Rainwater Harvesting Educational Workshop
Tucson Water's Incentive Program

Watershed Management Group

Don't forget to report your attendance!

SCAN ME

Scan QR Code or visit:

docs.tucsonaz.gov/Forms/Water-Rebate-Workshop-Attendance

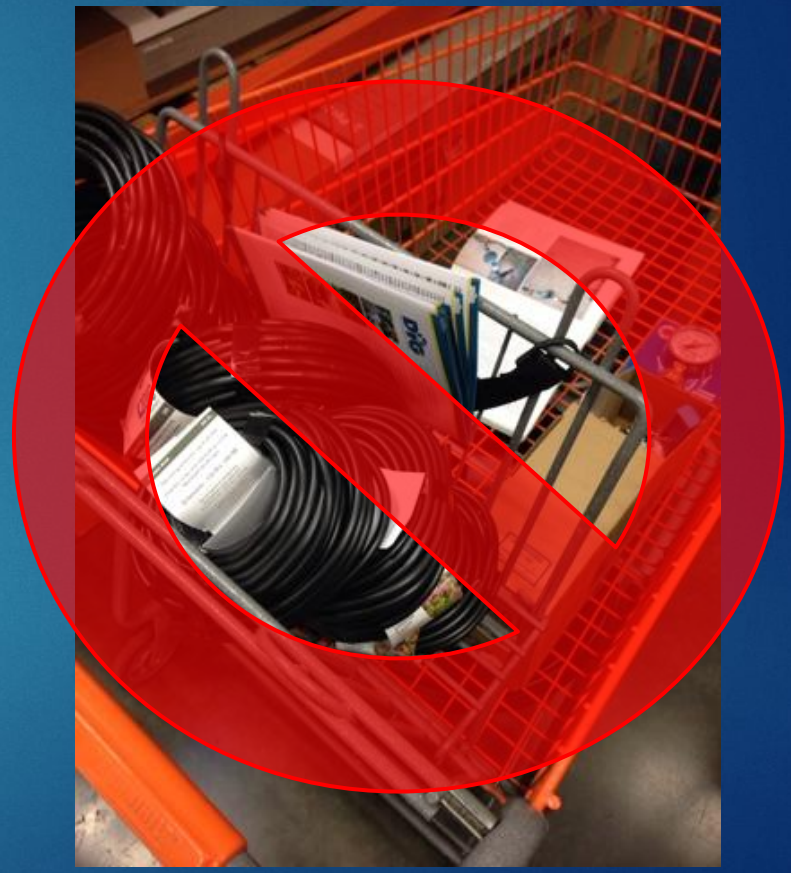
Rainwater Harvesting Educational Workshop -- Tucson Water's Incentive Program

Welcome to the class:

- We take attendance and follow up with additional resources for all class attendees.
- Please change your name on zoom to match the name of the person that registered for the class.

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 2 years
5. Scale your veggies or fruit water use to your rain and greywater supply



