

Everybody needs a rain barrel!

*Fresh water is expensive--
and the world is running out.
Meanwhile, runoff is the No. 1 source
of new pollution in the Elizabeth River.*



A rainwater reuse guide prepared by **THE Elizabeth River Project**





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Why waste "free" water that falls from the sky?

A fresh water crisis

"The world is running out of fresh water, and the fight to control it has begun. ...There's water everywhere, of course, but less than three percent of it is fresh, and most of that is locked up in polar ice caps and glaciers, unrecoverable for practical purposes... Water demand, on the other hand has been growing rapidly-- it tripled worldwide between 1950 and 1990-- and water use in many areas already exceeds nature's ability to recharge supplies. By 2025, the demand for water around the world is expected to exceed supply by 56 percent... Meanwhile, more than a billion people have no access to clean drinking water ... There are businessmen in Alaska who believe that the state's earnings from fresh water will eventually dwarf its earnings from oil."

-William Finnegan, "Leasing the Rain,"
The New Yorker, April 8, 2002

Runoff pollutes!

Rain may be a wonderful resource before it hits the ground, but once rain and snow fall on roof, lawn and driveway, on streets, parking lots and industrial surfaces, the runoff picks up oil and gasoline, heavy metals, industrial waste, animal droppings, topsoil, pesticides, mulch, litter and many other pollutants. Typically, storm drains, culverts and ditches, while preventing floods, carry polluted runoff straight to creek, stream, lake, river and bay with no treatment. Spongy wetlands and other shoreline vegetation that once filtered this toxic soup are diminishing.

Stormwater runoff is now the number ONE source of new pollution in the Elizabeth River, and in most waterways nationwide.

Rain barrels are one simple way to help with both problems.



10 benefits of a rain barrel

1. Reduces water bill.
2. Reduces pollution of creeks, rivers and other water.
3. Reduces need for stormwater management (detention ponds, ditches, etc.)
4. Reduces draws from wells, reservoirs, underground aquifers and other sources.
5. Increases self-sufficiency.
6. Reliable source of emergency water when other sources fail.
7. Fun do-it-yourself project.
8. Easy to suit new construction or existing buildings.
9. Inexpensive parts and labor.
10. Reduces permitting and testing costs for industries.

Introduction: The rain is free...

I'm not a technical whiz, just a citizen concerned about the environment. Nonetheless, using basic common sense, my husband and I found we could build an inexpensive, efficient, and user-friendly back-yard system with easily obtained materials and simple tools. Now we have lower water bills, we never have to water our shrubbery, and we feel great about helping reduce water pollution. It was an adventure to figure it all out, but not difficult, and now all my neighbors want to know how to do it. Thus, we at the Elizabeth River Project decided to offer a guide to reusing rainwater, to benefit our watershed-- and you.

Collecting the rain is an old idea that has become cool again. Rain barrels remind me, as a sailor, of the old salts saying "The wind is free, so put up a sail." *The rain is free, so put out a barrel.* There's something here that appeals to my Yankee thriftiness and my earth-mother sensitivities. There's something that's just better about doing things the simple way.

This is how our system came together. Your plan will be different, to suit your location and available materials, but the basic elements should be the same as those we discovered.

Our Norfolk house is perched on a small urban lot less than two blocks from the Chesapeake Bay. I hated paying big water bills year after year and watching rainfall fill the gutters and run down the street carrying contamination to the Chesapeake. As I

learned more about stormwater problems while working for the Elizabeth River Project, my husband and I talked about trying some sort of rain collection tank.

First we thought we would just get a pickle barrel, as these 50-gallon drums are easy to scrounge and easy to modify. My husband Joe thought that such a small container would quickly run dry between rainfalls, though, which is when you need it. The next thing I knew he came home from work with a 275-gallon detergent tank from a cement plant where his tug delivers gravel. As with many industries, the plant finds recycling too difficult, and was glad to have him haul it away.

I was amazed that this big tank turned out to be perfect for our yard, in size and shape, fitting right into an inconspicuous shady spot behind a trellis, which protects the plastic from UV damage. We set it off the ground on cinderblocks, so gravity would improve flow to the hoses. It's close to Joe's thirsty ferns that always want more water.



Soaker hoses from the cistern keep Joe's ferns watered.



... so put out a barrel.

I was in the dark as how to connect the tank to our roof three stories up and worried about the cost of all the plumbing. At the hardware store I saw that sewer-grade PVC pipe is a fraction of the cost of drinking-water PVC pipe. This allowed us to spend less than \$150, even though our tall house called for extra-long downspout pipes, flexible elbows, faucet fittings, brackets and adhesives. Joe and a friend spent about eight man-hours connecting gutters to tank, and tank to faucet. Soaker hoses connect to the faucet and we can siphon off buckets of water for washing cars and outdoor furniture. The opening on top serves as access for a power washer when algae accumulates.

