

# Rainwater Harvesting Educational Workshop -- Tucson Water's Incentive Program



Welcome to an online class:

- ▶ We take attendance and follow up with additional resources for all class attendees. Our moderator will contact you if we need additional information.
- ▶ During the session please use the chat window if you have a question.
- ▶ At the end of the session we will have a Q&A. You will be able to use your webcam and mic if desired or just use your chat box.



# Learning Objectives

- ▶ How to save potable water
- ▶ Select appropriate strategies
- ▶ Ensure best practices
- ▶ Enhance quality of life - grow shade and food while saving potable water
- ▶ Submit a successful rebate application



# 5 Steps to Saving Outdoor Water

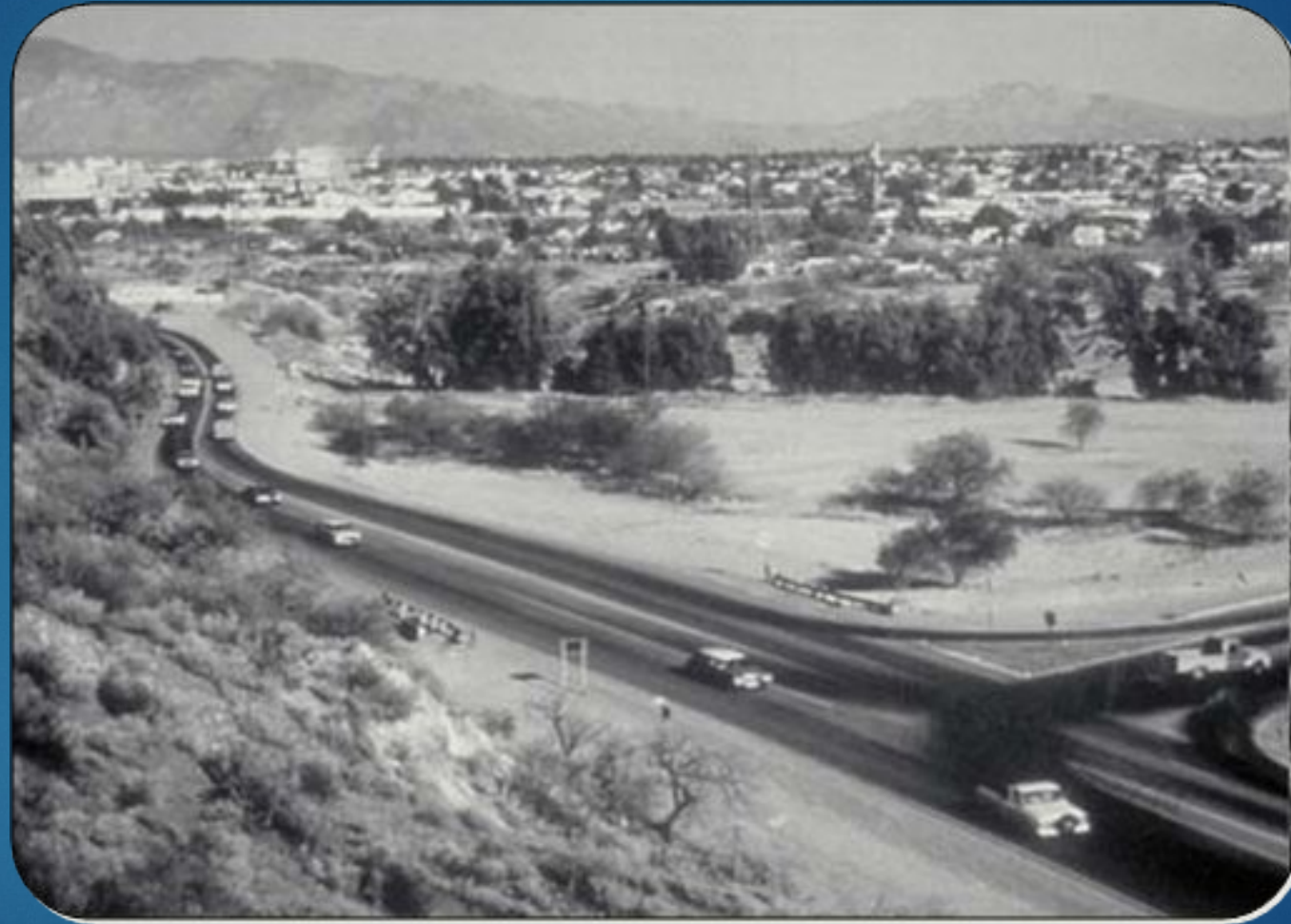
1. Check your irrigation system and settings monthly!
2. Plant the water (basins) & plant low-water natives
3. Use organic mulch
4. Plan to not irrigate your native landscape after 3 years
5. Scale your veggies or fruit water use to your rain and greywater supply



Tucson, 1904. Santa Cruz River from "A"  
Mountain



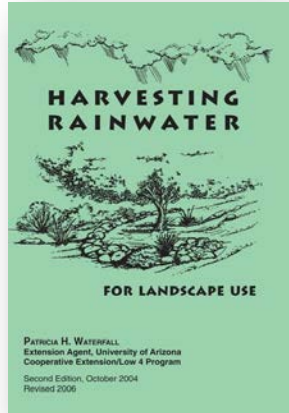
# Tucson, 1981. Santa Cruz River from "A" Mountain



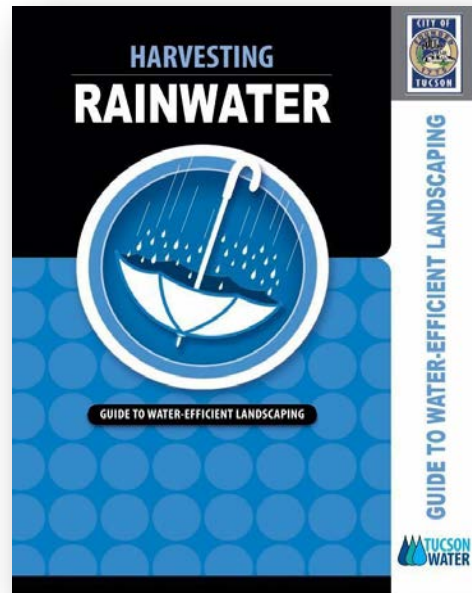
# Program Goals of RWH rebate:

1. Capture onsite rainwater as a functional water source (aligning with OneWater goals to provide quantitative data estimates that previously have not been captured)
2. Utilize rainwater to grow landscape plants and the urban canopy, to yield:
  1. More vegetation without increasing potable use
  2. Decrease potable water use
3. Align 1" rainfall capture with regional stormwater retention requirements

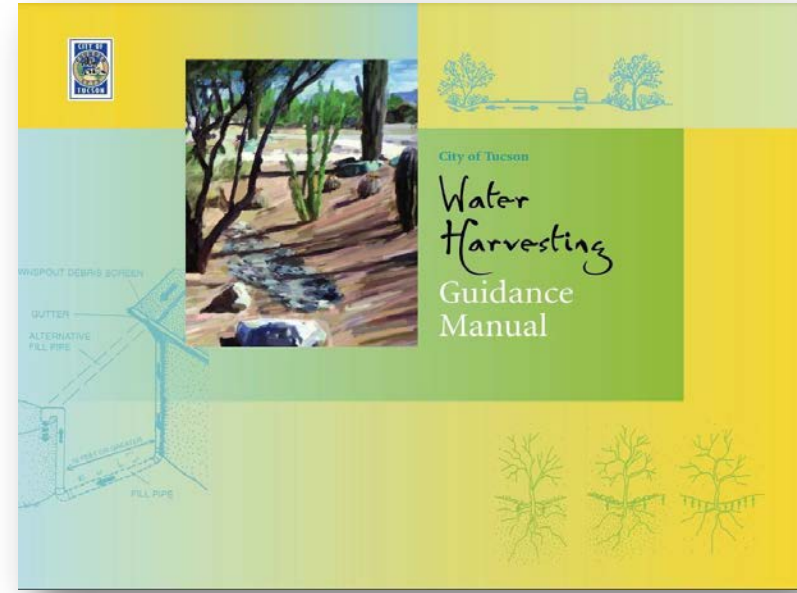
Out of print: UArizona Cooperative Extension