Tonight's Class Objectives

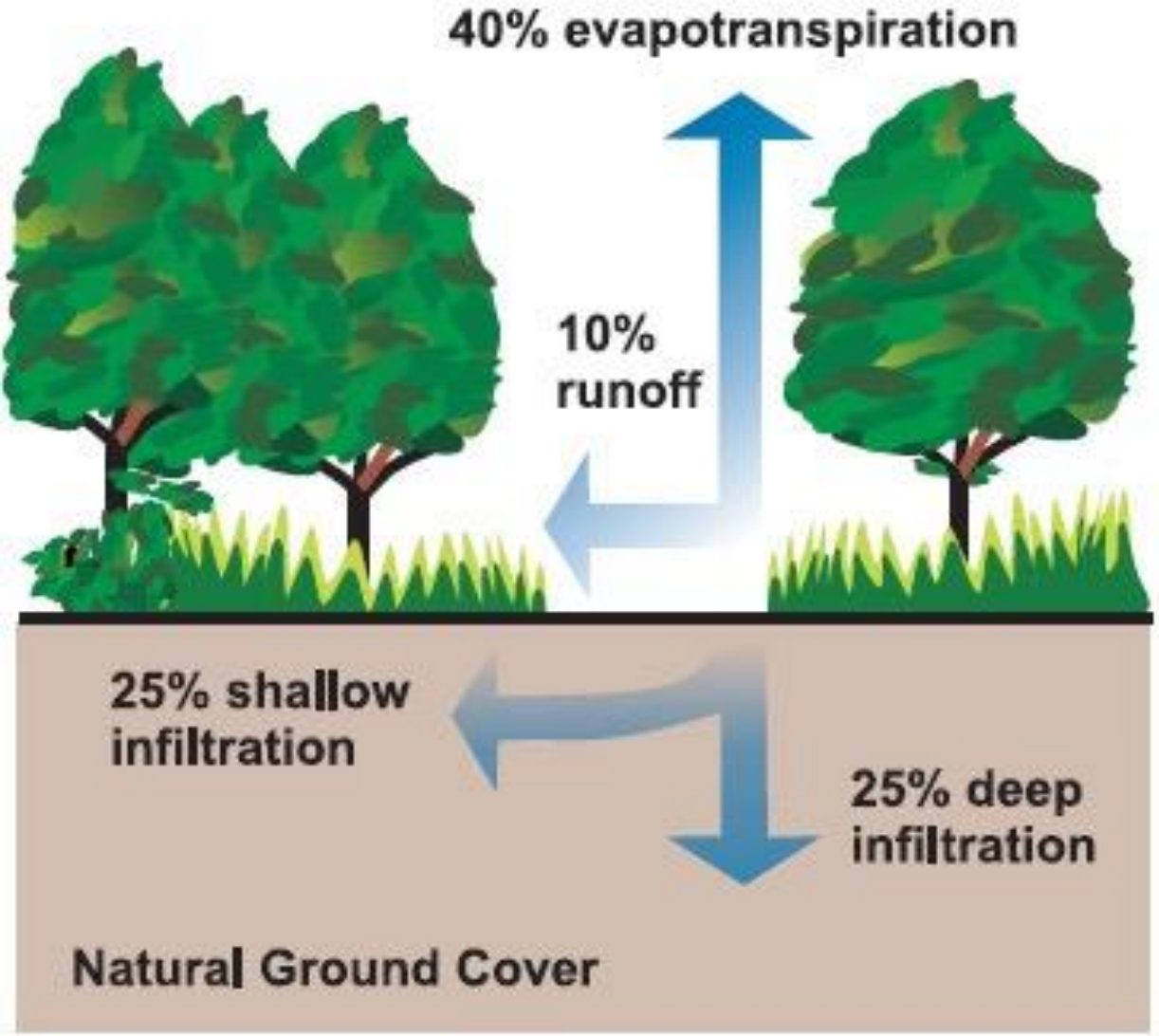
- Consider goals and benefits of Tucson Water's Rainwater Rebate incentive program
- Virtual Tour of active and passive water harvesting systems
- Learn best practices for low-maintenance and low-cost systems
- Submitting successful rebate application to Tucson Water

