

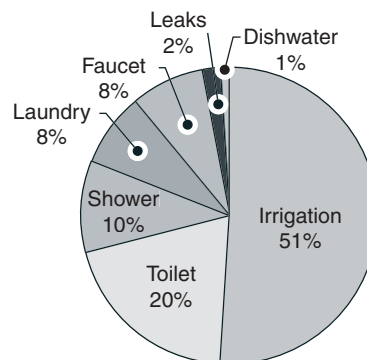
According to the Atlanta Journal Constitution, within the next 30 years Lake Lanier, fed by the Chattahoochee River, may not be able to supply enough water to the growing Atlanta area if current use patterns continue. By the year 2050, the worldwide availability of freshwater will have decreased by a third as a result of global warming, population growth, and wasteful habits. The natural underground aquifers will be at all-time low levels. Scarcity of fresh water will become the limiting factor for healthy, livable communities. Using water conservation techniques, like rainwater harvesting systems, helps reduce the negative impacts on our water supply, keeping our cities vibrant and healthy.

The average U.S. household uses 146,000 gallons of water per year with up to 50% of water going towards landscaping during summer months. Installing a rainwater harvesting system is one way to reduce outdoor water use by collecting water during the rainy season that can be used during droughts. By capturing water on a 1500 square foot roof, a family could reduce their water bill by 50 percent and save 43,000 gallons of water yearly.

Why harvest rainwater?

- Save money! Avoid the increasing economic and environmental costs associated with purchasing water from the centralized water system. Operating costs are lower than the cost of purchasing water from the centralized water system.
- Save energy! By reducing water use, energy demands to pump water from the water treatment plant to the service area are reduced. The number of newly built polluting power plants will also decrease as a result of collecting rainwater.
- Save water! Reduce the demands on scarce surface and ground water sources. Reuse water instead of pulling from the water table (or a freshwater source). Centralized water systems and wells pull from the water table.
- Reduce erosion and stormwater run-off and increase water quality! Capturing the rain that falls on roofs reduces flash floods and household stormwater run-off. Less stormwater run-off may reduce the stormwater collection fee for the household and will certainly improve the health, quality, biodiversity of our watersheds, and replenish the water table (or our freshwater supply).

Typical Household Water Usage



Rainwater Harvesting Strategy

Rainwater harvesting systems for landscaping can be constructed quite easily and without the need of chemical filtration. There are five components to a rainwater harvesting system for landscape use. The water is collected on the *roof* and transported by gutters and *downspouts* through a *leaf screen* or a large particle filter to a *cistern*, where the water is stored. The water then flows through a simple gravity run *delivery system* to the garden.

Costs

A rainwater harvesting system has higher initial costs than buying water from the central water supplier, but the payback period is less than 1 to 2 years. Save up to 50% on the water bill by reusing water. The largest cost of the system is the cistern container. Construction costs (with new barrels) can range from \$250 to \$2000. This cost can be reduced drastically by purchasing barrels previously used for food products.

Maintenance

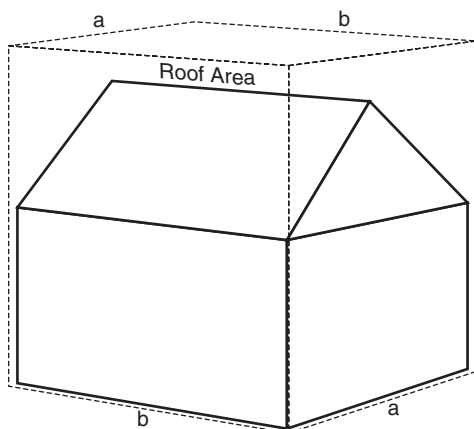
An effective system requires minimal, but regular maintenance. Change the filters every month or two depending on use. Clean the inside of the cistern yearly. Minimize the amount of debris in the gutters and keep leaves out of the filters.

Simple Rainwater Harvesting System in Five Easy Steps

Step One: Sizing your system.

The size of a rainwater collection system depends on the size of the roof, the amount of rainfall, and the water demands from the system.

1. Assess the landscape. How often and for how long do you water your lawn and garden a week? What do you use to water the landscape?
2. Calculate the water demand during the driest four months of the year (June-September). Keep in mind the following:
 - A sprinkler uses 480 gallons/hour
 - A regular hose uses 480 to 720 gallons/hour (Average is 600 gallons/hour)
 - A drip hose uses 1 gallon/hour for every 100 feet of hosing
3. Determine the average rainfall for your area (obtain this number from a local TV station or visit www.weather.com). This number will be needed to determine how much water will be caught.
4. Determine the size of the catchment area. Any roof of sufficient size with a gutter system can act as the catchment area as long as the water is used for non-potable uses. The above figure illustrates how to determine the area of the roof and calculate how much rain the roof will catch. The area is the length of the roof's gutter system multiplied by its width.



