Installing a rain capture system for your home is an easy way to conserve both water and money. Here is a collection of helpful tips and links to ensure that the installation of your system is both smooth and successful! Read at your leisure as a supplement to a how-to guide. Enjoy and good luck!

Contents (click the 🔄 to return here!)

- Big Picture
- Helpful How-to Guides
- Safety
- What is my Water Demand?
- Placement and Platforms
- Barrels
- Piping, Seals and Spigots
- Overflow
- Downspouts and Diverters
- Maintenance
- Sources/Useful links
Big Picture

These tips have been assembled from several accounts of how best to assemble a rain harvesting system, drawing from the knowledge and experience of rain capture experts and amateur homeowners alike. There is more than one correct way of creating a safe and sustainable rain capture system. All systems generally include:

A. Raised container(s) to hold rainwater
B. A filtered opening through which water flows into container
C. A spigoted opening to access captured rainfall
D. A third opening to allow overflow, and
E. Some alteration to the gutter allowing water to be diverted to the barrel.

There are countless variations on these five steps, however, some equally as good as others. Rain capture systems can differ depending on factors like financial investment, water demand, and material preference. These tips and resources should help you choose the method most appropriate for you!

Helpful How-to Guides

There is a wealth of instructional videos and guides online that give instruction on the creation of a rain barrel system. Here a few websites and videos that we particularly like, but feel free to do your own research as well! Again, do not be alarmed if different websites give slightly different instructions. It’s up to you to install the system that is best for your situation.

- The Rain Barrel Guide blog: for questions and general rain barrel information
- Rain Water Collection Systems: reviews and ratings for ready-made rain barrels
- General how-to videos:
  - Clemson Extension
  - Lowe’s
  - Fort Hays State University
  - HGTV Gardening by the Yard
  - Helpful video from a personal homeowner
  - For the creation of a bottom-fill manifold rain barrel system (see “Piping Basics”):
    - Helpful video from a personal homeowner
    - Another helpful video from a personal homeowner (for specifics on the bottom piping)
Guides:
- Clemson Extension (our choice!)
- From a personal homeowner
- The Master Gardeners
- Bottom-fill manifold system by a personal homeowner

Safety

A rain barrel system installed, used, and cared for properly is a wonderful thing. On the flip side, a rain barrel system installed, used, and/or cared for improperly can be a health and safety hazard. Be sure to take a look over these safety issues and take precautions against them accordingly.

There’s Something in the Water!

Your rainwater is not potable and should not be used for drinking or cooking. Why is it not potable? Because, as reported by the North Carolina State University, “rooftop runoff has been shown to exceed U.S. EPA drinking water standards for pH, fecal coliforms, aluminum (Al), lead (Pb) and zinc (Zn)” (click here to read the whole publication).

Here’s What to Worry About.

LEAD. Ingestion of high amounts of this element can cause brain and nervous system damage, stroke, kidney disease, cancer, and more.

Fecal Coliform. It’s not actually these bird and squirrel leftovers that are harmful to human health; the presence of fecal matter is an indicator that infection-causing bacteria may also be present in the water.

ZINC. Elevated levels that have been found in roof runoff can cause plant poisoning, or phytotoxicity.

Mosquitoes. These potential disease-carriers will happily breed in your barrels, given the chance.

Children. Not in the water, but around it. Rain barrels aren’t jungle gyms! Small children can drown in only a few inches of water.

What to Worry Less About.

Eating homegrown vegetables. Most of the metals found in runoff water, like copper, chromium, cadmium and lead, are already present in rainwater before they come in contact with your roof. These metals are not likely to affect your edible plants because they bind with soil particles and organic matter in the ground. The same goes for phosphorus and nitrogen.
Here are Some Precautions Against Rainwater Contaminants

- Be sure not to drink or cook with water from your rain capture system.
- Systematically flush your gutters to clean them out, or at least before you install your rain capture system.
- Wash your vegetables and other edible plants thoroughly before eating or cooking with them.
- Use a lid and install fine-mesh screen over all barrel openings.
- Install a leaf eater and/or a first flush water diverter to block debris.
- If you’ve treated your roof with any chemicals, unhook your rain barrel for at least two weeks.