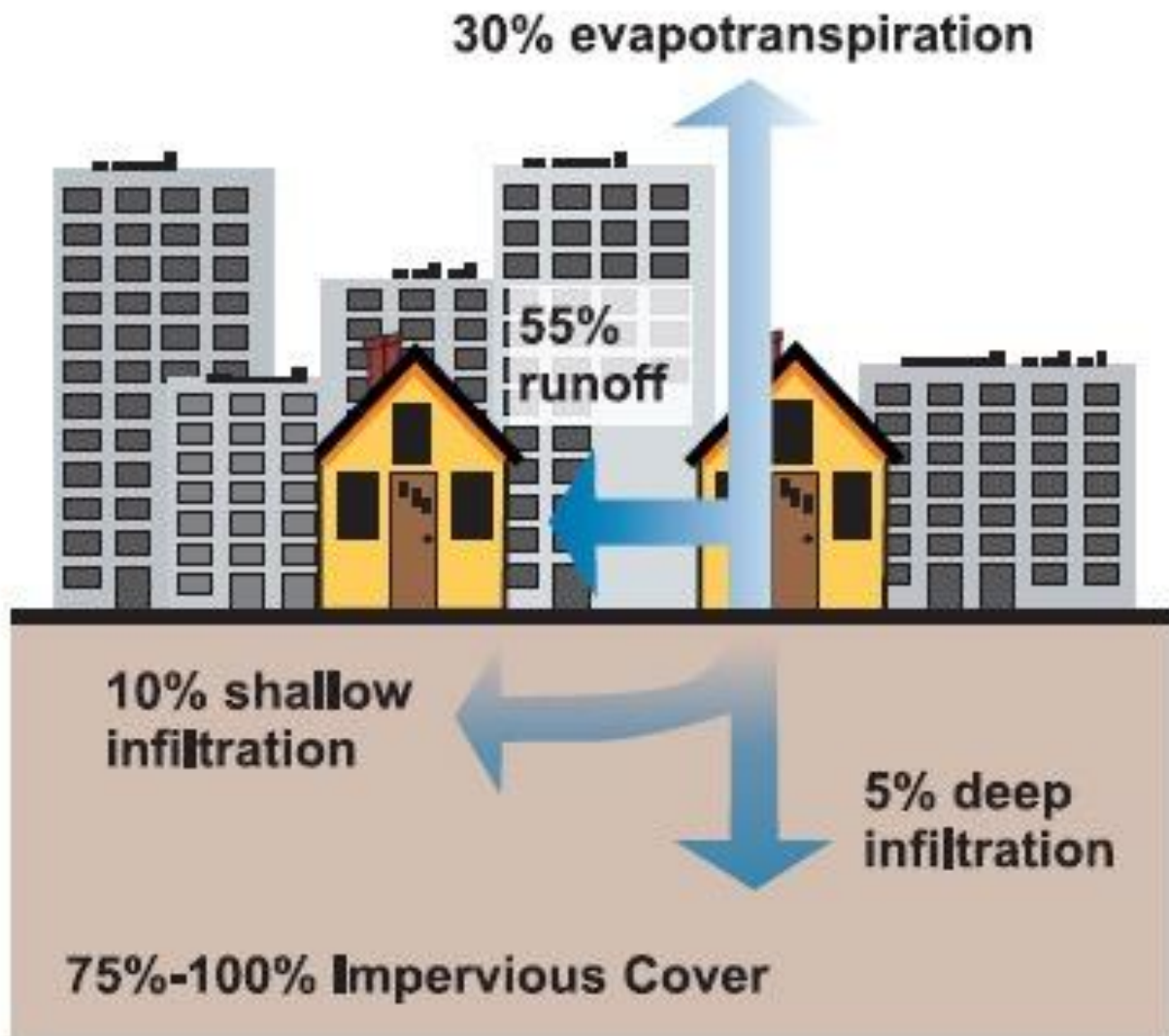
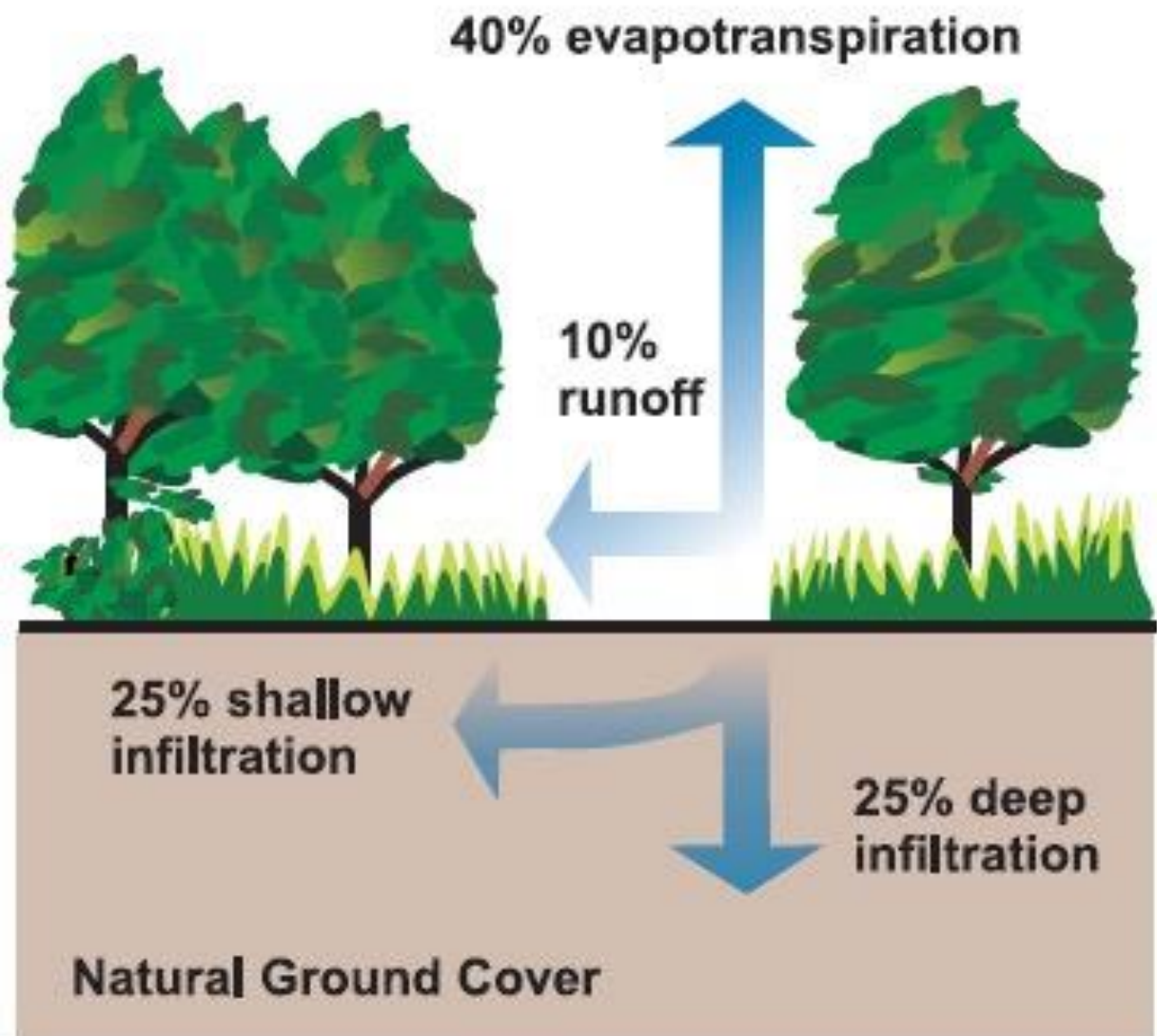


Revised printing of Patricia Waterfall brochure



Developed for public rights-of-way properties





# water harvesting restores local hydrology & can benefit our homes!



Images courtesy of Brad Lancaster, [harvestingrainwater.com](http://harvestingrainwater.com)



Harvest Rainwater in the soil and/or a tank to promote resource abundance!



**And move beyond  
resource scarcity**



# Rainwater Harvesting Systems

- ▶ **Harvest:** collect rainfall from roofs, patios, and other surfaces
- ▶ **Store:**
  - ▶ In the soil (Passive Systems) – allows plants to access moisture stored in the soil
  - ▶ In a tank (Active Systems) – allows long-term storage and distribution when needed
- ▶ **Benefit:** reduce/eliminate potable water demand for irrigation or other water needs



# Incentives Program Rebate

## Who qualifies?

- ▶ Residential and small commercial Tucson Water customers
- ▶ Small commercial is a property with a single meter that is 5/8 or 3/4 inches. Commercial properties with more than one meter or meters larger than 3/4 inches do not qualify.

## Two levels

- ▶ Applicants may apply for both a passive and active rebate not exceeding \$2,000 for the combination

# Rainwater Rebate Incentive July 1, 2023

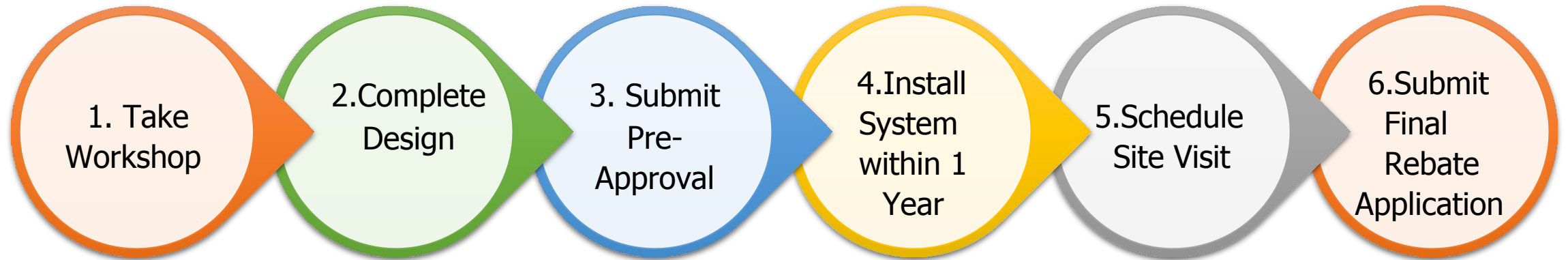
## Rebate pricing changes:

- All water harvesting features on a property can be combined and calculated to a maximum of \$2000 rebate.
- Calculate the rebate for passive systems based on the size of the basin(s); the rebate for passive systems is \$1.50/gallon, based on basin volume, if the system is correctly sized (rebate amount accounts for basin infiltration of 1.5 times the measured volume).
- A rainwater harvesting system must be sized to capture at least one inch of rainwater from the drainage area (usually roof area) to receive the full rebate amount (\$1/gallon active and \$1.50/gallon passive). If a system is not sized large enough to capture the full one inch of rainfall, the customer will receive \$0.50/gallon for all system features. A property can have multiple drainage areas.



Questions: email [conservation@tucsonaz.gov](mailto:conservation@tucsonaz.gov) or call 520-791-4331

# Application Process



# Zoom Help Sessions

Weekly Zoom Help Sessions, starting Monday, June 26th  
Mondays at 3pm and Thursdays at 12pm

<https://us06web.zoom.us/j/84335115426> Meeting

ID: 843 3511 5426 Dial-in: +1 253 205 0468 US



[tucsonaz.gov/water/rainwater-harvesting-rebate](https://tucsonaz.gov/water/rainwater-harvesting-rebate)

A group of approximately ten people are gathered around a newly planted tree in a dry, outdoor setting. The tree is surrounded by a circular bed of rocks and has a small pool of water at its base. Several black irrigation hoses are visible on the ground. The people are dressed in casual work clothes, including t-shirts, button-down shirts, and hats. The background shows a residential area with houses, a fence, and palm trees under a bright sky. The text "Questions?" is overlaid in white on the left side of the image.

Questions?

# Residential Resources

## Potential Annual Rainwater Supply:

- Roof, 1000sf = 6,000 gallons/yr
- Landscape, 1000sf = 3,000 gallons/yr

- Total Rainwater potential for 1/5 acre  
> 45,000 gallons/yr
- + Greywater! (~4000 - 18,000 gal)
- + AC condensate! (~200 – 500 gal)

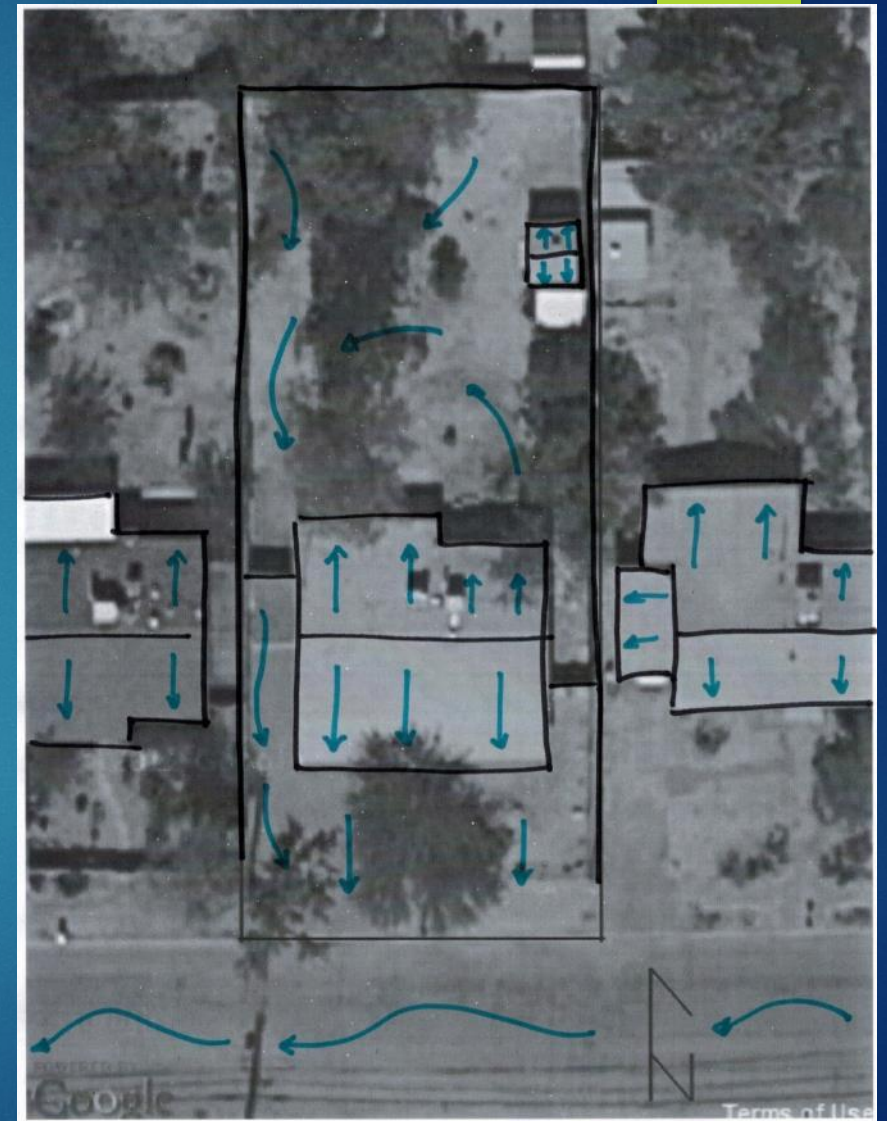
Annual Municipal Water Demand:

