

Civil DEFENSE

VOLUME 51

2018 Issue 1

Emergency
**WATER
STORAGE**

**CRACKING
WALNUTS**
~for Survival~

EMP
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TEOTWAWKI,
PTSD, and
YOU



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PRESIDENT'S MESSAGE



WHAT WOULD YOU DO?

Change is inevitable and it can either be resisted or embraced. We plan to embrace the changes in communication methods and information platforms at TACDA in order to fulfill our mission to help American citizens prepare for natural or man-

made disasters. You can look for many changes in the near future expanding our reach by using social media and other platforms to spread the message, but we are still planning to support our members by continuing with the Journal of Civil Defense in both printed and electronic formats.

There remains a significant need to provide useful and relevant information for individuals that are interested in preparing for natural or manmade disasters. As I write this message, I am listening to the news about another hurricane about to impact the Southeastern United States and political unrest in the United States and around the world. There is definitely a need.

We welcome input and comments from our members and subscribers and suggest that you continue to spread the word about TACDA and our mission. We appreciate your support and look forward to serving you in the future.

Jay Whimpey, PE

FROM THE EDITOR

We are pleased to present you with this valuable issue of the Journal of Civil Defense. We have worked hard to ensure that the collection of articles are informative and can be used as a valuable resource in your preparedness efforts.

I greatly appreciate our authors, who willingly donate their valuable expertise to the Journal. Special thanks to Lisa Potter, Sharon Packer and Roseanne Hassett for their work in making the Journal a success.

Please share this resource with your friends and family. I firmly believe that we are not prepared until our community is prepared. That is why we work so hard to encourage others to become better prepared for a challenging future. You can make the difference.

God bless you!

Kylene Jones
Editor, *Journal of Civil Defense*

TEOTWAWKI, PTSD, & YOU



by Cynthia J. Koelker, MD

In the aftermath of life-threatening disaster, will you react more like Humpty Dumpty or a cat with nine lives? Will you continue to experience the horror of your personal tragedy, reliving each terrifying moment, unable to go on with your life, or will you process the danger into a memory of the past which no longer holds sway over your mind and heart?

That's the difference between developing PTSD and a normal recovery. And though you may consider yourself immune to the problem, odds are that one or more of your family or friends will not be. After a significant trauma, nearly 1 in 3 survivors are at risk for developing this disabling disorder. Of all the ailments you're liable to face post-calamity, mental disturbance is surely the most likely.

Is there any way to prepare? Could you identify the problem? Can you know who will succumb?

For the past few decades the term "post-traumatic stress disorder," or PTSD, has been used to categorize the injury that victims often suffer as a result of a shattering personal experience such as rape, war, or severe

accident. The term became popular after the Vietnam War to describe and validate the horror many returning soldiers continued to experience in flashbacks and nightmares. However, the problem was recognized long ago, labeled by such monikers as battle fatigue, shell shock, and soldier's heart. No doubt the problem dates back to ancient man.

By definition post-traumatic stress disorder involves having endured a horrific incident, which then continues to surface and be experienced as stressful in a person's life well after the inciting circumstances are resolved. Reliving the event, along with associated mental and physical reactions, is the hallmark of the disorder. These are not mere memories, like looking at pictures in a photo album, but more like being trapped in a holographic video game from which there is no escape. Imagine how you would feel if constantly surrounded by armed terrorists. With PTSD these physical and mental symptoms resurface unbidden, often triggered by a thought, object, or sensation. It is very difficult to function at your best if your heart is racing, you can't sleep, or you feel hopeless, anxious, or afraid.

The diagnosis also requires persistence of symptoms

Genetic factors also play a role.



beyond a month after the actual danger resolves. Although some people will process a threatening event quickly, within days or even hours, others can take a few weeks to do so. PTSD goes beyond acute anxiety, a common short-term reaction to trauma, occurring over the first few weeks in nearly half of trauma survivors. Though health professionals may term this acute anxiety a disorder, it might also be viewed as a normal adaptation after a stressful event, depending on how badly resultant anxiety interferes with one's life. When symptoms continue unabated, post-traumatic stress disorder becomes more likely.

Are you one who is likely to suffer PTSD after a traumatic event? Is there any way to predict?

If you think about people you know, you would probably guess that those with a pre-existing mental illness such as anxiety, depression, or prior PTSD would be more susceptible, and you would be right. You might also correctly predict that the greater the trauma or life threat, the more likely PTSD is to occur.

People who react to stress in certain ways are also at great risk. Have you ever experienced a trauma as if outside yourself? Have you ever blanked out a stressful event? This tendency to disturbed awareness or perception during or immediately following a traumatic experience,

termed “peritraumatic dissociation,” puts a person at definite risk for developing PTSD.

Factors beyond your control also increase the likelihood you might develop PTSD. Are you easily hypnotized? Are your serum stress hormones chronically elevated? Does your heart race every time you feel frightened? Each of these tendencies increases the chance of a persistent stress reaction.

Genetic factors also play a role. Has your father or brother suffered from PTSD? Have your parents or siblings been treated for anxiety, depression, or other mental health disorders? Such a medical history raises not only their own risk of a PTSD reaction, but yours as well.

Naturally you cannot control these factors; hence the disorder should not be viewed as a weakness of character or mind. It is more like an injury that cannot heal, rather than an inborn or unchangeable disorder, and thus thankfully allows the hope of recovery.

What is it that keeps the mind from healing fully? Current thinking is that these traumatic memories have not been transferred correctly, from present awareness into the past. Somehow the processing has been blocked, and they remain inappropriately active within the mind, rather than being filed into the past, where resolved threats are stored. Much of this processing is thought to occur at night during REM (rapid eye movement) sleep phase. When a person is scared, hypervigilant, and cannot get adequate rest, the brain cannot properly encode these memories.

Most Americans have seen the impact of unresolved PTSD, though they may not recognize it as such –

hopelessness, broken families, lost jobs. Your local homeless shelter is a living illustration. On-going anxiety, depression, irritability, and emotional withdrawal take a terrible toll on both relationships and productivity. Effective treatment may require months of therapy and cost thousands of dollars. In a survival group situation, the incapacitation of just one productive member may weaken or threaten the entire group.

Fortunately, treatment for PTSD has been proven effective, and there are steps you can take to help your loved ones who may succumb to this condition. Successful options include drug therapy, counseling or psychological therapy, or a combination of methods.

The most effective medications belong to the class of selective serotonin reuptake inhibitors, such as Prozac, Zoloft, Paxil, Celexa, and Lexapro, which are used to treat other forms of depression and anxiety as well. These drugs tend to restore the altered chemistry that prolonged stress incites in the brain and body.

If you wonder whether stress can alter your own bodily chemicals, consider the adrenaline rush you get when someone jumps out at you from a dark corner. Though no actual harm has occurred, for a moment you felt threatened and reacted accordingly. Your mind delivered a blast of chemicals, signaling your body to be on the alert. When these signals won't turn off, as in PTSD, your brain and body don't know how to react. Medications can help improve the balance of these chemicals and their effects, allowing healing to occur.

Alternatively, non-medical “talk-therapy” has also been shown

to work. Counseling methods include cognitive-behavioral therapy (CBT), prolonged exposure therapy (PE or PET) and eye movement desensitization and reprocessing (EMDR). I will add to this what I call “grandma therapy,” that is, a loving individual who is naturally skilled at allowing a person to talk through their feelings in a safe and supportive relationship. Make sure your social network includes such a person. Though perhaps unable to chop wood or hunt game, a kind-hearted grandmother may be indispensable when it comes to monitoring and maintaining the mental health of the “worker bees.” Of the other counseling methods mentioned above, only one (EMDR) is likely suitable for the layman and will be discussed further below.

Given the statistical inevitability of encountering PTSD post-disaster within your own family or group, what could an untrained person realistically do to help such an individual?

- To begin, your social support network should be established well before disaster strikes, as this process requires an investment of time, but thankfully does not require professional involvement. However, it does necessitate that group members actually care for and talk with one another about their personal lives, not just sports and the weather. Men may find this difficult, and so actual practice is advisable before crisis descends. Ideas for team-building activities are readily available online. If you have group meetings, bonding games may help coalesce members into a tight and caring group.
- Secondly, if you are fortunate

enough to have a licensed physician available, it would behoove him or her to acquire a stockpile of the above medications before they are needed. At least one additional person needs to learn details of dosing, although these drugs can only be legally dispensed by a medical professional. One drawback is the duration of treatment, which is often prolonged and may continue beyond a year. If additional supplies are unavailable, the medication treatment option may be unrealistic.

- Lastly, some or all of your family or group should learn the essentials of EMDR therapy. Though practicing professionals might argue, I believe this is doable. And although official instruction is required to become a licensed therapist, books, videos, and trainings are available to anyone online at little cost. Having your group practice pre-catastrophe could be a great bonding experience, and for certain individuals, self-administration of EMDR is effective.

EMDR therapy is based on two primary ideas: 1) relocating the traumatic memory from the present to the past, 2) by making use of rapid eye movements such as occur while sleeping. Though some verbal interaction is involved, it does not require people to reveal their deepest thoughts or fears, but rather only to bring them to mind. A disturbing thought is first brought to awareness, and the patient is asked to evaluate how distressing the thought is to them. Next the administrator asks the client to follow his or her fingers back and forth for about 30 seconds while continuing

to hold the thought in mind. Afterward the degree of distress is re-evaluated. The process is then repeated for each thought until the distress level is diminished. Results can occur quickly, but may take multiple sessions.

