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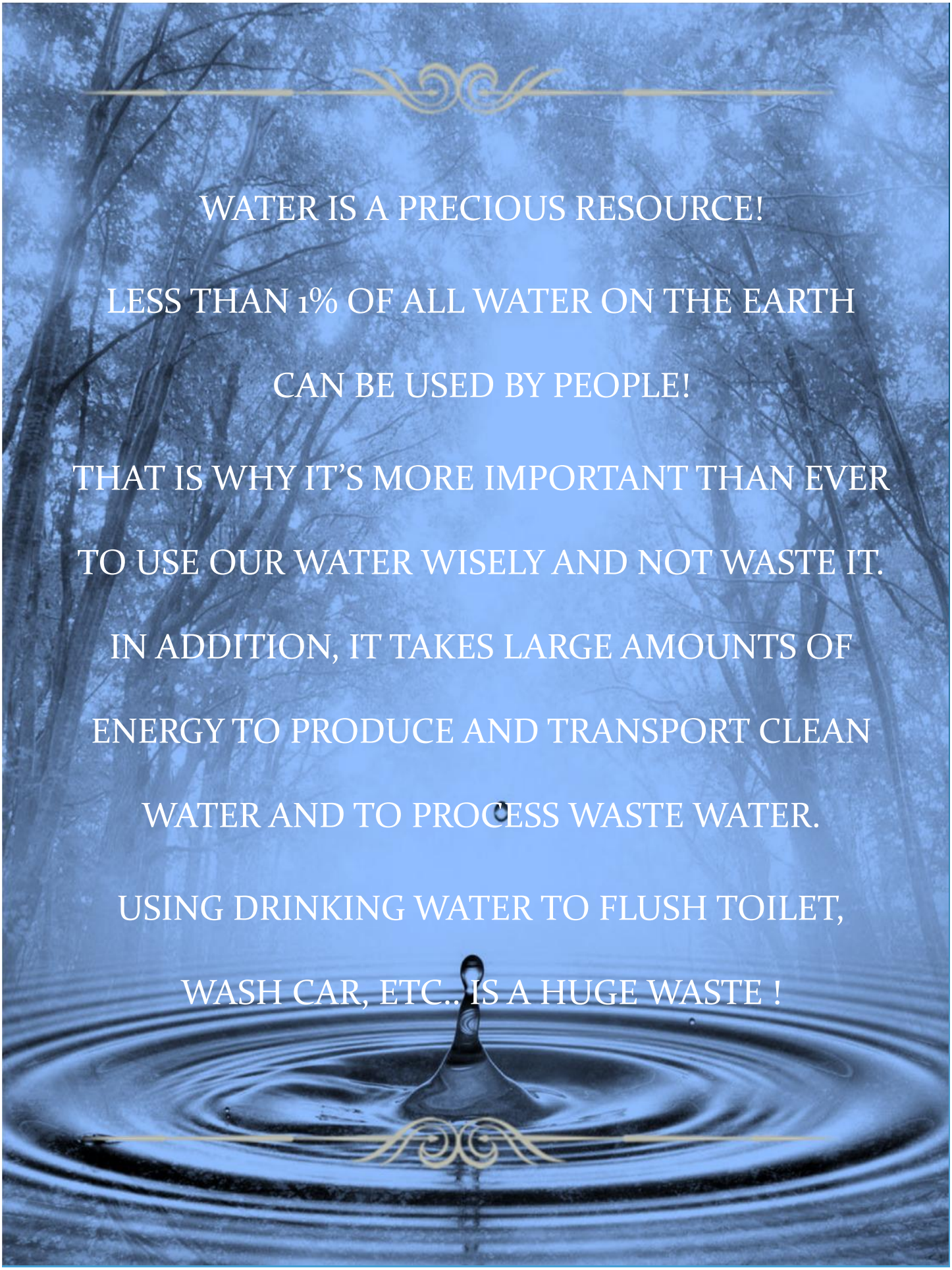
Rainwater Harvesting

Renewable Energy 101


WATER IS A PRECIOUS RESOURCE!
LESS THAN 1% OF ALL WATER ON THE EARTH
CAN BE USED BY PEOPLE!
THAT IS WHY IT'S MORE IMPORTANT THAN EVER
TO USE OUR WATER WISELY AND NOT WASTE IT.
IN ADDITION, IT TAKES LARGE AMOUNTS OF
ENERGY TO PRODUCE AND TRANSPORT CLEAN
WATER AND TO PROCESS WASTE WATER.
USING DRINKING WATER TO FLUSH TOILET,
WASH CAR, ETC.. IS A HUGE WASTE !