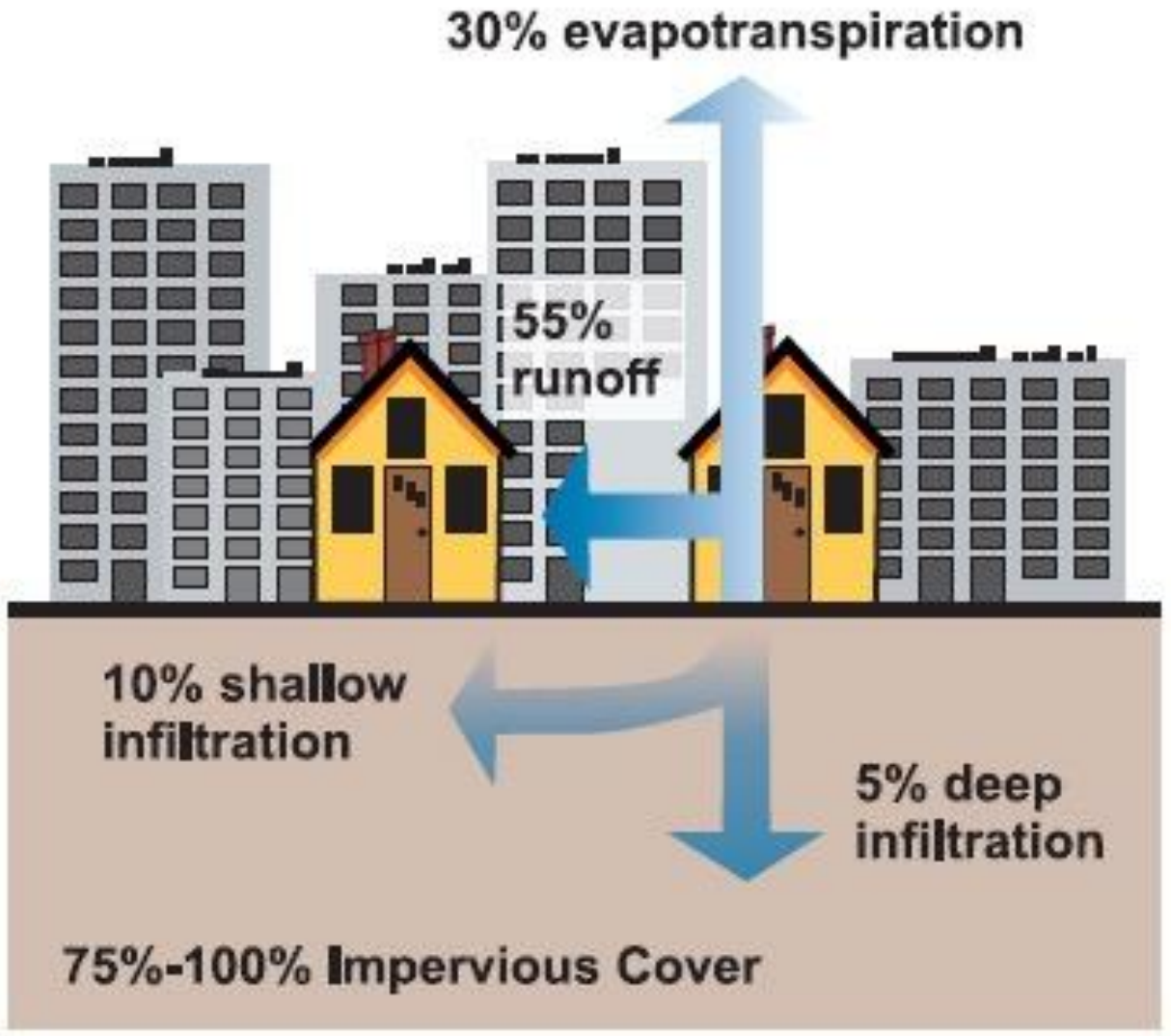
Incentives Program Rebate

Who qualifies?

- Applicant must be a residential or small commercial Tucson Water customer with active water service at installation address

- 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.


40% evapotranspiration
10%
runoff
25% shallow
infiltration
25% deep
infiltration
Natural Ground Cover


30% evapotranspiration
55%
runoff
10% shallow
infiltration
5% deep
infiltration
75%-100% Impervious Cover

water harvesting restores local hydrology & can benefit our homes!

