



**HOW TO BUILD
a WATER
BIOFILTER**

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Using Plants To Clean Your Water In A Crisis

Getting clean water is essential in an emergency situation. Water in general is a necessity for human survival. It should go without saying that filtering your water so that it's safe to drink is also a necessity. Drinking contaminated water exposes you to diseases that could potentially be fatal. If you don't have access to clean drinking water you will need to know how to filter the water yourself so that it's safe enough to consume. Since in an emergency situation, machinery and devices won't be available to filter the water for you, we'll need to examine the use of bio filters in order to clean your water naturally using things found in nature. You will learn what bio filters are, and how to use them to clean your water.

What are bio filters?



To put it simple, a bio filter is a system where living material is used to capture and filter out potentially dangerous and unhealthy pollutants. We will be discussing using bio filters in order to remove organisms from drinking water but bio filters have several other popular uses as well. It is commonly used to treat wastewater for aquaponics, capturing silt or chemicals from surface runoff water, or for cleaning fishponds and aquariums. Think of bio filters as a way to

take out all of the bad things from water naturally without the use of devices or technologies. It is nature's water filtering system in a way.

Man has been using bio filters for centuries. They were popularly used in Europe to clean surface water so that it is safe to drink. As mentioned, one of the most popular uses of bio filters today is in aquaculture such as aquaponics as a way to filter out wastewater and basically recycle old water. The benefit that bio filtering offers is that it keeps the amount of replacement water needed to a minimum while improving the quality of the water so that it is deemed safe for reuse and living creatures can consume it without the risk of disease or contamination.

In order to treat water so that it is safe to drink, we will look at using microorganisms on surface water to filter out all of the toxins and harmful chemicals found in untreated water. A balance of low turbidity and high oxygen can help microorganisms make water safe for drinking by breaking down the pollutants found in untreated water. Using natural resources that can be had for free to filter your water will be crucial for your survival in a crisis situation. Unless you plan on trying to stockpile thousands of water bottles, being able to filter out water from lakes, rivers, and other sources will be very important. We will show you how to use floating plants such as duckweeds, water lilies, and more in order to filter water for free in a crisis situation so that it is safe enough to drink. Also, keep in mind that these organisms can be used for more than just drinking water and are used throughout aquaculture on a regular basis. So do not feel restricted to only using bio filtering when in an emergency. These methods apply to a variety of other uses as well.

Duckweed



The first organism that we will look at happens to be one of the most popular choices. Duckweed is extremely well known as one of the best organisms there is for naturally filtering out your water. You may be wondering what duckweed is. It has nothing to do with actual ducks. It's the name given to small aquatic herbs called Lemnaceae that commonly grow in fresh water. They're actually the smallest flowering plants in the world and don't have any type of leaf structure. From a distance, duckweed can easily be mistaken for moss as it can be found just floating atop of water. Duckweed sometimes has roots and often times is seen without it. One of the greatest things about duckweed is that it's easy to get a hold of. It's commonly found in areas with temperate and tropical weather. Because it's so widely available, it makes it the perfect type of organism to use as a bio filter in an emergency situation. As you know, one of the key objectives in an emergency is getting your hands on free materials that are readily available.

With duckweed, you don't have to worry about continuously having to gather more and more of it either. Duckweed multiplies itself naturally. It can double its mass in less than two days under optimum conditions. In order to receive results this great, you need to ensure that the duckweed is getting proper nutrients, sunlight, and temperature. This is one of the major reasons duckweed is so popular amongst survivalists as a natural water filter. While you may not need to collect this much duckweed, a small patch of duckweed could eventually cover up a large amount of surface area in a relatively short period of time. This is what you're looking for in any type of natural resource. The ability to build itself up and give you a nice supply of itself so that you're not constantly having to go out and get more of it. Duckweed is extremely low maintenance as well which is another desired characteristic of a natural resource. Since you're going to be using this as a long term solution to filter out all of your water, you don't want to have to constantly look over it. Of course you will want to monitor it every now and then but it doesn't require constant upkeep and much work at all on your end.

Duckweed for water filtering



When using duckweed for filtering, you're going to be able to take advantage of many of its great qualities. Duckweed is extremely efficient at clearing out ammonia, nitrate, potassium, calcium, phosphorous, magnesium, sodium, boron, chlorine, and iron. That means it's able to clear out many of the harmful toxins found in untreated water so that it is safe for human consumption. Thanks to some movies and false information, there seems to be a belief that you should and can drink water from streams, rivers, and any other source of open water if you're in a dangerous or hazardous situation. This belief can get you killed or violently ill in real life. Keep in mind that these sources of water are where fish and other sea creatures live. This means that they are contaminated with the waste from these animals and other toxins that aren't safe to consume. This is why companies go through so much effort to carefully filter water before it's sold on the market or even put through pipes into your home. Duckweed is able to naturally filter out these toxins and do a very good job at it. If your water recirculation system is set up correctly, duckweed is able to remove 99% of the toxic solids and nutrients found inside wastewater. Even without the "ideal" setup, duckweed is still very effective at removing waste from water and making it safe to drink.

Much of what we know about using duckweed to filter out water has been discovered through its use in aquaculture and aquaponics. While it may not be necessary for an aquaponics setup, the addition of it can greatly improve the overall efficiency of your setup.