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GREEN-STAR AWARDS

Rainwater Harvesting

What is Rainwater Harvesting?

Rainwater harvesting is collecting the run-off from a structure or other impervious surface in order to store it for later use. Traditionally, this involves harvesting the rain from a roof. The rain will collect in gutters that channel the water into downspouts and then into some sort of storage vessel. Rainwater collection systems can be as simple as collecting rain in a rain barrel or as elaborate as harvesting rainwater into large cisterns to supply your entire household demand.

The idea of rainwater harvesting usually conjures up images of an old farm cistern or thoughts of developing

countries. The reality is that rainwater harvesting is becoming a viable alternative for supplying our households and businesses with water. It's not just for the farm anymore! There are many countries such as Germany and Australia where rainwater harvesting is a norm. Due to the green building movement, you will be seeing rainwater harvesting systems become more popular here in America.

The collection of rainwater is known by many names throughout the world. It ranges from rainwater collection to rainwater harvesting to rainwater catchment. In addition, terms such as roofwater collection or rooftop water collection is also used in other countries.

We believe that rainwater harvesting is a viable technology in an urban setting. All that is necessary to take advantage of this resource is to capture the free water falling on your roof and direct it to a rainwater storage tank. By doing this, you can take control of your water supply and replace all or at least a substantial portion of your water needs. Rainwater harvesting systems can be configured to supply your whole house and/or your landscape needs.

What are the benefits of rainwater collection?

- Rainwater is a relatively clean and absolutely free source of water
- You have total control over your water supply (ideal for cities with water restrictions)
- It is socially acceptable and environmentally responsible
- It promotes self-sufficiency and helps conserve water
- Rainwater is better for landscape plants and gardens because it is not chlorinated
- It reduces stormwater runoff from homes and businesses
- It can solve the drainage problems on your property while providing you with free water
- It uses simple technologies that are inexpensive and easy to maintain
- It can be used as a main source of water or as a back up source to wells and municipal water
- The system can be easily retrofitted to an existing structure or built during new home construction
- System are very flexible and can be modular in nature, allowing expansion, reconfiguration, or relocation, if neccesary
- It can provide an excellent back-up source of water for emergencies

What are the uses of collected rainwater?

You can essentially use rainwater anywhere you use tap water. The idea of using drinking water to flush our toilets and water our lawns is wasteful and irresponsible, especially in light of population growth and water shortages across the country. Rainwater collection is a technique to green your home and to lessen your environmental footprint.

There are basically three areas where rainwater can be used:

- Irrigation use
- Indoor, non-potable use
- Whole house, potable use

Here are some ideas for specific uses of rainwater:

- Hand water your lawn and garden
- Connect rainwater collection system to irrigation/sprinkler system
- Wash your vehicles
- Wash your pets
- Refill your fountains and fish ponds
- Refill your swimming pool
- Replace the use of tap water with rainwater to wash your driveways and sidewalks (if you don't use a broom)
- Use it for all indoor non-potable fixtures (toilets and clothes washer)
- Use it for all potable needs when properly filtered and disinfected
- Use it for industrial processes instead of municipally treated water

How much rain can I collect?

