

Stormwater Management:

How to Make a Rain Barrel



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Rain barrels are typically 50-100 gallon containers used to collect and temporarily store rainwater from a roof downspout. A ready-made rain barrel can be purchased from a retail outlet or one can be assembled from a repurposed plastic barrel and parts from a hardware store.


Why Use a Rain Barrel?

 **Rain barrels help reduce stormwater runoff from a property.** With many impervious surfaces in cities and towns, most rain and snowmelt cannot soak into the ground. Instead, much of the stormwater runoff flows into storm drains and storm sewers and is then carried directly to nearby streams, rivers, or other bodies of water. Because of the speed and volume of runoff, streams can flood and stream banks can erode. Runoff also collects soil, trash, leaves, fertilizer, oil droplets, pet waste, and other contaminants as it flows over surfaces. Runoff water flowing in a storm drain is normally not treated or cleaned before it empties into a stream or river so pollutants are carried with the runoff into surface water. By capturing some of the runoff that would have gone into a storm drain, runoff and runoff pollution are reduced. Although the amount of rainwater collected in one rain barrel is small, it is a start, and more than one barrel can be used to increase the amount collected.

 **Rainwater is natural and good for plants.** It does not contain chemicals often found in municipal drinking

water or sodium from the in-home water softening process. Rainwater generally has fewer dissolved minerals than tap water so it is “softer” and often slightly lower in pH than tap water.

 **A rain barrel helps conserve water.** Using water from a rain barrel saves drinking water that would otherwise be used for plant irrigation.

 **Rain barrels raise awareness about urban runoff.** Seeing how quickly a rain barrel fills, even during a small storm, helps us appreciate the large volumes of runoff produced from roofs, pavement, and other surfaces that do not let water soak in. This can lead to property owners taking additional steps to reduce the amount of runoff. Rain barrels are conversation starters to help spread the word about runoff to family, friends, and neighbors. In some communities, they also have become works of art through professional artist or youth rain-barrel-painting programs that further heighten the visibility of stormwater management.

Rain Barrel Basics

There are many ways to make a rain barrel. It is important to choose a design that will work well for the site, is safe, convenient to use, and easy to clean. Regardless of the specific design, all rain barrels need:

- A cover
- An inlet where rainwater is directed into the barrel

- An outlet to get water out of the barrel
- An overflow because most rain barrels will not hold all of the runoff from even a moderate storm

Cover

Rain barrel covers can be solid or screened. They are needed to keep out mosquitoes, tree leaves and other debris, pets, wildlife, and especially to keep children from crawling inside.

Inlet

The inlet can be as simple as a hole cut in the top or cover of the barrel with a piece of screen caulked over it. Other inlets include a grate covered with screen or a downspout extension elbow that fits snugly into a hole in the top. There are commercially available downspout diverters that redirect water back through the downspout once the barrel is full. No matter what type of inlet is used, it should not allow mosquito entry into the barrel. This is why screening or a snug fit is important.

Outlet

An outlet is needed to get water out of the rain barrel. Most often this is a spigot or hose bibb located in the side of the barrel near the bottom.


A rain barrel cannot be left with an open top. An open rain barrel is a drowning hazard. 



Figure 1. Simple rain barrel



Figure 2. Drain/waste/vent (DWV) adapter

Overflow

A rain barrel overflow is often a PVC elbow inserted into the side of the barrel near the top to allow excess water to flow out. A PVC pipe or flexible hose is attached to the elbow to direct rainwater at least 10 feet away from the building foundation to a location where it can safely infiltrate into the soil. The overflow from one barrel also can be directed into another barrel, but the final barrel still must have an overflow that is directed to an area where the water can safely soak in. The only situation where an overflow may not be needed is when using a properly installed downspout diverter to direct water back through the downspout when the barrel is full.

Location

Decide where the barrel will be located before buying parts and beginning assembly. It needs to go under or near a downspout that carries runoff from a roof. The site should be fairly level and have good drainage away from the foundation of the building for the overflow. Ideally, the barrel should be located close to the flowers, shrubs, etc. that will be watered with the rain barrel water, or convenient to a door into the house to fill a container for watering houseplants.

Parts to Make a Simple Rain Barrel

A rain barrel made with the following parts will have a simple inlet on which the downspout can rest, or hang above, and a rigid overflow pipe (*Figure 1*). Variations are discussed later.