Part of the design challenge was to prevent a build-up of sludge in the tank. The first drops of rain pick up air pollution, shingle sand and other unwelcome additions from the roof. Sand and leaves could clog our soaker hose, and salt spray off the Chesapeake would be bad for the garden. We learned that other contamination could also be of concern, such as bird droppings leading to a bacterial build-up. Our solution: Joe joined front and back downspouts together in a Y, then simply made a deep loop near the tank to allow dirt to settle out, like the trap under a sink. Other “roof washer” ideas are on page 11.

Then it sprinkled. Wow! The tank filled right up. I discovered that even our average-size house causes enough runoff to fill our big tank in less than half an inch of rain. Since then, people have asked me if their house is too small for rain collection to work well. Based on our amazing results, any building could work if the design is efficient. We just cracked the valve to the soaker hoses and let water flow to those ferns. They have never been thirsty since and



Joe used PVC cement and caulking compound to stop all leaks.

I don't have to do a thing. We leave the faucet at a trickle and rain keeps replenishing the tank. Even under our record drought conditions this year, the tank only ran dry once for a few days. We have picked up a second tank and soon will double our capacity - we won't run dry again.

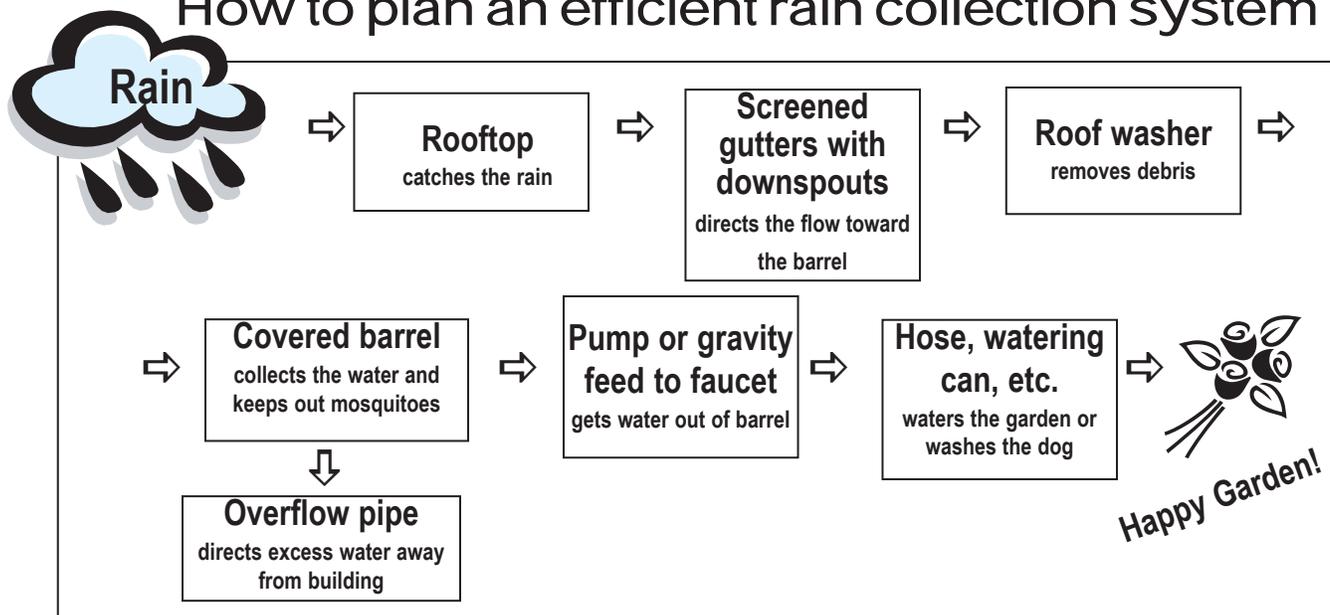
Now people stop on the street and we have to give tours. Everyone wants an automatic watering system that saves money, requires no power, and helps our waterways.



--Kathy Hill, author
and Willoughby Spit
homeowner



How to plan an efficient rain collection system



Checklist: What will I need to get started?

