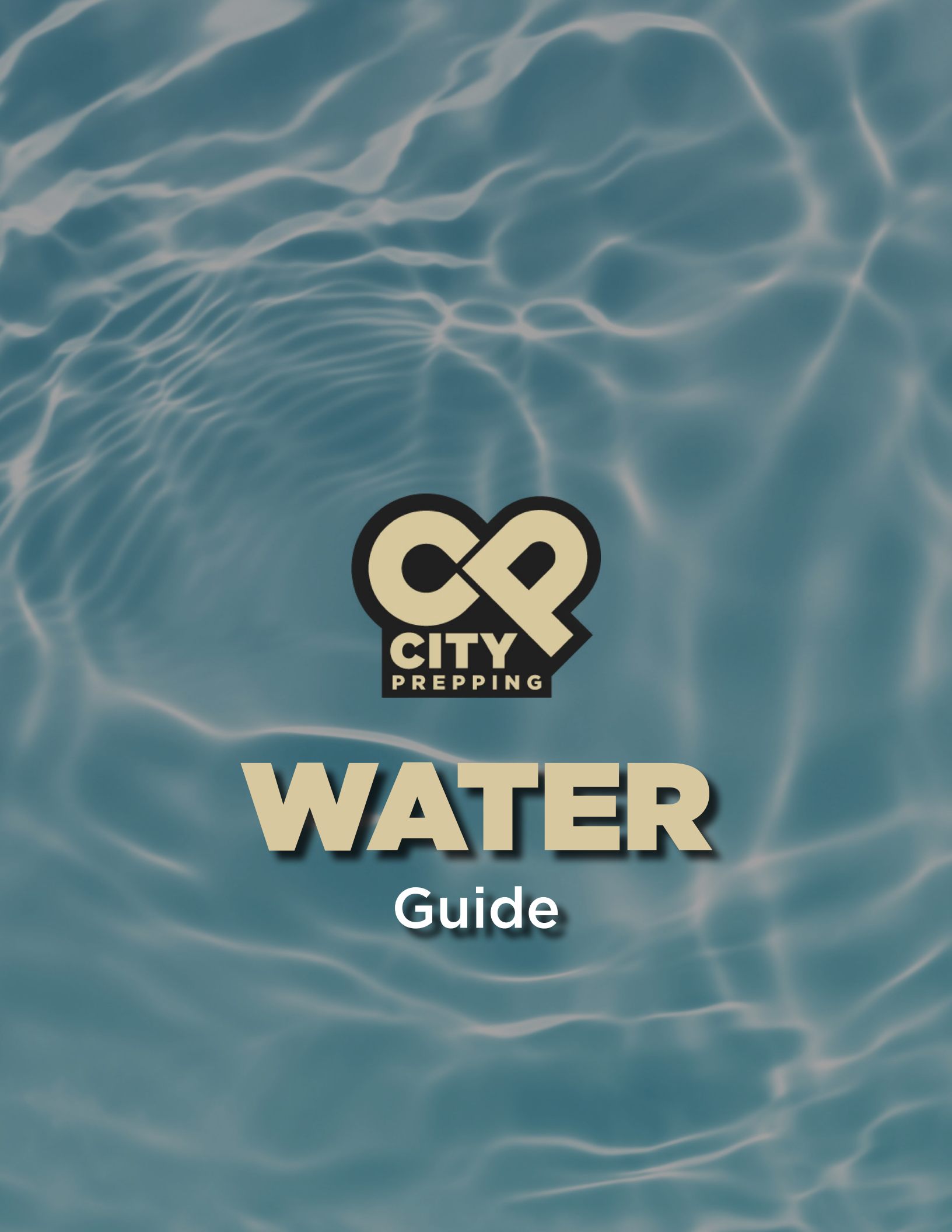

CP
CITY
PREPPING
WATER
Guide

INTRODUCTION

Hi, my name is Kris (aka City Prepping), and I have been involved with emergency preparedness for several decades now. Between achieving Eagle Scout in my youth, doing humanitarian work in impoverished areas of Mexico and in 3rd world nations such as Afghanistan, and receiving C.E.R.T. training, I've come to learn and appreciate the foundations of preparedness that I'll outline in this document.

Over the last several years, I've developed over 1 Million subscribers on my YouTube channel. During that time, I've gained a new level of appreciation for being prepared during these times of uncertainty and have learned from the community's insight. I've created this quick guide to help you prepare an essential aspect of preparedness: water!

WHY YOU NEED WATER

It would seem obvious, but it's important to remember that you can survive about 3 minutes without air, three days without water, and three weeks without food. Knowing this, many who take a casual or partial approach to emergency preparedness fail to set aside and plan for the water they may need after a disaster. Even if it frequently rains where you live or lakes and waterfalls surround you, drinking that water from the wild can be dangerous. In addition to viruses, bacteria, amoebas, toxins, and pollutants in the water, it may be tainted by whatever chemical, biological, or radioactive materials that come from whatever disaster you just faced.

In the last few years, we have seen hackers attack municipal water supplies[1] in an attempt to adjust the[2] chemical mixture of sodium hydroxide to a toxic level. From one high-profile attack in Florida[3], we learned that it could be done. Still, we also learned that our critical infrastructure is sometimes running on very old software that's highly susceptible to cyber-attacks– in this case, Windows 7[4] , which was unsupported with updates and was first released 15 years ago. From this incident, many were shocked to find out that some of our infrastructure systems are still running Windows 98[5] . I'll save you the trouble of doing the math on that and tell you that the software is 26 years old.

