

Home & Environment

Building a Rain Barrel

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A rain barrel is a simple and inexpensive means of conserving fresh water by collecting and storing rainwater from rooftops for use during drier periods. Though water collected in rain barrels is non-potable—not suitable for drinking—it can be used in a variety of ways around your home.

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Why use a rain barrel?

Rain barrels offer a number of benefits such as helping to reduce stormwater runoff, decreasing municipal water usage, and potentially protecting your home's foundation. Impervious surfaces such as rooftops, parking lots, and roads prevent rainwater or stormwater from soaking into the soil. Instead, the stormwater flows across these impervious surfaces where it picks up trash, oil and grease, pet waste, pesticides, and other pollutants before entering streams, rivers or lakes untreated by way of storm drains. Rain barrels can be used to capture and store rainwater or even detain and slowly release rainwater so that the amount of runoff from rooftops is decreased.

Once captured in a rain barrel, rainwater can be used to water lawns and gardens, moisten compost bins, rinse tools and equipment, or even as a water supply for ornamental ponds and bird baths. Remember, harvested rainwater is not suitable for cooking or drinking. By using rainwater, the

amount of municipal water used can be reduced thus resulting in a lower water bill.

Rain barrels can also help control soil erosion caused by water gushing out of downspouts and can potentially help control the settling of water near foundations by containing and redirecting water to more desirable locations such as a rain garden.



Figure 1. Rain barrels are a simple way to conserve stormwater.

How do I build a rain barrel?

Rain barrels can be purchased from home improvement or gardening supply stores with prices typically ranging from \$100 to \$300 or they can be easily constructed using parts from a local hardware store. The main components include a storage tank or barrel, screen, spigot, overflow outlet, platform, and a downspout connection. Commonly, a 50- to 65- gallon food-grade plastic drum is used as the storage tank, although larger containers are available. If selecting a used barrel, make sure the material previously stored in the barrel was not harmful to plants or animals and be sure to thoroughly rinse the barrel prior to use. Barrels should be dark in color or painted to reduce sunlight exposure and thus prevent or minimize algae growth. Table 1 contains a parts list and Table 2 includes a tool list for building a rain barrel. Instructions and a schematic are also provided for constructing the rain barrel (Figure 2). Though dimensions may vary slightly depending on the barrel selected, the basic procedure will remain the same.

Outlet

To construct the outlet of the rain barrel, drill a $\frac{1}{16}$ -inch hole a distance of approximately 3 inches from the bottom of the barrel. Apply a bead of silicone caulk around the $\frac{3}{4}$ -inch brass adapter and insert one #14 O-ring onto the caulked adapter. Use an adjustable wrench to insert the brass adapter into the $\frac{1}{16}$ -inch hole that was drilled into barrel. Caution should be taken to protect your hands during this step. From the inside of the barrel, attach the conduit lock-nut onto the brass adapter using the adjustable wrench. Connect the $\frac{3}{4}$ -inch brass hose adapter to the brass Y valve.

Once captured in a rain barrel, rainwater can be used to water lawns and gardens, moisten compost bins, rinse tools and equipment, or even as a water supply for ornamental ponds and bird baths.

Table 1. Rain barrel parts list.

Item	Unit Cost (\$)
Plastic food-grade drum with a solid screw-on lid ^{1,2}	20.00
One $\frac{3}{4}$ -inch brass adapter	3.53
One brass Y valve	8.97
One #14 O-ring (set of 4)	1.97
One conduit lock nut	0.91
Clear silicone sealant	3.89
Charcoal aluminum screen mesh (36 by 84 inches)	6.49
One 2-inch PVC adapter with a male threaded end	1.07
One 2-inch PVC 90° elbow with a female threaded end	2.97
Garden hose coupling (optional) ³	1.99
Garden hose section (optional) ³	6.98
20 plastic cable/zip ties (8 inch)	1.76
Total Cost (including optional items)	60.53

¹ 65-gallon plastic food-grade barrel purchased at Lexington Container Company (<http://www.lexingtoncontainercompany.com>).

