# Water Catchment to Sustain Food Production in the Midst of Climate Crisis

Weather patterns are becoming more erratic, making growing conditions increasingly difficult for farmers. In response, high tunnels and hoop houses are being used to extend growing seasons and moderate temperatures. These provide benefits, but they also make water management more challenging because they divert rainfall away from the soil within. Providing consistent water for crops is becoming a greater challenge given the drought that has been affecting the western U.S. and is now much of Kansas. Further, high tunnels affect soil health through accumulation of salts when using municipal water instead of rain.
This project will demonstrate rainwater harvesting (RWH) techniques for high tunnels at three small farms in Wyandotte and Miami Counties in Kansas. The project will construct systems to collect runoff from high tunnels, storage using tanks or a basin, and a distribution system for use within the tunnels. Construction methods, costs, water use, and savings will be documented during the project. Educational workshops will share the knowledge with other farmers on design, construction, operation, efficiency, and costs. In addition, a small-scale system relatable to home or market growers will be installed at KC Farm School and used for outreach through their “Let’s Grow Wyandotte!” program.

“Water Catchment to Sustain Food Production in the Midst of Climate Crisis” is a collaborative project between Moose Paw Farm, Herdsman House Farm and KC Farm School.

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# RAIN BARREL EDUCATIONAL MATERIALS

# Rain Barrel Construction

This paper describes how to construct, install, and maintain a rain barrel. If you have a source of barrels available, the parts needed to turn one into a rain barrel should be readily available at your local hardware store, and the process is not complicated. There are a few tips that might help you along however, and we'll cover them here.

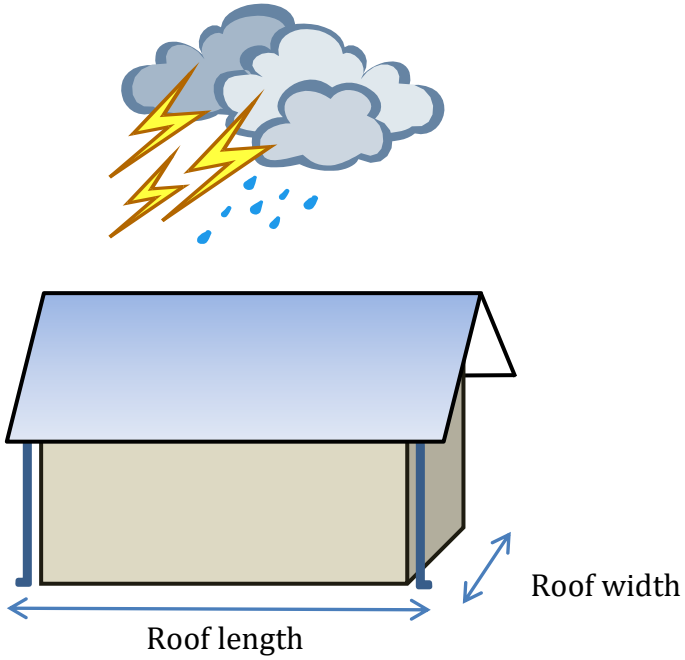
## Rain Barrel Parts


## Why Install a Rain Barrel?

Rain barrels are used to collect rainwater from your roof and store it for a dry day. They help conserve water, and plants like rainwater because it doesn't have chlorine or other chemicals in it. We use ours to water the potted plants around our house and also occasionally hook a drip irrigation hose to our barrels to water along the foundation of the house. They also help reduce stormwater runoff, which can help reduce erosion in your yard and the amount of water that drains into your street when it rains.

## How Much Water Can I Collect?

This section shows you how to estimate the amount of rainwater that runs off your roof. Let's say you have two downspouts on the back side of your house and want to put a rain barrel at each one. Measure the length and width of the portion of your roof that drains to the downspouts as in the picture below.




Multiply those two numbers to calculate the square feet of roof that drains to the downspouts. For example, if the width of this side of the roof is 15 feet and the length is 40 feet, the area draining to the downspouts is 15 ft x 40 ft = 600 square feet (sf).

One inch of rain that falls on one square foot produces about 0.6 gallons of water. So if you multiply the roof area by 0.6 that tells you how much water will run off the roof in a 1-inch rainstorm. For our example roof: 600 sf x 0.6 gallons/sf = 360 gallons.

For this roof a 1-inch rain storm will produce 360 gallons of water on this side of the house. That is 180 gallons to each downspout. A typical rain barrel holds about 50 gallons of water, so you can see it doesn't take a real big rainstorm or roof to fill one up. If you want to catch more water, you can connect several barrels in series, as shown later in this paper.

## Choosing a Barrel

Used barrels are sometimes available from food industries such as soda bottling plants and breweries. So those may be sources in your area. When picking a barrel, look for three things:

1. Make sure it was used in the food industry. Most will have labels on them. Here is one that we would not use. The label was from a local chemical plant and it contained industrial glue.