It's not just old software on aging systems; the infrastructure components are also old and failing. We take for granted how easily we open a tap on a faucet, and the water flows to us. After a storm, however, municipal water systems

1 https://cyberscoop.com/pennsylvania-water-facility-hack-iran/
2 https://www.nbcnews.com/tech/security/hacker-tried-poison-calif-water-supply-was-easy-entering-password-rc-na1206
3 https://www.theverge.com/2021/2/8/22273170/hackers-water-treatment-facility-florida-hacked-chemical-levels-changed
4 https://abcnews.go.com/US/outdated-computer-system-exploited-florida-water-treatment-plant/story?id=75805550
5 https://lanaiwatercompany.com/wp-content/uploads/2017/09/Manele-SCADA-Project-RFP.pdf

can be inundated with toxic runoff waters carrying every form of bacteria, pesticide, industrial chemicals, and more.

In 2022, severe flooding in Mississippi caused significant damage to a crucial pump at Jackson's primary water treatment facility. This resulted in approximately 150,000 residents in the city without safe drinking water. Due to the water shortage, residents had to line up for over a week on streets and highways across the city to collect water from distribution sites. The overwhelmed pump's backup pump had been broken for a while. Then, when these infrastructure systems fail, we frequently find that the massive component was manufactured overseas and is no longer available for importation.

Texas experienced a severe winter event in February 2021, also known as the Texas Snowpocalypse, Snowmageddon, and Snowvid.[6] The temperatures were so cold, and the state was without power. It was just a short while before pipes started bursting in homes and businesses. These bursts render the water undrinkable without treatment and damage the structure where they occur. As enough lines break, water flow further down the line is reduced to a trickle or drops to nothing.

Sadly, these are just three out of hundreds or thousands of infrastructure failures. We heard about these in the news, and they raised other questions about the fragility of our existing infrastructure systems and the ability of antiquated systems to keep up with explosive population, residential growth, and extreme weather events. And, if you think you're safe because you rely on well water, you might want to think again. Every year, we witness industrial accidents[7] and conduct tests to realize that even that seemingly safe water supply is highly susceptible to contamination.[8]

If you have well water, take the time to test it and understand what may be seeping into it. Water testing kits are available online and at many hardware stores but are limited in the scope of the results they provide. If you have never tested your well water, connect with the Drinking Water and Wastewater Laboratory Network[9] and have a test done. They aren't very expensive, and the results will be more detailed. Especially consider this every few years if you live in an industrial, agricultural, or fracking area, or anywhere near a spill site.

While most municipal water departments release an annual report of the water

flowing to your home, you might also consider a home test kit. The

6 https://www.ncei.noaa.gov/news/great-texas-freeze-february-2021
7 https://www.nbcnews.com/health/health-news/ohio-train-derailment-hazardous-chemical-polluted-air-rcna93640
8 https://fortune.com/2023/10/26/water-use-private-wells-contaminants-cancer-minerals-rural-america/
9 https://www.epa.gov/waterlabnetwork

chemicals and contaminant levels water departments are “required” to report, and what you might want to know about may not be the same. Their routine testing may not cover emerging contaminants like pharmaceuticals and endocrine-disrupting compounds. Industrial chemicals specific to certain regions, microplastics, and a broader range of pesticides and herbicides are also areas that may not be routinely tested. Additionally, the potential presence of radioactive elements like radon and uranium, harmful algal blooms producing toxins, and specific viral contaminants may not be part of standard testing procedures. Regular updates to testing protocols based on evolving scientific knowledge can enhance the ability of water departments to address emerging threats and maintain water quality standards.

Suffice it to say you need safe, clean drinkable water to survive even three days. You need it to drink and stay hydrated for all your body’s chemical processes. You also need it for hygiene, first aid, food preparation, sanitation, cleaning, livestock, and agriculture. To ensure you have the water you need after a major disaster, you need stored water, a means to collect water from the wild, and the ability to filter and treat water to make it safe for consumption. Collecting water from the wild without proper equipment (e.g., containers, drinking water-safe hoses, pumps, filters, etc.) can be challenging. Accessing water from lakes, streams, or rivers, especially frozen bodies of water, can be treacherous. Untreated water from these sources or public fountains can be deadly.

HOW MUCH WATER DO YOU NEED?

Government groups, like the CDC[10] and Ready.GOV,[11] suggest that each person should have a 3-day supply of emergency drinking water stored. By this, they mean one gallon per person, per day, solely for drinking. FEMA and the Red Cross[12] suggest enough per-person supply of one gallon per day to last for two weeks. All of these groups assume that help and relief will come for you within that timeframe. Unfortunately, relying on the government or an NGO to respond and get through to you may be foolish. Increasingly, we are witnessing more extreme disasters spanning more prolonged periods.

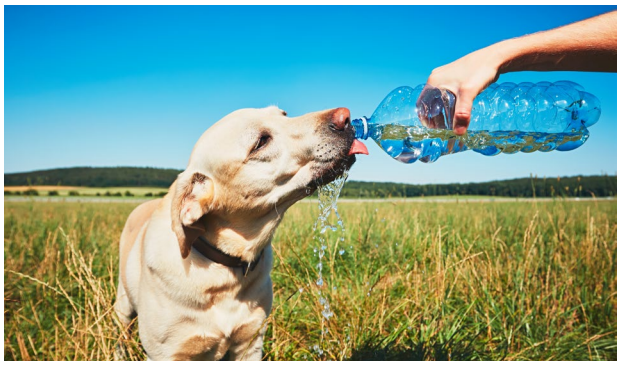
While the estimations of these groups vary, I will simplify it for you and explain how they come to these numbers. An adult male needs 15.5 cups of water daily to maintain sufficient minimal hydration. A woman needs slightly less (12 cups), and a child even less. They simply round up to 16 cups (8 ounces per cup), which is one gallon (128 ounces). [13]

You must also realize that you might derive water from other fluid sources such as coffee, tea, juice, fruits, and vegetables. These calculations, too, are only for the purpose of hydration. They don't account for hygiene, sanitation, or other uses. The hydration numbers are at the high end for a large adult male. They also assume that your water needs may significantly increase in a post-disaster environment when your body is exposed to the elements or your work is more arduous. So, as a guideline, one gallon per living creature in your home is probably good. I would take it a bit further and

10 https://www.cdc.gov/healthywater/emergency/creating-storing-emergency-water-supply.html
11 https://www.ready.gov/kit
12 https://www.fema.gov/pdf/library/f&web.pdf
13 METRIC CONVERSIONS: A woman needs slightly less (approximately 2.8 liters), and a child even less. They simply round up to 3.8 liters (240 milliliters per cup), which is one gallon (3.8 liters).

make it a gallon and a half to allow for a longer time, and the many other water uses like hygiene, first aid, and sanitation. As for the time, I strongly suggest three weeks as your bare minimum. More is, of course, better.