- Barrel. Plastic barrels are relatively easy to work with and are inexpensive. Look for a food-grade barrel or one that did not hold toxic materials; 55 gallons is a common size. Clean, rinse, and drain the barrel. Barrels with removable lids are easier to clean, but a closed-top barrel will also work. A dark-colored barrel admits less light which helps reduce algae growth, although light-colored or translucent barrels can be painted to admit less light.
- PVC drain/waste/vent (DWV) adapter or similar piece (*Figure 2*)
- Screen to fit over the DWV adapter or similar piece
- Hose clamp to fit DWV adapter or similar piece
- 3/4-inch brass spigot, hose bibb, or boiler drain with threads for attaching a garden hose
- PVC trap adapter, at least 1½ inches in size (*Figure 3*)
- 90° PVC street elbow, same size as trap adapter (*Figure 3*)
- 90° PVC elbow, same size as trap adapter
- PVC pipe, same size as trap adapter and elbows

Before buying PVC pieces, test to make sure they fit together correctly. 💧

Tools and Materials Needed

- Electric drill, 15/16-inch spade bit, and hole saw (*Figure 4*) matching the size of the threaded end of the trap adapter
- Jigsaw
- Hacksaw
- Pocket knife
- Slot-head screwdriver (flat blade)
- Tape measure
- Marking pen
- Carpenter's level
- Thread seal tape or outdoor caulk (optional)
- Concrete blocks or pavers
- Safety glasses
- Ear plugs
- Heavy duty gloves



Figure 3. PVC trap adapter on left, PVC street elbow on right, flexible drain hose in back



Figure 4. Hole saw and spade bit for an electric drill

Cutting and Drilling Instructions

- When cutting and drilling, wear safety glasses, ear plugs, and gloves.
- Mark a hole in the top of the barrel by tracing around the smaller end of the DWV adapter or similar piece. This will allow it to slip into the hole, but not fall through. Place the hole where it will work best for your downspout set-up but not too close to the rim of the barrel, as it is often thicker near the rim and harder to cut. Cut out the inlet hole using a jigsaw.
- With a 15/16-inch spade bit, drill a hole in the side of the barrel approximately 2-4 inches from the bottom for the outlet spigot. Having the outlet close to the bottom reduces the amount of water remaining in the barrel after emptying and may slightly increase the water pressure available to disburse the stored water for use.
- Using the hole saw, drill a hole in the side of the barrel, near the top, for the overflow. Look/feel inside the barrel before drilling — there is often a thicker section near the top so try to drill below it. (Note: A barrel has a curved surface. The

parts being installed won't fit flush with the barrel surface, but this is not usually a problem.)

Assembling the Barrel Components

- Carefully screw the brass spigot into the spigot hole, keeping it as straight as possible. If you can't insert the spigot, ream the hole with a pocket knife to make it slightly larger. If desired, wrap thread seal tape around the threads before installing, or caulk around the spigot. The spigot should fit tightly to prevent leaking.
- Disassemble the trap adapter. Insert the longer threaded piece into the overflow hole from outside the barrel. Screw the ring onto the threaded piece from inside the barrel to hold the trap adapter in place. Caulk around the adapter, if desired. Attach the street elbow to the trap adapter so it faces downward.
- Fasten the screen around the wide end of the DWV adapter using the hose clamp. Place the DWV adapter into the inlet hole in the top of the barrel.

Set-Up Instructions

Prepare a flat, level base using concrete blocks or pavers at the desired location for the rain barrel. Be sure the base is level and stable because the barrel will be very heavy when full. (A 55-gallon barrel of water will weigh over 400 pounds.) Elevating the barrel on a short, secure platform provides clearance for attaching a hose, placing a watering can beneath the outlet, or interconnecting multiple barrels for additional storage capacity. Elevating the barrel also will help the water flow out a little faster. Rain barrels should be anchored to a building or other secure object for increased stability and safety.

Set the barrel in place on the elevated base. Determine the length of downspout to remove so the remaining



Figure 5. Flexible hose overflow option



Figure 6. Round grate with screen and hose clamp

portion of the downspout will rest on the edge of, or hang slightly above, the DWV adapter and empty into the barrel beneath it. Disconnect the downspout from the building and cut it to the appropriate length with the hacksaw, then reattach the downspout to the building. (You may want to save the cut downspout piece(s) for reinstalling in the fall when the barrel is removed for winter storage.)