Since tapping on alternate knees (or similar stimulus) may work equally as well as eye movements, success may have more to do with assisting the safe present to replace the disturbing past, somehow enabling the brain to re-catalogue troubling memories more appropriately. No one knows for sure how EMDR works, but this therapy can be as therapeutic as prescription medication. It has been successfully used after international disasters, where other treatments are unavailable. It has also been used to help individuals resolve negative feelings associated with less intense traumas, and could certainly be tried for anxiety and depression whenever medication is unavailable. The likelihood of harming an individual appears low, making it a reasonable choice for the layman to consider.

Having a working knowledge of EMDR in your survival toolkit is essential, and may well help you in your personal life even if no crisis is encountered.

Feedback from those who follow the above suggestions would be most welcome at my website, referenced below. ●

Cynthia J. Koelker, MD is the author of “Armageddon Medicine, How to Be Your Own Doctor in 2012 and Beyond,” available at www.ArmageddonMedicine.net, where you can learn more about PTSD and hundreds of other survival medicine topics.



Rainwater Harvesting: A Critical “Peace” of Being Prepared

By Jonathan B. Jones, P.E.

“EMERGENCY BREAKING NEWS: Hundreds are dead this evening and thousands more are being treated in dozens of hospitals and medical clinics resulting from a massive breach of the city culinary water system. Details are still being pieced together, but officials believe an ISIS sleeper cell is responsible for the largest lethal water supply contamination in our nation’s history.

Widespread panic has ensued as two million people scramble to find safe water for drinking and sanitation purposes. The National Guard has been called in to begin transporting water from as far as 200 miles away, but this operation will take two days to mobilize, and up to two weeks to provide enough water for other than drinking. Meanwhile, city officials are beginning the clean-up of this act of terrorism, but anticipate it will be up to 30 days or more before the city municipal water system will be fully functional. We will provide more details as they become available.”

This fictional, but very possible scenario could feasibly happen at any time!

As we prepare for whatever may come, I believe that rainwater harvesting should play a role in our plan. Depending on your climate and rainfall, this can be a tremendous water resource. For some, this may be a continuous water source that is utilized for irrigation, sani-

tation, drinking water and other purposes. For others, it may be just having the awareness, thought process, knowledge and some minor equipment tucked away for such a potential emergency as described above, or for any other situation (and there are many) that might require us to obtain an expedient supply of water. This article focuses on the latter of the two options.

There are several advantages of rainwater harvesting, not the least of which is the close proximity that minimizes the transporting of water, which, at more than eight pounds per gallon, becomes heavy very fast. Other advantages include knowing the relative quality of the water and the ability to control the resource. Although this water is not considered safe for immediate drinking, the water is generally of good quality and can be disinfected and filtered fairly readily.

How do I get this water? This article is not intended to be a design guide, but there are many resources to help you figure this out. As long as you have rain gutters, the rest becomes a fun, creative process. It is important that your water storage

be covered to maintain the quality of the water and to prevent the creation of a mosquito breeding ground.

So just how much water can I get off my roof? The math is fairly straightforward. Simply take the area of your home and multiply that by the amount of water received in an average storm. For example, my home is about 1800 square feet. A good rainstorm for our area is about a half an inch, or 0.042 feet. In this storm, about 76 cubic feet of water hits my roof. Since there are 7.48 gallons per cubic foot, this equals 565 gallons of water. Recognizing that some will “bounce” off and we will lose other minor amounts, I conservatively multiply this amount by 0.75.

Accordingly, I can collect and use at least 424 gallons from that storm, enough to meet critical need for my family for 5-10 weeks. This math helps you understand the size of catchment containers you will use. If you have fewer, more productive storms, you may want to increase your storage capacity, creating the ability to capture more for use over a longer period of time.

It should be noted that the laws on rainwater harvesting vary from state to state. Some states encourage it or allow it on a limited basis, while others disallow the practice altogether. It is my belief that nobody will object



to rainwater harvesting in a disaster or crisis situation, particularly if you are helping others in the process. If you plan to do something more permanent, check with your local water resource authorities for guidance.

As we already discussed, rainwater should be disinfected and filtered before use as drinking water to mitigate for bird excretions or other nasties. Even though the water should be fairly clean, I always recommend clarifying the water using a coffee filter, bandana, 1 micron filter bag, or other methods. This will help your filter last longer.

I feel a lecture coming on here...*this is not meant to replace the water storage you should always have in and/or about your home.* I strongly recommend that

you have a minimum of two gallons per person per day for a minimum of at least two weeks. In other words, a family of four should have a minimum of 112 gallons of high quality drinking water available to them at all times. If you have the ability to store more than this, so much the better.

Water may be stored in a variety of quality, food grade containers of various sizes. This is the best water insurance you can have. Clean stored water buys you time to figure out the next steps if it appears the crisis may become longer-term.

In a nutshell...If you don't yet have your water storage in place, make it your first priority. Water is absolutely critical for life! After securing your water storage, I highly encourage you to consider the opportunity of capturing rainwater. The relatively small investment of time and resources needed to capture and use one of nature's blessings to us can produce tremendous returns when they are most needed. ●

Jonathan B. Jones is the co-author of "The Provident Prepper: A Common-Sense Guide to Preparing for Emergencies." Visit TheProvidentPrepper.org to learn more.



The Energy Efficiency of “INSTANT POT” Type Electronic Pressure Cookers

By Jay Whimpey, PE

The “Instant Pot” type pressure cookers were evaluated for energy efficiency and overall usefulness in emergency situations and found to be quite efficient and easy to use. A 6-quart “Instant Pot” brand pressure cooker was tested. It was expected that it would be quite efficient due to the fact that it is a pressure cooker that cooks much more quickly than ambient pressure cooking and there is limited heat loss to the surroundings.

Cooking time can be halved for each 18° F or 10° C temperature increment increase because of the increase in molecular motion and thereby chemical reaction rate increase with temperature, and the fact that conductive heat transfer through solid materials is increased with increased temperature differential. Pressure cooking creates much higher cooking temperatures. Cooking in the Instant Pot was also expected to be more efficient since the heating element is contained in

an insulated housing with the food with no steam venting, resulting in much less heat loss to the surrounding air. The Instant Pot only used 220 watt-hours to cook six large potatoes over a period of about 30 minutes. The maximum current draw rate was 1000 watts so the Instant Pot can be operated with many small generators.

The Instant Pot does not vent steam during the pressure-cooking process, which also greatly improves the efficiency compared to traditional pressure cookers that vent during the entire pressure cooking time. It is also much quieter and does not make the cooking area hot and steamy in the process. There was virtually no sound from the Instant Pot during the entire pressure cooking cycle.

The electronic controls were fairly simple where either the high pressure or medium pressure setting can be selected and the number of minutes at pressure selected. The pressure cooker will heat up and start timing once the interior pressure reaches the required level and

then shut off once the time has been reached. The pressure can be vented with a manual selector knob on the lid of the cooker. The pot with contents can be removed once the pressure is released and the lid can then be rotated and removed.

Small appliances such as induction cook tops, portable convection ovens, and electronic pressure cookers could be very useful in an emergency situation due to the ease of use and low energy consumption. They can also be much safer than trying to cook with open flame in a temporary arrangement due to the fire hazards involved. Most people are used to operating small electric generators and using electricity in confined spaces carries much less risk of asphyxiation.

Although gasoline for small generators is very flammable and somewhat volatile, most individuals are used to handling that fuel. Store gasoline in small containers. It is recommended that you use gasoline without ethanol and that you add stabilizer as soon as it is purchased. Gasoline stored for emergency situations can be rotated on a regular basis by using it in lawnmowers or motor vehicles.

Small generators and small portable electric cooking appliances are also relatively inexpensive, easy to operate, and portable, making them very useful in emergency situations. Cooking food helps eliminate any harmful organisms and is probably even more important in emergency situations due to the possibility of food contamination or spoilage and less than ideal sanitary conditions. Medical attention is also much less available in emergencies. It is suggested that you consider investing in such equipment in order to help cope with any situations in the future when normal utilities are interrupted. ●



Stay and **DEFEND!**

*By Colonel Jim Smith,
MSS, NRP, FABCHS,
CPC, CLEE*

The ability to isolate oneself and family during a crisis is a necessity. The key is deciding when such is necessary and feasible. What circumstances could one find that might require a shelter-in-place or to be isolated from society?

During the recent severe influenza season, some families and individuals decided to implement reverse quarantine to isolate themselves from any outside contact. Although this may seem extreme, it certainly reduced the probability that the individuals would acquire influenza.

Those living in the emergency planning zone of nuclear power facilities, railroads, or chemical plants, might elect to isolate themselves during an incident in which a radioactive or chemical release occurs. This might be an emergent event in which evacuation is not feasible. With the instability of countries with nuclear weapons, a nuclear attack with resultant fallout might be an event one elects to shelter-in-place.

If one lives in a rural area in which independence and self-sufficiency is a daily way of life, this is not a difficult issue. Those living in suburban and urban areas will find themselves in a more precarious position and dependent upon external assistance.

First, what circumstances might

cause one to implement a plan to eliminate external contacts. Obviously, a pandemic would be one, but one should consider a hazardous material event, or public disorder.

The key is to have not only a plan, but also determine ahead of the incident as to what incidents will trigger isolation. The events may be foreseen and can be implemented in a non-emergent fashion while others, such as a hazardous materials incident might occur with no warning.

In several recent derailments of trains with chlorine or anhydrous ammonia, residents had little warning. In some of the incidents, those who elected to flee, did so directly into the plume with some dying and many injured. Sheltering-in-place

until the plume dissipated was the correct procedure and this information may be delivered by the emergency alert system via weather radio or media.