- Wash any part of the body that has come in contact with collected rainwater with warm, soapy water afterwards to avoid infection.
- A drip irrigation system or other type of system that waters the soil directly will not only water your plants more efficiently than a typical hose, but will help to cut down the amount of contact you have with the captured water as well.

What’s a first flush diverter?

A first flush water diverter diverts the first gallons of rainfall (which are the dirtiest) out of your gutter but away from your rain capture system before allowing the rest of the rainfall to be diverted to the barrels. Click here to see how one works. The College of Charleston purchased both a leaf eater and a first flush diverter for a rain barrel system installation from North American Rain Systems.

Zinc-Induced Phytotoxicity

- NC State suggests conducting regular soil testing if you’re using captured rainfall to grow and irrigate edible plants. They have written another helpful document, A Gardener’s Guide to Soil Testing, to help you do this.
- Vegetables and other edible plants grown in soil with zinc concentrations high enough to induce phytotoxicity should not be consumed.

Mosquitoes

There are several approaches to reducing mosquito populations around your rain barrels. Read through the ones listed here and choose ones that appeal most to you.

- Use or empty your water regularly. Most mosquito species need at least 10 to 14 days to complete the aquatic stage of their lifecycle.
- Pour a few teaspoons of lightweight vegetable oil or summer-grade dormant oil in the water, which will not harm your plants but will suffocate mosquito larvae on the surface of the water.
Purchase mosquito dunks to put in your water. This larvicide is not a chemical but the bacteria Bti, Bacillus thuringiensis israelensis. These bacteria will kill feeding mosquito larvae but will not harm humans, other animals, or plants.

Put a few goldfish or mosquito fish inside your rain barrels. The fish will feed on the mosquito larvae. Be sure to read more about keeping and aerating fish properly in the “Helpful Links” section.

Barrel-Induced Danger to Children

- Talk to your children. Take the opportunity to give a lesson in sustainability while telling your kids that it’s not allowed to climb on the rain barrels by explaining why you’re installing them and how they work.
- Keep a lid on your barrel at all times to protect children and pets.
- Lash your barrels down to the platform or wall with one or two straps so that they cannot be moved. Proper materials can be found at a hardware store.
- Keep 2 to 4 gallons of water in the bottom of your rain barrels for stability. A sufficient amount of water will be kept in the bottom of the barrels if you install the spigot on the side of the barrel about 2.5” from the bottom of the barrel.

What is my Water Demand?

Probably more than you think! The size of your rain capture system is dependent upon two factors:

a. How much rainwater is available for capture?

b. How large is my demand for rainwater?

How much rainwater is available for capture?

If your roof is relatively large and your need for rainwater is abundant, you may want to consider installing a larger system (or leaving...
room for later expansion). Considering that a quarter inch of rain falling on a typical family-size roof yields about 200 gallons of water, we suggest installing at least two barrels (which can fill to capacity in less than twenty minutes in a heavy Charleston rainfall).

How can I calculate how much rain comes off my roof?

A roof captures about six-tenths of a gallon per square foot for every inch of rain.

A 1,200 square-foot roof, for example, will yield about 720 gallons of water for every inch of rain.

\[ 1,200 \times 0.6 = 720 \]

In the Charleston area, precipitation measurements range from an average of 2.66 inches in November to 6.91 inches in August and have an average of 48 inches a year. Charleston also occasionally experiences severe weather events such as hurricanes and tornados.

So, a 1,200 square-foot roof has the potential to yield 34,560 gallons of rainwater a year!

How large is my demand for rainwater?

Take care not to harvest an amount of rainwater that is greater than your demand. It is recommended that harvested rainwater be used regularly if possible: stagnant water provides mosquitoes with undisturbed breeding grounds and can produce unpleasant odors as well.

Rainwater may be used for a number of purposes, a few being washing your car, flushing your toilets, or watering your garden. Though it might intuitively make sense that rainwater is a clean water source (it hasn’t touched the ground yet, right?), rainwater is not potable and should not be used for drinking or cooking. Children should be kept from playing with the rainwater to prevent ingestion. Read more in the ‘Safety’ portion of this guide.

