This presentation covers passive RWH systems, large active systems (>200 gal) and small, “do-it-yourself” systems for small yards.

Picture shows two 200 liter (50 gal.) used food containers with flowerpots on top and a small raised vegetable garden behind.

Used food barrels are cheap (possibly free at a food distributor). Food barrels also come in white & blue colors but can be painted after pre-treatment.

Black object on downspout is a water “diverter” that sends water from the downspout to the barrels.

Advantages of Rainwater Harvesting

• Better water: Rainwater has no chlorine, salt or other chemicals
• Save water & save money
• Reduce pumping water from our aquifer
• Save expense of adding pipelines
• Reduce runoff
• Reduce soil erosion

Photo shows Fiskars commercial rain barrel (center) plus two used food barrels. Barrels are raised on concrete blocks. Left barrel was painted.

Where does Prescott’s water come from?

According to AZ Dept. of Water Resources the aquifer recharge rate (“safe yield”) is 4,000 acre-feet per year. Withdraw rate is over four times as high — about 18,000 acre-feet/year.

(1) 58 gal. Fiskars commercial barrel (center) ~$140 including downspout diverter and one spigot. (Second spigot near bottom of barrel was added at extra cost.)

Used food barrels cost $40 each at C-A-L Ranch store in Prescott, including small spigot. (You may wish to replace the spigot.) You also need a diverter.

Barrels are raised on concrete blocks so a bucket can fit below.

Author has eight 50-60 gal barrels. Total capacity 440 gal.

Grey barrel was painted with latex house paint after “flame” treatment.

(2) Prescott’s drinking water comes from the Little Chino Aquifer near Chino Valley.

According to AZ Dept. of Water Resources, the current withdrawal rate is over four times the aquifer recharge rate (18,000 vs. 4,000 acre-feet per year).

Some private wells in the shallow parts of the aquifer have already gone dry and more will go dry as the water table drops.

Del Rio Springs, where Prescott got its water 100 years ago, is projected by the Dept. to go dry by 2025.
(4) Prescott and Chino Valley are in process of raising rates over several years.

Note that Sedona charges most for conserving homeowner (because of high fixed charge) but less for water wasters.

(5) This is an actual water bill for a conserving household for the dry month of June – **20 gal per person per day.** Many homes use over 100 gal/day/person. Try to use less than 35 gal.

About half of summer water use is for landscaping. With rainwater harvesting and drought-tolerant plants you can avoid using potable water for irrigation.

(6) Collection area is the horizontal area covered by the roof (including overhangs). 1000 sq. ft. is a very small house and 6500 sq. ft. is a very small lot.

Collection example: ¼ of a 2000 ft² house => 500 ft². With a 1” rain => 300 gal.

The first ½ mm or so just wets the roof and is not collected.

Water cost is from 2019 City of Prescott single family residential rates.
(7) Aerial view of Prescott home with gabled roof. Hip roof similar except gutters on all sides.

Gutters shown in green, downspouts in blue, rain tanks in red.

Gutter drain at left-front discharges to street, which wastes rainwater. Others discharge into ground.

(8) Store enough water to last the dry months, April through June. Fill your containers during late winter rains and again during the monsoon.

Eight 50-60 gal barrels (440-gal total) at author’s house is usually enough for a small yard with drought-tolerant plants plus a small vegetable garden.

(9) Precipitation for Verde River watershed Oct 2017-Sep 2018 plus median and extremes. Note the extreme variability of fall & winter storms but much less variation for spring & summer.

El Niño winters are often rainy.

Slide from Michael Crimmins, U. of AZ.
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Large system should have direct fill from downspout plus overflow line. Diverter not effective for more than ~200 gal.

Fiskars DiverterPro at middle costs ~$32 from HomeDepot.com. One Fiskars diverter will feed two barrels (need add’l fitting -- connection kit (~$16) has 2 fittings). Black tubes transfer water from downspout to barrels. Oatley “Mystic” diverter ~$22 blocks only 7% of downspout.

