

"When the well is dry, we will know the worth of water." Benjamin Franklin

Agriculture Resiliency

Rainwater Harvesting



Snohomish Conservation District

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RAINWATER HARVESTING



As we move into the next few decades, climate projections for the Puget Sound show a rise in temperature with very wet winters and springs followed by warm, dry summers. Increases in winter and early spring rainfall, coupled with decreasing snow packs in our mountain ranges, will equate to more frequent and intense flooding events followed by dry summers with significant decreases in stream flows (CIG, 2015).

We have already begun to experience long, hot summers that have dried up pastures and increased the need for crop irrigation. As this pattern becomes more frequent, many farmers are likely to find their water bills rising. Rainwater harvesting can be a valuable tool, allowing farmers to collect water when it's abundant and save it for when it's needed most.

Rainwater harvesting is a method of storing rain that falls on roofs that would otherwise have run down drains, evaporated, or soaked into the ground. Rainwater harvesting systems can vary widely in size and cost, depending on your needs and your budget. Larger systems may store rain

for agricultural irrigation or watering, and provide partial relief to well water or municipal water use. Stored rainwater is also gentler on crops since it has a more neutral PH and does not have mineral or chemical contamination. However, some crops may require filtering or UV treatment of stored rainwater before application. Crops that are fresh-picked and eaten like lettuce or berries may need filtration to ensure food safety.

In Western Washington, rainwater harvesting is legal and property owners may retain up to 5,000 gallons of storage volume onsite without any permits. If landowners need to expand the volume of rainwater storage above the 5,000-gallon limit, applying for a permit is a simple process.

Benefits

On a watershed scale, rainwater harvesting has the potential to catch and hold water in times of plenty while mitigating the dangers that heavy rainfall can cause, such as flooding. Capturing the water that flows off of a roof (even small outbuildings, livestock shelters, and barns) can also significantly reduce mud and erosion. Rainwater stored during the wet months can be held in reserve for irrigation or livestock watering when faced with a long dry summer. This helps reduce dependence on river and groundwater sources.

Rain Barrels and Cisterns

Rain barrels and cisterns are the most common form of rainwater harvesting. Such systems collect roof runoff and hold it in storage tanks or bladders until the water is needed in drier months. Cisterns are larger than rain barrels and can collect thousands of gallons of water annually. Typical storage containers are above ground polyethylene tanks and PVC bladder tanks. A single bladder tank can be sized to contain up to 100,000 gallons of harvested water.

There are several things to consider when assessing whether or not to install a rainwater harvesting system. Ask the following questions to help determine the size and type of system you will need:

- How much water is typically used and what is it used for?
- How efficiently is water currently being used?
- Is there enough rainfall to accommodate your needs?
- Is there a suitable collection area?
- What quality of water is needed?
- What are the potential energy costs of a system?
- What is your budget?

Look at the roofs on your property, especially those that add to mud or ponding issues. Well-functioning gutters are necessary for an effective rain catchment system. Ensure your preferred location can hold a stable base for your cistern (crushed gravel, concrete, or cement blocks).

In Western Washington, the size of your cistern will most likely be limited by cost—not the amount of rainfall. For example, the rain from an average residential roof during one storm would fill a 650 gallon cistern. Systems often require gutter work, tank installation, and a pump. A system typically costs between \$0.40 and \$0.80 per gallon of storage volume.

Consider the distance from the cistern to the end-use area, such as a pasture or animal trough. Slight downhill slopes are ideal for gravity flow. For areas that are uphill or far away, a pump will be needed.

Overflow valves are essential, and excess water should be directed away from any building foundations to other parts of the landscape that can safely absorb water.

There are simple calculations to help determine the amount of rainwater running off of a roof. This calculation will give you an idea of the overall rainwater harvesting opportunity that your structures will provide. First, multiply a building's width by its length to find the estimated footprint. Next, determine the portion of the footprint that will drain into a catchment system.

Rain caught (gallons) = (inches of rain) x 0.6* x (portion of building footprint).

***One inch of rain falling on a square foot of surface yields approximately 0.6 gallons of water.**

For example, if your home's footprint is 1,400 square feet, and you want to know the amount of water that comes from a ¼ inch (.25") rain event:

**Rain caught (gallons) = (.25) x (.6) x (1,400) = 210 gallons
(or less if you're only gathering from one part of the roof) (Seattle Public Utilities, 2018)**



Other Methods

While rain barrels and cisterns are common, there are other methods of harvesting and holding rainwater in the landscape longer into the dry months.

Berms and swales can be strategically placed along a slope to passively harvest rainwater. A swale is a shallow trench, excavated along the contour of a slope, with a mound of uncompacted soil, or berm, on the downhill side. As water flows down the slope, the berm acts as a retaining wall, interrupting and slowing the runoff (which has the added benefit of reducing erosion). Water fills the swale and the berm soaks it up, passively storing the rainwater in the soil and sub-soils below.

Swales and berms can take many forms and can be designed to retain large or small amounts of rainwater. When designed properly, roof runoff from buildings or other impervious surfaces can be directed to swales. Swales and berms can also be built so that any excess water will flow into another swale farther down the slope.

The image to the right shows an example of swales and berms being used for perennial plants, but these can also be designed for use with annual crops.

For step-by-step instructions on how to construct swales

and berms for passive rainwater harvesting, visit: <https://snocd.org/swale-berm>

Capping drain tiles on farmland is another form of rainwater harvesting. These systems use tiles to drain fields while water levels are too high, but also allow for capping those tiles and holding back water in soils just below the necessary level of drainage needed for initial planting. The Snoqualmie Valley Watershed Improvement District is implementing projects on farms in King County to test the viability of this method for keeping moisture in soils longer into the growing season.

Capping tiles has additional benefits. Research has shown that by plugging drain tile outlets for up to ten days after manure applications, most of the nutrients from manure are retained in the soil profile instead of draining off to surface water. This could protect water quality and reduce the need for applications over the long term (Lawrence et al, 2011).



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Find Out More

For more information on rainwater harvesting contact the Snohomish Conservation District at (425) 335-5634.

Department of Ecology Rainwater Collection

- <https://snocd.org/doe-rainwater>

Snohomish County Ordinance No. 05-103

- <https://snocd.org/ordinance>

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