Placement and Platforms

There are important issues of placement, ground level and elevation to consider before creating your rain barrel system!

PLACEMENT

- For the best water pressure, place the system as close as possible to the area in which you will be using the water.
- Consider window placement in the installation of your barrel. With a platform, the system will be about four feet tall. The rain barrel system may block your view, prevent the window from being opened, or allow an intruder easy access into your home.
- Choose the downspout from which water will be
diverted carefully. Considering the large amounts of water that can funnel off of a roof (see “What is My Water Demand?”), it is recommended to use a downspout that drains 500 square feet of roof-space or smaller.

GROUND LEVEL

- Your rain barrels will weigh hundreds of pounds when full. It is essential that the platform on which the barrels sit is on level ground to prevent them from tipping. Find a flat spot or level an area yourself next to your downspout.
- Each rain barrel will require an area of about 2.5 square feet by 2.5 square feet of ground space.
- Dig out 1-2 inches of ground space and replace it with gravel to keep the area flat over time.

ELEVATION

- The average rain barrel system is a type of gravity-fed system, meaning the user is dependent on gravity to distribute the water out of the barrels. Elevating the entire rain barrel system with some type of platform helps to increase water pressure of the system. The system gains about .433 PSI for every foot above ground it is located.
- Your platform should raise your rain barrel system at least 8 inches off the ground.
- You can build a custom platform of your own, or it can be as simple as a triangulation of three cinder blocks for each rain barrel. The College of Charleston Physical Plant built a wooden platform for the CofC Office of Sustainability’s rain barrel installation at the Early Childhood Development Center (ECDC) (pictured right).
- If you are attaching a garden hose to the rain barrel, install the rain barrel system in an area with a higher elevation than the area that will be watered.

You can also attach a pump to your rain barrel system if you’re not satisfied with your water pressure. The folks at TheRainBarrelGuide.com suggest a pump that pumps 5 to 10 gallons of water a minute, like this one.
Barrels

The main body of your installation is the barrel itself. Here are some places to find barrels, a few pointers in what and what not to look for in a barrel, and some tips about decoration.

WHERE CAN I FIND BARRELS?

- See the “Helpful How-To Guides” portion for a link to reviews of ready-made rain barrels.
- You can find 50 to 60 gallon barrels for free to cheap prices ($5-$20) from local food or soda distributors. Be sure to wash out any barrel that has been used before with vinegar and water.

WHAT SHOULD I LOOK FOR? WHAT SHOULD I AVOID?

- **DO** get a food-grade barrel. Regular plastic cannot be trusted to support heavy water pressure for as long as food-grade plastic. That means that using a trash can as your rain capture container is not the best idea.
- **DO NOT** use a barrel that was formerly used to hold a chemical or toxin.
- **DO** try to obtain rain barrels that come with lids, whether a solid one-piece or a two piece lid with ring and bowl. If you have solid lids on attached barrels, create small hole in the lids so that pressure does not become an issue as barrels fill and empty.
- **DO** try to get a darker, or at least opaque, color to prevent the growth of algae, like blue or black.

![Figure 5: students paint barrels at Grice Marine Laboratory. From the CofC Sustainability Blog](image)

HOW CAN I PAINT OR DISGUISE MY BARRELS?

- Make sure you are using a paint designed to adhere to plastic. Use a primer before applying the paint. Roughing up the surface of the plastic with, say, a razorblade will also help adhesion.
- To paint your barrels to match your house, take a sample or picture or your siding to a hardware store to help them better match the color.
Create a flexible trellis for your plants to grow on by wrapping wire mesh around your rain barrels.

The College of Charleston Grice Marine Laboratory decorated their rain barrels with the help of Harborview Elementary School students and sponge animal stamps (pictured above)! Involve your favorite little helpers by letting them decorate your barrels as they choose. Take the opportunity to explain to your kids the function and purpose of a rain barrel system.

Piping, Sealant and Spigots

If you’re one of those people who are brilliant at thinking mechanically, good for you! For the rest of us, here are a few things we learned during the process of our own rain barrel installations that we wish we had known starting out.