- A barrel, cistern or tank (more about this later).
- Gutters.
- Gutter screens are great for keeping out leaves.
- Downspouts from the gutters into the tank.
- If your tank is not right under the downspout: hardware to connect spout to tank, such as elbows, pipes and PVC cement. Sewer piping works fine and costs little.
- A “roof washer” to divert the first flow of dirty water away from the tank (see page 11).
- A tank overflow pipe to direct water away from your foundation, and prevent erosion.
- A faucet for the bottom of the tank.
- A tight-fitting child-proof, removable cover that will keep out mosquitoes and allow access for cleaning.
- Hoses or watering cans to get water from the faucet to the garden or wherever it is needed. Soaker hoses work great.



Industrial reuse: A River Star success story

Rain can be an asset for industries as well as homeowners. The simple reuse idea can turn stormwater from a challenging regulatory issue into an asset. That's what happened with Southern States Cooperative, a fertilizer plant right on the Southern Branch of the Elizabeth River.

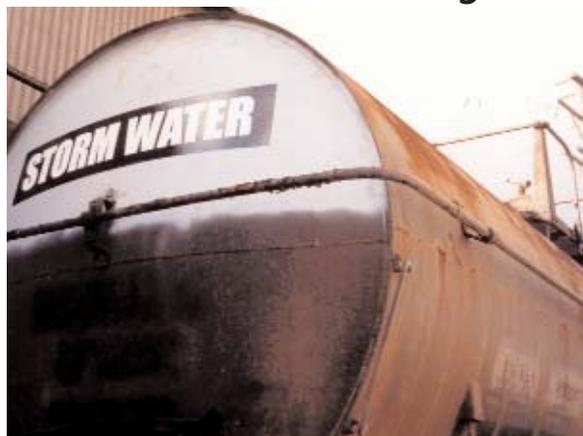
Saving money three ways

In addition to preventing pollution, Southern States is saving with:

- ◆ *less runoff sampling (\$131 per test).*
- ◆ *reduced water purchasing (by about \$500 per year).*
- ◆ *reduced nitrogen and phosphorus purchases.*

This plant manufactures ammoniated fertilizers, saves money, and prevents pollution with a simple cost-effective rainwater collection system, earning recognition from the River Stars program of the Elizabeth River Project. Southern States formerly discharged runoff to their retention pond, and then it flowed to the river. Now this plant in Chesapeake, Virginia, models a new ethic for environment-friendly enterprises. Its "rain barrel" was created out of an old rail car.

Collection and Storage: Southern States collects runoff from most of the site, then pumps it to the rail car, which was a former acid tank. The recycled tank stores it for use in the manufacturing process.



Southern States made a cistern out of an old rail car, collecting 150,000 gallons of rain every year.

Simple Process: The company uses about 150,000 gallons of rain each year in this way, water that would otherwise be purchased. Less nitrogen and phosphorus are needed, nutrients included in fertilizers, because rain naturally contains nitrogen and phosphorus (using rain in this way on farmland is called "fertigation").

Southern States documented these results, and other stewardship efforts, to be recognized at the highest tier, Model Level, in the River Star program in 2001.

Other River Star industries are looking at collecting the rain for reuse in their process, or for irrigating landscaping. Call the River Star program staff at the Elizabeth River Project for ideas!



Choosing your barrel: Rain is free ...

I didn't like any of the choices when I went out to shop for a barrel. You can buy a gorgeous aged whiskey barrel with an antique hand pump, but you still only have 50 gallons of water-- not enough to last between the rains in our area, and you're out a big pile of money. You can easily modify a plastic trash can with a \$25 faucet kit-- but again, the capacity is too small for Hampton Roads. For the average suburban household, 40 per cent of water consumption is for lawns and gardens! Your rain barrel can only help you out if it's big enough.

Three questions will help you figure out what size will work for you.

1. How much and how often does rain fall?
2. How big is your roof?

3. How much water will you want-- enough for your lawn (not likely), garden and shrubs (easy), potted plants (if that's all you want it for, a barrel may not be worth the trouble).

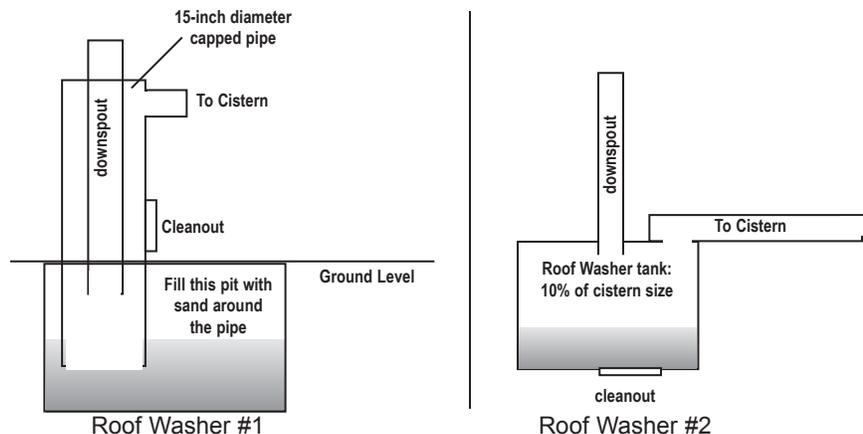
Rain in Hampton Roads: Who knew? Right now we're in a drought, but historically, Norfolk has almost the same rainfall in a year as soggy Portland, Oregon, 44.8 inches. However, our rain falls only on every fourth day in the dryer months, about half an inch a week. People around here water their gardens almost daily in the hot months. Your water bill for last summer will indicate how many gallons you needed: 40 percent is probably a sizeable number of gallons per month. Aim for a rain barrel big enough to help eliminate this cost.