Total Use = 80 gal/person/day x 3  
persons/home x 365 days =

87,600 gallons/yr

Outdoor use (~30% of total) =

26,280 gallons/yr





# Create your Local Water Budget!

[watershedmg.org/water-budget-calculator](http://watershedmg.org/water-budget-calculator)

Home > Local Water Budget Calculator

## Local Water Budget Calculator

VIEW EDIT WEBFORM RESULTS CIVICRM

### How much rainwater and greywater can you harvest at your home?

Just fill in the five input fields and the calculator will show your rainwater harvesting potential in the following chart. Once you know how much rainwater and greywater you can harvest at your home, take the next steps and [join our Rain to Table campaign](#) and share your progress!

Input

What is your roof area (in square feet)? \*

*Your roof area can be simply calculated by multiplying the length x width of your house.*

What is your landscape area (patio and planting areas in square feet)? \*

How many persons live full time in your home? \*

What is your January total water use (from your water bill in gallons)? \*

*If your monthly use is measured in CCF than multiply your monthly use by 748 gallons per CCF. (Example: 2 CCF \* 748 gal/CCF = 1,496 gallons)*

What is your July total water use (from your water bill in gallons)? \*

*If your monthly use is measured in CCF than multiply your monthly use by 748 gallons per CCF. (Example: 10 CCF \* 748 gal/CCF = 7,480 gallons)*

# Evaluate Your Space

Analyze your site

- ▶ Where is water already gathering?
- ▶ How can you get the water to where you need it?
- ▶ Are there any additional sources of water (e.g. AC condensate, greywater, stormwater, etc)



# You've got rainwater water, now make a plan!

## **Project Plan**

Participants are encouraged to bring a basic site plan (sketch or bird's-eye view) of their property to work on during the last hour of the class.

A project plan must be submitted with each rebate application to demonstrate the selection, use, and anticipated outcomes of the practices. The project plan may be hand drawn.

- Draw site to scale and include dimensions, property line, and street address.
- Show direction of water flow off roof tops and landscapes with arrows.
- Determine catchments.
- Identify areas that require irrigation.
- Label surface areas of hardscapes, identified rainwater practice(s), and associated potential storage volume.



# RAINWATER HARVESTING REBATE

Runoff Calculations & Site Elements

# RWH

## Runoff

- Largest area to collect greatest amount of rainwater runoff on typical urban residential property:
  - **Rooftop** (largest impervious surface on property) – the first point of contact for rainfall
  - This can include other rooftop structures on property (i.e., ramadas, dwelling unit, shed, etc)



- Determining direction of roof rain runoff (aerial site example captured from [PimaMaps Guide](#))
  - Pitched roof – flow is direction of roof slope
  - General flow of rainwater on property



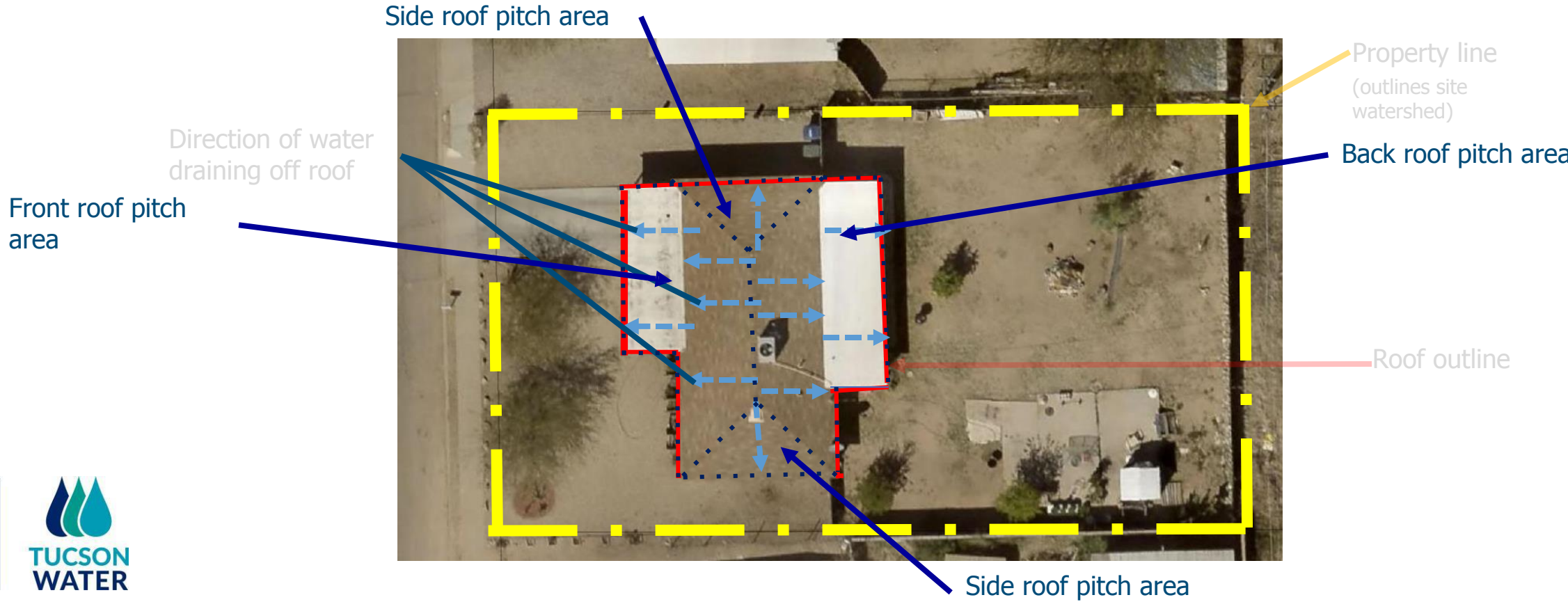
# RWH Runoff: Roof Calculation

- Determining area of roof rain runoff (aerial site example captured from [PimaMaps](#) Guide; can use other site maps/aerials)

- Pitched roof – flow is direction of roof slope

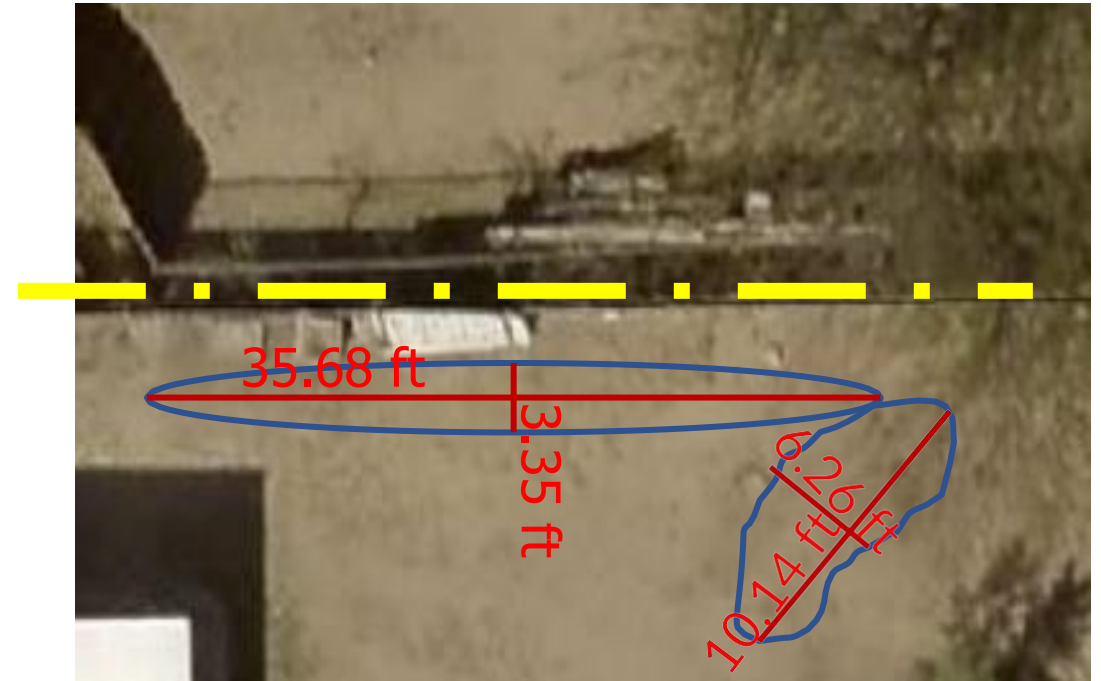


- Select PimaMap's 'Tools'
- Using Tools → MeasurementArea, outline area of roof sloping in same direction



# Site Plan: Measuring Basins – Back Yard Detail

- Basin measurements:
  - Longest length
  - Widest width, that is perpendicular to length
  - Enter in online application
- Default basin depth is 8" (0.65')
  - 8" has been majority of residential installations
- can be manually changed on form (i.e., swales may be shallower)
- Depth over 3' requires a permit