PIPING

- **WHAT MATERIAL?** There are many different choices for the piping of your installation. We used mostly PVC (polyvinyl chloride) piping and some flexible hosing, which is cheap and easy to assemble, but many installers use brass threaded fittings and even brass piping.
- Position the barrels so that the joints are easily accessible.
- **SHOULD THE PIPES COME OUT THE SIDE OR THE BOTTOM?** This is completely up to you.

A bottom-up **manifold system** connects barrels with piping that is installed beneath the barrels, so that each barrel is filled with rainwater at the same rate and at the same time. The spout at the bottom seems like it would help with water pressure, as well. If you choose this design type, be sure to still filter your water somehow. A U-bend trap in the pipes leading to the barrels may help to stop debris from reaching your water. A system with a spigot on the side and the water input at the top will produce a few less gallons of usable water from the same size barrels as that of a bottom-fill system, but those few gallons of unused water below the spigot are valuable for stability. In this sort of system, the barrels would be **daisy chained** together near the top.

**MANIFOLD**: a system of piping with several openings to receive water and to distribute it to a single source

**DAISY CHAIN**: to connect; to fasten two pieces together.

**Male Threaded Fittings? Female Slip Fit??**

Check out two helpful links from [WiseGeek.com](http://www.wisegeek.com) if you feel you need a few lessons on basic plumbing terminology. Click [here](http://www.wisegeek.com) for an easy-to-understand video about PVC and click [here](http://www.wisegeek.com) for a refresher on pipe fittings.
SEALANT

For the best-performing rain barrel system, we advise you to seal all joints and fittings with a watertight sealant. The type of sealant largely depends on what kinds of fittings you’re working with. Here are just a few pointers that can help you get started.

- **PLUMBER’S PUTTY** is a useful tool used in many faucet and drain installations. It is preferable when a seal needs to be reversible, but may not stand up to intense water pressure on its own.

- **TEFLON® TAPE**, also known as plumber’s tape or PTFE (polytetrafluoroethylene) tape, is used to fill the space between threads if you are using threaded fittings. Be sure to wrap the tape in the same direction you will be screwing the fitting into the barrel to prevent the tape from unraveling.

- **PVC CEMENTS AND SOLVENTS** work by “melting” the two PVC plastic slip fit pieces together, so the results are quite permanent! Make sure the fittings are exactly how you’d like them to be before you start gluing. Many PVC solvents work in a two-step, color coded process, requiring a primer before glue. There are one stage PVC glues as well, however. With either type, try to apply the solvents thinly and evenly.

SPIGOTS

- **If you are indeed placing your spigot on the side**, measure about 2.5” up from the bottom of the barrel along the seam of the barrel. You can place your overflow opening at the top of the barrel on the same seam.

- **BRASS FAUCET (SILCOCK VALVE) OR BALL VALVE?** Feel free to conduct your own experiments, but [this video](#) shows that the ball valve allows water to flow more freely and with better pressure.

- **If you are using rubber bulkhead fittings (also called bungs)**, an easy way to place the washer and inside half of the fitting on the inside of the barrel to install the spigot is to attach the pieces to a piece of duct tape (sticky side out) on the end of a yard stick and lower it down. See [Fort Hays State University’s demonstration video](#) for more.
Overflow

A typical rain barrel system will fill up with rainwater fairly quickly. It is essential to include a plan for overflow, which normally involves the creation of a third hole in the barrel that the inflow is going into for overflowing water to escape. This is a matter of safety, so be sure to read this section carefully.

- Aim the overflow away from the foundation of your house!
- The overflow pipe should be as large as or larger than the downspout in volume. If a severe rainstorm occurs, the overflow pipe volume must be the same or more than the downspout volume to prevent water from escaping from the rain barrels in ways that you don’t want it to.
- If you can, disconnect your rain capture system if you will gone for your house for a long period of time. Make sure the rainwater will divert away from your house as it normally would without the installation of a rainwater capture system.

Downspouts and Diverters

And now, tips and pointers about getting the water from the roof into the barrels! Again, there are multitudes of approaches out there about modifying gutters and diverting water, so do your research and pick and choose what method is most appropriate for you in context with your living space and available funds.