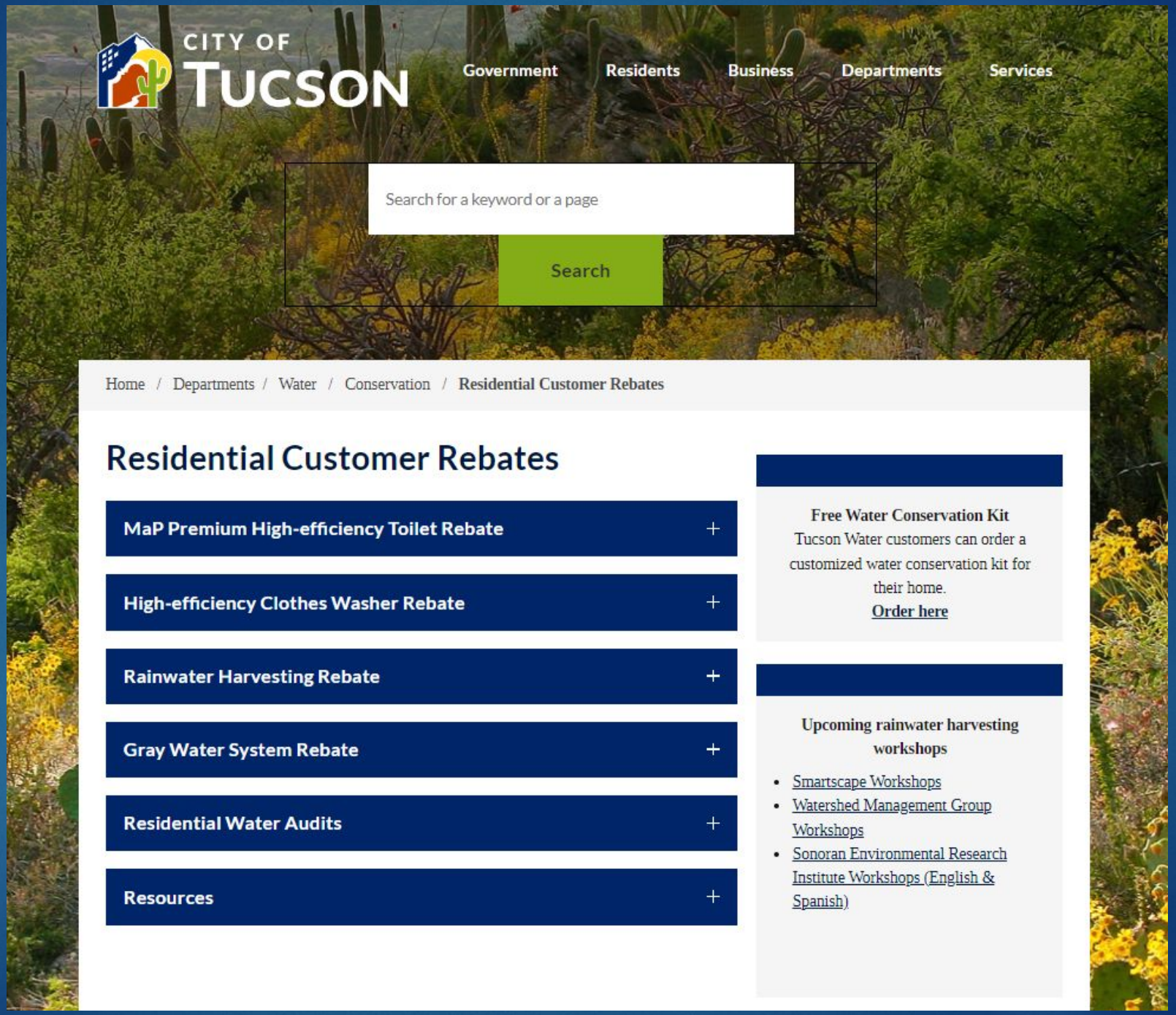
Images courtesy of Brad Lancaster, harvestingrainwater.com