To assemble the overflow, attach the 90° elbow to one end of a PVC pipe section and place the elbow on the ground with the pipe standing upright next to the barrel. Mark the pipe at the level of the street elbow. Use the hacksaw to cut the pipe to this length. Insert this section of pipe into the street elbow. Insert additional PVC pipe into the elbow at ground level to carry the overflow at least 10 feet away from the building foundation. This pipe needs to slope slightly to drain the water in the desired direction. Direct the overflow to a rain garden, landscape bed, lawn area, or other pervious surface.

After the first rainfall, check the rain barrel to make sure everything is functioning correctly. Remember to clean the inlet and any filters/screens regularly.

Rain Barrel Variations

Variations to make the barrel work best for a specific site or situation are encouraged. However, one variation to avoid is using another spigot with a regular garden hose attached for the overflow. It will not be large enough. The smallest overflow that should be used is 1½ inches. If the overflow is too small, water can flow out of the top of the barrel, potentially causing water damage to the building foundation.

Flexible Overflow Option

This option (Figure 5) uses a 2-inch flat, flexible discharge hose as the overflow, rather than solid PVC pipe. This hose will fit over a 1½-inch PVC street elbow. (If a discharge hose of greater diameter is used, test fit it onto PVC of various sizes to see what will work.)

Items needed:

- 1½ inch PVC trap adapter (Figure 3)
- 1½ inch 90° PVC street elbow (Figure 3)
- Hose clamp that fits over the large end of the street elbow
- 12-14 feet of 2-inch flat discharge hose (Figure 3)

Insert the trap adapter as described previously. Slide the hose clamp onto one end of the discharge hose. Stretch the end of the hose onto the large end of the street elbow and position the hose clamp over both and tighten. Insert the street elbow into the trap adapter. Position the discharge hose to carry overflow away from the building foundation.

Inlet Options

Figures 6, 7, and 8 show some alternatives to using the DWV adapter for the inlet.



Figure 7. On left, flexible downspout adapter fitted into a 4-inch atrium grate. Atrium grate shown separately on the right. Screen can be fastened around the grate, but if the downspout adapter fits snugly into the grate opening, it isn't necessary. Be sure to clean the screen and grate frequently.

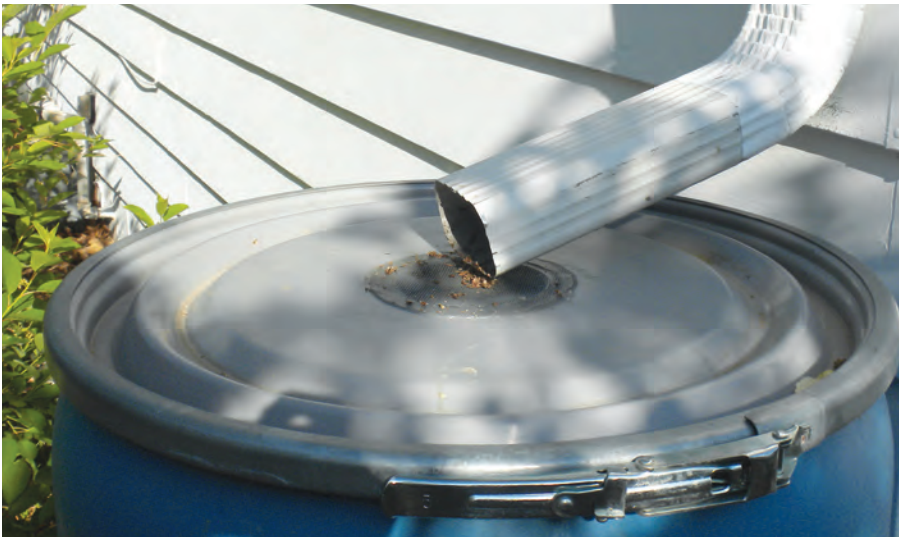


Figure 8. If the barrel lid is removable, a hole can be cut in the lid and a piece of screen caulked in place over the inlet opening. Make sure the screen is not too fine, or surface tension can make it difficult for water to enter the barrel. This method also can be used on a closed top barrel, but the screen must be removed to clean the barrel and then reset with new caulk.