The numbers don't account for pets, either. Depending upon what pet or pets you have, you will want to consider their post-disaster water requirements. Also, understand that dogs and cats can drink water from the wild with far lower risk to their health.



Dogs can often drink water from the wild without getting sick due to their natural resistance, including stomach acidity, a strong immune system, instinctive behavior, and adaptation, but it's advisable for pet owners to monitor their dogs in unfamiliar environments and provide clean water to minimize potential health risks from contaminants. Your pets aren't entirely immune to bacteria, parasites, or toxins.

Your equation for how much water you need to have stored is this:

# of living creatures x 1.5 gallons each x 21 days.

For example, a family of 4 with one dog would be 5 x 1.5 x 21 for a total of 157.5 gallons needed for three weeks. Of course, if you are rationing or someone requires less water, you may be able to stretch that water supply for longer. If you take in a few relatives or friends after a disaster, you will have enough with some careful planning and rationing.

For a family of 4 with one pet:

- CDC, Ready.GOV suggest 12 gallons (3 days)
- FEMA, and Red Cross suggest 56 gallons (2 weeks)
- City Prepping suggests 157.5 gallons (3 weeks and beyond minimal hydration)

HYDRATION

Maintaining hydration after a disaster is really the key to survival. Dehydration occurs when fluid intake is insufficient to meet the body's needs. The extent of chronic dehydration can vary among different demographics, regions, and age groups. Some recent alarming studies, however, indicate that 75% of Americans are chronically dehydrated.[14] That means that when a disaster strikes your area, it's likely those in your community–up to ¾ of them– are going into the water-deprived aftermath of a disaster, already lacking the water their bodies need to survive.

Dehydration can significantly reduce your chances of surviving a disaster by inducing fatigue, impairing cognitive function and decision-making, and triggering feelings of irritability and anxiety. Moreover, the delayed onset of thirst as an indicator of dehydration and the potential link between chronic dehydration and kidney stones highlight the critical importance of maintaining proper hydration levels, particularly during high-stress situations or intense physical activities.

In a survival situation, the crucial question arises: should one sip or drink water? The significance of this decision lies in the fact that the brain is the last organ to receive hydration. It is well-established that impaired judgment during survival scenarios can lead to fatal consequences,[15] even in the presence of accessible resources that could otherwise be employed for self-preservation. The second day without water is a critical threshold as the brain ceases to function optimally, extending survival but rendering the individual incapable of aiding themselves, resulting in a challenging and unpleasant predicament.

Contrary to a common misconception that prompts individuals to conserve

14 https://www.dripdrop.com/blog/health-wellness/6-dehydration-facts-may-surprise
15 https://www.foxnews.com/story/utah-survival-school-where-man-died-of-thirst-to-allow-water-bottles

water by sipping it sparingly, survival experts emphasize the importance of drinking rather than sipping even when water is scarce. The rationale behind this advice is supported by various sources, underlining the critical role of hydration in maintaining cognitive function. In a survival scenario, the emphasis should be on consuming available water judiciously to sustain both physical and mental capacities, recognizing that the brain's well-being is paramount for effective decision-making and resource utilization. Whether to ration your water or not depends on your resources, but we suggest an 8-ounce (one cup) per hour sipping schedule if your supply is sufficient.

So, here are my quick tips and tricks to stay hydrated after a disaster:

- **Start a hydration schedule:** Especially if water reserves are high, remind yourself and others to drink at least a cup of water every hour. Dehydration is a slow process that comes on quickly once it has a hold of you. Rehydration is also a slow process. Sipping water regularly ensures you are providing your body with what you need.
- **Monitor hydration signs:** Be aware of signs of dehydration, such as thirst, dark urine, dizziness, or fatigue, and address them promptly by consuming fluids. The color of urine can be a helpful indicator of hydration levels, with lighter-colored urine suggesting good hydration and darker urine potentially indicating dehydration. However, other factors like medications, foods, and medical conditions can also influence urine color. It's essential to consider other signs of dehydration, such as thirst, dry mouth, dry skin, fatigue or weakness, sunken eyes, or dizziness and lightheadedness.
- **Hydrating Foods:** Opt for hydrating foods like fruits and vegetables to supplement your water intake with added nutrients. The fibrous nature of these foods aids in distributing water through the digestive tract for consistent hydration. When dealing with canned foods, check sodium levels, but consider repurposing the packing liquid by diluting it with water or incorporating it into your cooking.
- **Add flavor and electrolytes:** a little flavor will make drinking water easier, and electrolyte or mineral solutions will enhance nutrition and hydration levels. Even just a pinch of Himalayan Sea Salt will give you trace minerals and enhanced absorption.[16] Sodium is crucial to maintaining adequate hydration; the body loses salts as it sweats. A slice of lemon can turn a bland glass of water into a refreshment.

16 https://www.health.com/does-adding-salt-to-water-help-hydration-7550827

YOUR WATER SUPPLY

Some of the solutions I present here can be scaled up for more extensive use when you are at your safe location, but the focus is on storing, filtering, or treating water for personal daily use.