What does one need to have to shelter-in-place or isolate oneself? Obviously, food, water, medical supplies, emergency power (generator, solar cells, battery-operated systems and the like), battery-operated radios, defensive items, but other items which are less likely to be present might include:

- Air purifying respirator with “super filters” and chemical resistant clothing to defend against acid gases, volatile organic compounds, chlorine, and ammonia would be useful in retreating to the above ground level of the structure (most dangerous chemicals are heavier than air) should the residence become engulfed in a chlorine or anhydrous ammonia plume from a nearby truck route, chemical plant, or railroad.
- Know the threats in the area by consulting the public records from the local emergency planning committee and local Pre-Disaster Mitigation Plan (public records usually available from emergency management agency). This same device would be excellent to defend against radioactive particles, radioactive iodine from a nuclear plant incident, and radioactive fallout from a nuclear attack.
- However, these items must be fitted to the individual and the filters have a short shelf life and can be expensive. The other issue is these devices are only useful when sufficient oxygen is present and should not be used to enter a chemical plume or atmosphere which contains unknown chemicals. They are useful to prevent minor exposures from becoming

a serious medical problem. Most will filter tear gas crystals and OC droplets should these be deployed. Some filters will resist other chemicals and biological agents, but the type of filter governs this applicability and makes them useful in circumstances where airborne biological agents are deployed.

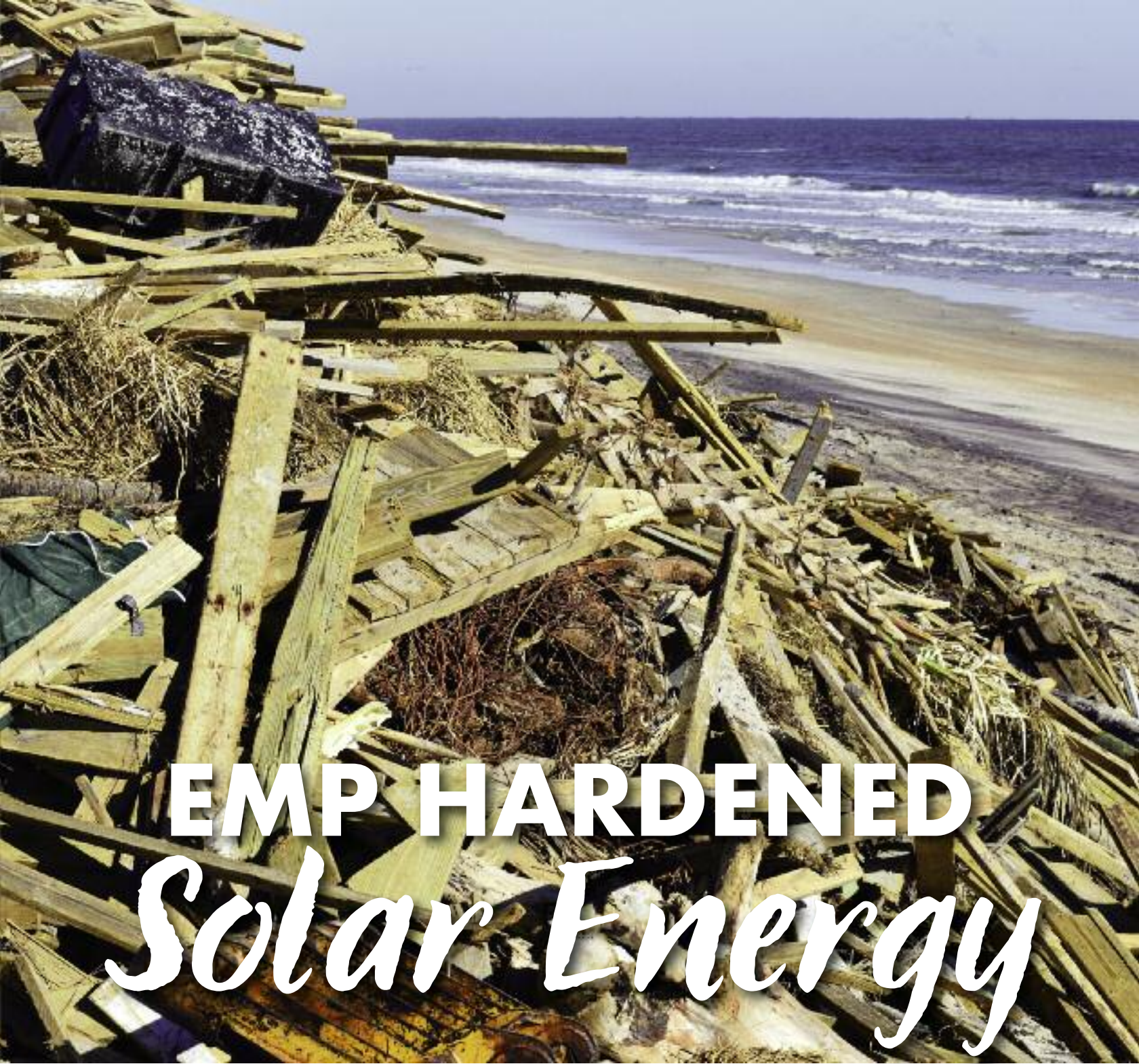
- If one is concerned regarding a nuclear incident or attack, the inexpensive older civil defense radiation detectors are useful as they can determine if radiation is present from fallout from a nuclear weapon, or if a radioactive dispersion device is present. However, these devices are not as effective with a nuclear plant incident as some of the isotopes emitted do not register easily on these older instruments. The older civil defense dosimeters can provide approximate dosage of radiation, but one must remember that these are simply guides. More expensive electronic dosimeters and modern instruments can provide a much better approximation of exposure, dose rates, and contamination. Potassium iodide (over the counter) is useful in flooding the thyroid with iodine to lessen the exposure from radioactive iodine present in radioactive fallout or from a release from a nuclear power facility.
- Defensive items may include security rated doors and windows to prevent entry into the residence or shelter. The items might include proactive defense items such as firearms and externally deployable less lethal agents such as OC (Oleoresin Capsicum). Some residences are equipped with safe rooms or use OC deployed by preplaced tubing or aerosol dispensers to discourage approach to the resi-

dence. Obviously, firearms may be needed to defend against those intent on forcing entry.

- Fire is perhaps the more significant threat when sheltering-in-place during public disorder. One should have the basic firefighting equipment in the form of fire extinguishers and fire resistant protective clothing (Nomex, PBI, Kevlar, etc.). However, the best defense against fires started by individuals to breach the residence is a prevention through offensive use of firearms to neutralize such a threat. A generator operating a well to provide a water supply that might be used to fight fires, or in the case of impinging wildfires, to saturate surrounding materials and roof materials can be valuable. The construction of the residence with the prevention of fires in mind using a metal roof, brick or block, or other fire-resistant siding, metal windows with multiple layers of glazing, are good fire-resistant materials.

The most important factor is to determine what threats are present by performing research. Plan for the common threats while not spending monies on exotic or low probability threats. Try to purchase items which have multiple uses. ●

Colonel Jim Smith is the public safety director of a rural community in Alabama. He has more than 40 years' experience in public safety and a master's degree in safety from the University of Southern California. Smith has served as a task force officer on a federal joint terrorism task force. He is a graduate of the Domestic Preparedness and Toxic Agent Program from the US Army Chemical School, is a hazardous materials technician, and health physics technician.



EMP HARDENED *Solar Energy*

The images coming out of the Florida panhandle, and from the Carolinas should remind us all of the critical need to be prepared. Like most of you, I am stunned at the numbers of people who, within a day of the

storm's passing, have *no water*, food, or makeshift sanitation. Did they not hear of the hurricane's approach? Could they not afford a dozen flats of bottled water? Some canned soup and crackers? Would it occur to them that flashlight batteries might be handy after being advised that the entire region

would lose power for days to weeks?

Seriously, folks, when considering the aftermath of long-term disasters such as hurricane, cyber attack, EMP attack, nuclear attack, etc., we should take a hard look at other branches of readiness other than food and water.

While it is possible to go Cave Man and live without power, our quality of life is vastly improved by having ample, even robust amounts of it. Ever popular are the tiny backpacker-size solar charging rigs that can recharge your cell phone, flashlight, etc. I advocate a far more ambitious position to have more than enough power to run refrigeration, communications, a well pump, lights, even running a furnace or small air conditioners during the heat of the day. In many cases, electricity will mean the difference between having drinking-water, and not.

This will require some serious investments in solid, proven equipment. Since the whole reason for having an alternative energy capability is having sustainable power when the grid is down, let's focus on off-grid systems. If all you are concerned about are conventional disasters, you will do well to review this article about off-grid inverters and take a look at the comparison chart below. <https://www.wholesalesolar.com/blog/the-best-off-grid-solar-inverter/>

If you are like me, and are con-

cerned about nuclear attack or EMP-related events, something more rugged might serve you better. A company named Sol-Ark, headquartered in Texas, designs and manufactures solar power generation systems specifically designed to thrive in a nuclear EMP environment. Unlike petrol-dependent generators, which announce their presence to everyone in the area, solar-powered generators are silent, have no moving parts, do not need a list of filters, lubricants, fuel stabilizers to keep running, and never run out of fuel.

The only catch is that one needs a correctly-sized battery bank (or one or two industrial forklift batteries) to store excess power harvested during the day, to be used when the sun is off-duty.

The user can determine what level of power is needed to meet requirements. Plan for bad weather, when the sun may be blocked by heavy clouds for days—but even on cloudy days, as much as 20% of normal power output can be relied upon to keep minimal chores addressed.