Decorating and Disguising a Rain Barrel

A rain barrel can be painted to match the color of a house or to turn it into a focal point for the yard (*Figures 9 and 10*). For white barrels, painting makes the barrel more opaque and less susceptible to algae growth, although rain barrels will always have some algae. Assuming a plastic barrel is used, you will need:

- Medium to coarse grit sandpaper

- Mineral spirits or paint thinner
- Paint primer suitable for use on plastic
- Acrylic or other paint that can be used on plastic and is for outdoor use. (It can be difficult to find paint labeled for use on plastic in the exact color desired. Good preparation should help make the barrel accept other paint, but if in doubt, test it on a small area before painting the entire barrel.)

- Clear topcoat to help protect decorative designs

Roughly sand the entire barrel, then wipe the surface well with mineral spirits or paint thinner. Apply the plastic primer. If using spray paint you will need about two cans. Be sure to follow all safety and other directions on the label. Let the primer dry thoroughly. The whole barrel can be painted a desired color or decoratively painted with acrylic paint. Let this paint dry thoroughly. To protect decorative painting, apply at least two coats of clear topcoat. Even with the clear topcoat, the paint will be susceptible to scratches and chipping, especially during handling.

There are other ways to camouflage a barrel, if desired. For example, loosely wrap woven wire, such as “chicken wire,” around the barrel and plant vining flowers at the base of the barrel. Train the vines to cover the barrel. Use annual vines or a perennial that can be severely cut back each year so the barrel can be removed for cleaning and winter storage. Some rain barrel owners have positioned flower pots on top of the barrel or built a flower bed around the base of the barrel. The only limit is your energy and imagination.

Using the Rain Barrel and Rain Barrel Water

Do not drink rain barrel water or use it for washing hands. Do not give it to pets or use in a child's wading pool. Rain barrel water is good for flowers, houseplants, shrubs, and trees. However, rain barrel water is not recommended for use on edible plants because of the possibility it could contain bacteria or other harmful substances picked up from the rooftop. Wash your hands after using rain barrel water or cleaning the barrel.

Water flow and pressure from a rain barrel will be much less than from an outdoor spigot, making it ineffective to use sprinklers for water distribution. Soaker hoses that require very low



Figure 9. A decoratively painted rain barrel.

pressure (some are sold specifically for use with rain barrels) may work. Using taller rain barrel containers and elevating them on a platform will slightly increase water pressure. The simplest and best distribution method is often with a watering can.

When temperatures begin to drop below freezing at night, remove the rain barrel, drain it, scrub it out with a scrub brush or long handled brush, rinse, and store for the winter. Store indoors or upside down in a protected location outside. If outdoors, secure the barrel so it doesn't blow away. Be sure that children or animals cannot crawl inside the barrel.

When the barrel is not in use, reattach the downspout section that was removed or install a long, flexible



Figure 10. Rain barrel painted by students at Saddlebrook Elementary, Omaha, as part of a school project.

downspout extension. Make sure that water is directed away from the building foundation or other critical areas.

Summary

Collecting rainwater with rain barrels is an introduction to rainwater harvesting. The benefits of correctly installing and using rain barrels include:

- A reduction in the amount of runoff water and runoff pollution
- Increased awareness of stormwater runoff issues
- Conservation of drinking water by reducing the amount used for non-potable needs like plant irrigation

- Increased soil moisture for reduced irrigation requirements as well as enhanced plant vigor, hardiness, and drought tolerance

Resources

UNL Water Website: water.unl.edu

NebGuides: (ianrpubs.unl.edu)

- *Rainwater Harvesting with Rain Barrels* (G2220)
- *Rainwater Harvesting in Residential-Scale Landscapes* (G2148)
- *Rain Garden Design for Homeowners* (G1758)
- *Plant Selection for Rain Gardens in Nebraska* (G1759)
- *Installing Rain Gardens in Your Yard* (G1760)
- *What Stormwater Management is and Why It Is Important* (G2238)
- *Disconnecting Downspouts and Impervious Surfaces* (G2186)
- *Green Roof Basics* (G2244)
- *Water Pollution and Our Own Yards* (G1848)
- *Landscape Water Conservation* (G1859)

Circulars: (ianrpubs.unl.edu)

- *Rain Garden Design Site and Selection Guide* (EC1262)
- *Nebraska Bioretention and Rain Garden Plants Guide* (EC1261)
- *Stormwater Management: Terminology* (EC701)
- *Stormwater Management on Residential Lots* (EC707)

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