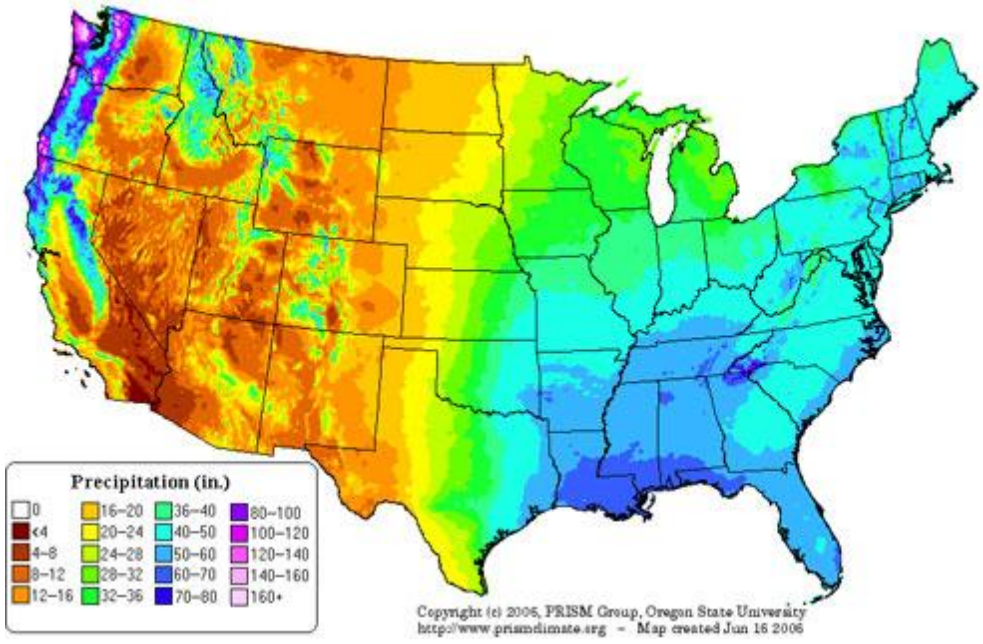
The amount of rainfall that you can collect is governed by the following formula:

1" of rain x 1 sq. ft. = 0.623 gallons

Or put in an easy form to remember :

1" of rain from 1,000 sq. ft. will provide 623 gallons

To calculate the amount of rainwater you can collect, you need to know your annual average precipitation for your area. You can use the precipitation map below to find an approximate amount for your area (click for a zoomed image at the website Rainwater Harvesting page).



Rainwater Harvesting Methods

How to Harvest Rainwater?

So you're convinced that you want to start collecting rainwater at your house. Below you will find the resources to educate yourself on the best method for harvesting rainwater in your situation. You will also find information about the basic components of a rainwater collection system. Even though rainwater catchment is an old technology, there have been many improvements over time through product innovations.

What are the different methods to collect rainwater?

The only thing that differs in the following methods is the scale of the system. They all follow the same principles but differ on aesthetics and actual water conservation effectiveness. Click the pictures for a closer look.

Rain Barrels

This method is the most common and one that many people are familiar with. This involves installing a barrel at a gutter downspout to collect rainwater. The actual barrel may be a recycled barrel or a new commercially available rain barrel.

Pros:

- Easily implemented by anyone at any residence
- Barrels are readily available in your community or at various stores & websites
- Barrels don't take up much space so they can fit into any situation

Cons:

- Capacity is generally only 50 to 100 gallons
- Easily overflows and wastes collection opportunities

"Dry" System

This method is a variation of a rain barrel set-up, but it involves a larger storage volume. Essentially, the collection pipe "drys" after each rain event since it empties directly into the top of the tank.

Pros:

- Can store a large amount of rainwater
- Great for climates where rainfall happens with infrequent, larger storm events
- Can be inexpensive to implement
- Less complicated system so maintenance is easier

Cons:

- The storage tank must be located next to your house

"Wet" System

This method involves locating the collection pipes underground in order to connect multiple downspouts from different gutters. The rainwater will fill the underground piping and the water will rise in the vertical pipes until it spills into the tank. The downspouts and underground collection piping must have water-tight connections. The elevation of the tank inlet must be below the lowest gutter on the house.

Pros:

- The ability to collect from your entire collection surface
- The ability to collect from multiple gutters and downspouts
- The tank can be located away from your house

Cons:

- More expensive to implement due to underground piping
- Sufficient difference between gutters and tank inlet must be available