Back yard typical swale + basin

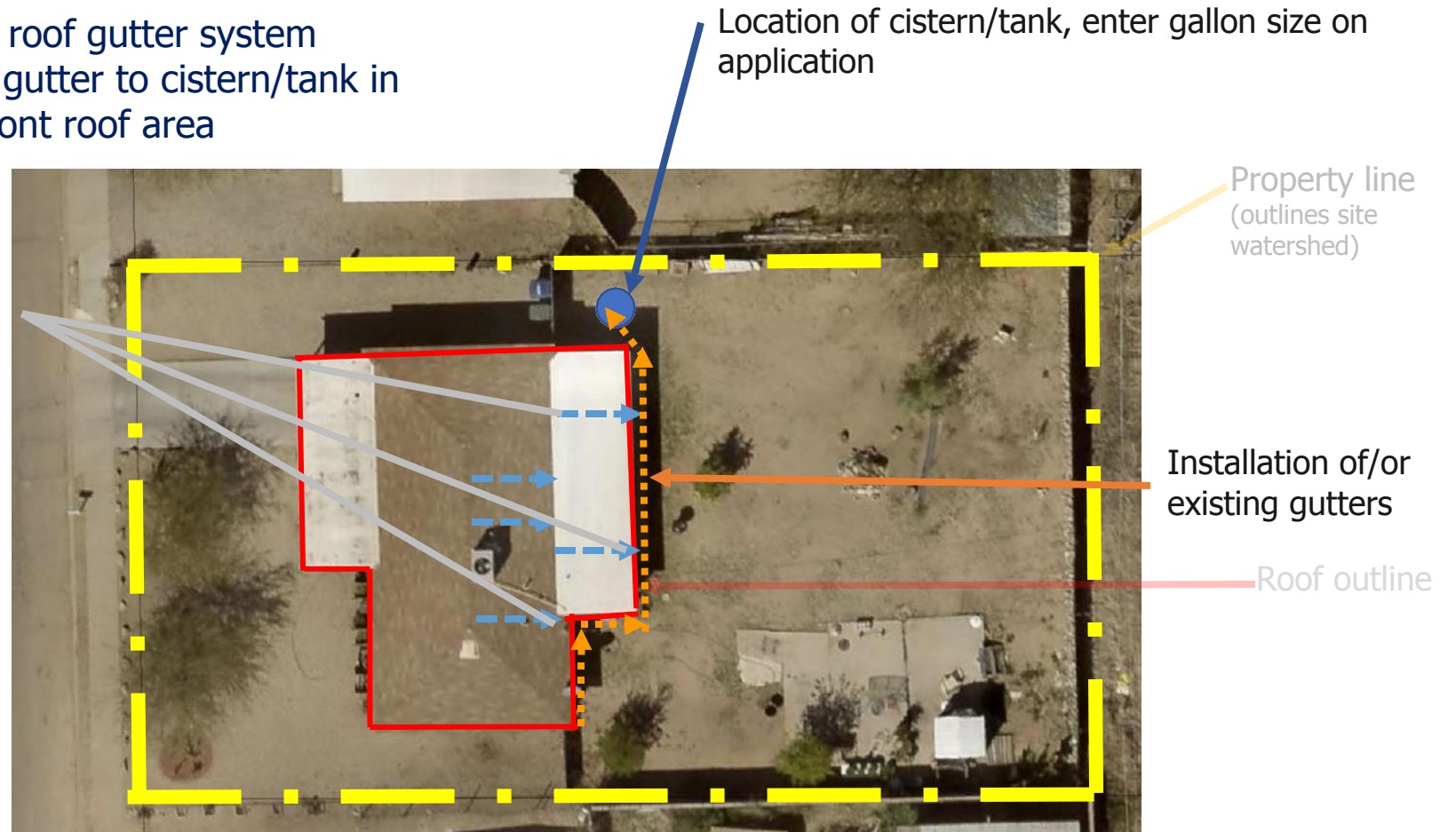




# Site Plan: Back Yard Cistern/Tank

- Cistern/tank placement
  - Determine location of cistern (back and/or sideyard)
    - must be connected to a roof gutter system
    - If connecting front roof gutter to cistern/tank in Side/back yard, enter front roof area

Direction of water draining off roof



# On-line application

## Tucson Water - Rebate Programs

### Design Submittal - Rainwater Harvesting



#### Site Plan & Design Measurements

Please note that the rebate amount will be calculated by the storage capacity of the system. Customer must determine the best system for their property whether it is all passive, all active, or a combination of both.

The complete rainwater harvesting system must be sized to capture at least 1" of rain from the drainage area to receive full rebate amount. Not to exceed the total amount of \$2,000 for the entire rebate.

- o \$1.00/ gallon for active
- o \$1.50/ gallon for passive (this dollar amount is calculated in the formula with a 1.5 multiplier in the volume of basin storage)
- o \$0.50/ gallon for all system features (if not sized to capture 1" of rainwater)

Please upload your site plan below and submit the measurements of your design.

Site plan \*

Upload

We only accept PDF, JPG, TIFF, PNG.

Front Yard Design Measurements



Back Yard Design Measurements



Side Yard Design Measurements



Total System Storage Capacity



Previous

Next

# Site Plan Submittal

- Example site plan for submittal
  - Site inspection will be based on submitted site design

## Key

- Property line
- ← Roof rainwater flow direction
- ⋯ Onsite rainwater
- ⋯ Gutter
- runoff Basin
- Basin measurement lines
- Cistern/tank



# On-line application

## Front Yard Design Measurements

Code does not allow for tanks taller than 5' to be placed in front yard. See City of Tucson Tank Zoning and Permit Requirements [here](#).

Are you collecting water from a front yard roof? \*

- Yes
- No

Do you have front yard basin(s)? \*

- Yes
- No

A group of approximately ten people are gathered in an outdoor, arid environment, likely a community garden or farm. They are positioned around a newly planted tree, which is surrounded by a circular bed of rocks and a small pool of water. Several black irrigation hoses are visible on the ground. The background shows a residential area with houses, a fence, and palm trees under a bright, cloudy sky. The text "Questions?" is overlaid in large white font on the left side of the image.

Questions?



# Passive Systems/Earthworks

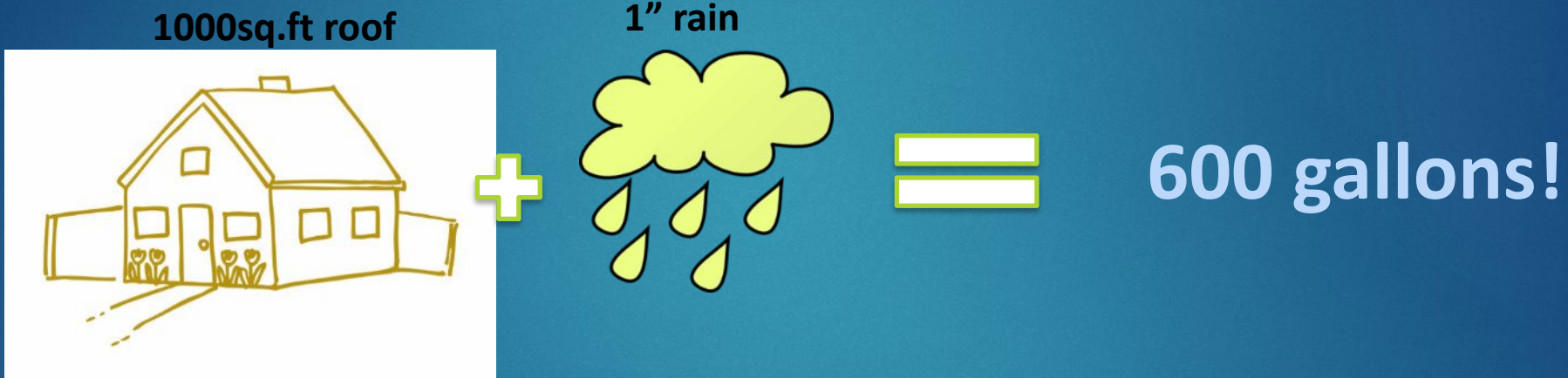
Use gravity to distribute rain runoff

- SLOW
- SPREAD
- SINK

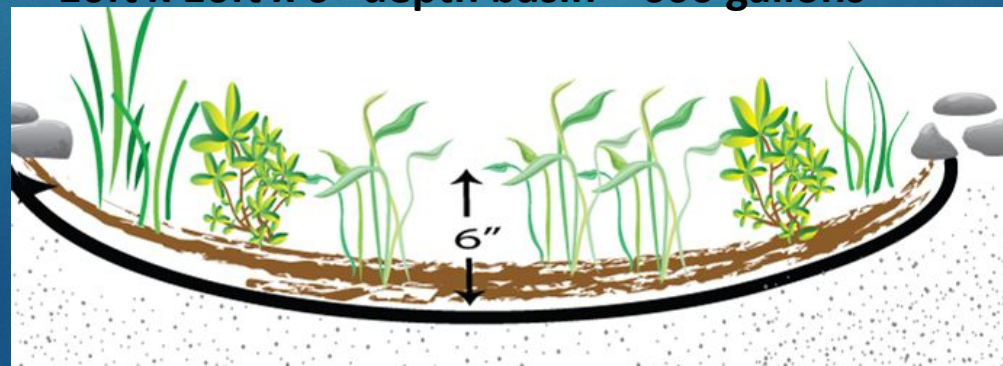
Cheapest storage option for large amounts of rainwater

# Make your earthworks meaningful!

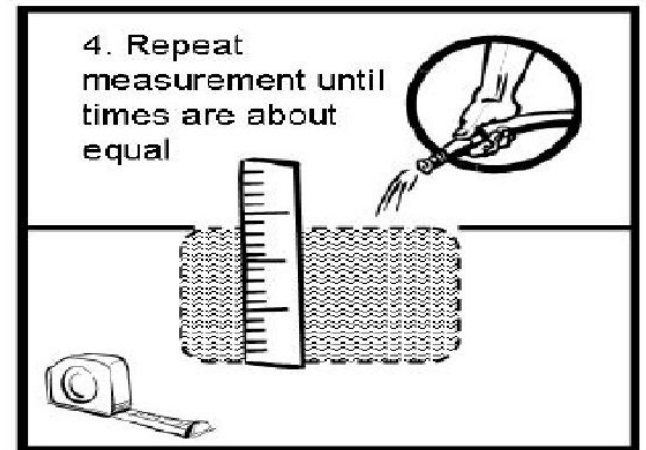
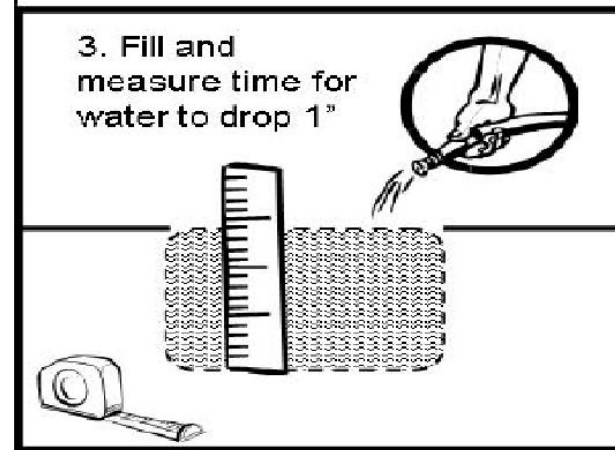
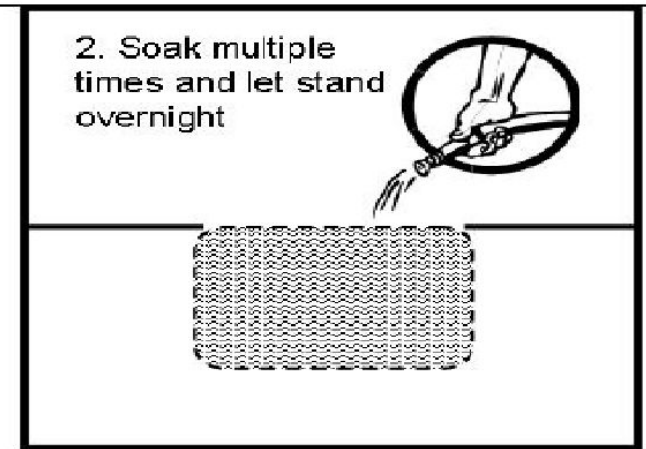
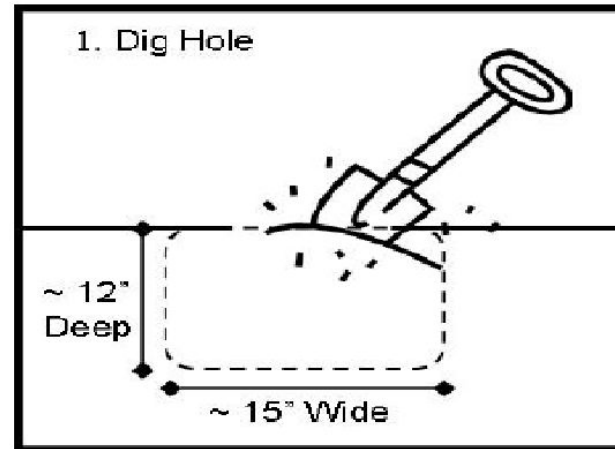
Size for a large rainfall event = 1" to 2.5"