Storing Options

The question of how long water can be safely stored lacks a straightforward answer due to various factors. Water doesn't have a strict expiration date, but its safety depends on factors like microbial growth, chemical contamination, and storage conditions. Water stored for many years may take on chemicals from even safe containers from the leeching process. It may develop algae or bacterial growth from contamination. It may taste funny. Don't throw it out, though, because this is why you also need to make sure you have the means to treat or filter your water- even your stored water if need be.

There are three water categories:

1. **Wild** - this is any water you have collected from creeks, wells, rivers, rain, or any other

natural precipitation source from nature. It must be treated to render it drinkable. Drinking wild water poses various risks due to potential contamination. Common problems include:

- Pathogens: Wild water may harbor harmful bacteria, parasites, and viruses that can cause severe illnesses.
- Chemical Contaminants: Natural water sources may contain pollutants, chemicals, or toxins harmful to human health.
- Sediment and Particles: Untreated water from the wild often contains visible impurities like sediment and particles that can affect taste and safety.
- Microorganisms: Protozoa and other microorganisms in wild water can lead to waterborne diseases and infections.

- Additionally, consider seasonal challenges, such as during the winter when these sources can be dangerous to get water from in icy conditions.

2. **Stored** - this is any water you have thoughtfully stored away, including water purchased

in containers or water you have pre-treated and stored. It has likely been pre-treated in some way at the commercial or municipal plant before your storing of it. Common problems that may develop in water stored for a long time include:

- Stale Taste: Over time, stored water may develop a flat or stale taste due to the absorption of odors and flavors from the storage container.
- Microbial Growth: Extended storage provides an environment conducive to microbial growth, potentially leading to the presence of bacteria, algae, or other microorganisms in the water.
- Container Leaching: Water stored in certain containers for a prolonged duration may experience leaching of harmful substances from the container material into the water, compromising its safety and quality.

3. **Treated** - this is any water you filter or chemically treat to render the water safely consumable. I will address several methods of this further along in this document.

Stored Water

To ensure water longevity, use opaque, airtight containers stored away from light and air exchange. Chlorine can be added to prevent microbial growth, and chemical contamination is avoided by using food-grade containers. Temperature stability is preferred. Despite technically indefinite safety, a general practice of rotating stored water every six months is recommended to maintain freshness and quality.

Potential issues like flat taste or plastic aftertaste after six months can often be addressed by aerating the water before consumption. Simply pouring the water between two containers a few times can eliminate flat or plastic tastes in water. Filtration, aeration, or chemical treatment upon retrieval ensures safe drinking. While water doesn't go bad technically, adhering to best practices enhances its taste and quality. Having a plan for approved container use, proper storage, and periodic rotation ensures a reliable water supply in emergencies.

FACTORS LEADING TO WATER CONTAMINATION

The three main reasons for water spoilage are microbial growth, chemical contamination, and external chemicals. Precautions include using sealed, opaque containers to prevent microbial growth and avoiding harmful chemicals in storage. Chlorine is recommended for long-term storage. Here are some storage considerations:

1. **Chemical Contamination from Containers:** Chemical contamination may arise from using containers that store non-water substances. Reusing non-approved containers may lead to harmful chemical leaching. Do not use non-food-grade containers, and know the source of used containers. If you don't know the source of the container, understand that some chemicals (pesticides and other deadly compounds) may be odorless and tasteless, and they can be absorbed into the plastic. These chemicals might not kill you instantaneously when you drink the water you stored in them, but they may result in serious health complications later or even death.

   Food-grade containers using

   polyethylene-based plastics (#1, #2, #4) will always be your best bet for the safest storage of drinkable water.
2. **Temperature and Storage Location:** Ideal water storage involves placing containers in temperature-stable locations. While a very hot environment could accelerate microbial growth, many people store water barrels in toasty garages without issue. A gallon of water is slightly over 8 pounds (8.34 pounds, or 3.78 kilograms). So, for our example from earlier, of a family of 4 with one pet, that would be a weight of 1,314 pounds. Consider that when storing your water, and while it would be ideal to store it all in one place, that

might not be possible. Here are several places to store water:

- Cases of bottled water can range between 3 and 6 gallons of water each. A case of canned water is just over 1 gallon of water.
- Flat or square containers may be used to stack water or store it under beds. These tend to come in sizes of 3, 5, or 10 gallons each.

- Water bladders, collapsible containers, or Water BOBS can be filled in the immediate minutes before a disaster strikes to provide anywhere between 60 and 100 gallons of water. With that in mind, our same family could store 60 gallons of water and deploy a 100-gallon emergency water bladder in the bathtub to quickly achieve their 3-week supply.
- Pantries, closets, under stairs, outside sheds, vehicles, and cabinets under sinks are all places where you could store a few gallons of water for emergencies. Just make sure that if there is any possibility of freezing, your containers are only 4/5ths filled to accommodate ice expansion.

3. **Preventing Chemical Contamination from Surrounding Area:** Airtight, approved containers minimize the risk of chemical contamination from the surrounding area. Even pinhole leaks could introduce bacteria, emphasizing the importance of proper container choice and maintenance.
4. **Duration of Water Potability:** Technically, water remains safe indefinitely if treated or filtered upon retrieval. Though a common practice is to rotate stored water every six months, there are many instances where people have successfully used water stored for years without issues.
5. **Addressing Taste and Aroma After Storage:** After six months, stored water may develop a flat taste or plastic aftertaste. Aeration before consumption, achieved by stirring or pouring between containers, helps mitigate these issues. Various filtration methods ensure safe drinking, including using a life straw, charcoal filtration, Brita, Berkey, ProOne, boiling, or chemical/UV treatment.
6. **Benefits of Rotation Practice:** While technically not mandatory, rotating water every six months provides advantages, such as ensuring storage techniques work and keeping one focused on water as a resource.

If properly managed, stored water won't cause immediate harm but may taste unpleasant. When in doubt about water, always seek to filter and treat it, even if you know the origin and storage of the water. Even the cheapest charcoal filter storage pitchers can provide some layer of protection.

