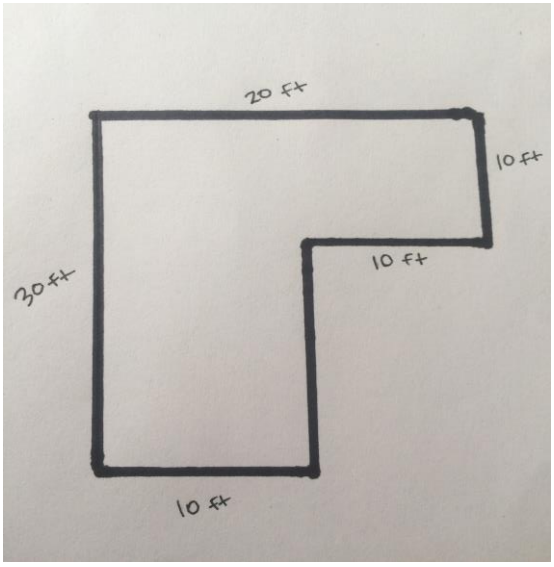
**Name:**
**Date:**

# Rainwater Harvesting Calculation Worksheet




**Purpose:** To practice designing a rainwater harvesting system for our own households.

1) **Calculating Roof Surface Area**
*What is the surface area of this roof? (show your work)*

2) **Calculate Rainfall Volume for 1" of Rain**
*Reference formula & example on screen (show your work)*

3) **Calculate Rainfall Volume for average annual Vallejo rainfall** *(~21 inches of rain / year)*

4) **In order to determine which size rainwater tank makes the most sense for our house and local climate, we need to calculate how many times the rainwater tank would fill up throughout the year. Calculate how many times each of these rainwater tanks would fill up each year** *(show your work)*

a) **500 gallon tank:**

b) **1000 gallon tank:**

c) **2500 gallon tank:**

d) **5000 gallon tank:**

5) **Which size rainwater tank do you think makes the most sense for our rainwater system?** *Please explain your reasons why!*

# Rainwater Harvesting Calculation Worksheet

**Drawing of House Roof Dimensions:**

It is now time to calculate the rainwater harvesting potential of your own household. Draw a diagram of your roof perimeter here. To calculate the rough distance of each roof section, use either a tape measurer (having an extra hand helps with this process) or count out the number of steps you take, heel to toe, for each distance of the roof. Or ask your parents if they know the square footage of their house, which will be similar to the roof. Feel free to simplify your house design and round to the closest foot to simplify the calculations – a rough estimate of the roof dimensions is fine. *(If you don't live in a house, calculate your apartment roof or make up your own roof!)*

1) **Calculate Roof Surface Area** *(show your work)*

2) **Calculate Rainfall Volume for 1" of Rain** *(show your work)*

3) **Calculate Rainfall Volume for average annual Vallejo rainfall** *(~21 inches of rain / year)*

4) **Calculate how many times each of these rainwater tanks would fill up each year** *(show your work)*

a) **500 gallon tank:**

b) **1000 gallon tank:**

c) **2500 gallon tank:**

d) **5000 gallon tank:**

5) **What are some of your irrigation needs at your house? Do you have a backyard lawn, garden, or potted plants?**

6) **Which size rainwater tank do you think makes the most sense for your household rainwater system?** *Please explain your reasons why!*

7) **Explain one water harvesting design principle and how you would use it in designing your rainwater tank for your home?**

8) **What are three reasons that water harvesting is important?**

9) **Why do we always begin our permaculture / ecological designs with the principle, Observe & Interact?**

## The Eight Principles of Successful Rainwater Harvesting

*(From Brad Lancaster's Book - Rainwater Harvesting Volume I)*

**1. Begin with long and thoughtful observation.** Use all your senses to see where the water flows and how. What is working, what is not? Build on what works. Try to understand the site as whole, not as separate pieces.

**2. Start at the top (highpoint) of your watershed and work your way down.** Water travels downhill, so collect water at your high points for more immediate infiltration and easy gravity-fed distribution. Start at the top where there is less volume and velocity of water. **Watershed:** a *catchment area* – the total area of a landscape draining or contributing water to a particular site or drainage.

**3. Start small and simple.** Work at the human scale, so you can build and repair everything. Many small strategies are far more effective than one big one when you are trying to infiltrate water into the soil.

**4. Spread and infiltrate the flow of water.** Make water stroll, not run, through the landscape. Spread out the flow of water so it can slow down and infiltrate into the soil. Slow it, spread it, sink it! Practice the art of waterspread… the gentle harvesting, spreading, and infiltrating of water throughout a watershed rather than the rapid shedding or draining of water out of it. Turn *runoff* into *soak-in*!

**5. Always plan an overflow route, and manage that overflow as a resource.** Always have an overflow route for your water harvesting system in times of extra heavy rains. Where possible, use that overflow as a resource – to feed a rain garden or another source.

**6. Maximize living and organic groundcover.** Create a living sponge of mulch and plants to improve the soil's ability to infiltrate and hold water. Native vegetation – indigenous plants found within 25 miles of your site and within an elevation of 500 feet above or below your site – are generally best adapted to local rainfall patterns and growing conditions and therefore often make the best groundcovers.

**7. Maximize beneficial relationships and efficiency by "stacking functions"** Get your water-harvesting strategies to do more than hold water. Berms can double as high and dry raised paths. Vegetation can be placed to cool buildings and provide food. Rainwater tanks can provide shade, privacy, or support structures. By stacking functions, you get far more efficiency and productivity for the same amount of effort.

**8. Continually reassess your system: the "feedback loop"** Continual reassessment is the key to long-term maintenance of a water-harvesting system. Observe how your work affects the site – beginning again with the first principle – long and thoughtful observations. Make any needed changes, using the principles to guide you.

**How-to Calculate Rainfall Volume from Roof**:

| **Surface Area Roof** (sf) **x Rainfall** (inches) **x 0.623** gallons/sf-in = **Gallons Rainfall / In. Rain** |
|---|

***Ex#1 -*** *For a roof that is 12ft x 20ft and with an annual Vallejo rainfall of ~21 in./year:*

(12ft x 20ft) = 240sf **x** 21 inches/year **x** 0.623gallons/sf-in = 3588 gals rain / year

***Ex#2 -*** *For a roof that is 80ft x 22 ft with a 1" rainfall event:*

(80ft x 22ft) =1760sf **x** 1 inch rainfall **x** 0.623gallons/sf-in = 1096 gals rain / 1" rainfall event