The catchment area of the roof is a simple calculation of width x length of the house. To find how much rain will be collected, take the area of the roof, multiply by the annual rainfall amount, then multiply by .5618 to arrive at the average number of gallons yearly.

Example: A house in Atlanta with a 1500 square foot roof. The lawn is watered with 4 sprinklers, three hours a week. The plants are watered with one sprinkler, two hours a week and with a hose for an hour a week.

- It rains 51 inches in Atlanta therefore the roof will catch 42,978 gallons. (Number of gallons caught derived from the following formula: square feet X .5618 X inches of rainfall.)
- Sprinklers: 4 sprinklers for 3 hours—12 hours X 480 gallons/hour = **5,760** gallons
- 1 sprinkler for 2 hours—2 hours X 480 gallons/hour = **960** gallons
- Hoses: 1 hour X 480 gallons/hour = **480** gallons
- **5760 + 960 + 480 = 7200** gallons/week X 16 weeks = **115,200** gallons of water demanded during the dry season.
- If this house utilized 500 feet of drip hoses for 14 hours a week instead of sprinklers only 1120 gallons of water would be needed.

Step Two: Choose the right cistern.

The size of the cistern depends on the amount of water to be collected and cost restraints. Choose a cistern that fits the needs of the water harvesting system. Collecting a small volume of water is better than collecting none. All cisterns should be watertight, durable, and have a clean, smooth interior. The cover

| Cistern Type | Advantages | Disadvantages |
|---|--|---|
| fiberglass tanks | prevents algae growth and evaporation, rust resistant, durable | higher initial costs, degradable, requires exterior coating |
| polyethylene tanks | various sizes, shapes, alterable, inexpensive, movable | can deteriorate over time if not treated for UV radiation |
| plastic garbage can | available, inexpensive | use only new cans |
| barrels | attractive, alterable, great for small systems | hard to find, small |
| 55 gallon steel drums | available, durable, great for small systems, moveable | prone to corrosion, rust and/or toxins |
| galvanized tanks | inexpensive, attractive, moveable, alterable | can rust, higher long term costs |
| plaster cisterns | low profile, inexpensive, can alter color | large footprint, unalterable, immovable |
| concrete tank-ferrocement, stone, or concrete block | durable, permanent | potential to crack, difficult to maintain |

needs to be tight fitting to prevent evaporation. A cistern with a lid allows for easy access to attach a faucet and to occasionally clean inside. It is best to place the cistern out of direct sunlight to prevent algae and bacteria growth, which can clog the system. The use of two or more smaller cisterns enables service on one unit at a time without disrupting the entire system.

Step Three:

Placement of the cistern.

- Place the cistern at a high point on the lot and elevate approximately 3 to 4 feet on a sturdy, load-bearing foundation or structure. This will create enough pressure to use gravity for running the water through a hose, soaker hose, or drip irrigation system to the landscape. Foundations can be made of bricks, concrete, or a wood frame. A full 55-gallon cistern will weigh around 500 pounds.
- Above ground cisterns are less expensive than a below ground cistern and easier to maintain. With this system it is easy to take advantage of gravity to guide water throughout the irrigation system.
- Below ground cisterns are good for colder climates. Storing water below ground can have aesthetic appeal while keeping the water out of the sun. Underground systems require a more complicated design and a pump to achieve gravity irrigation. Below ground systems tend to be used primarily in commercial sites due to the additional cost of pumping.

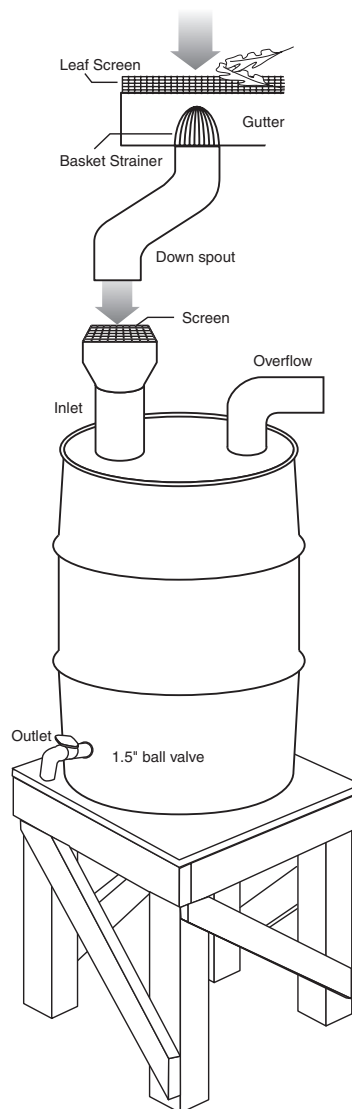
Step Four:

Set up a conveyance system with a large particle filter between gutters and cistern.