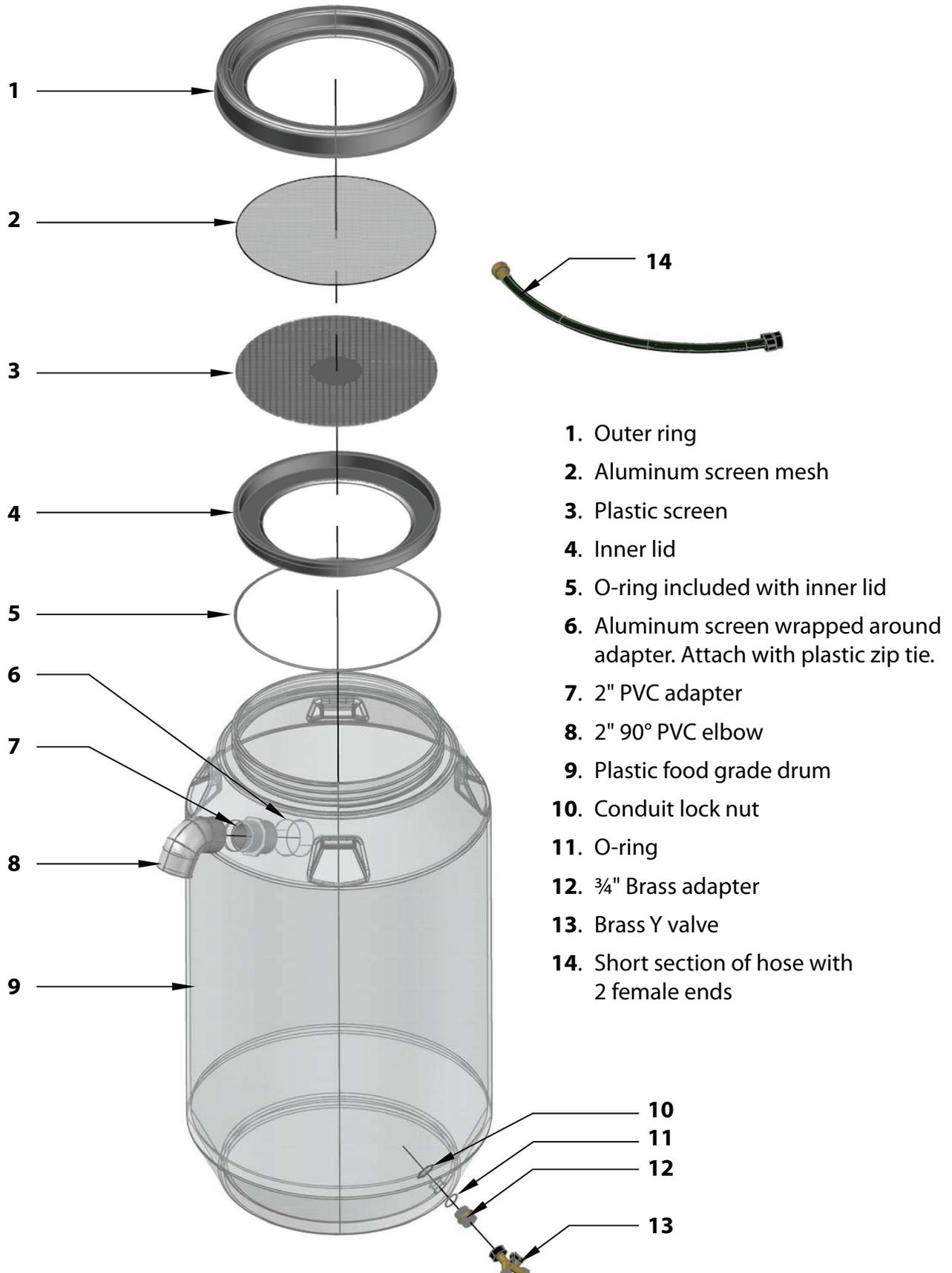
² As purchased, barrel is supplied with plastic screen. Lid is comprised of an outer ring and an inner lid with an O-ring.

³ Optional components used to connect multiple rain barrels.

Table 2. Rain barrel tools list.

Necessary tools
Jig saw
Adjustable wrench (10-inch)
Handheld electric drill
Wood drill ($\frac{1}{16}$ -inch or $\frac{3}{32}$ -inch)
Scissors or tin snips
Compass
Hole saw (2 $\frac{3}{8}$ -inch, optional)
Drill bit ($\frac{3}{8}$ -inch, optional)
Measuring tape

Figure 2. Rain barrel schematic.



Source: James Ash, Biosystems and Agricultural Engineering.

When filled with water, rain barrels are quite heavy. (A 65-gallon barrel of rainwater weighs about 540 pounds.)