When using duckweed to purify drinking water, you do have to remove the duckweed biomass after treating the water. You do not want to drink water wither duckweed floating in it. It is very important that you remove the duckweed from the water before you use it for consumption. This can be done with a bucket or if you have a netting device similar to what is used to clean pools. While the removed duckweed may not be safe for consumption, it does have other uses such as fodder. In certain conditions where you're in "survival mode" you want

to make sure that you're using all available resources to their full potential and don't become wasteful. So instead of simply disposing of the duckweed, try to find a good use for it.

Another thing to keep in mind when using duckweed to filter your water is that the more contaminated the water, the harder the duckweed will have to work in order to purify it. So trying to use duckweed to purify sewage water (which you should not be drinking) it will take a very long time and it might not even work. If the levels of metals and toxins are too high, the water can actually kill the duckweed rendering it absolutely useless. Some people prefer to treat the water with something else before using duckweed but in an emergency you probably will not have access to such materials or resources. So for your purposes, duckweed will be the only form of filtration you will be using for your water. So it's best to make sure you're using it to clean water from lakes or ponds where the toxin levels are not as great as other sources of water.

In order to get quicker and better results, spread your duckweed over a shallow pool of water. If the water is too deep, the duckweed will take much longer to filter out the water. You want to be able to spread the duckweed evenly across your water source for the best results. Another tip to get the best results is to make sure that your duckweed is getting adequate sunlight. In order for duckweed to grow and be as productive as possible, it must have enough sun. After all, duckweed is a type of plant after all so it needs some sunlight. Also, the temperature that the duckweed is placed in also plays a big role. As mentioned earlier, duckweed flourishes in warmer conditions. So if the area is too cold, it won't be very effective at filtering the water. This does not apply simply to the water but more importantly the actual environment that your water is in. So trying to do this in Alaska probably won't be very effective. But since duckweed is typically only found in areas where it naturally works the best, it shouldn't be too much of an issue.

Water Lilies



Another option you have for natural water filtering is water lilies. Water lilies should be seen as a defender in a way. They live in the water they inhabit and seek to detoxify it and use the waste found in water to grow. Water lilies are great for several other reasons as far as treating water. For one, they provide your water with shade to help moderate the temperature of the water somewhat.

When using water lilies to filter your water, the main thing that you will be concerned about is its ability to detoxify the water. While duckweed does an excellent job at removing many toxins, water lilies are great at absorbing and removing heavy metals found in contaminated water. In fact, one study from the Hebrew University of Jerusalem Faculty of Agricultural, Food and Environmental Quality Sciences in Rehovot showed that water lilies can actually absorb as much as 16% of their own body weight in heavy metals! This is an invaluable feature that will be very important when you need clean water. The very last thing you want to do is start consuming water that is loaded up with metals as they will not only make you sick but can also be fatal over time. These metals aren't necessarily a quick killer so it could take a while for you to realize that you are ill because of the water you're drinking. And if there is no medical attention available due to a crisis situation, you will really regret drinking that unfiltered water.

The method in which water lilies purify water is through the roots. The water lilies absorb the harmful toxins and metals through the roots so that they are filtered out and safe for drinking.

Do not eat the water lilies!

When food is scarce and you're growing desperate, you may be tempted to eat the water lilies by boiling them or another method. In certain conditions water lilies are considered a delicacy and they are 100% edible. However, you cannot and should not consume water lilies that have been used to purify water under any circumstance. You will expose yourself to harmful toxins that were absorbed by the lily and it will be almost as bad as drinking the untreated water. Look for other sources of food that will potentially kill you!

Water Mint



Another less talked about plant that can be used to help clean out water is water mint (*Mentha aquatica*). This plant grows up to 6 inches and has purple flowers. As you can imagine, it has the fragrance of mint. For the purposes of filtering, it can be grown in a container and submerged no further than 3 inches below the waterline. While it may not be as powerful as an all around water filtering system, it is very effective at removing very dangerous bacteria such as E. Coli and salmonella according to research conducted at Washington State University Extension. As you know, this bacteria can be deadly so it's crucial that you're able to remove it from your drinking water.

Bulrush



This is another less talked about plant that is useful in purifying water. It's a grass like plant and can grow up to 10 feet high. It does grow flowers and is a greenish color. They are useful for filtering out oil, bacteria, and other material found in water. They will take up a little more space than other plants so they might not be the *best* option but they certainly are an option.

Soft Rush



Soft rush is an aquatic plant so it thrives in water. Like bulrush it is a grass like plant but does not grow as tall as bulrush. It removes many of the same organics that bulrush does and also is great for removing heavy metals like zinc, copper, and cobalt. We've already discussed how important is to remove these from drinking water so soft rush is another viable option if it's available in your location.

Cattail



Lastly, cattail is another option you have for filtering your drinking water. It received its name from its dark brown color it has at the top that look like a cat's tail. The leaves it bears are flat and twist on the plant. It will remove zinc, cadmium, lead, nitrate, and other potentially harmful material from your water. Getting out all of those harmful metals is very important and I cannot stress that enough.

Is the water safe to drink?



After using any of the filtering systems mentioned above, your water should be safe enough to drink. The only way to truly know the quality of the water is to perform tests with a pH testing kit or with a microscope because you won't be able to physically see these microscopic organisms just by looking at the water. You're going to want to ensure that the water is at least clear. If the water is foggy and murky looking, it more than likely isn't safe to consume. Since in a crisis situation you probably won't have access to tools needed to test the water, you will probably have to rely on looking and smelling the water to determine if it's safe for drinking. However, as long as you used one of the methods above first, the water should be treated enough to drink.