The challenge for alt-power

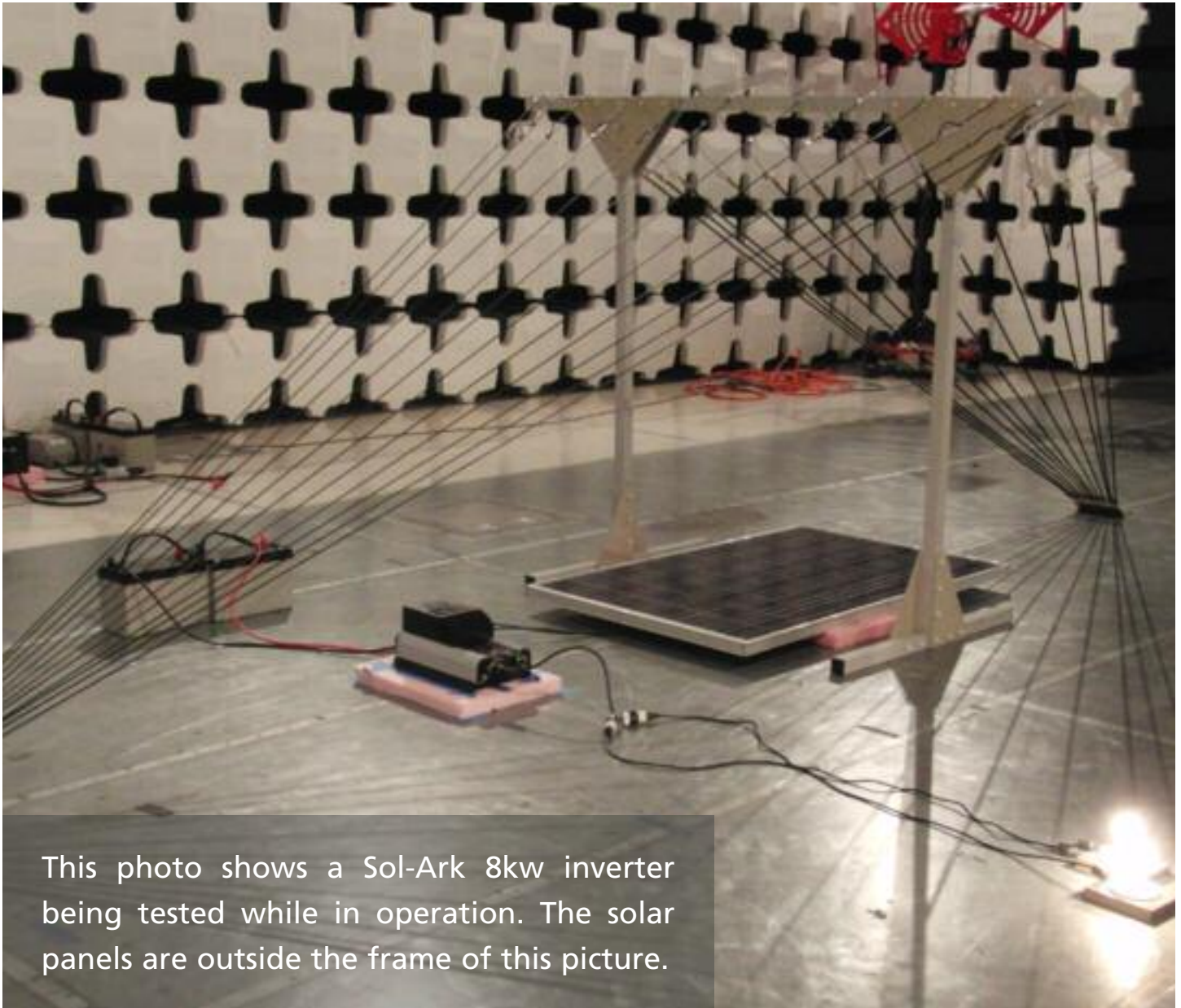
systems, like the grid, is the damage to system components by the E1 and E2 components of nuclear EMP (Coronal Mass Ejections do not have the E1 and E2 threat to deal with).

Of the two, E1 poses the most serious threat to power generation equipment because of its very fast rise time—usually from 1 to 5 nanoseconds. Surge suppression is fairly easy to build in for lightning, but E1 requires much more sophistication and careful engineering.

Solar panels are equipped with multiple technologies, enabling the panels to handle up to 8000 amps of surge, with clamp times hovering around 500 picoseconds (one half of a nanosecond). Voltages on the 35-volt, 300 watt solar panel will not be allowed to exceed 36 volts. The layout and integration of these technologies is very smartly done.

If I sound a bit obsessed about solar panels, it's because they are a critical part of your system. While solar panels in storage, disconnected from wiring harnesses, are usually able to survive insult from RF EMP (the radio-frequency compo-

| Design Type | DC Transformerless | | | | | DC Coupled | AC Coupled | |
|--|--------------------|--------------------|----------------------------|---------------------------------|-------------------|--------------------------------|----------------------------------|--|
| | Sol-Ark 8K | Outback SBX5048 | Pika X7600 + 4xS2500 | SolarEdge 7600A + 32xP400 | Darfon 2xH5001 | Outback Radian FPR-8048A | Magnum 2x4448PAE +16xGT500 | Tesla 2x Powerwall2 + String Inv |
| Inverter Continuous Power | 8KW | 5KW | 7.6K | 7.6KW (Batt=5KW) | 2x5.5KW | 8KW | 2x4KW | 2x5KW |
| Off Grid Inverter Power peak (5s) | 20KW | 5KW | 12K | 6.6KW | 13KW | 12KW | 17KW | 14KW |
| System Idle Power | 60W | 50W | | | 200W | 75W | 58W | 78W |
| PV to Batt Efficiency @ 65% | 97.5% | | 92.0% | 91.0% | 91.0% | 97.5% | 80.5% | 92.5% |
| AC to Batt Efficiency @ 65% | 96.0% | | 93.0% | 91.0% | 90.0% | 82.0% | 85.0% | 95.0% |
| Batt to AC Efficiency @ 65% | 95.5% | | 93.0% | 88.0% | 90.0% | 93.0% | 91.0% | 95.0% |
| On Grid PV to AC Efficiency @ 65% | 96.5% | 94.0% | 95.5% | 96.5% | 95.5% | 90.2% | 95.5% | 97.0% |
| Off Grid or Time of Use PV -> Batt -> AC Losses @ 65% | 7.0% | | 15.0% | 21.0% | 19.0% | 9.5% | 29.5% | 12.5% |
| EMP/Solar Flare Hardened to >100KV/m | optional | X | X | X | X | X | X | X |



This photo shows a Sol-Ark 8kw inverter being tested while in operation. The solar panels are outside the frame of this picture.

ment—they don't do so well with directly-induced surges through the wiring), the peace of mind of having panels that can soak up hit after hit after hit of EMP on powerful simulators dishing up 100,000 volts per square meter cannot be measured. Sol-Ark owns their own simulators, but have submitted their complete solar generation systems to independent laboratories for testing. Shielding panel wiring inside steel conduit may increase the survivability of a

solar array.

This photo shows a Sol-Ark 8kw inverter being tested while in operation. The solar panels are outside the frame of this picture.

It is not lost on me that solar power is making a big splash in Puerto Rico, where the heavily-damaged power grid is still in disrepair one *year* after Hurricane Maria. Sol-Ark's solar panels are very competitively priced, especially in light of proven performance in brutal testing environments.

If our country is ever attacked with an EMP, your alternative power system will be the only electricity you will likely have for the rest of your life (or not). Either have *lots* of spare panels, or have panels that are smartly engineered to serve you for many years no matter what the future holds.

I recommend reviewing the Sol-Ark website for more information on the systems they offer. They may have a system that is right for you and your budget. ●

DISINFECTING WATER

in a 55-Gallon Barrel for Long-Term Storage



By Kylene Anne Jones

This article will take the guess work out of disinfecting water in a 55-gallon barrel so it can be safely stored and ready when disaster strikes. Start by thoroughly cleaning the food grade barrel and placing it in its permanent home. Then fill the barrel with the cleanest water available.

Add 1/8 teaspoon of calcium hypochlorite (68% powdered or granular pool shock without other chemicals added) to the filled barrel and screw the lid on. Another option is to add 2 Tablespoons of *fresh* unscented bleach (sodium hypochlorite). I prefer calcium hypochlorite over liquid bleach. Liquid bleach must be fresh (less than 6 months old) to be effective and there are other chemicals in bleach that are needlessly added. However, either one will be effective in killing both bacteria and viruses.

Treatment to disinfect the water may not be necessary if your water

supply comes from a chlorinated municipal source and you feel confident that both your container and the water are clean. If you are concerned that your water source is contaminated or cloudy, you may want to double the amount of chlorine you use to disinfect the water.

You may also choose not to treat your water at the time of storage and opt to treat it before use instead. It is possible that adding chlorine to the water may accelerate the leeching of the plastic into the water. I choose to treat the water at the time of storage because I don't know what the situation will be when I will need to use it.

For more details google the term: The Provident Prepper How to Disinfect Water in a 55-Gallon Barrel. You will learn

everything you ever wanted to know about storing water in a barrel and more. Water storage is a critical component of a good emergency preparedness plan. Check your water storage today! ●

Kylene Jones is the co-author of The Provident Prepper—A Common-Sense Guide to Preparing for Emergencies and blogs at TheProvidentPrepper.org.





❧ Mexican Tortilla Lasagna ❧

Fine Dining from Shelf-Stable Food Storage

*By Megan Smith
MyFoodStorageCookbook.com*

You've had it with "just add water" meals and - survival or not - all you want is something that tastes like normal food! This Mexican Tortilla Lasagna is just the answer. It is made entirely from shelf-stable long term food storage ingredients.

MEXICAN TORTILLA LASAGNA, *continued*

Best of all, it is brought up to temperature on the stove and then transferred to a Wonder Oven to slow cook for an hour utilizing retained heat, which allows its flavors to combine perfectly. It is guaranteed to hit the spot!