10ft x 16ft x 6" depth basin = 600 gallons

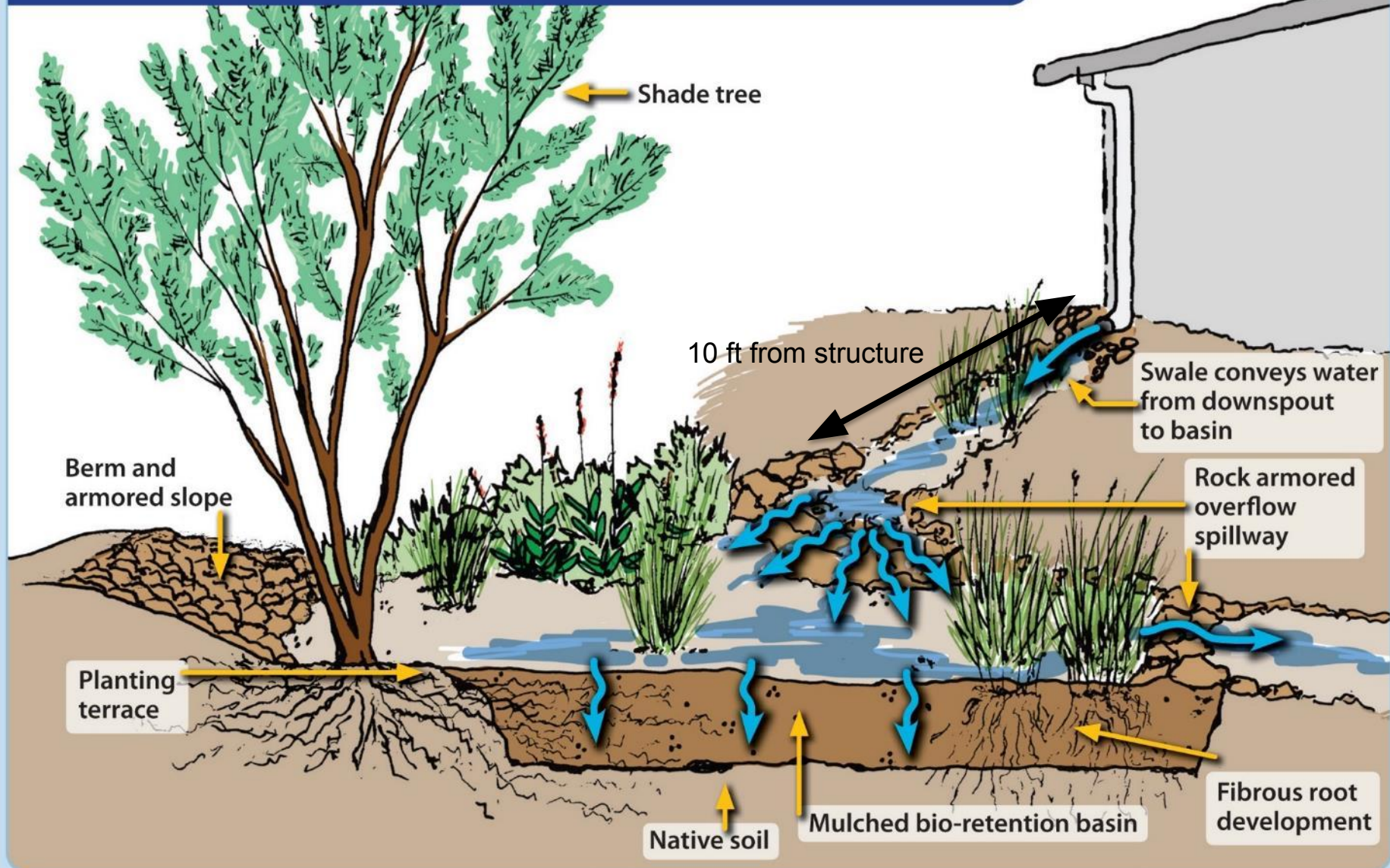


# Explore Your Soils



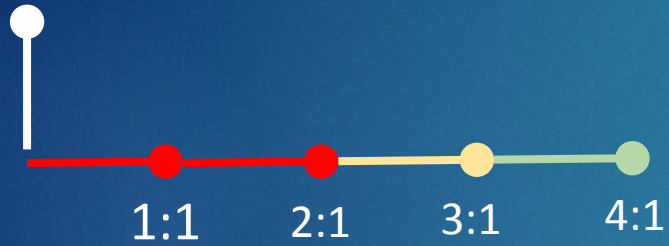


## RAIN GARDENS CREATE AN EARTHWORKS SPONGE



Organic mulch is applied to basins, 2 – 4 inches thick, to help infiltrate more water, reduce evaporation of soil moisture, and replenish nutrients in the soil.

# Basin Edge Slopes

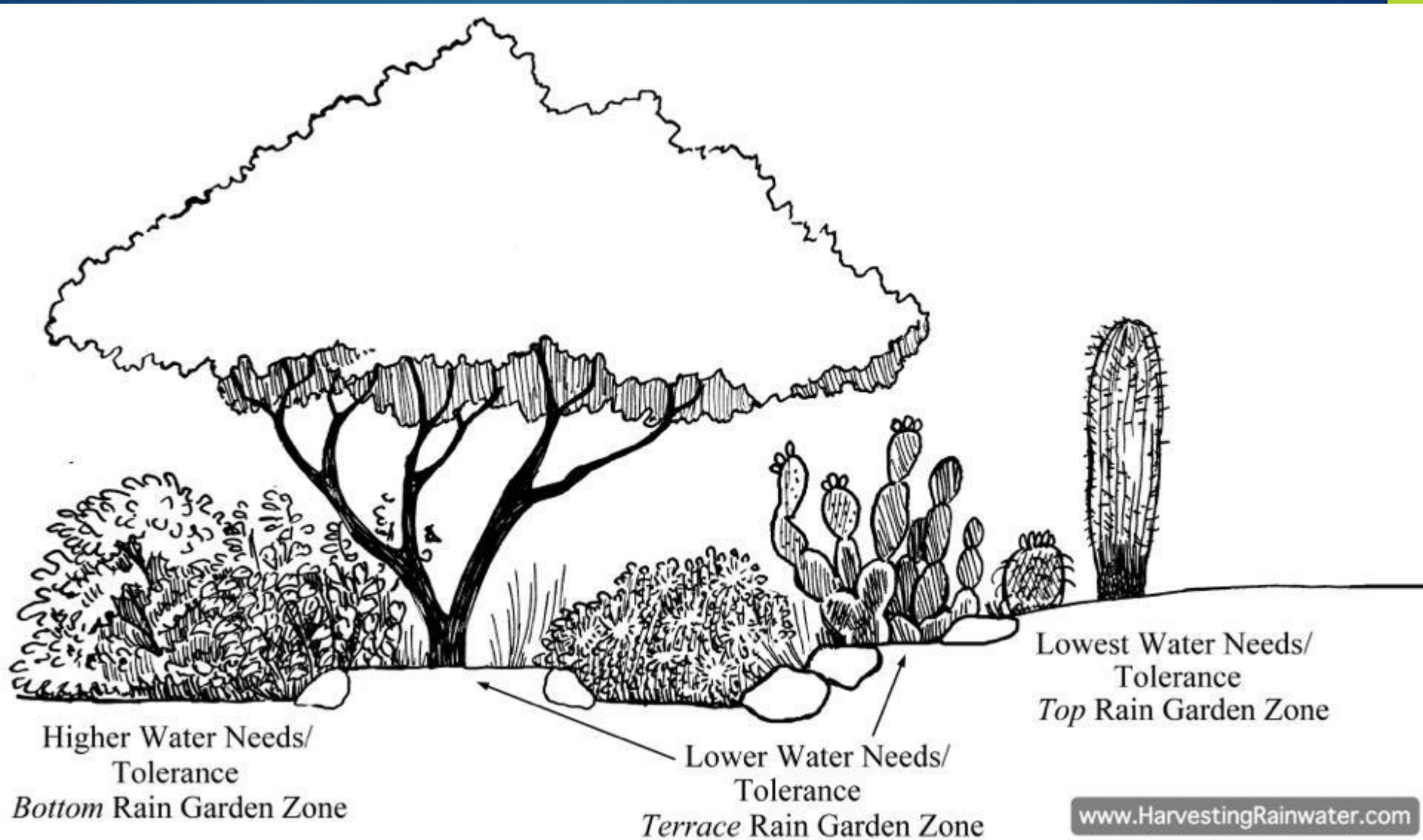




# Let's Plant the Water!

Benefit/Cost: \$4.4 returned for every \$1 invested

# Right Plant, Right Place



**Rain Garden Care**  
 H A N D B O O K  
 backyards  
 neighborhoods  
 commercial

Watershed Management Group

## Say NO to Mow, Blow, & Go!



Grass is a water hog and is maintained with loud mowers and chemical fertilizers.



Leaf blowers are a public nuisance—they cause air and noise pollution. And they blow vital organic material off the landscape!



Chemical weed killer is sprayed frequently on public landscapes (often seen as blue/green coloring). These chemicals are harmful to our soil, water, and wildlife.

## Say YES To Hoe, Flow, & Grow!



Hand tools are the best way to remove weeds. You can be selective about what weeds you pull, and there is no noise or chemical pollution!