Move away from scarcity
Support local abundance we see in the desert

Images courtesy of Brad Lancaster, harvestingrainwater.com

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 while supporting local ecology and natural shade!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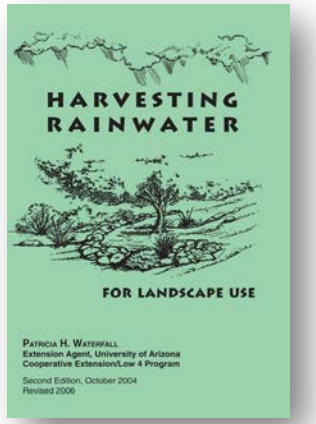
Residential Customer Rebates
MaP Premium High-efficiency Toilet Rebate
High-efficiency Clothes Washer Rebate
Rainwater Harvesting Rebate
Gray Water System Rebate
Residential Water Audits
Resources
Free Water Conservation Kit
Tucson Water customers can order a customized water conservation kit for their home.
Order here
Upcoming rainwater harvesting workshops
Smartscape Workshops
Watershed Management Group Workshops
Sonoran Environmental Research Institute Workshops (English & Spanish)

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



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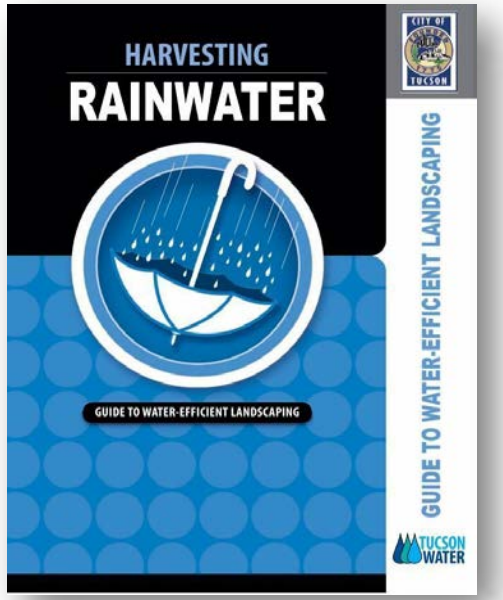
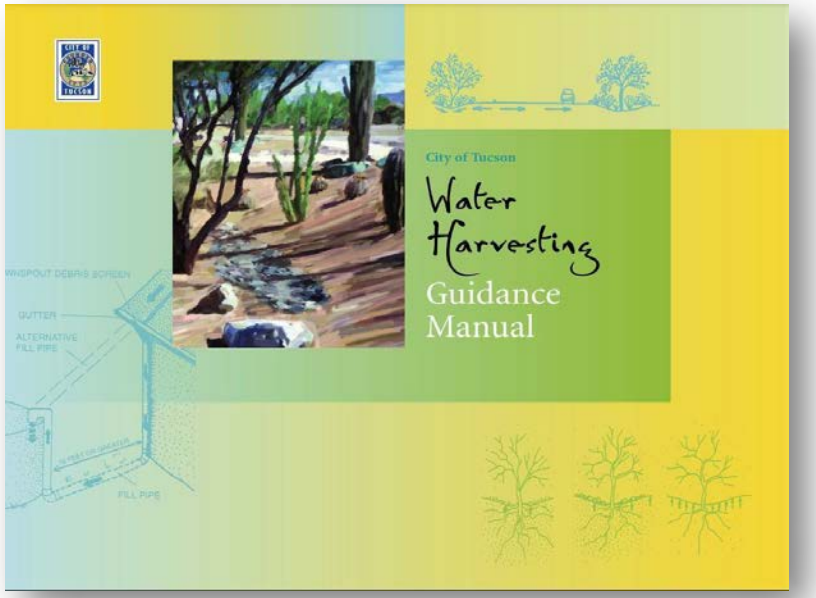
Revised printing of Patricia Waterfall brochure



Developed for public rights-of-way properties



Rainwater Rebate Incentive

- 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 $1.00/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 (roof area) to receive the full rebate amount ($1/gallon active and $1.00/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.