Screened Lid

To construct the screened lid, draw a circle 15 inches in diameter (7½-inch radius) on the plastic screen, and cut out the circle using a jig saw. Using a pair of scissor or snips along with the cut-out of the 15-inch diameter plastic screen as a template, cut a 15-inch diameter circle from the charcoal aluminum screen mesh.

The screw-on lid, which was supplied with the barrel, is comprised of a solid inner lid with an O-ring and an outer ring. The inner lid rests on the barrel frame; the outer ring is threaded onto the barrel. On the solid inner lid from the barrel, locate the slight ridge, which has a diameter of about 12¼ inches. Inside this circle, drill a hole using the 15/16-inch drill bit. Insert the jigsaw blade into the drilled hole and cut along the ridge line. Once the 12¼-inch diameter circle has been cut out, place the inner lid onto the rim of the barrel. Next, place the plastic screen followed by the charcoal aluminum screen mesh onto the inner lid, and then secure the layers by screwing on the outer ring.

Overflow

An overflow device should be constructed to direct water from the rain barrel to a specified location such as a rain garden. If such a device is not constructed on the rain barrel, water will flow uncontrolled from the screened lid. To build the overflow device, cut a 2¾-inch diameter hole in the top section of the barrel. Be sure not to place the hole too low, as water above this point will not be stored. This hole can be drilled using a hole saw or a jig saw with a pilot hole. Apply a bead of silicone caulk along the threading of the 2-inch PVC adapter. The silicone caulk should be applied at the contact point between the fitting and the barrel. Teflon tape may be used instead if desired.

Once the silicone caulk is applied, insert the adapter into the hole from the inside of the barrel, making sure that the threaded end extends outside of the barrel. By hand, screw on the 2-inch 90° PVC threaded elbow; the elbow should point downward. To keep mosquitoes from entering the rain barrel from the overflow device, place a piece of the charcoal aluminum screen mesh, previously used in constructing the lid, onto the 2-inch PVC adapter (inside of the rain barrel). Secure the aluminum screen with a plastic zip tie.

Multiple barrels (Optional)

Multiple rain barrels can be connected using garden hose lengths and hose couplings. Measure the hose to the desired length and cut off the male thread end. Attach the hose coupler to the cut end, and then attach the coupled hose to the brass Y valve. Water from the rain barrel will be released when the valve handles are turned to the “open” position.

How do I install a rain barrel?

When filled with water, rain barrels are quite heavy. (A 65-gallon barrel of rainwater weighs about 540 pounds.) Therefore, they should be located on a solid, stable, flat surface. It is also recommended that you elevate your rain barrels enough so that a garden hose can be easily attached or a bucket can be easily placed under the spigot. This raised elevation will also increase the water pressure in a connected garden hose; however this pressure increase will be only slight. By raising the rain barrel 2.31 ft, a one psi (lb/in²) increase in pressure can be achieved. Concrete cinder blocks are often used for this purpose or a wooden platform can be constructed. Make sure to level the blocks to prevent the rain barrel from tipping over, especially if children and pets are present. Be sure to

direct the overflow for the rain barrels away from your home's foundation.

Once the rain barrel is positioned, you will need to shorten your downspout and connect it to the rain barrel using a flexible downspout extender. Use a hacksaw to cut the downspout and steel wool to dull the cut edge. Next, connect the downspout extender to the rain barrel. For barrels without a sealed top, as in Figure 2, place the end of the downspout extender on the top of the barrel. For barrels with a sealed top, cut a hole into the lid and insert the end of the downspout extender.

How do I connect multiple rain barrels?

Multiple rain barrels can be connected either at the top or the bottom of the barrels with tubing or PVC pipe (Figure 3). If connected at the top, both rain barrels will need an outlet so that water below the connection point can be drained. However, if connected at the bottom, then only one barrel will need an outlet as the water level in both barrels will drop equally when the spigot is opened.

Figure 3. Outlets for connecting multiple barrels.



To discourage algae growth, empty your rain barrel every 5 to 7 days and, if possible, keep your barrel out of direct sunlight.

Source: James Ash, Biosystems and Agricultural Engineering.

If you disconnect your rain barrel from your downspout, you will need to extend your downspout and direct the flow away from your foundation.

What maintenance is required?

Though rain barrels require minimal maintenance, proper upkeep will help ensure your rain barrel continues to work well.