TREATMENT AND FILTRATION OPTIONS

If you are on the road and the only water you can get is in the wild, it could contain viruses, bacteria, protozoa, toxic algae, deadly amoebas, or chemical contaminants. Any one of those can make you violently ill and unable to move any further. If you are fleeing a disaster, your journey can end with just a few drops of tainted water. Because of this, you must have the means to filter or treat water in your bug-out bag to make it safe enough to drink. Here are the most common treatment and filtration methods:

1. **Commercial & Natural Filtration:** Commercial filtration involves individual filters and straws, varying in price, method, and micron filtration levels. Some deadly biological contaminants can be smaller than 35 microns, posing a challenge and highlighting the need for proper filtration. Personal devices like the MiniSawyer and personal straws offer affordable solutions, filtering down to 0.1 microns.

However, they may not handle chemical contaminants, have limited lifespans, and can be damaged by freezing. Gravity-fed solutions, such as gravity bags, are recommended for stationary locations, and they are capable of filtering larger quantities for groups post-disaster. High-end systems like Go Berkey and ProOne, while more expensive, excel in

comprehensive contaminant removal.

- In extreme circumstances, natural but less effective filters can be constructed using a repurposed plastic bottle. This involves layering cloth or moss, fine sand, charcoal, coarse sand, pebbles, and rocks topped with another layer of fabric. This DIY filter effectively strains out particulate matter and neutralizes toxins. Another natural option involves digging a hole near a lake or stream and collecting water as it fills from the bottom. However, this should only be a last resort due to potential soil contamination and the risk of tainted water from decomposed animals or animal feces.

2. **Chemical Treatment:** Chemical treatment methods have been utilized for years in the wild to make water safe for consumption. Common additives like bleach, hydrogen peroxide, sodium hypochlorite, chlorine dioxide, calcium hypochlorite, and iodine effectively neutralize waterborne pathogens.

One common brand, Potable Aqua iodine water disinfection tablets, was developed by Harvard University in conjunction with the U.S. Army in the 1940s and has been used by the military for emergency drinking water disinfection since then. While some treatments may leave a mild chemical taste, they are widely employed by hikers and military personnel in the wilderness. Iodine or hydrogen peroxide are considered simple options. Using a 2% tincture of liquid iodine, add five drops per quart or twenty drops per gallon, waiting at least 30 minutes before drinking. Hydrogen peroxide, at two tablespoons per gallon, requires a 24-hour waiting period, allowing sediment to settle. Chemical additives offer the advantage of compact

portability, enabling the purification of large volumes of water with minimal storage. A 1-pound bag of calcium hypochlorite with 65% available chlorine can treat about 10,000 gallons of water. Bleach, though less effective on the go, works in emergencies, requiring about ten drops per gallon with a waiting period before safe consumption but may have harmful additives. Whatever chemical treatment you decide upon, ensure you know how to utilize it, but do make sure you have some form of chemical treatment in your preps.

3. **Light Treatment:** Light treatment, employing UV light pens or built-in bottle lights,

represents a modern and efficient method to eliminate waterborne pathogens. Stirring the light in water or using a bottle with built-in UV light effectively neutralizes pathogens by disrupting their DNA, preventing reproduction upon ingestion. It targets viruses, bacteria, and protozoa without removing minerals or pollutants. UV lights come in three types: A, B, and C, with C-band wavelengths being the most effective against organic matter. This technology has drawbacks. UV devices are heavier, bulkier, and pricier, starting around $60. They are susceptible to breakage and require a power source for charging. While effective for treating raw water if well-maintained, it may not be the most practical option for every situation.

4. **SODIS** - In dire situations, exposing water to sunlight in a clear container can offer some UV treatment, albeit with limitations in neutralizing all pathogens. This method combines UV light treatment with pasteurization, requiring extended sun exposure, and is less effective compared to dedicated UV water purification devices. Solar water disinfection, or SODIS, utilizes solar energy for portable water purification, specifically targeting biologically-contaminated water containing bacteria, viruses, protozoa, and worms.[17] However, non-biological contaminants may demand additional treatment. SODIS integrates solar photovoltaics panels, solar thermal heat, and solar ultraviolet light to induce electrolytic processes and generate oxidative free radicals for pathogen damage. The technique also incorporates solar thermal heat and ultraviolet light in repurposed PET plastic bottles for effective water disinfection.

   The household application of SODIS involves selecting transparent PET bottles, filling them with water from potentially contaminated sources, and exposing them to sunlight. The bottles are placed on reflective surfaces to enhance heating. SODIS is considered effective in regions with high solar radiation, and educational initiatives are essential to ensure proper implementation. The method offers an economical and environmentally friendly alternative where fuel availability is limited, though its suitability depends on factors such as water turbidity. The cautionary aspects of SODIS include considerations regarding bottle material, aging, container shape, oxygen levels, potential leaching of bottle material, regrowth of bacteria in the dark, and the method's limitation in removing toxic chemicals. Studies suggest SODIS, along with other household water treatments, can significantly reduce waterborne diseases and diarrhea, contributing to improved public health.

5. **Pasteurization:** Pasteurization, often overlooked in survival discussions, is a

17 https://en.wikipedia.org/wiki/Solar_water_disinfection

highly effective method for purifying water through heat treatment. While it doesn't sterilize water instantly, it significantly reduces pathogen loads based on temperature, contact time, and pathogen heat resistance. Simply put, a lower than boiling temperature over a very long duration of an hour or more results in pathogens dying off. Achievable at a lower temperature than boiling, pasteurization at around 160 degrees can be accomplished with a simple solar oven made from materials like tinfoil, plastic wrap, and a pizza box, reaching temperatures up to 200 degrees.[18]

For optimal pasteurization, a non-insulated stainless steel container painted black is recommended, as it efficiently absorbs and retains heat. The goal is to elevate and maintain the water temperature within the range of 120 to 212 degrees. Non-insulated containers are suitable for placing near heat sources or small fires without boiling the contents, enabling controlled heating. Exercise caution with glass containers, as non-tempered glass may crack or explode due to air bubbles.