Plan your landscape to let the water flow through your yard and soak into the soil.



Let your plants grow and prune minimally. You'll be pleased with the results—healthier plants, unique shapes, and better wildlife habitat.

# Right of Way Basins



- ▶ Harvests Stormwater
- ▶ Support shade in your neighborhood
- ▶ Permit required
- ▶ Rebate 50 cents/gallon





Curb Cut /  
Core drill

Right Plant, Right Place





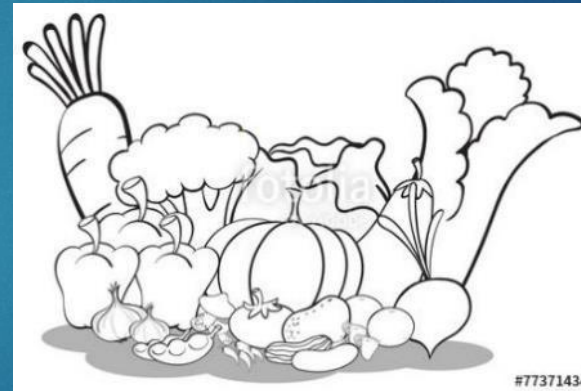




Questions?

# Active Water Harvesting: Cisterns

- ▶ Food production
- ▶ Drinking water
- ▶ Flood prevention
- ▶ Fire protection
- ▶ ....



What are **your** goals for a cistern?

# How much water do your plants need?

- ▶ Mesquite or Palo Verde = 4,000-5,000 gal/yr
- ▶ Full citrus, high-water use tree = 8,000 gal/yr
- ▶ Pomegranate, mod-water use tree = 3,000 gal/yr
- ▶ Lawn & Veggie Garden, very-high water use = ~40-50 gal/sq.ft/yr

If you have an existing landscape

- ▶ Review your water bill:
  - ▶ compare **winter use** with **summer use**; the difference is your landscape irrigation

# Tank Sizing Considerations

- ▶ Water demand required over length of dry period, 4 months (March – June)
- ▶ Available seasonal rooftop supply (~4-6" per rainy season)
- ▶ Available space
- ▶ Budget
- ▶ Meet 1 inch demand requirement

1000sq.ft roof

4"-6" rain



2400 - 3000  
gallons!

# Tank Systems Overview

Wet Inflow

Catchment

Collection

Leaf  
Diverter

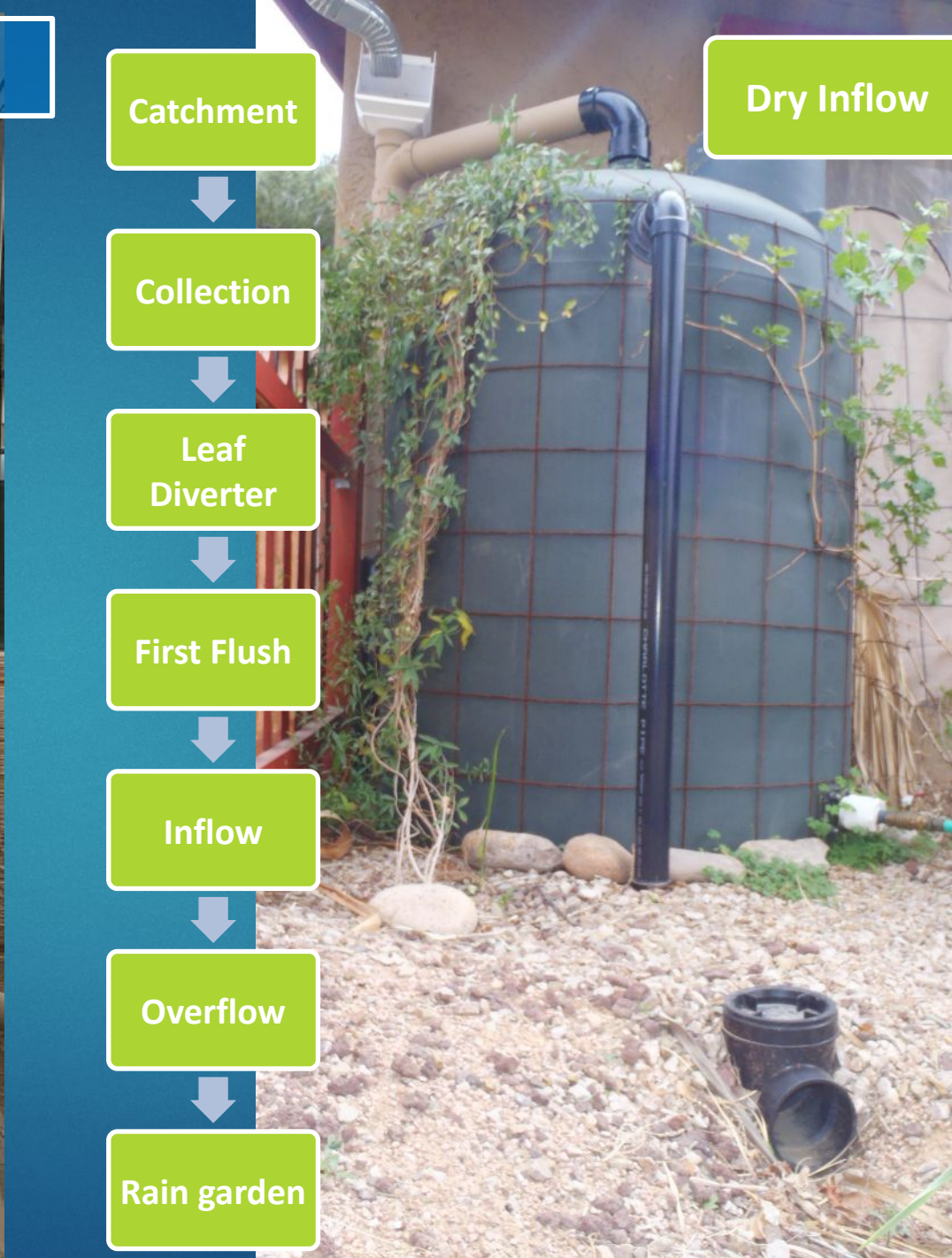
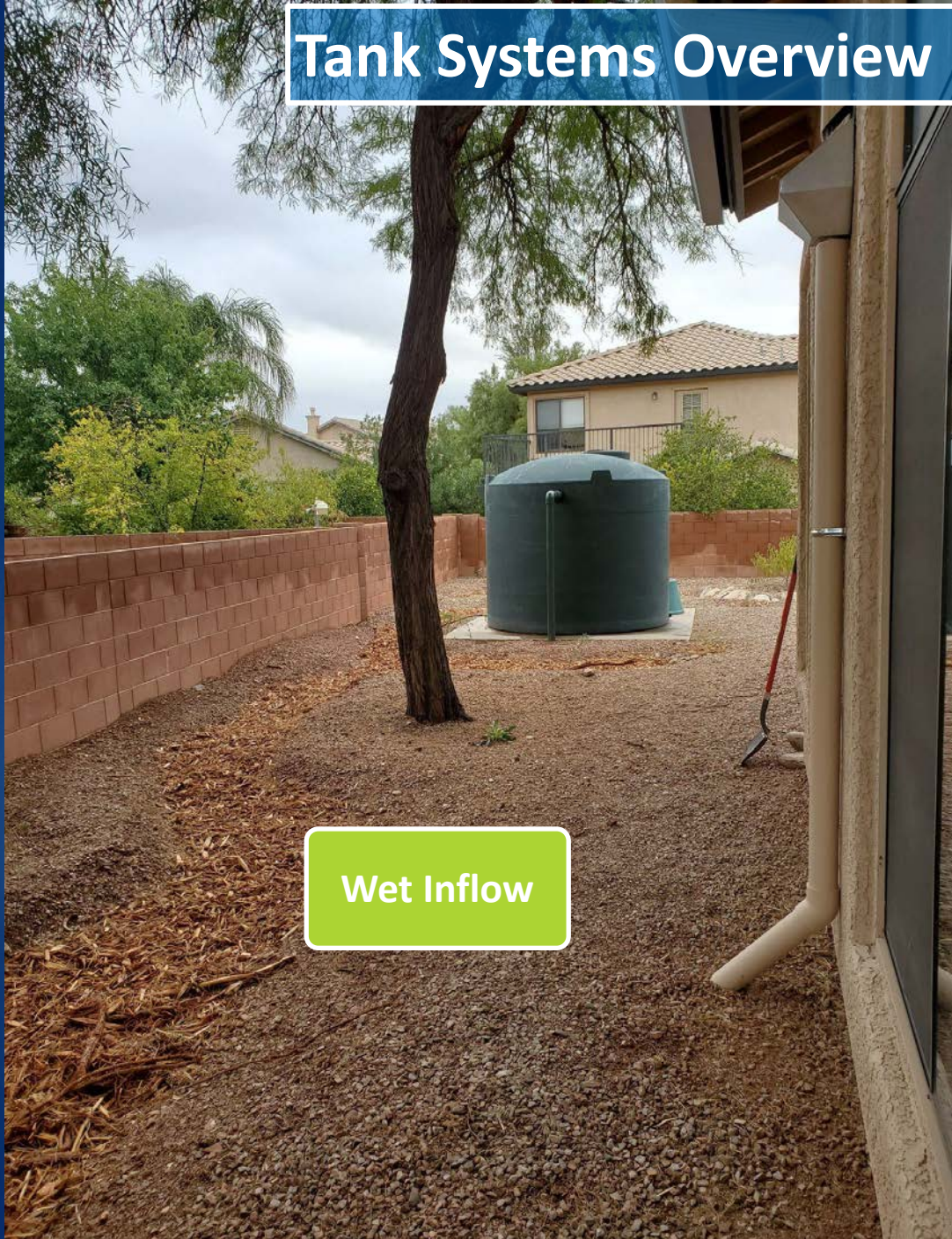
First Flush

Inflow

Overflow

Rain garden

Dry Inflow



# Review: Rain Tank Best Management Practices

- Use high-quality materials (Schedule 40 PVC & ensure painted to withstand UV; sheet metal leaf catcher)
- Install closed systems (no light into tank, screen tanks)
- Install systems to minimize maintenance (accessible debris filters & first flush devices)
- Install tanks on level pads (concrete or compacted sand, not gravel)



