

14

Rainwater Capture: Rain Barrels and Cisterns

Rainwater harvesting is simply capturing water and storing it for future use. It's an impulse as natural as tilting back your head and opening your mouth to catch a taste of a late-spring rain. It is an art and practice thousands of years old.

Nothing beats rainwater for purity. Rain starts with zero bacteria, chemicals and salt. Only the air it falls through and the surfaces it runs off contaminate it. Rain is incredibly soft (no minerals) and slightly acidic. For these reasons, plants prefer rainwater above all other water sources.

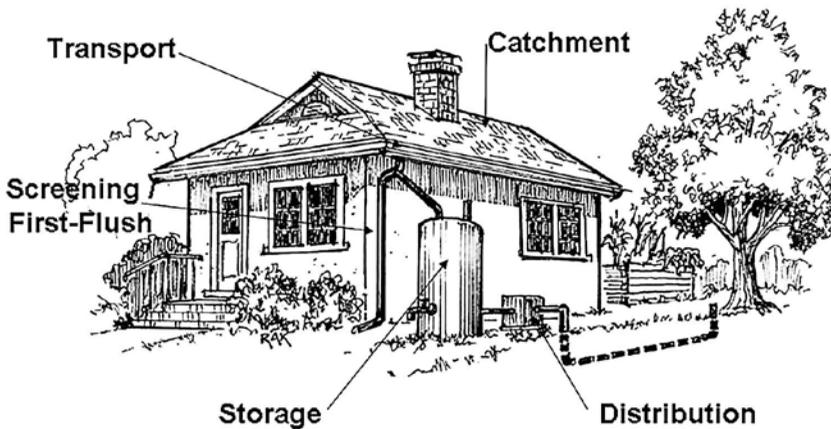
Despite these fantastic benefits, rainwater capture can become a public nuisance if not properly maintained. It can inadvertently create vector problems by increasing the population of insects and animals that transmit disease to humans. It can leak or malfunction, which can cause pooling, runoff and rot problems to the site's infrastructure. A long-term commitment to maintenance will ensure all of rainwater's the benefits without any of the above-mentioned the risks to public health and urban infrastructure.



Arlington Garden, Pasadena.

Maintenance

The basic steps of rainwater harvesting are capture, transport, screening, storage, and distribution. Rainwater falls on a roof, is channeled into gutters, screened of large debris, transported to a storage device, and then finally delivered to the landscape either by gravity or a pump. The drawing below illustrates these steps. Following it is a description of the maintenance required at each point.



Drawing by Richard Kent

Rainwater Capture Surface: The Roof

Any surface that allows water to sheet and run can be used to capture rain. Naturally, the cleaner the surface, the cleaner the water and the longer it can be stored without significant change to its quality. Maintaining a clean surface ensures better water quality. Sweeping or blowing the debris off the roof and gutters helps ensure better quality.

Avoid Collecting Water from Toxic Surfaces

The water that runs off some surfaces should not be collected and stored—it might create a toxic soup. The surfaces to avoid include:

- Petroleum-based surfaces, such as asphalt, slurry and tar.
- Surfaces treated with a preservative, such as wood shingles.
- Rough surfaces (They trap more particulates and dust and are more likely to support algae, bacteria, mold and moss).

The fact that these surfaces produce water too toxic for storage means that the water is also damaging to our rivers, lakes and ocean. Rainwater coming off contaminated surfaces should be led to the landscape where the toxins can be naturally changed or removed.



This is not an ideal situation for rainwater capture. Under several *Eucalyptuses* that shed profusely water collected from this roof will be full of leaves and spoil quickly.

Transport System

To get rainwater from a surface to a storage device requires a system of transport. Gutters do this job. The single most important part of maintaining the efficient transport of rainwater is keeping gutters clean. From misdirected and spilling water, to pooling and mosquito problems, cleanliness affects the quality and quantity of water collected.

- Clean the leaf guards before every major storm to ensure proper flow.
- Repair damage to gutters to reduce leaking and pooling.
- Maintain a proper slope. Gutters must have a slight incline to efficiently move water. No less than a ¼" fall per 10 feet is required, and a ½" fall is recommended.
- Replace interlocking gutters with continuous gutters to greatly reduce opportunities for leaks, spills and pooling.

Diversion and Screening Devices

After months without rain a roof will be exceptionally dirty. This water must either be finely screened or diverted away from a storage container. There are inexpensive techniques, such as manually directing a downspout to a landscape, installing funnels with filters, and making first-flush boxes. Expensive systems will have pumps, extensive filters and electronically regulated diversion systems.

After the initial cleaning, all subsequent work will be aimed at screening organic debris, such as feathers and leaves, from being swept into storage. Screening is essential because the cleaner the water coming into storage, the cleaner it will be when it comes out, and the cleaner the water, the more uses it has. Screening devices are fairly inexpensive and include gutter screens, leaf-guards and strainers.

Gutter screens should be cleaned before the start of every storm.



Not only will this fine-mesh screen prevent debris from getting into the rain barrel, but also mosquitos.