6. **Boiling:** Boiling stands out as the most effective method to transform raw, contaminated water into a safe, drinkable form. I put it nearly last here, though, because I want you to know your many options if boiling water isn't possible. Boiling for several minutes ensures the destruction or inactivation of protozoa, bacteria, and viruses while also eliminating impurities and pollutants lighter than water. Water is considered boiling when it reaches its boiling point, which is 100 degrees Celsius (212 degrees Fahrenheit) at standard atmospheric pressure. However, the boiling point changes with altitude and pressure variations, being lower at higher altitudes and higher in increased pressure conditions. Combining boiling with an evaporation collection system provides the ultimate water purification.

Achieve a rolling boil and maintain it for at least a full minute, then allow the water to cool before transferring it to clean containers. To enhance purification and introduce micronutrients, consider boiling water with wild plants possessing astringent qualities, such as pine needles, rose hips, or Oregon grape. A simple tea like this can enhance hydration and further neutralize potential pathogens or biological contaminants. When your container can't be directly heated, rock boiling can be employed by dropping heated rocks into the water. While boiling water in a plastic bottle over a fire is feasible in desperate situations, it's not ideal for long-term consumption due to potential substances released from the plastic into the water. You don't need fancy containers to boil your water. Any pot will do, and if you can expose that vessel to the high heat of an open fire, even better. Boiling is the

18 https://youtu.be/DaiGiRqCTQw?si=TbpNLpEG5O91qYc7

most effective means to create clean, drinkable water.

7. **Evaporation:** Evaporation techniques offer a water purification method by utilizing the sun's heat or other heat source to evaporate water and subsequently collecting the vapor, effectively freeing it from pathogens. Solar stills come in various forms, all relying on sunlight as a means of collecting water vapor. The problem here is suitable and prolonged sunlight is necessary to obtain a steady evaporation rate.

   One simple but small-scale approach involves two angled bottles connected at their openings. The lower bottle, containing dirty water, heats and evaporates, with the vapor collected in the upper bottle. Adding a straw hole in the bottom facilitates easier water collection, although the output may be limited.

   A larger-scale evaporative still can be created by covering a contained water pool with a clear plastic sheet during peak sunlight. This method produces slightly more drinking water with a small pebble at the center to create a downward cone and a collection container underneath.

   A larger solar still can be constructed using materials like a metal shed for a more substantial solution. Sealing the structure, painting it black, and directing the collected evaporates to a container provides a decent daily water supply. It's crucial to trap the evaporates and create a cool collection area for condensation. Various solar still designs, from baggies over leaves to shed-based setups, exist, but it's essential to acknowledge that evaporation techniques are time-consuming and yield relatively low production.

It's crucial to pre-treat water when possible and consider factors like water source purity and potential contaminants. Whatever water treatment and filtration method you choose, it is always more effective to combine two filtration and treatment methods and to wait the full amount of time required to allow the treatment to reach its full effect.

PLACES TO FIND WATER

Discovering water sources in urban areas after a disaster is crucial for survival. When collecting water for treatment or filtration, always collect the clearest water from moving sources. This will significantly reduce bacterial, virus, and protozoa load in the water. Even flowing water is not free from foreign, harmful elements or pollution. I heard it explained this way: a beaver can release billions of giardia spores into the water, but it only takes about ten of those billion cells to make you sick. If you are in an urban environment, collecting water can be trickier, and it may have already been treated once. You definitely don't have beavers in urban environments. Still, there are millions of types of biological and chemical contaminants that can wash into your water supply in the aftermath of a disaster that are detrimental to your health. After a disaster, municipal treatment systems can be overwhelmed or fail, so filtering or treating your water is still your best option. A Sillcock key is needed to access water in an urban environment.

Here are several places to find water when the tap stops running:

1. **Your Home:** Prioritize filling containers, sinks, and bathtubs before a storm. Capture water from melting ice, or pipes, even if municipal water stops, as gravity-fed water may still provide some supply.

2. **Canned Foods:** Utilize water from canned foods, including fruit syrups and saltier brines, to obtain vital electrolytes. Dilute saltier brines with stored water before consumption.

3. **Toilet Tank:** Consider the clean water in the back tank of your toilet as a potential source after a disaster strikes. Treat and filter before consumption, if needed. Do not use the water if the tank has cleaning tablets or chemical treatments. It may be used for bathing but may contain chemicals that are toxic if consumed.

4. **Irrigation Lines:** Tap into irrigation lines in your yard for a potential water source. Use a hand pump and be cautious of water safety, treating, and filtering as necessary.

5. **Transpiration and Plants:** Capture small amounts of water through transpiration by placing plastic bags tightly over leaves. Be cautious of toxic plants and experiment beforehand.

6. **Harvesting Rain:** Utilize tarps to collect rainwater effectively. Calculate potential water collection by multiplying tarp square footage by inches of rainfall and .62.

7. **Fire Hydrant:** While not recommended due to legal and safety concerns, hydrants can provide municipal water if necessary. Use extreme caution and have appropriate tools.

8. **Commercial Buildings:** Use a sillcock key to access external water outlets in commercial buildings. Even if the water supply is out, draining the stored water in pipes is possible.

9. **Ponds, Fountains, and Pools:** Exercise caution with these sources due to potential organic and chemical contaminants. Future videos may cover safe water treatment methods.

10. **Springs and Wells:** Explore historical areas to identify abandoned wells and springs that can serve as hidden water sources during a crisis.

11. **Lakes, Creeks, Streams, & Rivers:** Exercise caution with natural water sources, observing signs of contamination. Look out for an oily sheen on the water, dead fish or wildlife, absence of all life, foam, or any unusual discoloration or cloudiness. Proper filtration and treatment are essential for ensuring the safety of water consumption in such environments.