- Install continuous leaf screens, made of ¼-inch wire mesh in a metal frame, above the gutters to prevent debris from entering the system.
- Place a basket strainer (e.g. a screen or wire basket) at the top of the downspouts (optional). Make the downspout out of 4-inch diameter Schedule 40 PVC pipe or comparable piping. Angle bends should not exceed 45 degrees. Slope the piping at ¼-inch slope per foot minimum.
- Adapt the gutter to PVC piping with a downspout adapter.
- Place pantyhose or other filtering system before the head of the cistern to filter out debris from the roof.

Rainwater Catchment

Sample diagram



Step Five:

Set up a distribution system to remove water from the cistern to the landscape.

Place a faucet near the bottom of the cistern with a hose connection. Do not place at the very bottom because sediment will build up here. Drill a hole into the cistern for the connection and install a ball valve. Seal the area completely around the hole with aqua or water resistant sealant. (Sealant can be purchased at a hardware or pond supply store). Enough pressure is generated to run soaker hoses and drip irrigation systems from a cistern that is elevated 4 feet. A pump may be needed to create enough pressure to run sprinklers, which require a higher amount of pressure.

Troubleshooting Rainwater Harvesting Systems

Algae growth in the cistern.

- Water with algae growth is still usable for landscape watering. To reduce algae growth, which could clog up the system or slow down water flow, clean the system on a regular basis. Placing the cistern in the shade or underground or using dark barrels will help discourage algae growth.

Leaves on the roof or in gutters.

- Obstructions and leaves caught in the gutters can reduce the amount of rain captured. Clean gutters on a regular basis for maximum collection.

Finding a cistern.

- A variety of containers can be found at farm supply stores, local hardware stores, or on the Internet. Contact Southface Energy Institute for suggestions on where to purchase used drums.

Generating enough pressure to run a sprinkler.

- Water gains 1 psi of pressure for every 2.31 feet the cistern is elevated. A sprinkler requires at least 20 psi. An auxiliary pump may need to be installed to generate enough pressure. Solar powered pumps work well. Or use a drip irrigation system, which uses less power and water.

Xeriscaping—Water Efficient Landscaping

By using xeriscape and permaculture landscaping techniques, outdoor water use can be reduced by 50 percent without compromising the aesthetic qualities of the landscape.

Xeriscaping incorporates seven steps for developing and maintaining a water-wise landscape.

Step 1: Planning and Design

Divide the landscape into water-use zones. Incorporate shade and native/drought tolerant plants into the design.

Step 2: Soil Analysis

Determine what improvements need to be made to the existing soil. Soil testing can be done by your local extension service.

Step 3: Appropriate Plant Selection

Choose non-invasion, native plants that are appropriate for the soil and sun exposure. These plants will be drought tolerant and low maintenance.

Step 4: Practical Turf Areas

Choose drought tolerant turf and limit the use of turf to areas of play.

Step 5: Efficient Irrigation

Set up an efficient design for the irrigation system based on the water-use zones. Water only when necessary and early morning watering is best. Try to keep every drop of water on site to prevent run-off use. Use a drip irrigation system set to a timer for efficient watering.

Step 6: Use of Mulches

Mulch traps moisture into the ground and insulates plants from the harsh seasonal air temperatures.

Step 7: Appropriate Maintenance

Use slow release, natural fertilizers. Mow lawns less during droughts to strengthen root structure. Increase height of the mowing blades by 33 percent. Thin plants rather than shear them.

Other ways to save water

- Install low-flow shower heads.
- Install a water efficient toilet. Do not use your toilet as a trash can.
- Use water and energy efficient appliances like horizontal axis laundry washers. Always look for the Energy Star logo.
- Fix leaky water pipes and faucets. A leak of one drop per second wastes 192 gallons per month.
- Turn the faucet off while brushing one's teeth and shaving.
- Greywater reuse—check with the local Health Department for legalities.
- Take showers rather than baths.
- Compost food waste instead of using a garbage disposal.

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