A roof washer keeps the water clean for reuse

A "roof washer" traps shingle sand, salt from a sea breeze, bird droppings, most air pollution residue, anything gutter screens don't catch, and other debris, before it gets into your barrel, by giving gravity time to work.

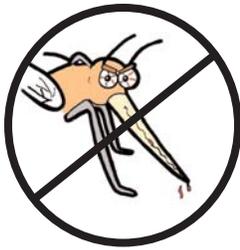
You can leave a roof washer out if your system is small and easy to clean, or buy one on the internet, or easily make one.

Here are two examples: both take up little space, are easy to make and clean out, and are effective in areas with a lot of leaves.



... and sometimes so are cisterns.

The simple solution to mosquitoes: Cover your barrel!



Your unique circumstances: Your roof size determines how much rain you collect. Divide your roof area, in square feet, by two. You can collect roughly this many gallons of water from one inch of rain, after losing some to the roof washer, evaporation, etc. (25 by 40 foot house = 1000 square feet of roof area, divided by 2 = at least 500 gallons in one inch of rainfall.) It doesn't matter whether your roof is flat or steep, it collects the same rain regardless of its configuration.

How much water do you want? I was surprised that for most trees, shrubs and flowers, a little rain goes a long way. There are too many variables, like shade, humidity and soil type, for a precise formula, but I estimate that a 200 gallon tank will keep my 200 square foot garden going for up to two weeks between rainfalls, even in hot, dry conditions, with judicious use. If in doubt, get the largest tank you have room for, then enlarge or shrink your irrigated area to suit your weather.

What kind of tank do you need?

Tanks can be round, square, rigid or soft like bladders. Tanks *must* have tight child-proof

covers to keep kids, pets, debris and mosquitoes out. Tanks can be plastic, aluminum, steel, wood, fiberglass-- almost anything. Plastic tanks must be treated for resistance to ultraviolet radiation (sunshine), or kept well in the shade. Steel tanks should be coated inside and out to prevent rust. Make sure any recycled tank is well rinsed or pressure washed.

Free sources: What is manufactured near you? Go to the nearest industrial park. Look for pickle barrels where pickles are made; look for whiskey barrels at a distillery. Tanks from 50 to 50,000 gallons are used for shipping everything from orange juice (plastic inside galvanized steel) to whiskey (oak barrels) to detergent (plastic in a metal cage). Large shipping tanks are used for many liquids and can often be found for free. Junkyards, businesses, manufacturers, processors, shippers, recycling centers, shipyards, marinas: many kinds of businesses buy materials in tanks; stop in and ask. Often when a tank is empty the owner must pay to have it hauled away-- and is happy to give it away instead.

Wholesale sources: If you don't find a free container, the same sources above might negotiate a reasonable price. Or check classified ads. Don't forget trade magazines at the library. We found ads for 275-gallon orange juice containers in *Boats and Harbors*, a marine industry tabloid. Get together with friends in your neighborhood and order a truckload of barrels to bring the price down if you have to buy new ones.

**Relax -
this won't
be you!**

ORANGE, VA
(Associated Press,
September 18, 2002)--
Town officials in Orange
and Gordonsville
reimposed tough water
restrictions after the level
of their only water
source, the Rapidan
River, dropped by 5
inches over the weekend.
... Residents will be
limited to one 3-minute
shower a day... Only
recycled water can be
used on plants, ... and
residents are prohibited
from operating a
dishwasher or washing
machine unless it is full...
Restaurants... must use
paper plates and plastic
eating utensils. ...
Businesses must supply
cleansing hand-wipes in
bathrooms and turn off
water fountains....



Web sources

These are the best I found, among many, for kits, information, parts and ideas.