Visit MyFoodStorageCookbook.com to learn more about how to use retained heat to stretch your stored fuel. Retained heat cooking is like using a slow cooker without electricity. It works like magic!

Mexican Tortilla Lasagna 🍴

Serves 8

Ingredients:

- 1 cup freeze-dried onion flakes (or one large onion diced)
- 3/4 cup freeze dried carrot dices (or 2-3 carrots diced)
- 1 cup water (to rehydrate the onion and carrot)
- 1 (28 oz.) can crushed tomatoes
- 1 (24 oz.) jar chunky salsa
- 2 (12.5 oz.) cans canned turkey, drained
- 1 (15 oz.) can whole kernel corn, drained
- 1 (3.8 oz.) can sliced olives, drained
- 1/2 cup sour cream powder (rehydrated with 3 TBS water)
- 1/2 tsp. onion powder
- 1/4 tsp. garlic powder
- 1 tsp. ground cumin
- 1 tsp. salt
- 1/2 tsp. chili powder
- 2-3 cubes Knorr cilantro seasoning (optional)
- 1 cup freeze dried cheddar cheese (with 1/2 cup cold water for rehydrating)

Corn Tortillas 🍴

Ingredients:

- 4 cups Masa flour
- 1/2 tsp. salt
- 1/4 tsp. baking soda
- 1 (15 oz.) can whole corn (I like Del Monte's brand)
- 1/2-3/4 cup water
- 1/8 cup oil
- 1 tsp. lime juice



Tools and Supplies: 🍴

Flexible Cutting Mats (set of 4)

Manual OXO food mill—non-electric tool used to puree whole kernel corn in this recipe, adding authentic corn flavor to the tortillas.

STEP 1:

Make the tortillas. Mix together masa flour, salt and baking soda. Add in pureed corn (including the water in the can), stirring with a spoon and then add 1/2 to 3/4 cup of water, mixing with clean hands until the dough is a good consistency. Using your hands to mix in the water will make it easier to be able to tell if the dough is too wet or too dry.

Working with small to medium sized dough balls, press one dough ball at a time in between two flexible cutting mats. After covering with a second cutting mat, use a rolling pin to press the dough into a thin uncooked tortilla.

Carefully remove the tortilla from the cutting mat by using a third cutting mat to loosen the tortilla. After the top of the tortilla has been loosened, remove the top cutting mat and loosen the bottom of the tortilla in the same manner. Slide the tortilla off the cutting mat to cook on a hot skillet to cook 10 seconds or so. Flip over and cook 10-15 seconds on the other side. Stack and set the tortillas aside to cool.

STEP 2:

Combine the tomatoes and salsa in a pot and heat over a medium low heat.

STEP 3:

Rehydrate onions and carrots. Drain and chop the turkey. Whisk the sour cream powder with 3 tablespoons of water.

Rehydrate the cheese with 1/2 cup cold water. After 5 minutes the cheese should be ready to blot dry.

Combine the onions, carrots, turkey, spices, corn, olives and sour cream in a large bowl.

STEP 4:

When ready to assemble, place a large skillet over a heat source on medium low. The entire skillet must be heated in order to effectively bake using retained heat.

Next, pour 2 1/2 cups of boiling hot tomato mixture in the bottom of the skillet followed by a layer of tortillas, followed by a layer of 1/2 of the turkey mixture. Sprinkle 1/3 of the cheese over top. Spread another 2 cups of hot tomato mixture, followed by another layer of tortilla and remaining turkey mixture. Continue layering and sprinkle the remaining cheese over top.

STEP 5:

Cover the skillet with a tight-fitting lid and heat on medium until the skillet and lid are both very hot (5-7 minutes). Transfer immediately to the Wonder Oven and allow to bake a minimum of one hour.

Serve piping hot right out of the Wonder Oven.

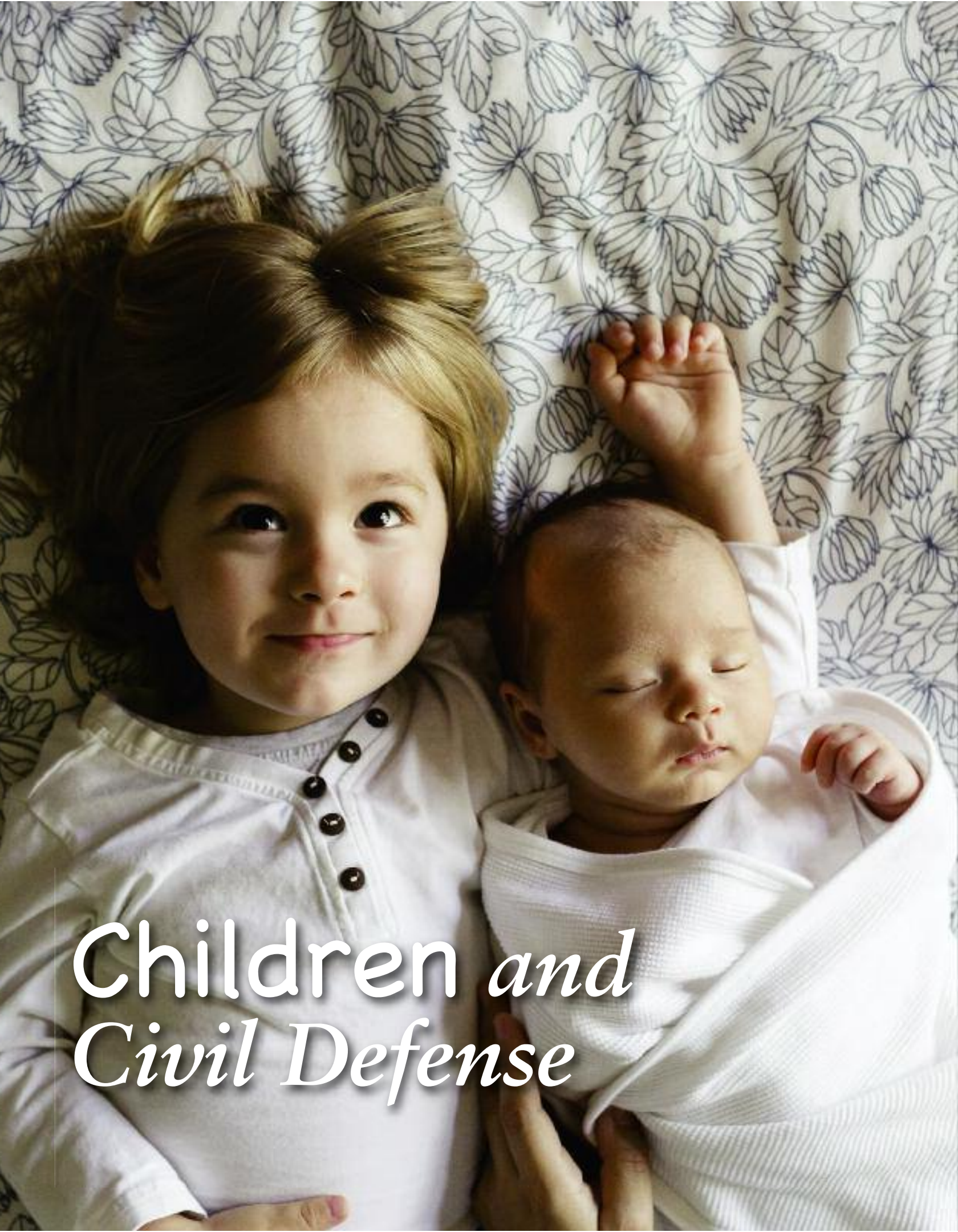
I hope you enjoy this Mexican Tortilla Lasagna as much as we do. Any canned or rehydrated meat may be used in this recipe. If water is scarce, you may choose to use the broth from the turkey to rehydrate the onions and carrots. Adding a can of beans to the turkey mixture is an easy add-in, if desired.

Food storage doesn't have to be bland and boring. Knowledge and a few basic stored ingredients can enable you to eat like a king even when the restaurants and stores are closed for business. ●

About the Author:

Megan Smith blogs at www.MyFoodStorageCookbook.com and is an expert on retained heat cooking and using food storage to create delicious meals. She designed The Wonder Oven as a convenient way to use retained heat in everyday cooking.





*Children and
Civil Defense*

By Bruce Curley

We teach children from their youth to help them have a long, healthy, and prosperous life. Yet the subject of civil defense, essential to those goals, is completely neglected by public, private and home schools every day.

This article will seek to help fill that gap and provide information for parents (and grandparents) in some of the core areas of civil defense so you can educate your children. Greater exploration of these topics is available by visiting the websites or reading the books suggested here.

Brief Definition of Civil Defense

Civil defense includes all the tasks undertaken to ensure the safety of citizens and to protect them from attack (chemical, biological, radiological and nuclear) as well as from the negative impacts of natural disasters.

At the very core of civil defense is the protection of children. In the United States, this is mostly done by unpaid volunteers in support of front-line emergency personnel with oversight by the government.

Civil Defense History: WWII to Today

Civil defense for children has been practiced from the beginning of time, but here we will briefly analyze civil defense from the end of World War II until today. I will then offer several ways to help children with various aspects of good civil defense planning, supplies, and tactics.

From the end of World War II through the 1950's and 1960's, the emphasis was on training children on how to "duck and cover" or find shelter from incoming nuclear weapons.

There was also an emphasis on building shelters, often in the basement or backyard. Fallout shelters were being built because nuclear war was considered a good possibility at the time and shelters were one way to reduce the loss of life should the unthinkable happen.