# City of Tucson: Do I need to permit my tank?

Requirement	Cistern size	Front Yard	Side Yard	Rear Yard	Screening
No review required	<ul style="list-style-type: none"> <li>💧 &lt;5' in ht.</li> <li>💧 &lt;10 sf area</li> <li>💧 ≈ 3.5' diameter</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>no setback</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>no setback</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>no setback</li> </ul>	<ul style="list-style-type: none"> <li>∅</li> </ul>
No review required	<ul style="list-style-type: none"> <li>💧 &gt;5'&lt;6' in ht.</li> <li>💧 &lt;10 sf area</li> <li>💧 ≈ 3.5' diameter</li> </ul>	<ul style="list-style-type: none"> <li>∅</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>no setback*</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>no setback*</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> </ul>
Site Review required**	<ul style="list-style-type: none"> <li>💧 &gt;6' in ht.</li> <li>💧 &gt;10 sf area</li> <li>💧 ≈ 3.5' diameter</li> </ul>	<ul style="list-style-type: none"> <li>∅</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>setback***</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>setback***</li> </ul>	<ul style="list-style-type: none"> <li>check zone requirement</li> </ul>
Zoning Admin. Interpretation	Part of building structure	case-by case	case-by case	case-by case	case-by case
Site Review + building permit	<ul style="list-style-type: none"> <li>💧 residential: max. ht. 12'</li> <li>💧 commercial: ht. of principle bldg..</li> <li>💧 2:1 ht:width ratio</li> <li>💧 &gt;5000 gal</li> <li>💧 elect/pump equip</li> </ul>	<ul style="list-style-type: none"> <li>allowed in commercial (but not residential)</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> </ul>	<ul style="list-style-type: none"> <li>check zone requirement</li> </ul>

**County or other jurisdiction or HOA = CHECK!**





Recycled (not eligible for rebate) –  
not rated for potable use



# Leaf Diverters

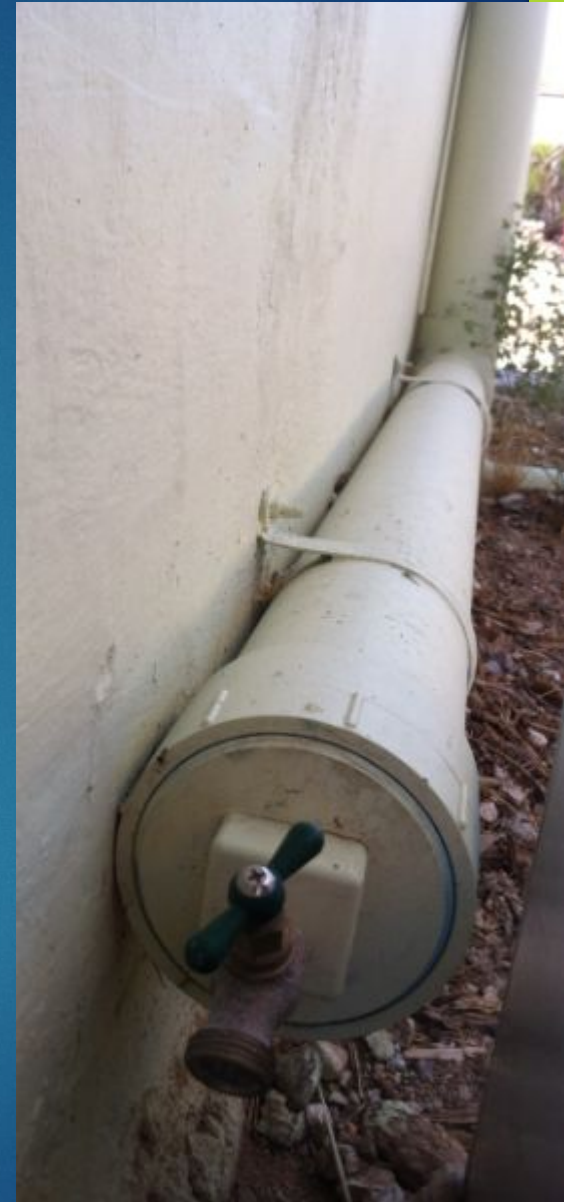
# Gutter Screens



# Strainer Baskets



# First Flush



# Overflow – End of Pipe Critter Preventers



# Rainwater Delivery

- ▶ Use at least 1" PVC pipe
- ▶ Use full-port hose-bibs and valves
- ▶ Locate cistern on high ground to maximize available pressure
- ▶ Use larger diameter irrigation emitters (*flag emitters – best*) for gravity-based systems
- ▶ Pump systems require backflow prevention



# Zero Pressure Gravity-based Irrigation Timers



Toro



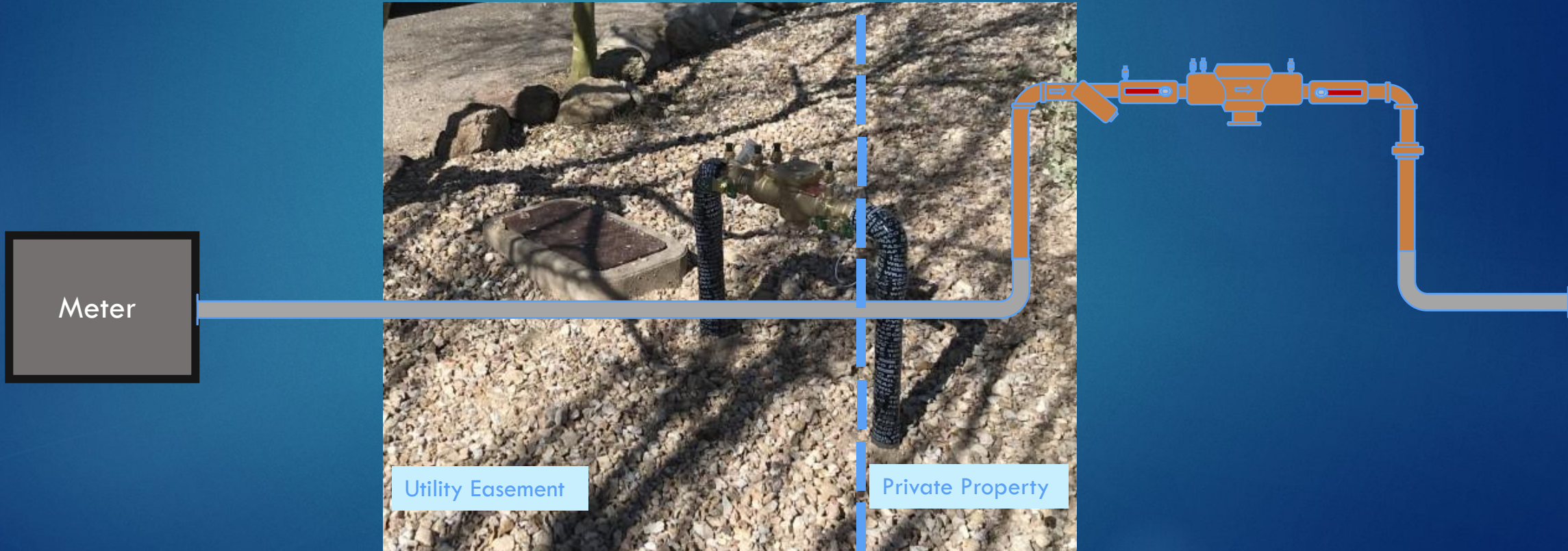
WaterYourLandscape.com



# Reduced Pressure Assembly (RPA) must be installed with all pump systems



Per Tucson City Code, the backflow assembly must be installed as close to the water meter as possible to help avoid cross-connections. It also needs to be installed on private property because it is part of the private plumbing system (Utility right of way is not private property).



# Below Ground Tanks

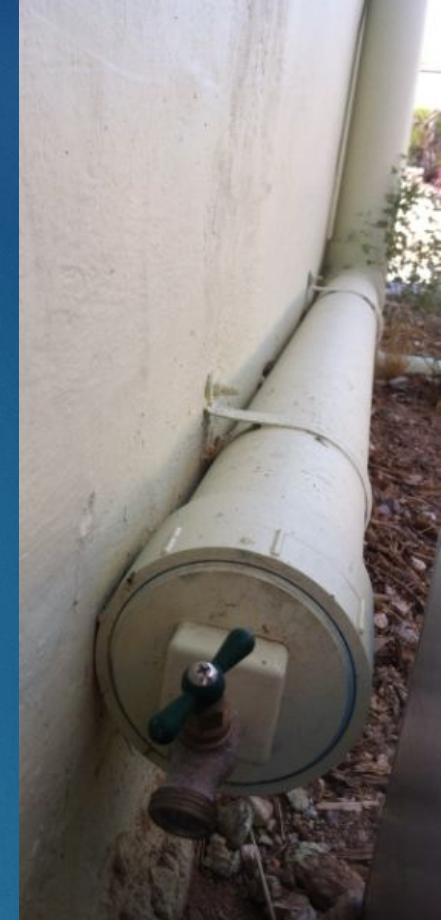


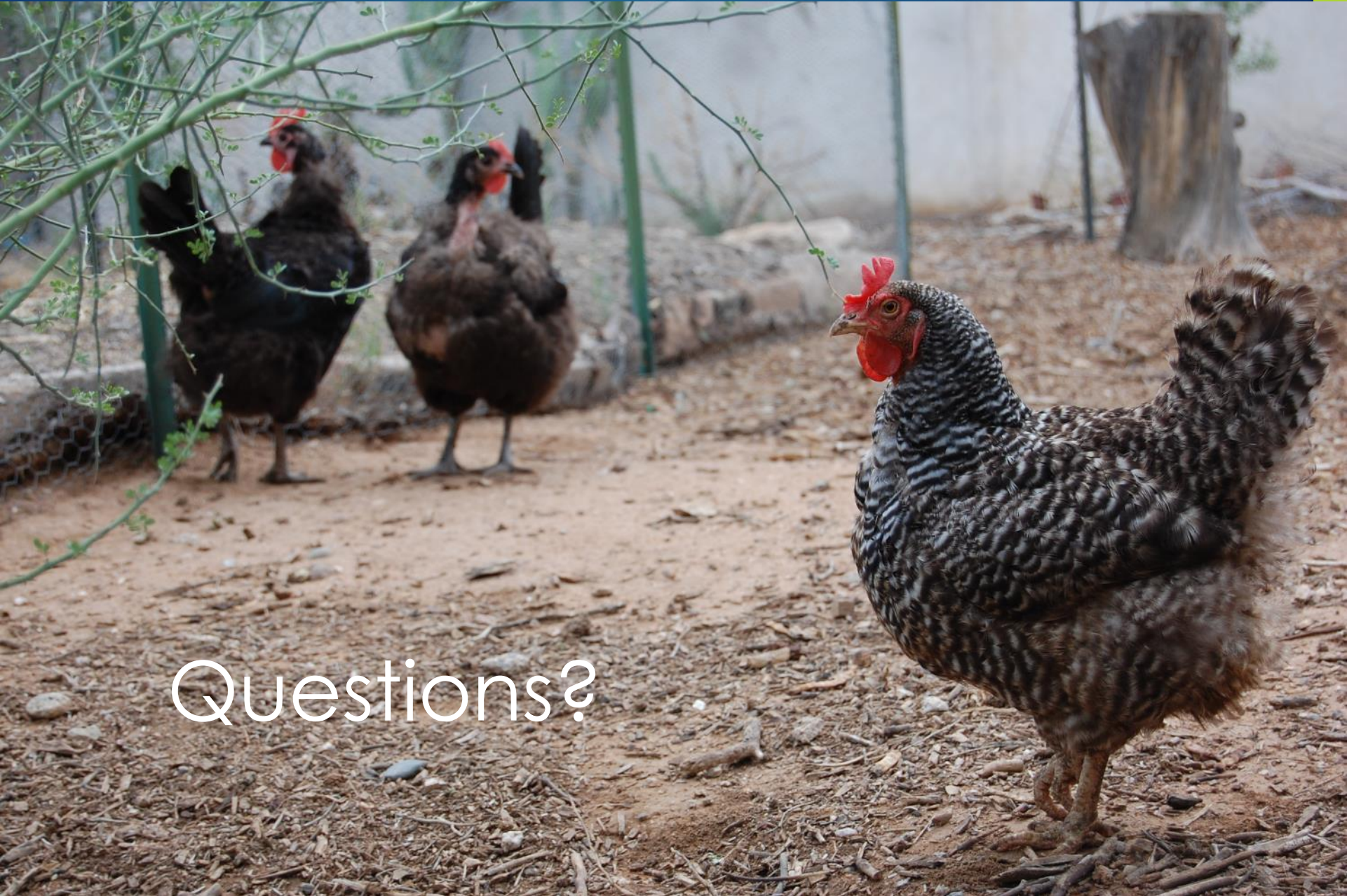
# Living Lab: 10,000gal Rain Tank



# Maintenance

- Have a specific plan!
- ▶ Clean gutters and leaf diverters
  - ▶ Check and reset first flush
  - ▶ Check for leaks
  - ▶ Inspect stability and integrity
  - ▶ Clean/flush/replace filters
  - ▶ Test water annually (if drinking)





Questions?