- ◆ rainbarrelsandmore.com
- ◆ Garden Tools by Lee Valley
- ◆ Composters.com
- ◆ Geocities.com/ rainsystem / howto.html
- ◆ Gardener's Supply Company
- ◆ Rainwater System.com

Retail sources: Hardware stores, garden centers, discount clubs, and department stores sell rain barrels and kits, although, as discussed, their size is usually very small.

Where do I put my barrel? Can you prevent freezing in the winter (rarely a problem if you keep it full)? Is it accessible for cleaning? Will the overflow drain into the ground? If the yard is big enough to offer several choices, consider:

- ◆ Under your downspout: minimum of work and plumbing.
- ◆ In a hidden area: more space for a larger tank without being unsightly.
- ◆ In the garden: easier to water the plants.
- ◆ Up on blocks: easier to fill a bucket from a faucet near the bottom of the barrel.
- ◆ In the basement, garage or shed: if appearance or codes are an issue.
- ◆ Under the porch, stoop or deck: often a good use of this space.
- ◆ Underground: invisible but needs one or more pumps; this can prevent freezing.
- ◆ On the roof: a good option where space on the ground is tight (requires a pump).

Is a foundation necessary for the weight of the tank when full? 500 gallons of water weighs 2 tons; you could dig a gravel foundation. For a 55-gallon drum (440 pounds), cinderblocks would work.

Construction tips: Try to keep pipe bends at no more than 45 degrees, and a downspout slope of at least 1/4 of an inch per foot. Any horizontal stretch of pipe needs cleanouts at both ends. Consider powering a pump with solar energy. Consider stacking several drums to increase capacity.

Do I have to treat the water? Not for mosquitoes, if you have that tight-fitting lid, so essential for keeping out critters of all kinds. Yes, if you want to drink the water. Meanwhile, cleaning is helpful for all uses.

Water in tanks often grows algae, but this does not matter if you are using the rain on the garden, the car, or the dog. Rainwater often contains nitrogen and phosphorus, which are good for your garden and houseplants: you may need to use less fertilizer! Rainwater is "soft" and non-chlorinated, with no lime or calcium, great for biodynamic and organic gardens, and window-washing. Our grandmothers used it for their hair, as a natural conditioner. In an emergency or natural disaster, your rainwater collection system will be useful for flushing toilets, but don't try to drink rainwater without careful disinfection first. You would have to invest at least \$1 a gallon to install several filter systems. Once in a while, empty your tank and pressure wash it to remove any algae or sediment. If you suspect bacterial growth (the smell will often be a big clue), empty the tank, pressure wash it, and add chlorine bleach when you refill it.

Good luck with your own rain barrel project!

Ours was great fun and yours can be too. And from the Elizabeth River Project, thanks for doing your part for the river. Rain was never meant to pollute, and your efforts will help us all. If you want to help even more, join us as a member and consider making your business a River Star.





Keep everything out of storm drains but rain

Other solutions to runoff pollution.

Restore or conserve wildlife habitat

Plant trees along the waterfront - a riparian buffer

Mulch to prevent evaporation - but not with bark!



Build a stormwater wetland in a tidal area

Keep cigarette butts and trash out of the runoff

Plant a rain garden in a low spot

Xeriscape: Plant native plants that don't need watering

Replace hard pavement with a permeable surface

Trench, pipe or pump runoff to a tank

Aerate compacted soil for better drainage

Pam Boatwright and Bill Hunt of the Elizabeth River Project's Stormwater Team test the soil at a potential River Star, the Trafton Rowing Center in Norfolk. Some of the suggestions here will work to prevent stormwater problems almost anywhere. Call The Elizabeth River Project for a Wildlife Habitat Guide for sustainable landscaping specific to Hampton Roads.

Stormwater contributes as much as 90 percent of heavy metals contaminating the Elizabeth River.



“Some solutions have been around a long time. Collection of rainwater is again becoming a valuable tool that can provide water for many purposes and reduce stormwater runoff at the same time.”

-- David Paylor
Deputy Director of Natural Resources
Commonwealth of Virginia

Elizabeth River restoration

If your home is on this map, your land drains to the Elizabeth River. Our home river drains 200 acres of the highly urbanized Virginia cities of Norfolk, Portsmouth, Chesapeake and Virginia Beach. Our watershed is one of the three most toxic “Regions of Concern” on the Chesapeake Bay, but a multi-million dollar partnership is underway to restore the river to health.

Join us!

The Elizabeth River Project is an independent nonprofit organization, founded in 1991, with a small staff and over 2,000 members. Our mission is to restore the Elizabeth River to the highest practical level of environmental quality through government, business and community partnership. Join us today. Memberships start at \$25 for individuals and \$175 for organizations.

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