The Duck and Cover film that was widely shown to children in the 1950's and 1960's can be seen at: <https://www.youtube.com/watch?v=LWH4tWkZpPU>.

A history of fallout shelters can be viewed here: History Brief: For Family Fallout Shelters, see the History Brief at: <https://www.youtube.com/watch?v=hLoiQ9pZjfk>.

Today there are many YouTube videos mocking these efforts, viewing them as laughable because the nuclear war they prepared for never happened, and the shelters and supplies gathered were never needed to save anyone.

I disagree with these uninformed assessments. Given the international tensions at the time and how close we came to nuclear war those preparations were prudent. I

personally know a Marine who was in Guantanamo Bay and another who was in Florida ready to deploy during the Cuban Missile Crisis and both assure me we were one call away from a nuclear war at that time.

Moreover, preparing to deal with known contingencies has been essential to human survival for thousands of years. And before laughing too hard, consider that citizens back then knew the threats, and took measures to prepare to meet and overcome them. How many citizens now can say the same today? Witness the panic buying as Hurricane Florence approaches as evidence of our current preparation for threats.

The Elite Engage in Civil Defense. So Should You.

As proof, the Carnegie Corporation just gave a huge sum of money to a junior professor named Alex Wellerstein at the Stevens Institute of Technology to "reinvent" civil defense. See the article at <http://blog.nuclearsecrecy.com/2017/07/13/the-reinventing-civil-defense-project/> and <https://reinventingcivildefense.org/>.

Alex Wellerstein's Nuclear Secrecy Blog (<http://blog.nuclearsecrecy.com/>) explores, in a highly cerebral and academic way, the history, reality, threat, potential use, impact and survival possibility of nukes.

Professor Wellerstein also created the NUKEMAP to help determine if you are in the blast zone should nuclear weapons rain down on your domicile. I actually entered my address in the NUKEMAP years ago to make sure my family would be outside the blast zones of Baltimore and Washington, D.C. when I moved to Mt. Airy.

I am not sure you can get more elite than the Carnegie Foundation. If they are spending large sums of money to analyze and promote (reinvent) civil defense, should not the average American also promote civil defense?

Moreover, the elites have built, and are building, multiple civil defense communities to ensure they survive a nuclear exchange.

See here (<https://www.realtor.com/news/trends/prepper-oasis-luxury-survivalist-community/>), and here

(<https://www.forbes.com/sites/jimdobson/2016/10/07/exclusive-look-inside-the-worlds-largest-underground-survival-community-5000-people-575bunkers/#29552b1c16e4>).

And the elite of the elite, Silicon Valley billionaires, have their survival communities ready, and if this is not a contemporary civil defense project, I don't know what is: (<https://www.independent.co.uk/life-style/gadgets-and-tech/silicon-valley-billionaires-buy-underground-bunkers-apocalypse-california-a7545126.html>).

On the natural disaster side, enter #naturaldisaster in an Instagram or Twitter search engine. You will be able to view thousands of videos of natural disasters.

They happen somewhere on the earth every hour. You only know of the ones that affect you directly or that the media chooses to report, but they occur continuously on this dynamic, living, erupting planet.

So, natural disasters happen. Nuclear war has happened and will likely happen again.

Let's prepare. And live. And triumph. And be great at it!

Here are a few ways you can prepare yourself, your children and grandchildren in civil defense without spending hundreds of thousands in funding from the Carnegie Foundation to do so. Just use your family budget in a wise and prudent way. I have listed a few ideas below:

Developing a Plan

Kylene and Jonathan Jones, in *The Provident Prepper: Common Sense Guide to Emergency Preparedness, Self-Reliance and Provident Living*, have written a book that comprehensively deals with civil defense.

For example, Chapter 2 called, Preparing Children to Thrive in a Disaster, present in Plain English the best thing you can do for your children, and their practical steps in this civil defense guide book will assist you.

Chapter 4, *Family Emergency Plan: We Can Make It Together*, details how to create a family emergency plan. They are clear about what I've observed for years: this is a parental responsibility that will pay off when the event happens, and it is a thankless task like many thankless parental tasks. See <https://theprovidentprepper.org>

Building a Civil Defense Community

Michael Mabee, who wrote *The Civil Defense Book: Emergency Preparedness for a Rural or Suburban Community*, takes a community civil defense approach. Children are part of a family, but they are

also a part of a community. He argues, insightfully, that if the community civil defense is strong, there is a far greater chance children will survive and prosper. The book examines how communities can prepare for and respond to nuclear, terrorist, hurricane, electromagnetic pulse (EMP), power outages, cyberattacks and other natural and man-made threats.

Planning for Medical Needs

Good civil defense planning for children involves medical planning beyond just simple first aid kits and training. To understand just how much greater medical needs for children are in disasters, see: *The Storm Doctor: Joplin Tornado* <https://stormdoctor.blogspot.com/>. You don't ever want to be caught having your children looking at you plaintively with fear facing a major medical catastrophe and you don't have the tools to handle it.

Visit North American Rescue Product with a Mission (<https://www.narescue.com/>) for:

- Trauma and First Aid Kits
- Audio Bleeding Control Kits
- Combat Application Tourniquets (CAT)
- Burntec Burn Dressing
- Bleeding Control Kits
- Casualty Response Kits
- Splinting and Immobilization Products
- Medical and Surgical Products

They offer special forces-level medical products that will provide you with the equipment and tools you need to care for children in a civil defense emergency.

Stockpiling Supplies

Because they are children, it will be mostly parents and adults gathering civil defense supplies. One option is the TACDA Store. For example, they sell Potassium Iodate (K103) to shield the thyroid and prevent it from absorbing radioactive iodine during a nuclear emergency. (Unfortunately, people in California during the Fukushima radioactive scare mostly bought knock-off pills that did not work.) Sanitation kits, personal hygiene and first aid kit, folding portable toilets, water filtration socks, AquaRain four filter systems, emergency food bars, privacy shelters, fire blankets and so many products offered there are of great civil defense for children. See: <https://tacda.org/store/index.php/>

Storing Clean Water

Water, of course, is essential to life and essential to children, especially for civil defense. Storing that water so that it is available when needed is even more essential. WaterBrick International offers a storage medium that is durable, clean, safe, portable and designed to be conveniently stacked. Each has a handle for easy use and transport. Each WaterBrick has a spigot for drinking and practicing good hygiene. They can be frozen to use as ice blocks to extend the life of food or medicine, and you can drink the fresh water when they melt. WaterBricks can also be used to store food, to build furniture and shelter, and as sandbags. See: <https://www.waterbrick.org/>

Educating Children—Making it Fun

It is up to parents (and grandparents) to know civil defense and to educate their children. The media, government, and schools are not going to do it. But you can.

Remember to keep it fun. For example, practice an emergency evacuation as a game. For the wee ones, this will be easy. For the bigger ones, it is more of a challenge, but it can be done.

One great event to do with your children or grandchildren is to take them to a civil defense expo in your community. It is usually called an Emergency Preparedness Expo. In Carroll County where I live, every September the Carroll County Department of Public Safety presents police and fire, emergency medical services, public safety electric companies, and standing emergency management (civil defense) displays. Many of the activities are directed at children. There are other such civil defense related activities (open house at a fire station (ours features toy trains at Christmas). Keep your eyes open and you will find such civil defense related events to which you can take your children or grandchildren.

See: https://poetslife.blogspot.com/2017/09/emergency-preparedness-expo_28.html

Find the civil defense and emergency management apps that apply to your area. Our Department of Public Safety offers a Prepare Me Carroll app. It enables residents to access emergency information, alerts and preparedness guidance on the go. Download the app to all your children's phones and then make a game of guessing how to find information. Some of the items featured in this app include emergency alerts, local weather and power outages, storm related closures, social media, traffic updates, emergency management contact information, preparedness guidance and

an interactive emergency kit checklist.

Use your imagination and keep it fun. They will learn how to use it as a game and know how to use it in an emergency.

Internet Resources

Use search engines on the Internet (<https://duckduckgo.com/> for search and <https://brave.com/> for browsing) to find additional civil defense resources and learning tools. Be aware that civil defense concepts, strategies, supplies and information may be found under emergency management, survival, prepping or other search terms more popular than civil defense.

The TACDA website (<https://tacda.org/>) has a very useful series of topics under the TACDA Academy tab. (Psychology of Civil Defense, Nuclear Weapons Effects, All Hazard Sheltering, Chemical/Biological Warfare, EMP (Electro-Magnetic Pulse) and Power Failure, Radiation, Natural Disasters, Food Storage, Water Purification, Sanitation, Cold Weather Survival, Evaluation and 72-Hour Kits, Communications, Alternative Energy and Fuel, Medical Preparedness, Triage and First Response, and Post Event Survival). All of these courses may be downloaded as a PDF so you may study them at your leisure.

YouTube has thousands of civil defense and emergency preparedness videos. As with anything on the Internet, you must be careful to discern what material is good.

Why Civil Defense for Children Matters

Disasters and emergencies happen every day. They are especially hard on children. While I was writing this, Hurricane Florence was barreling toward the United States. A million parents had to abandon their homes and drive hundreds of thousands of children great distances to unfamiliar surroundings.

Ask yourself: Am I prepared to keep my children safe, fed, sheltered, healthy, and medically treated when the next Florence-like emergency strikes? Learn civil defense and teach it to your children. The information in this article is a great resource to help you get started. ●

Bruce Curley has studied, taught, and practiced civil defense for 35 years. He is currently serving as Vice President of The American Civil Defense Association. More of his articles can be found at poetslife.blogspot.com.