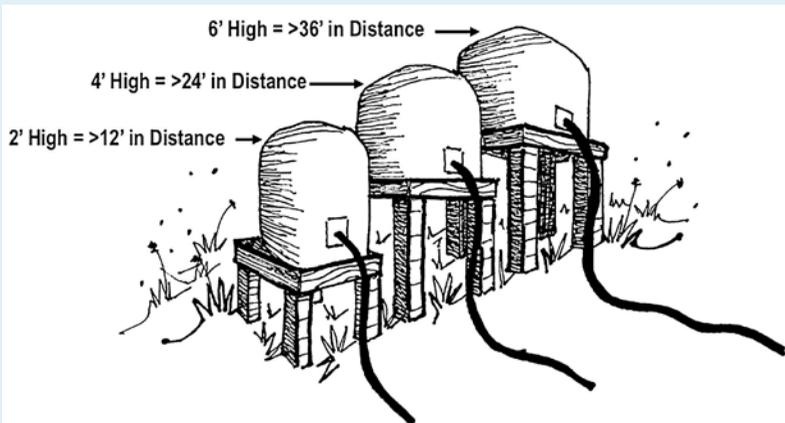
Storage: Barrels and Cisterns

Capturing rain is easy; storing it properly can be a challenge. Algae, pooling, mosquitos and misdirected water are common problems with poorly maintained storage systems. Storing rainwater is not a low maintenance practice. Below are the essentials of maintaining a healthy and effective storage system.

Benefits of Elevating the Barrels

The higher off the ground the stored water is the greater its energy potential and the greater its use. Increasing water pressure and rates of flow also makes cleaning the barrels easier.

Height of Barrel	Water Pressure (psi)	Useful Distance of Hose
On Ground		
Full	1.30	18'
Nearly Empty	0.00	0
2' Off Ground		
Full	2.16	30'
Nearly Empty	0.866	12'
4' Off Ground		
Full	3.03	42'
Nearly Empty	1.73	24'
6' Off Ground		
Full	3.90	54'
Nearly Empty	2.60	36'



Inspection: Before the start of the rainy season inspect the barrel or cistern, looking for cracks, loose fittings, a tears in screens, and joints that might need a fresh application of plumber's grease or silicon.

Cleaning: Rain barrels should be emptied out and cleaned of algae and sediment no less that once a year. If algae is a problem, scrub the inside with a solution of either vinegar and water (1 gallon per 1 gallon), bleach and water ($\frac{3}{4}$ cup per 1 gallon), or hydrogen peroxide and water (1.5 cups per 1 gallon). Be sure to dispose of the vinegar, bleach or hydrogen peroxide in the sewer system—not a landscape or storm drain!

Painting: Many people paint their barrels/cisterns, either to reflect sunlight or to match the color of a structure. Cooling a container with paint is effective and can increase the longevity of the entire system. Plastic storage units will need painting every 2 to 3 years.

The Essentials of Maintenance

The maintenance of rainwater harvesting systems falls into three categories: cleaning, protecting and replacing.

Cleaning: Cleaning is an essential and ongoing task. Starting from the catchment area and working towards the eventual outfall, every screen, filter and catch basin must be cleaned prior to the rainy season every year. Every other year the debris at the bottom of storage devices should be removed.

Protecting: A rainwater harvest system needs protection from the environment. Heat, cold and animals all cause a lot of damage. A system will last longer in the shade and steady temperatures; the north side of structures is the best location. Shading devices, such as cloth and structures, as well as light reflecting paint, will also increase the longevity of the system. Protecting the plumbing and storage tank from freezing will decrease chances of ruptures and fissures. This may require insulation for the pipes and placing a water heater in the tank. Make sure there are no access points for insects and animals by fixing all leaks, and repairing and replacing barriers.

Replacing: Maintenance means replacing fittings and filters, gutters and downspouts. Depending on exposure and use, most, if not all, of a rain storage system will have to be replaced in 20 years. This means that $\frac{1}{20}$ th of the initial cost must be paid out (or saved) for the system every year. Maintenance means doing a little at a time, all the time.

Thwarting Mosquitoes

Creating anxiety and discomfort, inflicting bites and disease, mosquitoes ruin a favorite Southern California ritual—enjoying the sunset at dusk. Storing water on a property increases the chances of mosquitoes. To safely store water and continue to enjoy the sunset follow the maintenance recommendations listed below:

***Bti* (*Bacillus thuringiensis israelensis*):** A larvicide that is used in water with access to the atmosphere. *Bti* is a bacterium that is toxic to the larvae of mosquitoes as well as some blackflies and gnats. It is available at any home improvement store and not much is needed for a 55-gallon barrel. Since *Bti* does not work on the other 3 stages of a mosquito, it must be combined with other strategies.

Draining Barrels: Draining a barrel once a week is very effective because mosquitoes go from egg to adult in 7 to 10 days. Be sure to remove any water that pools in top of the storage device.

Drain Rock: Water tends to pool around rain barrels. Placing barrels on a 6" layer of crushed drain rock will alleviate this surface pooling.

Securing Fittings: Make sure that the lid, vents and all incoming and outgoing pipes are properly secured. For systems that are regularly used and/or jostled, replacing gaskets and resealing fittings with silicon can be a yearly task.

Mosquitofish (*Gambusia affinis*): One mosquitofish can eat 300 mosquito larvae a day. Open-air storage devices, like troughs, benefit the most from these fish. The major drawback with mosquitofish is that people get attached to them and are reluctant to drain the troughs and which kills the fish. Mosquitofish are free in Southern California. Simply call your local Vector Control District to get a supply. Mosquitofish are not necessarily appropriate for rain barrels. They need just the right amount of water, temperature and light, and rain barrels rarely provide the right combination of these three needs. Exclusion and source reduction are the best options for barrels.

Screens: Any opening to the stored water that cannot be securely closed requires a mosquito screen. Mesh no larger than 1/16" is needed to adequately screen overflow pipes and lid openings. Window screen mesh is an inexpensive and effective option.

Mosquitoes go through their life cycle fairly quickly. They have 4 stages: egg, larvae, pupae and adult. The first 3 take place in the water and take only 7 to 10 days to complete. Adults may live a couple of months. Only females bite; they need the blood for their eggs. The buzzing you hear is related to mating.