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Rain Catchment Systems

The addition of a rain catchment system to one's home is a highly effective means of collecting and storing fresh water. By collecting the water that nature delivers directly to your residence in conjunction with gravity, one can significantly reduce utility bills. Currently in use at the Campus Center for Appropriate Technology (CCAT) at Humboldt State University is a rain catchment system that provides running water for all of the center's non-potable purposes. This system is an excellent model for those who live in dry climates or places with dry seasons. The system shows how to conserve water while also pinching a few pennies. Variables to consider when installing your own rain catchment system include:

- **Climate**
- **Gravity**
- **Surface Area**
- **Filtration**
- **Water Channeling**
- **Cisterns**
- **Location**

Climate

The part of the world where one resides greatly affects the success of a rain catchment system. The dryer climates will enjoy great benefits from such a system because it conserves water during the rainy seasons for later periods of drought, yet all climates can utilize the system's principle components to achieve success. A rain catchment system can be used anywhere that supplies an ample amount of rainfall. Positioned in northern California, CCAT's rain catchment system is in an optimal geographic location.

Gravity

Nature likes to be in a state of low energy and striving for equilibrium. The force of gravity is an agent that pulls water down, toward this state of low energy. We can use the simple mechanics of gravity and water flow to operate our catchment system. The system is virtually free of labor input after the initial installation of its components. The key is to keep your system ***constantly flowing in the downward direction***. Gravity is the mechanism that allows the system to function.

Surface Area

It is important to have a large, slanted surface area for rain to strike against. This allows for the consolidation of raindrops that can subsequently be redirected at the bottom of the sloping surface. The rooftops of houses, barns or sheds are all excellent possibilities for maximizing the potential of existing surface area. “One inch of rain on 1000 square feet of roof surface yields around 550 gallons of rainwater” (Banks, 2). Ideally, smooth, durable metal roofs are the way to go if you desire to use the water for potable purposes. This type of roofing should be used in regions that don’t receive much precipitation because it allows less debris to accumulate and attains a higher rate of run off due to less friction and less absorption. The roof of CCAT is lined with composition shingles. This type of roofing material produces a lot of friction and may add some debris particles to the system. Due to northern California’s rainy climate, the roof friction produced by the composition shingles does not hinder the CCAT system’s functionality.

Filtration

There are four phases of filtration to consider in a catchment system. The first is installing gutter guards (wire mesh) over the gutters to prevent any large debris, i.e. leaves, conifer needles, etc., from entering the initial water transport. Also, strainer basket should be installed to cover the entrance to the down-spouts and the mouth of the cisterns to further prevent debris from entering the water supply. The second filtration is running the water through a layer of sand within the cistern to sift out any small particles that made their way into the transport. The third filtration is a chemical purification of the water in the storage phase. “Carbon filters, reverse osmosis, and/or ultraviolet light in combination can remove nearly everything except radioactive particles” (Banks, 2). The system at CCAT by-passes this step because the water is not used for potable purposes. The final filtration is one of maintenance, but it must be addressed. It is important to incorporate a means of clearing sediment from the gutters and cisterns. Removable gutter guards and a removable lid or hatch at the tops of the cisterns are the methods emplored by the CCAT system.

Water Channeling

Once significant water mass is at the base of the slope, it needs to be directed by gutters. Again, rooftops of houses, barns, and sheds are the ideal surface areas because they already exist and their function serves a dual purpose. The gutters of this system must be clean and have a gradual slope toward the cisterns allowing gravitational forces to achieve water transport. This also prevents water from backing up and possibly speeding any deterioration processes of the roof.

The space between the gutters and the cisterns must be bridged in order to store the acquired water. Figure 1 illustrates how the CCAT system uses a 50-gallon plastic barrel for water capture at the base of the down-spout. The barrel then drains to the mouth of the 900-gallon cistern via 2-inch PVC pipe supported by 4 x 4 posts.

Cisterns

The cisterns serve a dual purpose. The first is to retain the water. The second purpose for having multiple cisterns is to maximize the "head"; the gravitational water pressure that keeps the plumbing supplied with running water. Cisterns may be made of fiberglass, plastic, metal, wood (although wood is a poor option because it tends to add chemical tannins to the water and is susceptible to rotting), or concrete. The size of the cistern may vary according to the amount of water you desire to store. 1997 prices for cisterns made of the above mentioned materials are listed in table 1.1.

Table 1.1 1997 Prices and Materials for Cisterns

Metal	*40-60 cents per gallon without a liner*
Polypropylene plastics	*35 cents to $1 per gallon*
Fiberglass	*38 cents to $1.50 cents per gallon*
Wood	*Variable upon type and size*
Concrete	*35 cents to $1 per gallon*

There are four holding tanks in use at CCAT. One 900-gallon cistern, two 300-gallon holding tanks, and one 250-gallon holding tank. They are made of polypropylene plastic and were donated in 1987 by the Sheriff's department. They were estimated to have a combined $400 dollar value at that time.

Location

When locating the cisterns, keep in mind that every situation is different. If the ground is level and the surface is made of rocks not large or sharp enough to puncture the cistern, no crash pad may be necessary. Crash pads made of at least four inch thick concrete are a good idea considering that "…water weighs about eight pounds per gallon, a 5000- gallon tank will tip the scales at 40,000 pounds" (Banks, 12). Make sure to place the cisterns where gravity will increase the water pressure. "Water gains one pound per square inch of water pressure for every 2.31 feet of rise or lift" (Banks, 11). Choose a spot that will not be a burden to work around at least 50 feet away from the septic tank; always keep plumbing in mind. Leave plenty of space for maintenance. If it is desired to keep the water at a cooler temperature, place the cisterns on the north side of the house or under the shelter of trees. Keeping the cisterns cool and out of direct sunlight will limit the amount of algal growth within the tanks. At CCAT, The cisterns are centrally located on the property. They are under the shade of trees on a gradual slope just above the garden. The tanks are about twenty feet off of the south-east corner of the house so they have minimal distance for water transport and are easily accessed if repairs are needed. The CCAT has a composting toilet so the septic tank issue does not apply. For the CCAT, the cisterns are positioned in the optimal location.

Sources: *Rainwater Collection for the Mechanically Challenged*
By Susan Banks, copyright 1997, Tank Town Publishing, TX
CCAT Archives- Rain Catchment Systems Folder (anonymous authors)
CCAT Rain Catchment System Diagram (Kris Biddle)
Verbal information about CCAT System provided by Sean Armstrong