CRACKING WALNUTS FOR SURVIVAL

By Jay Whimpey, PE

A walnut tree can be a great source of nutrition in a long term survival situation. A mature tree can produce over 100 pounds of shelled walnuts per year, and one pound of shelled walnuts provides roughly 3000 calories and is a good source of protein and healthy oils necessary for good nutrition and survival. One tree can almost provide for the nutritional needs of one person for an entire year.

There is a fairly large investment of time and effort required to shell the walnuts. Personal experience has shown that it takes roughly 2 hours to shell one pound of walnuts using a nutcracker with a single jaw and lever,

cracking one nut at a time. The nutcracker used was obtained from Lehman's for about \$60 and it is a great labor saving device due to the significant mechanical advantage of the lever mechanism.

A rotary nut cracker is available from "Davebilt" in Lakeport, California for about \$150 that cuts the time to shell walnuts to about 30 minutes per pound of shelled walnuts recovered. There is much more physical effort involved, but the shelling goes much quicker with the rotary nut cracker. There is a handle on the nutcracker that is moved in a reciprocating motion that drives the nut cracker, and several nuts can be cracked at once. The nut cracker can be adjusted for virtually any size nut. When cracking a large batch of nuts it is usually required to recover nuts that were too small and were not cracked

on the initial pass for processing again once the nut cracker has been adjusted for smaller nut sizes.

The rotary walnut cracker was modified by coupling it with an electric reciprocating drive in order to reduce the amount of time and labor that it takes to shell walnuts. The “Davebilt” rotary nutcracker was mounted on a board along with a $\frac{3}{4}$ horsepower electric reciprocating drive from a large diaphragm pump and coupled with a drive rod to the nutcracker. The drive has an 1800-rpm $\frac{3}{4}$ horsepower 115 VAC motor and a 30:1 gear reducer with an eccentric lobe mechanism to convert the rotary motion to reciprocal motion with a 6-inch stroke at 1 cycle per second rate. The drive mechanism can be directed to its former purpose of pumping water within thirty minutes when required.

A $\frac{3}{4}$ ” diameter drive rod connects the drive mechanism to a shoulder bolt connected to the handle on the rotary nut cracker and moves the handle in a reciprocating motion recommended by the manufacturer. The drive rod can slide on the shoulder bolt allowing adjustment of the clearance between the plates for varying nut sizes on the nutcracker without adjusting the position of the drive mechanism.

The rotary nutcracker consists of a hopper for feeding the nuts to the cracking mechanism and a tapered rotating plate with irregular surface to make the nuts roll as they are squeezed between a fixed and rotating plate. The space between the plates can be adjusted by adding washers to the end of the shaft of the rotating plate. Once the nut shells are cracked and broken, the smaller pieces and nuts fall from the space between the plates and are directed by a chute to a collection bucket below. The nuts must be manually separated from the shells. Some manual effort is required to finish cracking some shell halves in order to recover the walnut meat. Up to two-thirds of the walnuts are recovered as unbroken halves.

The addition of the electric drive to the nutcracker increased the rate of processing to about 5 pounds per hour with very little physical effort beyond sorting and finishing cracking some shell halves. The electric drive uses about 250 watts of electricity during operation and it only takes about 10 minutes to process about 5 gallons of unshelled nuts.

An electric drive added to the rotary nutcracker substantially reduces the time and effort to recover the nuts from the shells. This can be a significant advantage in a survival situation where both time and physical effort must be redirected to more critical tasks. The small effort to add the electric drive to the nutcracker may be well worth the effort in the future. ●



Long-Term Emergency Water Storage:

6 EASY STEPS

Jonathan B. Jones, PE

I often get asked, “How do I go about storing some water for my family to take care of them in a time of crisis?”

Storing water for an emergency is quite simple, and provides tremendous peace of mind knowing that you can provide for yourself, your family, and others in a time of crisis. We can do this in six easy steps as follows:

1. The first step is to make the decision to do it.
2. You then need to determine where you will be storing the water, and acquire the containers that work with the space available and meet your needs.
3. Decide if you will need to disinfect the water you will store (this will depend on the water you will be storing).
4. After ensuring the containers are safe and clean, fill the containers, add a disinfecting agent, if needed, and seal the containers.
5. Make sure you have the appropriate spigot, pump, or other device to get your water from the container.
6. Determine what you need to do to maintain your water supply in a safe condition.

Now, that isn't so hard, is it? You probably have a few more questions about each of these steps, so let's look at these steps in more detail.

1. Decide to DO THIS?

As is the case with any worthy endeavor, it all starts with a goal and desire. If peace of mind is important to you, you have probably considered that it may be important to have some water in storage just in case your water supply is interrupted or contaminated. This doesn't happen all that often for most of us, but it can and does happen.

I am a civil engineer by training. When I design a building or a bridge, I don't look at the odds of an earthquake or some other destructive event happening and base my design on those odds...crazy, huh? I look at everything that might reasonably try to destroy my structure and design it to withstand those forces (thus far, I am not designing for an alien invasion...we'll see what the future brings).

In my opinion, if there is any reasonable chance you might need water in the future, this is something you should do. You don't have to spend a lot of money to acquire a reasonable supply of water. Most people choose to acquire their supply in phases as their circumstances allow. You will likely find that you can come across inexpensive or free storage container just because your subconscious is quietly looking. Be sure, however, that you get the right containers...this is critical. We will discuss this further.

2. Determine Location and Containers.

Assuming you have decided to do

this, choose the appropriate place. As with most storage items, it is best to store them in a place with stable temperatures, preferably on the cool side. If you have a basement storage area, that is probably ideal. If not, do the best you can.

Water will store almost anywhere. If your best choice is outside, remember that the sun will degrade most containers. Also, if you live in a climate with freezing temperatures, you will need to allow expansion space for the water to freeze. Scientifically, water expands about 9% when frozen. Being the engineer that I am, I allow 10% or a bit more.

Recently, my wife got a little bit greedy when she was filling some barrels we had outside. She got one of them a bit too full. When spring came, that barrel was very light, having split down the side. Better to have a little less water than none at all.

In this discussion of containers, let me weigh-in on size. I think it is important to have a variety of container sizes. Large containers such as 55-gallon drums and larger are great in that they store a lot of water for the area they use. But trying to “throw” one of those in the car in an emergency evacuation would be a bit tough for anyone except the Incredible Hulk since they weigh on the order of 450 pounds.

These work great when you can leave them in place. On the other hand, a couple of cases of water bottles throw easily into the car if you

need to leave in a hurry. We also have gallon jugs, 5-gallon containers, 15 and 40-gallon barrels, and 250-gallon totes, each with their own purpose, strengths and weaknesses.

Store your water safely! Do not stack water containers that are not meant to be stacked. This can damage the containers and can create a safety hazard. Do not store contain-

ers on high shelves without securing them properly, especially if you live in earthquake country. If these containers fall, you put people in danger, and most likely lose the water you need and worked hard to store.

Critically important is the container material.

- *Never use any container that is not food grade, and even if it is food grade, never use it if it has*

has contained something you would not eat or drink.

- *Never use milk jugs...they are intended to rapidly break down and also may harbor bacterias that can make you sick...just don't do it!*

Here is a table of common plastics and other water storage container materials and my recommendation as to their use.

| | PLASTIC | CONSIDERED SAFE FOR WATER STORAGE? |
|--|------------------|---|
| MATERIAL | RECYCLING NUMBER | |
| POLYETHYLENE TEREPHTHALATE (PETE OR PET) | 1 | Yes, but I would reuse only soft drink bottles (nothing that had contained fats or cleaning products)and use this water primarily for sanitation purposes. No BPA (bisphenol-A) |
| HIGH-DENSITY POLYETHYLENE (HDPE) | 2 | Yes, considered safe for water storage. No BPA or phthalates |
| POLYVINYL CHLORIDE (PVC) | 3 | No, contains phthalates and other toxins |
| LOW-DENSITY POLYETHYLENE (LDPE) | 4 | Yes |
| POLYPROPYLENE (PP) | 5 | Yes, considered generally safe for water storage. |
| POLYSTYRENE (PS) OR STYROFOAM | 6 | Not Recommended - leaches toxic chemicals, especially when heated |
| OTHER (USUALLY POLYCARBONATE, BUT INCLUDES OTHERS) | 7 | No. Contains BPA Made with biphenyl-A, a chemical invented in the 1930s in search for synthetic estrogens. It is a known hormone disruptor. |
| GLASS | NA | Yes. The only downside to glass is that it breaks. |
| MYLAR BAGS/BOXES | 1 | Yes. Efficient for some storage areas. Typically 5-gallon size. |

3. Now that you have made that decision, let's get water in storage!

Your job now is to get the water

into containers. Some of the containers you will fill at your kitchen sink. In other cases, you will use a tap and hose. We recommend using

a recreational vehicle (RV) hose, also known as a drinking drinking water hose. These hoses are readily available online or in many stores.

Unlike your garden hose, these hoses are safe to drink from and are lead, BPA, and phthalate free.

Use care to keep the hose (particularly ends) clean. After draining the hose, reconnect the hose ends together to keep them sanitary and keep the spiders and other critters out. I like to store my hoses in a garbage bag on top of my barrels so I always know where they are.

Water containers should be stored off the ground or concrete if at all possible. I usually store them on some sort of pallet that I have either acquired inexpensively (usually free), or one that I have created, generally out of fir strips or other lumber I have readily available. From an engineering perspective, make sure you have enough surface area and support to carry the load (remember, water is fairly heavy) and to evenly distribute the weight so as not to have places where the pallet will put undue stress on the container.

Try to keep the container caps clean as you take them off, fill the container and put the caps back in place. If possible, turn the water on after putting the hose in the container, and turn it off before removing the hose. This will prevent splashing that might cause contamination.

