters before or after them typically only alter the chemical charge of the water passing through them to reduce the ability of hard water to attach to unsuspecting appliances and faucets. They may or may not reduce sedimentary contaminants, much less biological or chemical. These systems, even with cartridge filters, do very little if anything to protect you under CDC water advisories. When in doubt, use bottled water.

Boil Water Advisory:

<https://www.cdc.gov/healthywater/emergency/drinking/drinking-water-advisories/boil-water-advisory.html>

Do Not Drink Water Advisory:

<https://www.cdc.gov/healthywater/emergency/drinking/drinking-water-advisories/do-not-drink-advisory.html>

Do Not Use Water Advisory:

<https://www.cdc.gov/healthywater/emergency/drinking/drinking-water-advisories/do-not-use-advisory.html>