2. If you plan to paint your rain barrel, the color doesn't matter. If you don't have time to paint it, pick a dark barrel, not a white or clear one. Sunlight will cause algae to grow in the water so opaque barrels help prevent that.

3. Some barrels have screw thread openings in the top, like the photo above, and some have ring tops and the entire lid comes off. Both work but the ring tops are easier to open up for cleaning.

## Painting

Clean your barrel inside and out. If you are going to paint the barrel, let it completely dry. It is hard to get paint to stick to plastic, so you need to sand the entire surface to rough it up. Apply a primer first and then the paint. Both the primer and the paint need to be made for plastic.

I have had mixed results with paint staying stuck to my rain barrels over time, so ask your paint department staff at the hardware store for plastic paint recommendations. Unlike my bad example in this photo, you should wear a mask when spray painting to avoid inhaling paint.

## Construction

Cut 3 holes in the barrel for: 1) the inlet on the top, 2) the spigot/hose bibb, and 3) the overflow hose.

## Inlet and Debris Screen

Rainwater that drains off your roof will have some crud in it – dust, leaves, twigs, seeds, particles from your roofing tiles. So, you want to filter the water from your downspout through a screen to take out the particles. The debris causes two problems. It can clog your faucet and hoses. Also, organic matter in the water will encourage the growth of algae and bacteria. If water sits in the barrel for a long period of time it will become stagnant and smelly. Keeping the crud out keeps the water cleaner.

You can make debris screens out of plastic flower pots. Cover them with fiberglass or plastic window screen and hold the screen on with a string or rubber band cut from an old bicycle tire.

You can also use other baskets that you find at the hardware or kitchen store. Cut a hole on the top of your barrel that will allow the pot to slide down but not fall in. See the next photos.

## Spigot / Hose Bibb

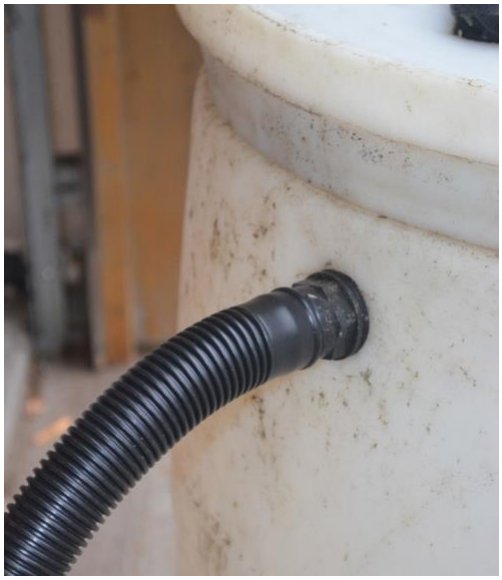
Locate the hose bibb 2 or 3 inches above the bottom of the barrel. This allows room for sediment to settle in the bottom of the barrel without clogging the spigot. Place it high enough so it doesn't scrape the ground when you set the barrel on a flat surface. You can buy plastic or brass hose bibbs. Plastic is cheaper but the brass ones open wider so they are less prone to plugging.

Drill a hole just slightly smaller than the diameter of the hose bibb, using a hole saw drill bit (2nd photo below). Put caulk on the threads before screwing the hose bibb into the barrel and let it dry thoroughly before using.

The threads on the hose bibb are sharp so wear gloves when screwing them in.


There is not much holding the hose bibb into the barrel, so take care not to yank or twist it when opening and closing the spigot. If you want a super secure connection, you can install a bulkhead fitting on the side of the barrel. That is the white fixture in the photo on the right. Bulkhead fittings are more secure, but more expensive. To install one you cut a larger hole in the barrel, the fitting goes through it and clamps down on gaskets on both the inside and outside walls of the barrel. The hose bibb screws into the center of the fitting.

## Overflow Hose



When you get more rain than the barrel can hold, it will overflow, so plan on how and where to direct that water. Attach an overflow hose or pipe and direct the water away from the house.

The most common approach is to attach a hose to the barrel a couple inches from the top, using a washing machine overflow hose or sump pump hose. See photo to the left. The hose is 1 ¼" in diameter and needs a threaded adapter to connect to a hole in the barrel.

A typical downspout is 3"x4" in size, which is much larger than the overflow hose, so in a big rain the barrel may still overflow once in a while If you don't want the barrel to overflow, the overflow pipe needs to be as big as the downspout pipe coming into the barrel. See the first photo in this paper for an example; a 3" PVC pipe was used for the overflow.

## Installation

Elevate the rain barrel high enough off the ground so that you can fit a watering can or bucket beneath the spigot. When completely full of water a 55-gallon barrel will weigh about 450 pounds, so make sure it is on a stable base that won't settle into the ground or tip over. You can use concrete blocks or pavers. Level and compact the soil before placing the blocks.

Cut off the downspout and connect a diverter to the barrel. Then make sure the overflow hose is directed away from your house foundation.