12. Hot Water Heater: Extract water from your water heater by following safety steps, providing access to 40-50 gallons. Share knowledge with neighbors for mutual benefit.

a. Turn off electricity or gas:
   i. For electric water heaters, switch off the circuit breaker.
   ii. For gas water heaters, close the gas valve (located on top) by turning the knob from “On” to “Off.”

b. Preserve water tank cleanliness:
   i. Close the supply valve to the tank to prevent contamination during water restoration.
   ii. Use restored water for flushing toilets and cooking, but not for drinking.

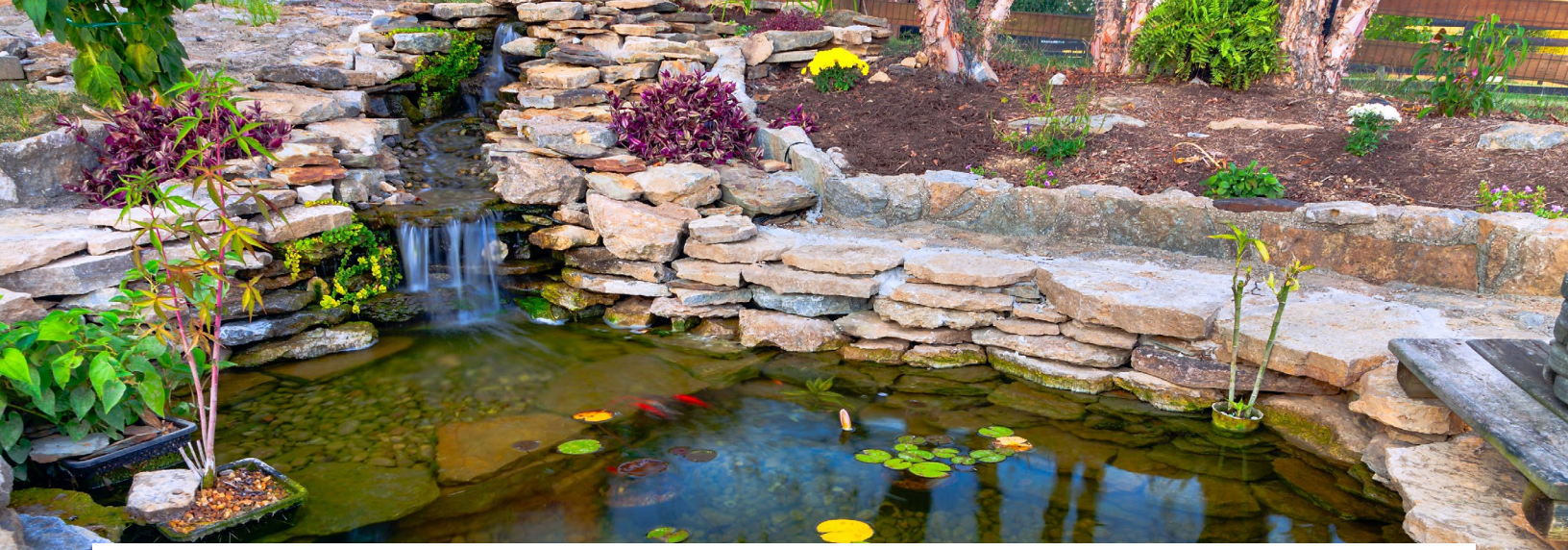
c. Identify and handle valves:
   i. Differentiate between ball valves (1/4 turn) and traditional gate valves (multiple turns).
   ii. Locate the draining valve at the tank bottom for collecting clean drinking water.

d. Connect and flush:
   i. Connect a short garden hose to the drain valve.
   ii. Briefly open the valve to flush out debris.
   Ensure the hose, drain, and container are clean before use.

e. Remove sediment:
i. Open any hot water tap in the house to allow air into the tank.
ii. Remove sediment that collects at the tank bottom. Sediment in drinking water settles over time and is generally harmless. This flushing technique will likely result in sediment in your collection container. It will sink to the bottom after some time, or you can filter the water to remove it. Generally, the sediment is just hard-water minerals and is harmless.

Water safety:
The tank is not made of inert material but is likely lined with glass. Water from the heater is safe to drink, but consider purifying or filtering it in emergencies. Replace the original valve with a ball-valve drain assembly for better functionality.

After exhausting stored water, understanding and locating water sources around you are critical for long-term survival.



LARGE-SCALE CHEMICAL TREATMENT

Many are surrounded by water after hurricanes and floods, but drinking any of it will kill them quickly. Maybe you have a pool, pond, lake, or fountain where you can collect or store hundreds or thousands of gallons of water. You have to know how to get water in the wild, and you have to know how to make that water drinkable. Pool shock (calcium hypochlorite) can be used for large-scale first treatment of biological contaminants. If you are working with large amounts of water, it can at least be effective to make a bleach solution capable of killing biological contaminants.

Making Bleach from Pool Shock (calcium hypochlorite) - see video here:

Materials Needed:

- Calcium hypochlorite (pool shock)
- Water
- Measuring spoons or scale
- Mixing container
- Stirring utensil
- Safety gear (ventilated area, eye protection)

Procedure:

Safety First:

- In a well-ventilated area, wear eye protection.

Measure Calcium Hypochlorite:

- Measure 2/3 teaspoons of calcium hypochlorite per one gallon of water. That is going to be .66667 of a teaspoon. Since they don't make a ⅔ teaspoon, you can either use a kitchen scale to subtract a third of a measured teaspoon, or you can use a ½ tsp + ⅛ tsp for .625, which is close enough.

Mixing:

- Gently swirl or stir the mixture until fully dissolved, similar to store-bought bleach.

Usage:

Surface Sanitation:

- For basic sanitation on surfaces, use the chlorine solution directly.