Periodically clean your filter screen and downspout outlet. Remove any accumulated debris such as leaves and twigs. If needed, guards can be installed on gutters to minimize the amount of rooftop debris entering the barrel.

Make sure the lid is properly sealed and the screen is free of cuts and tears. Securing the lid will make the barrel safer for children and pets and will prevent insects such as mosquitoes from entering the barrel. However, if mosquitoes still become an issue, products such biological larvicides are available at pond supply stores to control mosquito breeding.

To discourage algae growth, empty your rain barrel every 5 to 7 days and, if possible, keep your barrel out of direct sunlight. Plus, for your rain barrel to be most effective at capturing runoff, it should be empty before each rain event.

During the winter months, store your rain barrel indoors or open all spigots and leave it outdoors. It is recommended that you drain your barrel completely, including any connecting piping or hoses. If you disconnect your rain barrel from your downspout, you will need to extend your downspout and direct the flow away from your foundation.

What size rain event will fill my barrels?

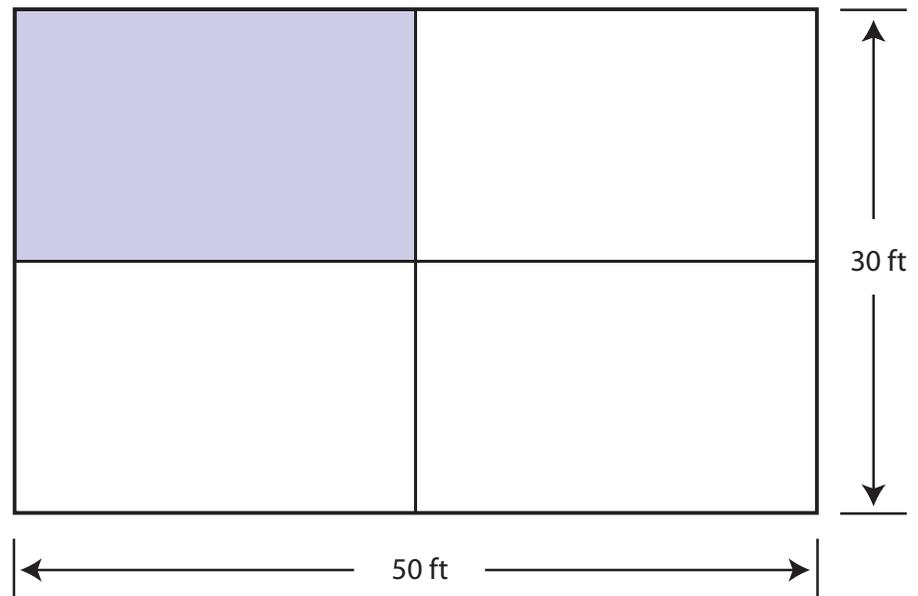
To approximate the size of the rain event needed to fill your rain barrel, use the following equation.

$$\frac{\text{Rain barrel volume (gal)} \times 0.134 \text{ (ft}^3\text{/gal)} \times 12 \text{ (in/ft)} \times \text{efficiency}}{\text{Contributing roof surface area (ft}^2\text{)}}$$

Contributing roof surface area (ft²)

To determine the surface area for a simple roof, such as a gable roof, multiply the length by the width. It is not necessary to take into account the pitch of your roof. Determine the fraction of the roof that contributes to each rain barrel. For instance, if you have four downspouts, one for each corner of your house, then about one quarter of the roof contributes to each

Figure 3. Roof surface area measurement example.



Example (drawing not to scale)

For a house 50 ft by 30 ft with one quarter of the roof emptying into rain barrels, the contributing roof surface area (blue) would be 50 ft x 30 ft x 0.25 or 375 ft². With two 65-gallon rain barrels (130 gallons total) at this receiving downspout, about one-half an inch of rainfall is needed to fill the barrels.

$$\frac{(65 \text{ gallons})(2 \text{ barrels})(0.134 \text{ ft}^3\text{/gallon})}{(12 \text{ in/ft})(0.95)} = 0.53 \text{ in. rainfall}$$

375 ft²

downspout. Multiply the total surface area by the fraction of roof contributing to the downspout.

Since roofing materials differ in their ability to capture runoff, a reduction should be applied to account for these inefficiencies. Losses are related to factors such as splash and water absorption into the roofing materials. For asphalt and metal roofs, assume a runoff efficiency of 95 percent.

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