## Connecting Barrels Together

In this location three barrels were hooked together. The overflow pipe was directed to a buried pipe that drains farther out in our yard.

Each barrel has a "Y" connection on the spigot, hoses connect the barrels, and the spigots are open. As the first barrel located beneath the downspout fills up the water level rises in the other barrels too.

Another advantage of this approach is that sediment drops out in the first barrel and the water in the second and third barrels is very clean.

## Maintenance

In Kansas City it freezes in the winter, so we usually disconnect our rain barrel over the winter, empty it, and store it where it won't collect water. If you leave it in-place, leave the spigot open so it doesn't hold water. The water will expand when it freezes which can break spigots.

We have oak trees around our house and they put out lots of pollen in the spring. In the first rainstorm after pollen drops each spring the water off our roof is green from the pollen. So, I typically do not collect water until after the trees have flowered and we get a good rainstorm to wash off the roof. I don't mind green water, but the organic matter in the water encourages bacteria and algae to grow and the water can become smelly.

I empty and scrub out my barrels once a year to keep slime from growing in them. This is more of a problem if you don't use the water often and it sits in the barrel and stagnates, especially if you have sediment or organic matter in the bottom of the barrel.

Mosquitoes will get in the barrel if there are any open holes in it. So, make sure the debris screen fits tightly in the hole you cut in the top of the barrel.

Clean the inlet screen on a regular basis and check to make sure the overflow hose is still in-place and not directing water towards your basement wall.

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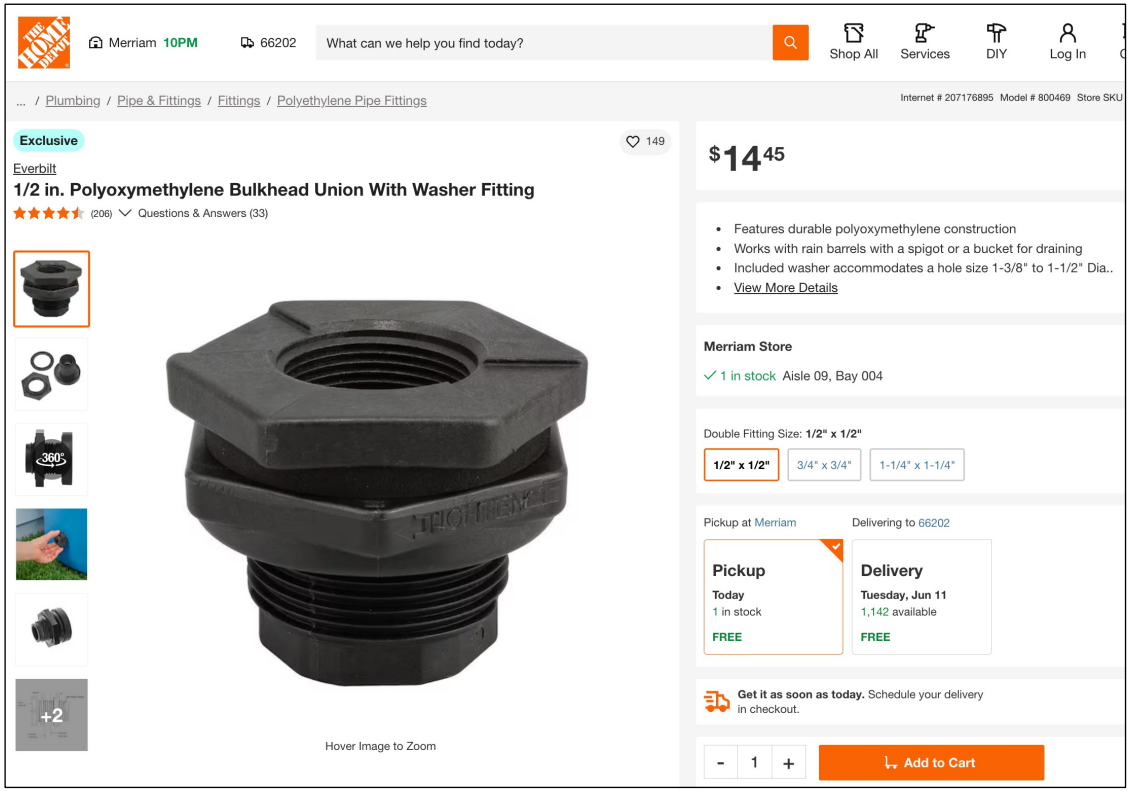
Water is a precious resource so help conserve a little, and have fun playing in the rain while you do.

# 3 Barrels Connected Together

Photos by David Dods

# Bulkhead Union / Bulkhead Fitting

Made for sealing a penetration in a tank, and is threaded so a pipe or spigot can be screwed into it
These images are from Home Depot.  Lowes and plumbing supply stores sell them too.




Bulkhead fittings come in different sizes.  Make sure the inside diameter matches the size of the hose bib that you will connect to it.  Usually ½ inch or ¾ inch.