As a reminder, if your water storage will be exposed to freezing conditions, allow sufficient room (minimum of 10%) for expansion. After the containers are filled, add your disinfecting agent if you have chosen to do so, and close up the container.

There – you did it! Can you feel the peace of mind?

4. Disinfect if Needed?

Deciding whether to disinfect your water is based on two factors:

- Is your water supply safe?, and
- Is your water container clean and sanitary?

If you put clean water into a clean container, and you store it appropriately, there is not much that will go wrong. The question becomes, how confident are you in the answers to those questions? If you have a municipal water supply, chances are good that your water is chlorinated. If this is the case, there may not be a need to add a disinfecting agent as the water will have some chlorine residual, meaning that after the chlorine has done its job, there is some remaining.

If your water container has been cleaned and thoroughly disinfected, you won't need to worry about the further disinfection. However, sometimes getting and keeping the container clean can be an issue. There are a variety of opportunities for a nasty critter to be introduced into the container in the cleaning, filling, or maintenance processes.

5. Accessing your Water in an Emergency.

In the words of Samuel Taylor Coleridge, in *"The Rime of the Ancient Mariner,"*

*"Water, water, everywhere,
And all the boards did shrink;
Water, water, everywhere,
Nor any drop to drink."*

If you have the water all around you, but can't easily make it useful, the job was only partially done. Make sure you have the right spigot, pump, or other devices needed to easily access your resource. If you are using 55-gallon drums, you may want to consider a drum cradle or cart.

6. Maintaining Safe Water Storage

Now that you have water in storage, you have done the hard part. The maintenance is relatively easy.

As we said before, if you have stored clean water in a clean container, and have stored it appropriately, not much will go wrong.

Some sources recommend rotating your water every six months...what a pain in the butt! I recommend you use that time to work on a hobby or have a date with your spouse or play with your kids, or volunteer at a homeless shelter, or any of a hundred other important, inspiring activities. If you live a really boring life, I would go along with changing the water out every couple of years.

If you have stored your water well, it will be fine. If the water tastes a little "flat", pour it back and forth between pitchers a few times to add a bit of air to the water. I always recommend putting the water through a good filter (I prefer a gravity filter such as the Aquarain or Berkey). Some may call that overkill, but the engineer in me would rather take an extra step than do the Aztec Two Step.

Remember, medical care may be difficult to get when you are utilizing this water in a crisis situation. If, when you open the container, there is an offensive odor, or you just don't have total confidence in your water, you can add an appropriate disinfecting agent. I would then filter the water.

No excuses! Get that water stored today!

Thank You for being part of the Solution! ●

Jonathan B Jones is the co-author of The Provident Prepper: A Common-Sense Guide to Preparing for Emergencies. You can find his other helpful articles on water storage and disinfection at www.TheProvidentPrepper.org.



Safe Drinking Water *in Any Situation*

By Kirk Sample

Everyone agrees that you should have an emergency supply of water. Most experts advise storing enough water to last at least 72 hours. The CDC recommends that you have one gallon of water for each person for each day. If you have a family of four, you will need to store at least 12 gallons of water. This is pretty easy to accomplish with stored bottled water.

Acquiring safe drinking water becomes a little more difficult if you need to abandon your home or when the emergency lasts longer than 72 hours. It is beneficial to understand how to create safe drinking water from whatever water you have available.

CHOOSE THE RIGHT WATER SOURCE

Water from flowing streams and rivers is always preferable to the stagnant water in ponds or lakes. Always try to choose water as close to the water source as possible. In many cases, spring water coming out of the ground will be the safest for drinking. Try to avoid water that is down river from towns and industry. Waste and pollutants often find their way into these water systems.



Likewise, water near agricultural land can be a problem. Fertilizers and pesticides soak into the land, and through rainfall and runoff, will get into the streams and rivers. Avoid water in marshes and swamps or where algae is growing.

Locating a clean water source will make your life much easier. With that being said, there are times when you do not have any choice about the water that is available to you. You must understand the potential contaminants in the water and the technology required to remove them.

WATER POLLUTANTS

To make water completely safe to drink, five types of contaminants need to be eliminated:

- Turbidity: visible dirt – sand, silt or mud
- Chemical pollutants: from heavy metals to pesticides – often associated with mining, agriculture and forestry
- Viruses: biological agents that reproduce in the cells that they infect
- Bacteria: single-cell organisms found everywhere. E. Coli, cholera and typhoid are examples of bacteria which cause infectious diseases.
- Parasites: waterborne parasites are single-cell organisms (such as protozoa, Cryptosporidium and Giardia) or multi-cell organisms (such as worms) that live in or on other living organisms.

HOW TO PURIFY WATER

Depending on the level of contamination that you are dealing with, there are a variety of methods you may need to use. Water purification technology has advanced quite a bit over the last few years and there are numerous methods for getting rid of the nastiness in contaminated water. Unfortunately, getting clean, safe, good-tasting drinking water requires more than one filtration medium. Below are different filtration methods and what they remove.

Boiling

Boiling water for at least one minute will kill or deactivate all viruses, pathogens, bacteria and protozoa. This is an easy way to disinfect water without special equipment. Boiling does not remove chemical pollutants or clarify turbidity in the water. Boiling also requires a fuel source, which may be difficult to acquire.

Filtration

A water filter is generally a device that blocks impurities or particles from passing through it. This works through size exclusion where the holes in the filter are so small that the bacteria cannot fit.

Adsorption

Adsorption normally refers to a product like activated carbon. There are a few forms of activated carbon (granular, powder, and fiber). The small pores in the carbon increases the surface area of adsorption.

Activated carbon is ideal for removing chemicals, metals, and turbidity of water. It will improve the taste of the water. Activated Carbon Fiber is a fibrous adsorbent that has 10x higher adsorption than traditional activated carbon and gives you faster flow rates.

UV light purifiers

This method uses UV rays to blast microbes and organisms in the water. UV light purifiers neutralize and render organisms harmless to humans. UV purifiers require a power source (generally batteries) and are potentially fragile.

FILTRATION PRODUCTS

Straws

Originally designed as an emergency water treatment method, straws are also well suited for time in the back-country and are cheap to throw in an emergency pack. The LifeStraw has a hollow fiber membrane filter that cleanses the water as you sip it straight from the source. LifeStraw does not remove viruses, chemicals, or heavy metals from the water.

HydroBlu manufactures a straw filter called the Sidekick that weighs one ounce. The Sidekick is made of hollow fiber and has a carbon pre-filter to help reduce the chemicals and heavy metals in the water.

Hand Pumps

Hand pump filters are common for backpackers and have the ability to filter large amounts of water. Hand pumps are generally reliable and



easy to use. Hand pumps have small filter pore sizes in order to remove more particulate, but this reduces the flow rate of water. Very few hand pumps have the ability to remove viruses, however, there are a few hand pumps that have been recently released on the market that provide complete virus protection.

Gravity Filters

Gravity filters utilize a 3-step process and are ideal for home use or camping where there is a semi-permanent place to set up. Most gravity filters have a large water reservoir that is filled with the contaminated water. A tube is connected to the filter medium and another tube attached to the clean water receptacle. Gravity filters are hassle-free and can collapse down to save space while in storage.

In-Line Filters

Another very common filter is an in-line filter. The Versa Flow In-line Filter is made of hollow fiber and turns any hydration pack into a filtered reservoir. Simply put the filter in-line with the tube of your hydration pack. Fill the hydration reservoir with contaminated water and drink through the mouthpiece.

The Versa Flow is one of the lightest filters on the market. It is economical to use and can also be used with a collapsible canteen, as a straw, and can be threaded onto a water bottle. This type of filter will filter up to 100,000 gallons if you continue to backflush it and take

care of the filter. The filter is great for a single user, but not very good for larger groups. The Versa Flow Filter does not remove viruses and does nothing to remove chemicals and metals.

Chemical Treatment

Chemical water treatment methods, most commonly contain iodine or chlorine. These options may be used to treat large amounts of water and kill viruses found in the water. The downside is it takes contact time for treatment to be effective and the chemicals leave a negative taste in the water. This treatment does not remove the turbidity of water. Filtering after chemical treatment can improve taste and remove contaminants.

Pressurized Filtration

One of the difficulties when using hollow fiber (size exclusion) is the pore size. Most hollow fibers use a 0.1 micron pore size. This will remove bacteria, but it is not small enough to remove viruses. To remove most viruses a 0.02 micron pore size is required. When going this tiny pore the flow rate drastically decreases and makes it hard to filter water. This is where pressurized filters come into play.

The HydroBlu Pressurized Jerry Can Water Filter is a 3-gallon purifier system that has the ability to remove chemicals, heavy metals, bacteria, and viruses. The Jerry Can comes with two separate filters (activated carbon and 0.1 micron hollow fiber) that are attached to a spigot that controls the flow of water. You simply fill the Jerry Can with water, attach the pump, and add pressure with the hand pump. Because the filter is now under pressure, the flow rates are greatly improved. Even when you use the 0.02 virus hollow fiber filter (sold separately), you get a flow rate

unparalleled by most filter systems.

Conclusion

There isn't a single water filter that is perfect for every situation. It is important to understand the limitations and benefits of a water filter in order to select the right filter to meet your needs. Ask yourself these simple questions:

- How will I locate water when I need it?
- How much water will I need to filter?
- How many people will I need to provide filtered water for?
- Is the ability to filter viruses a concern? Are you going to be in an area where viruses are a problem?

The answers to these questions will help you determine the type and size of filter that will best meet your needs. Chances are you will ultimately need a few different water filters. One that is highly portable for evacuation scenarios such as the SideKick as well as one that will filter larger amounts of water like the HydroBlu Pressurized Jerry Can. ●



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