# Rainwater Harvesting Financing Options

[www.watershedmg.org/rainmoney](http://www.watershedmg.org/rainmoney)



*Remember those...*

# Water Harvesting PRINCIPLES

From Brad Lancaster's, [Rainwater Harvesting for Drylands and Beyond](#)



A photograph showing four men from behind, looking out a window. They are observing a multi-story building with a prominent green trellis structure. The scene is brightly lit, suggesting daytime. The men are dressed in casual attire. The image is framed by a dark blue border on the left and right sides, with a small lime green rectangle in the top right corner.

# Water Harvesting Principles

1. Begin with Long and Thoughtful Observation



# Water Harvesting Principles

## 2. Start at the Top



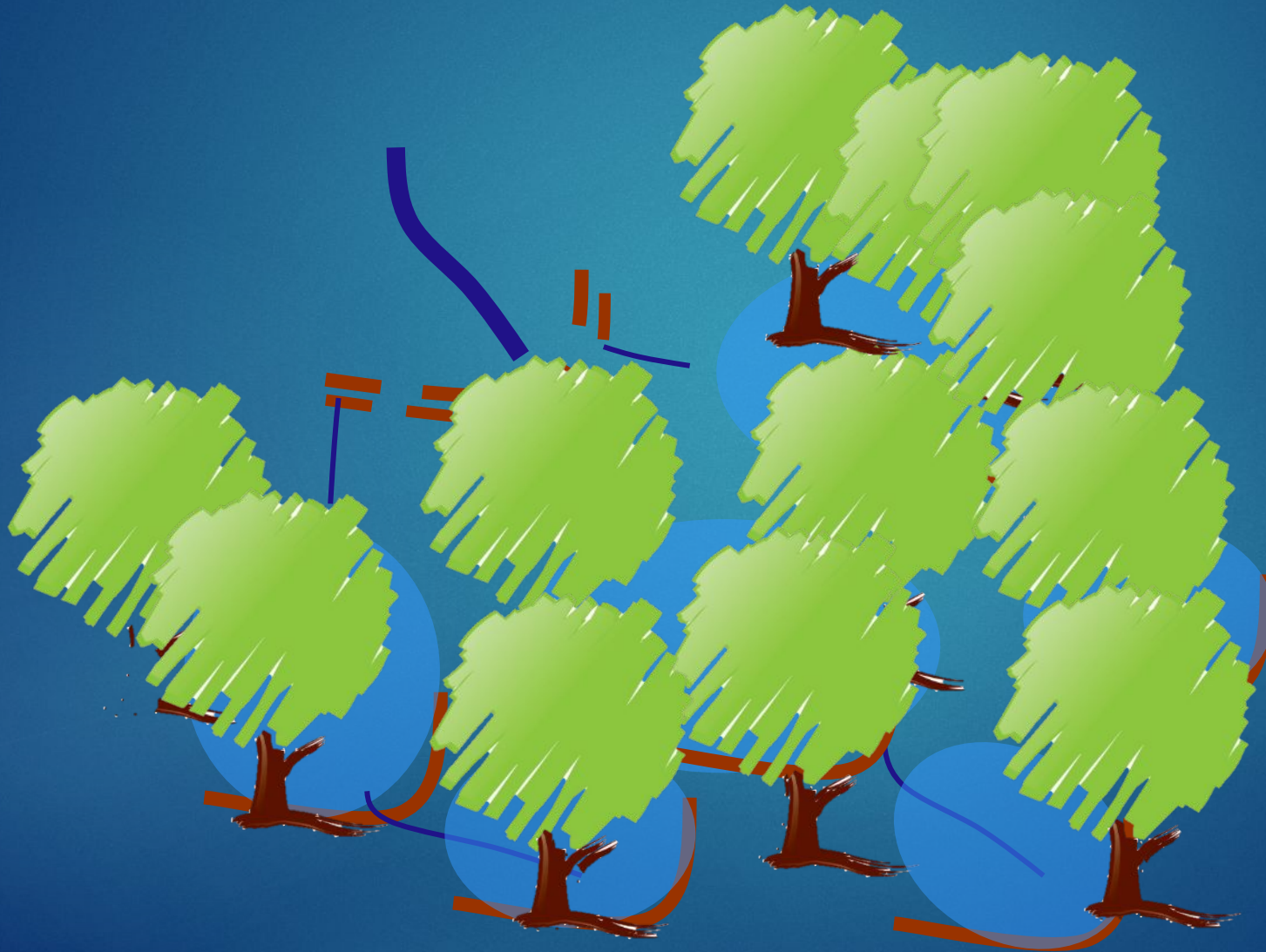
# Water Harvesting Principles

## 3. Start small and simple



# Water Harvesting Principles

4. Spread and infiltrate the flow of water





# Water Harvesting Principles

5. Always plan for an overflow route and manage overflow as a resource

# Water Harvesting Principles

## 6. Maximize living and organic groundcover



# Water Harvesting Principles

7. Maximize beneficial relationships and efficiency  
– STACKING FUNCTIONS



# Water Harvesting Principles

## 8. Continually reassess your system





And be sure to have  
FUN!





*Let's go for a virtual tour!*

# Living Lab: Courtyard

**BEFORE – 2017**



# Living Lab: Courtyard Limited Hours till 7/5, call for appt.

March 2020



# Living Lab: Dodge Blvd

**BEFORE – 2012**



# Living Lab: Dodge Blvd

After - 2018



# Living Lab: Dodge Blvd

March 2020



rkhed  
agement  
p  
**AND**  
**CENTER**  
ge Blvd



# Living Lab: Rain Tank



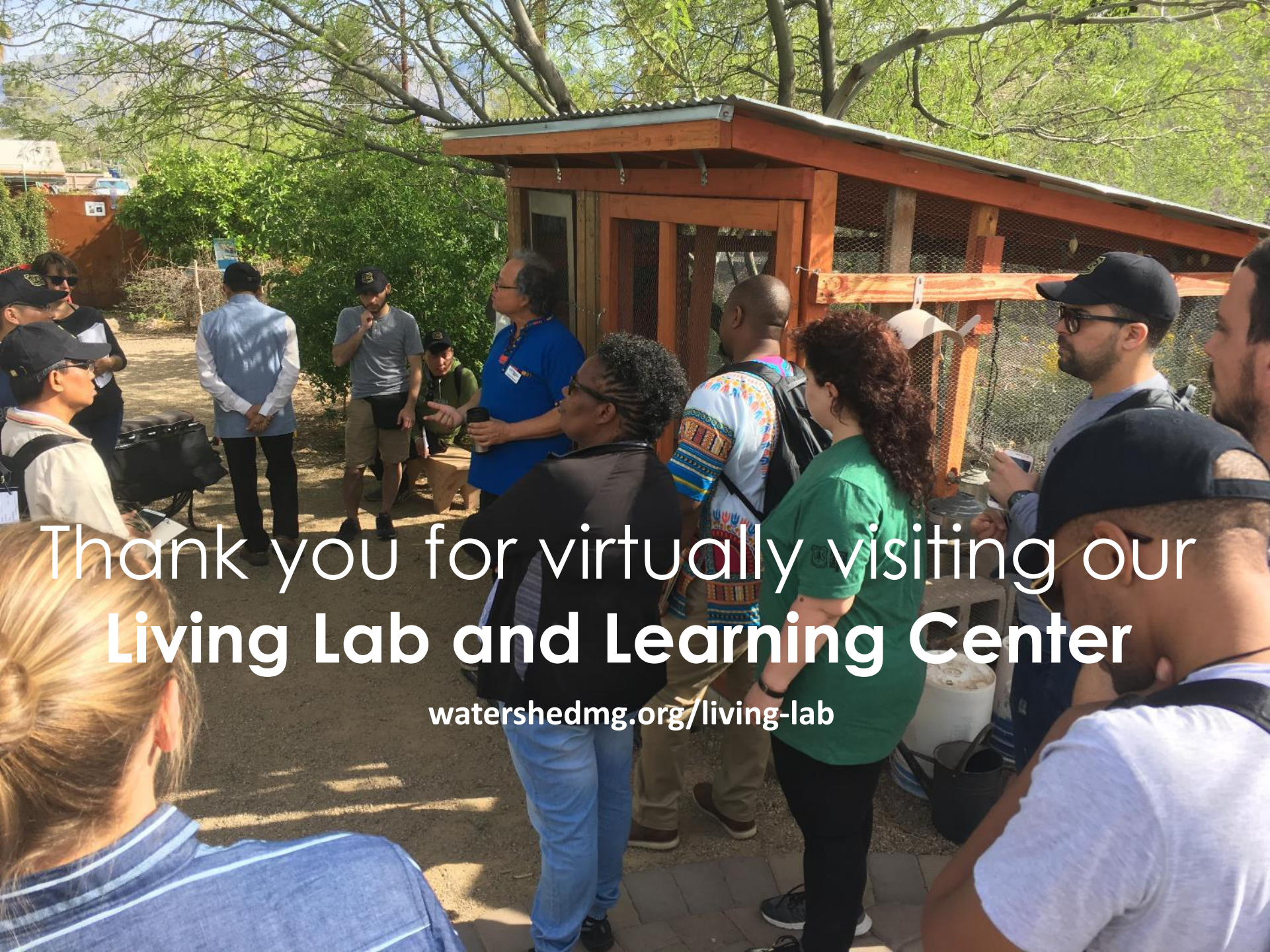


# Living Lab: Rain Tank





Questions?



Thank you for virtually visiting our  
**Living Lab and Learning Center**

[watershedmg.org/living-lab](https://watershedmg.org/living-lab)



# End of Presentation

[watershedmg.org/living-lab](http://watershedmg.org/living-lab)