Rubber diverter at center blocks ¾ of downspout -- backs up water and overflows barrel or even to gutter. Many barrels come with similar diverters.

Top-fill rainbarrel is prone to overflow because nothing stops the water flow when the barrel is full. Also, screen can clog and/or admit mosquitoes.

Photo at left shows two of author’s rainbarrels. The larger one on right fills after left barrel is full. The original rubber diverter overflowed the barrel (and even the gutter) so it was replaced with an Oatley “Mystic” diverter.

Multiple small containers can catch water from several sections of your roof.

Large 2500 gal. system at right is for house with fruit trees. It costs about ⅓ more for two tanks instead of one of double size but multiple tanks can catch water from larger area of your roof.

Commercial system with “Slimline” tanks funded through an Environmental Protection Agency grant. Note debris screen.

Cost: $4550 / (2*1060 gal) = $2.15/gal.
IBC containers are plastic containers in a metal cage, 175-gal & up. Containers in photo at left are larger. Containers should be painted or covered with fabric.

Used IBC containers are available in Prescott from C-A-L Ranch & NAZ Tanks. 275-gal container ~$200.

First flush intercepts dirt flowing off roof when rain starts. It should be emptied after rain or have a dribbler valve especially in freezing weather.

Some people consider first flush too much trouble.

(14) Shallow basins collect water for nearby plants. Little cost if installed during yard grading or landscaping. No maintenance (other than routine yard clean-up).

Top photo from Adult Center of Prescott.

Check dams slow runoff and erosion and collect sediment to provide environment for plants. During storms, water pouring over rocks can make “plunge pool” damaging dam. An “apron” of flat rocks just below dam can deflect force of water.

Passive collection should be combined with active harvesting in rain barrels or tanks.

(15) California poppies at Prescott College: Attractive low-water use plants.
(16) Basins (swales) and berms can store water for plants. If you don’t want to disturb existing plants by digging a basin, a berm alone will provide some benefit.

Irrigators should be at drip line to encourage roots to spread out, not close to base of tree except for newly-planted trees.

Putting plants on mounds and running gutter drains to the street or a ditch wastes rainwater.

(17) Pressure in psi = 0.43 times height in feet.

2’ tall barrel on 1’ base supplies 1.3 psi when full and only 0.4 psi as it empties.

Irrigation water pressure is typically 20-40 psi. Would take 70’ tower for 30 psi.

(18) Note: If barrels are connected at bottom, a leak will drain all barrels. Water freezing in pipe may break pipe. But bottom-connected barrels may make a pump feasible.

In winter, water in small pipes may freeze. But in Prescott, only a “cap” of water in a barrel will freeze.
(19) Right: Oatey diverter with Good Ideas Rain Wizard rain barrels, which originally were “pour in the top.” Screened openings were blocked and sealed. A vent hose beside the fill hose lets air out above the diverter (a lower vent will leak water). Oatey “Mystic Rainwater Harvesting System” ~$22 at Homedepot.com is fairly resistant to overflow. Oatey diverter may leak unless sealed. Supplied hose kinks during shipping.

Left photo: Wedge over downspout in gutter to block leaves.

(20) Some HOA’s require rainbarrels to be hidden or painted to match the house.

Photo shows a paint durability test. Barrel surface was prepped by rubbing with isopropyl alcohol, sanding (#400 grit) and/or lightly passing a propane torch flame over the surface.

After 3 days to dry, paint was scratched with a knife and then duct tape was applied & removed.

Paint tested was Rust-oleum “American Accents” spray paint. Another paint is Krylon “Fusion for Plastic” (not tested).

Second test used Frazee latex house paint.

The flame pre-treatment seems to work best.

(21) Small barrels can be stored in garage or shed or left outside in winter. If left outside, be sure they are tied down.

You can keep water in barrels in winter but drain small hoses and drain below diverter.

On large system “first-flush” should include a “dribbler valve” so it doesn't freeze. (Can be just small hole blocked by screw when not needed.)

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