

Cold Climate Rainwater Harvesting Systems

Rainwater harvesting and use was once a necessity. Systematic rainwater harvesting for domestic use has been practiced for thousands of years. Rainwater catchment systems can be found in most regions of the world, with adaptations suited to local climatic conditions. Despite its long history and ubiquitous use, rainwater harvesting is rarely practiced where safe, abundant, and reliable water is supplied by public and private utilities. But this is changing—the potential for rainwater harvesting is being rediscovered as stress on conventional potable water supplies increases.

Background

In recent years, pressures on municipal water supplies in the United States, including demand, drought, pollution, overallocation, overpumping, and inefficient use, have brought increasing attention to water use efficiency, water conservation, and rainwater harvesting as methods of increasing water security. This is especially the case in the arid southwest but also in other areas of the country where drought, pollution, or other problems occasionally limit the capability of municipal utilities to meet increasing demand.

Collection, storage, and subsequent use of rainwater from rooftops can reduce demand on municipal water supplies. Rainwater is suitable for a range of residential water uses (including toilet flushing, garden and landscape irrigation, and clothes washing) without extensive treatment. Rainwater use could offset residential water use by 50% to 70%, depending on region and system design and performance.

The basic components of rooftop rainwater harvesting are the same regardless of region: collection area, transport (gutters, pipe), first flush/filtration, storage, and distribution. However, climate plays an important



Figure 1. FPL's research demonstration house.

role in the specific design and operation of rainwater harvesting systems. Systems used in the tropics differ from those used in arid regions or those used in cold climates. This study will extend the growing field of knowledge in rainwater harvesting to contemporary residential situations in cold climates.

Objective

This research and development program will evaluate rainwater system options, design, and efficacy for application to the Forest Products Laboratory's research demonstration house (Fig. 1). The most suitable systems will then be constructed and integrated into the interpretive program at the house.

The research demonstration house provides a unique opportunity to demonstrate and evaluate the potential for rainwater harvesting in cold climates. This study includes development, design, construction, and performance evaluation of a cold climate residential rainwater harvesting system.

Approach

The study will be in three phases:

In the research and documentation phase, existing conditions of the demonstration house and site will be evaluated, along with products, suppliers, and systems design options (Fig. 2).

The system options analysis and design phase will fit the technologies to the facility and interpretive program. The major design challenge will be to determine what kind of rainwater harvesting system will be demonstrated and where it would be best located for both interpretation and function (Fig. 3). Three levels of rainwater use will be evaluated: (a) landscape irrigation, (b) toilet flush and other nonpotable uses, and (c) potable (treatment and testing required).

The third phase will involve construction and performance evaluation of the installed system.

Expected Outcomes

The research project will result in (1) development and refinement of technologies for rainwater harvesting and management in cold climate, (2) performance and reliability data for rainwater harvesting systems, (3) demonstration of effective rainwater harvesting systems and products, and (4) expanded public awareness of the potential for rainwater harvesting in cold climates

Timeline

House documentation and systems design will be completed by spring 2004. The first series of water harvesting strategies will be built and tested in summer 2004. Research on the first series of systems and design revisions will be completed by January 2005. Full commissioning of rainwater systems demonstration is scheduled for summer 2005.

Cooperators

USDA Forest Service, Forest Products
Laboratory
University of Arizona

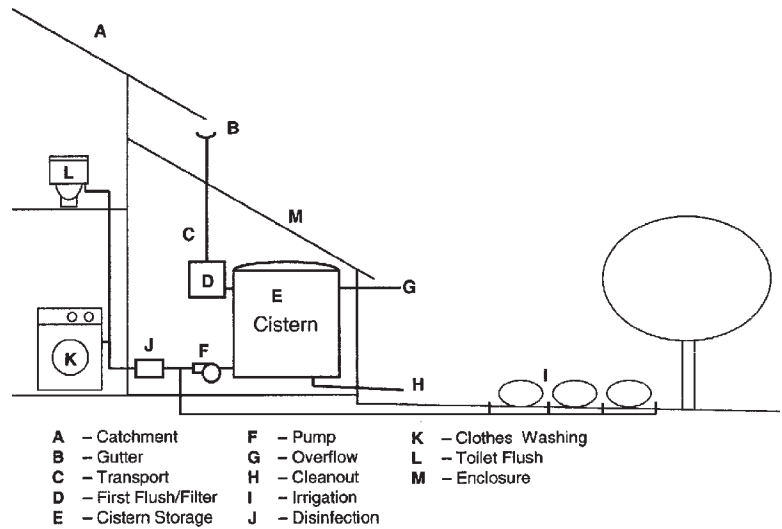


Figure 2. Rainwater harvesting system.

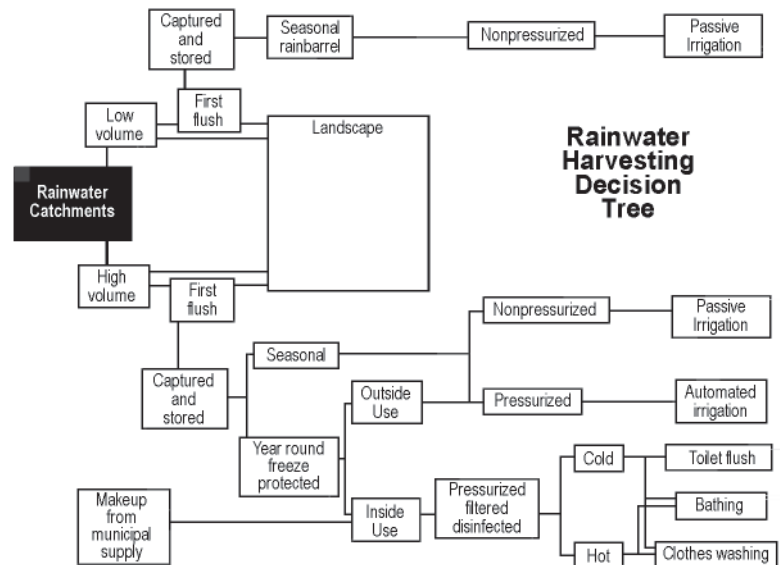


Figure 3. Rainwater harvesting decision tree.

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