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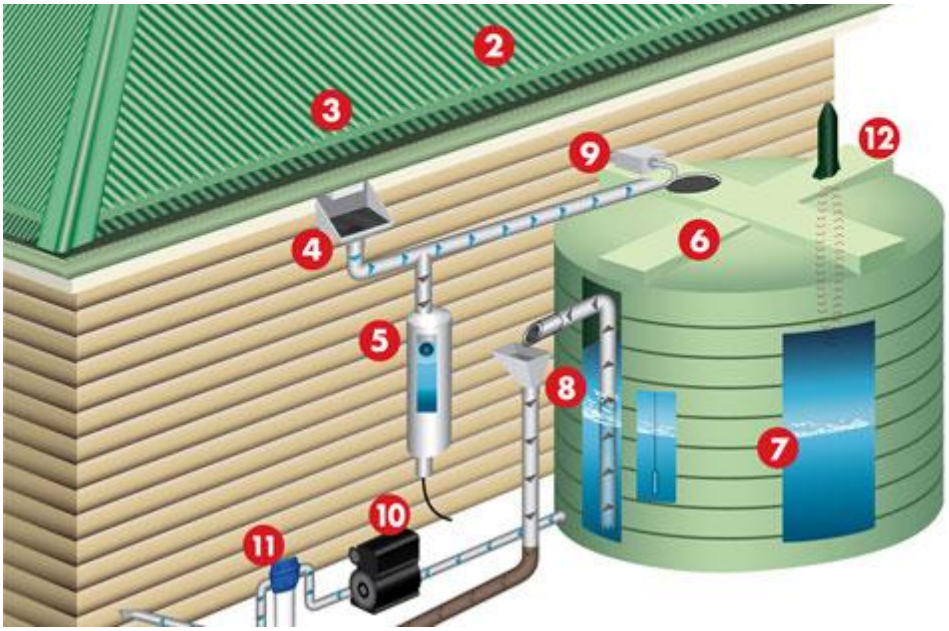
How do I create a complete Rainwater Collection System?

The image below shows a complete rainwater collection system. While some of the components shown are absolutely necessary, not all of the components listed are required. Although, all of these components will help create a harvesting system that is highly functional and nearly maintenance-free.



1	Collection Surface	7	Collection Cistern
2	Collection Gutters	8	Overflow Port
3	Gutter Protection	9	Auto-fill / Automatic Top-up Mechanism
4	Rain Head Inlet Filter	10	Pump
5	First-flush Diverter	11	Water Filter
6	Inlet Screen	12	Water Level Indicator

What kinds of rainwater storage tanks can I use?

Well, you can collect rainwater into any storage vessel but here are some of the more popular, commercially available, rainwater collection tanks. Every tank has its' own pros and cons and different situations call for different tanks. One important note to remember is to ensure that your base preparation is performed in accordance to the tank manufacturer's instructions. These rainwater storage tanks will be extremely heavy when water is present inside them. Remember, water weighs 8.34 pounds per gallon!

Some issues to think about when installing a rainwater system

Flying Pipes

This issue is not necessarily bad as it allows for a higher efficiency of collection, but for most people, they don't want to see PVC pipe flying overhead at their homes. Some other things to think about is the possibility of damage to the collection pipes from storms and injuries to people who could run into the pipes.

Tank material that allows sunlight inside

Do not use a translucent plastic tank for rainwater storage! The system may look great right after being installed, but unless you constantly put chlorine bleach into your tank, then the water inside the tank will grow algae and will look like pea soup. **Click on the image to see this.** These translucent tanks are meant for chemical storage not for raw water storage.

Water level indicator using a clear pipe

You find this type of water level indicator promoted on many DIY rainwater collection websites. Well, as in the previous issue with the clear or translucent tank material, the same phenomenon will occur with these clear pipe or clear flexible tubing water level indicators. The water in the indicator pipe is exposed to sunlight which promotes the growth of algae inside the clear pipe. Even if the indicator has a drain valve in it, the water vapor trapped in the clear pipe can still grow algae. **Click on the image to see what the clear pipe water level indicator looks like after some time of use.**

If you install a water level indicator on your rainwater storage tank, make sure to use a different technique than a clear pipe indicator.

First-flush diverter that mixes with good rainwater

The purpose of a first-flush diverter (as seen in this image) is to divert the first bit of rainwater that drains from your collection surface. This first bit of rainwater has the highest concentration of dust and other particles. The diverter shown in this image is normally called a "poor man's diverter". As you can see though, the initial flush of water that has filled the pea-trap shaped pipes just pushes into the collection tank. In this configuration, you get no benefit... you might as well connect the downspout pipe straight to the tank inlet.