- You’ll want to cut your downspout so that it sits about half an inch above the input opening of your barrel. Remember you’ll need to include the height of the platform as well as the height of the rain barrel into this calculation.
- The first water to come off your roof is the most contaminated. Install a first flush diverter to divert this water to slow-drip out of the system while the following, cleaner water is diverted into your rain barrels. It is connectable to PVC piping.
- If you do not wish to cut your downspout, flexible gutter extenders are easily found at hardware stores and online. Similarly, ready-made water diverters and diversion kits are readily available online.
Maintenance

Rain barrel systems are great in that they pretty much run on their own after you’ve installed them. You can avoid extensive issues with flooding or repair by performing regular small maintenance and checks to make sure that all the parts are continuing to function properly.

- Check for leaks at least once a year, making sure the pipes are still in their proper place and perhaps touching up seals around spigot and overflow fittings.
- Depending on how much sediment and debris comes off of your roof, periodically unclog your filters, piping, and gutters.
- If you have installed a first flush diverter, periodically clean out the bottom compartment where sediment has accumulated.
- Clean your barrel out once a year by washing it down and wiping down the insides with vinegar or a dilute solution of bleach (less than 5% bleach).
- DEALING WITH ALGAE: Algae will not be harm your plants, but can be a nuisance by clogging the fittings of the rain barrel. Keeping your barrel out of the sun and painting it a dark color will significantly help prevent algae from growing, since algae needs exposure to sunlight to grow. Do not allow your water to become stagnant but try and empty it in less than ten days. Washing your barrel out with bleach will also help to prevent algae growth.

Other Sources/ Helpful Links

Sincere thanks goes to Clemson Extension for their help in the installation of the College of Charleston’s rain capture systems. Be sure to contact us at the College of Charleston Office of Sustainability to tell us how your rain barrel installation is going or has gone! Browse through the following links that helped us for more information. Best of luck to you!

Miscellaneous

- [http://media.clemson.edu/public/restoration/carolina%20clear/toolbox/lcsc_stormwater101rbill.pdf](http://media.clemson.edu/public/restoration/carolina%20clear/toolbox/lcsc_stormwater101rbill.pdf)
- [http://www.clemson.edu/public/carolinaclear/cc_toolbox/tools_pubs.html#pubs_rb](http://www.clemson.edu/public/carolinaclear/cc_toolbox/tools_pubs.html#pubs_rb)

More Helpful How-to

- [http://www.youtube.com/watch?NR=1&feature=fvwp&v=GUhox3ORIRk](http://www.youtube.com/watch?NR=1&feature=fvwp&v=GUhox3ORIRk)
- [http://www.youtube.com/watch?v=t4_Fq5o9QNM](http://www.youtube.com/watch?v=t4_Fq5o9QNM)

Water Demand

Safety


Mosquitos

- [http://www.ext.nodak.edu/extnews/hortiscope/pests/mosquit.htm](http://www.ext.nodak.edu/extnews/hortiscope/pests/mosquit.htm)
- [http://www.vdh.state.va.us/epidemiology/DEE/Vectorborne/mosquitofaq.htm](http://www.vdh.state.va.us/epidemiology/DEE/Vectorborne/mosquitofaq.htm)

Hardware and Supplies

- [http://www.wisegeek.com/what-are-pipe-fittings.htm](http://www.wisegeek.com/what-are-pipe-fittings.htm)
- [http://www.rainharvest.com/shop/images/FirstFlushDivertersmall.gif](http://www.rainharvest.com/shop/images/FirstFlushDivertersmall.gif)
- [http://www.wisegeek.com/what-is-plumbers-putty.htm](http://www.wisegeek.com/what-is-plumbers-putty.htm)

Water Pressure

- [http://www.sprinklerwarehouse.com/category-s/8317.htm](http://www.sprinklerwarehouse.com/category-s/8317.htm)

Barrels


Maintenance

Photograph credits:

Figure 1: http://www.rain-barrels.org/rainwater-harvesting-schematic/

Figure 2: http://www.raincollectionsupplies.com/SearchResults.asp?Search=leaf+eater

Figure 3: http://www.rssweather.com/climate/South%20Carolina/Charleston%20Ap/

Figure 4: received from Ashlyn Spilis Hochschild

Figure 5: http://blogs.cofc.edu/sustainability/