Water Disinfection:

- Use one tablespoon and one-quarter teaspoon of the bleach mixture per gallon of water.
- Stir the mixture and let it stand for

30 minutes; for optimal disinfection, aim for 45 minutes of contact time.

Odor Removal:

- To remove the bleach smell, pour the water back and forth between containers.
- Expose it to sunlight and air for chlorine breakdown and rendering biological contaminants inert.

Water Filtration:

- Understand that chlorine treats bacteria, protozoa, amoebas, and viruses but does not remove pollutants or particulate matter.
- For complete water safety, consider next filtering the water.

Safety Precautions:

Handling Calcium Hypochlorite:

- Always handle, store, and mix calcium hypochlorite with extreme care.
- Follow safety precautions for eye, skin, and lung protection.
- Ensure proper ventilation during the process.

Testing:

Water Quality Testing:

- Test the finished water using chlorine and pH test strips.
- Aim for a finished water measurement of around four parts per million chlorine and a pH between 6.5 and 8.5.

Long-Term Storage:

Storage of Calcium Hypochlorite:

- Store calcium hypochlorite in a cool, dry location for its nearly indefinite shelf life.

Considerations:

Chemical Toxins and Filtration:

- While chlorine effectively treats organic contaminants, it has no effect on chemical toxins.
- If the water source is likely contaminated, consider additional filtration methods for comprehensive water safety.

Benefits:

Affordable Water Treatment:

- Calcium hypochlorite is an affordable, long-term solution for water treatment.
- Provides a sustainable and reliable water supply for emergency situations.
- Follow safety guidelines and conduct proper testing for comprehensive water safety.

PERSONAL FILTRATION & OTHER WATER DEVICES/CONTAINERS

Drinking raw, dirty water might not kill you immediately. Still, it definitely can make you violently ill or get you sick enough to lose fluids as the body tries to flush the alien invaders. The subsequent dehydration can certainly kill you. Combining one or more treatment techniques increases the effectiveness of your purification. Hopefully, you won't ever be forced to treat your water while on the road or in the wild, but you won't be able to transport all your water from your home, so it's good to have some plans in place to stay hydrated.

You can live about three days without water, but your body can begin to suffer from dehydration within a day. From dizziness, cloudy thinking, and headaches resulting in poor survival choices to tiredness when you have to be alert, irritated, dry mouths, lips, and eyes, dehydration and lack of water can quickly shorten your survival time. You may be sitting on a massive store of water, but what will you do if you have to bug-out, or you are forced out? At 8.35 pounds per gallon, even taking a couple of days' worth of personal water could easily weigh fifty pounds.

Having a personal water filtration device is an easy way to ensure the water you consume is safe to drink and free from harmful contaminants. Consider having one of these personal devices in your vehicle, bugout bag, and everyday carry bag. Some of these devices can safely filter up to 10,000 gallons of water for a person. That's enough water to keep you hydrated for months after any disaster.

- Mini Sawyer: https://amzn.to/2V0Iand - Well known by campers, hikers, and survivalists, many don't hit the trail without one of these.
- Personal Straw: https://amzn.to/3mKsksd - Also an affordable option for outdoorsmen.
- Gravity Bags: https://amzn.to/3kC7iJD, https://amzn.to/3zwOnpJ - These larger bags can be setup as a semi-permanent filtration station at a campsite.

- Go Berkey: https://amzn.to/2WDrl2n - This is a pricey option, but the GoBerkey is the portable version of the larger home filtration system that relies upon ceramic filtration.
- Drinking water safe hose: https://amzn.to/3SF6kyB If you think you will need to access water from other sources frequently, consider drinking water safe hose like those commonly used for RV'ing. I know, we all drank from the hose as a kid, but we did many things when we were young and invincible. We have discovered that garden hoses can contain lead, harmful plastics, and many other toxins. Some of those probably won't hurt you, but a lot over an extended time might.

- Personal Filtering Water Bottle: https://amzn.to/3SGrwnZ - Several brands of personal filtering water bottles are available. Read the reviews and understand the filtration levels you need, as there is a wide range of these products available.
- Water Filter: https://amzn.to/3HFBboh - Portable handpump water filter systems.
- Waterbob: https://amzn.to/3HEF5Og - Bathtub emergency water container can store up to 100 gallons of water after a disaster.
- Collapsible Water Tank Bags: https://amzn.to/4biGOpY - Collapsible water containers are an efficient means to collect and transport water after a disaster.
- Hand Pump: https://amzn.to/3UhJkqB - Hand pumps are needed to move large amounts of water between containers or to drain 55-gallon barrels.
- Spill Containment Systems - https://www.uline.com/Grp_412/Spill-Containment?pricode=WO184 Especially for under 55-gallon drums or IBC systems, these can allow you to save your water supply should your container be damaged or spring a leak.
- Water Pouches: https://amzn.to/3HEFccE -

Water pouches can be stored in emergency bags and vehicles to provide you enough water to survive for a few days after a disaster. They aren't long-term solutions, but they are better than nothing.

- Bottles or cans of water: Water bottled in plastic bottles or aluminum cans is a convenient way always to have a few days' supply of drinkable water. Because plastics and metals can leech chemicals into the water over time, be sure to rotate your supply appropriately.

In any preparedness plan, water is critical for survival, holding unparalleled significance in sustaining life during emergencies. A reliable water supply is indispensable for hydration, cooking, and maintaining essential hygiene, making it a non-negotiable element of any comprehensive preparedness strategy.

By understanding the diverse water sources available and potential contamination risks and implementing effective treatment methods, you fortify your ability to navigate unforeseen challenges with resilience. We trust that this guide proves invaluable in enhancing your preparedness, empowering you to safeguard one of the most critical aspects of survival – a clean and accessible water supply. May this information be a reliable resource in your journey toward a more secure and resilient future.

As always, stay safe out there.

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