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Questions: email conservation@tucsonaz.gov or call 520-791-4331

Direct Flow $1.00/gallon

- Gutters with downspout directed to a basin
- Gutters with downspout directed to swale leading to basin
- Gutters with downspout connected to PVC pipe directing water into basin
- Gutters with downspout flowing into rainwater tank
- Sheetflow off roof to swale leading to basin

Sheet flow $0.50/gallon

- Direct rainfall into basin not receiving roof runoff
- Right of way basins receiving stormwater or direct rainfall
- Basins receiving water sheet flowing along property - no swales or work done to ensure water arrives at basin.
- **Systems not sized to store 1" or more of rain off of roof area will receive $0.50/gallon**

Tucson Water does not provide rebates for work done in washes in or along your property and will not provide rebates for landscapes where no work was performed to capture rainwater. You must show you did work to store rainwater.

Direct Flow
$1.00/gallon

Sheet flow
$0.50/gallon

SERI Limited Income Program

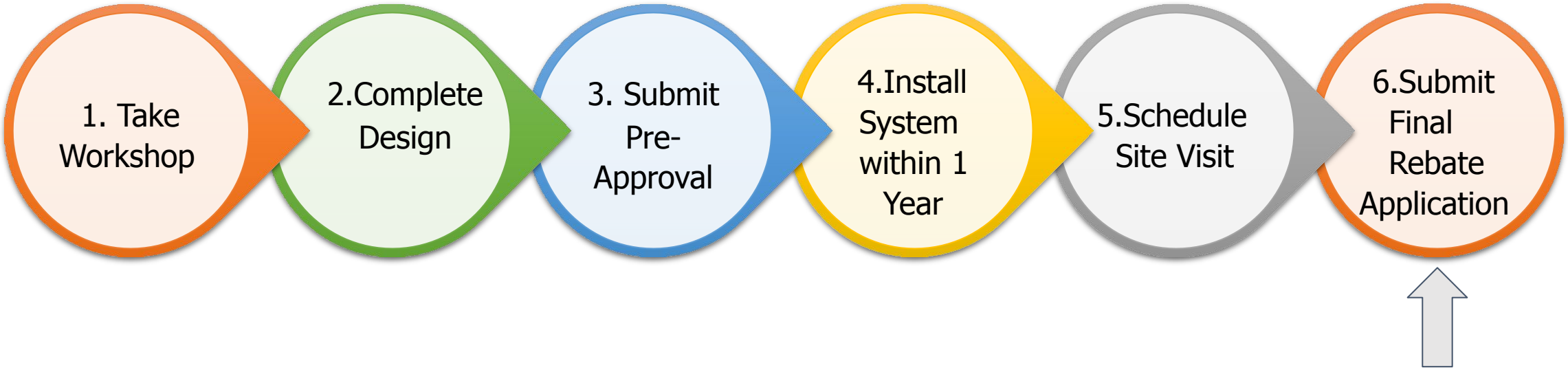
- SERI creates the property site plan, hires contractors, and files for the Tucson Water rebate for you.
- **GRANTS** of up to:
  - $1,000 (if income equal to or less than 100% FLP)
  - $750 (if income equal to or greater than 100% but less than or equal to 200% FPL)
- 0-interest **LOANS** of up to $2,000 to pay for these systems over time. Loan has a deposit (the higher amount will be applied) of $20.00 or 10% of its value.
- For more information scan the QR code

Persons in Household	Annual Income Federal Poverty Level	
	100%	200%
1	$15,060	$30,120
2	$20,440	$40,880
3	$25,820	$51,640
4	$31,200	$62,400
5	$36,580	$73,160
6	$41,960	$83,920
7	$47,340	$94,680
8	$52,720	$105,440
9	$58,100	$116,200
10	$63,480	$126,960
Effective 1/13/2024		

Check out SERI's other programs:

Gray Water Harvesting, Clothes Washer Replacement, Solar Panels
Home Repair Loan, Lead Prevention, and Fair Housing Education

Application Process



After a site visit, the customer will be sent the link to apply for the rebate. At that time, the applicant must fill out, sign, and upload receipts, invoices, and a W-9 Form for rebates of $600 or more.

Questions?

Residential Resources

Potential Annual Rainwater Supply:

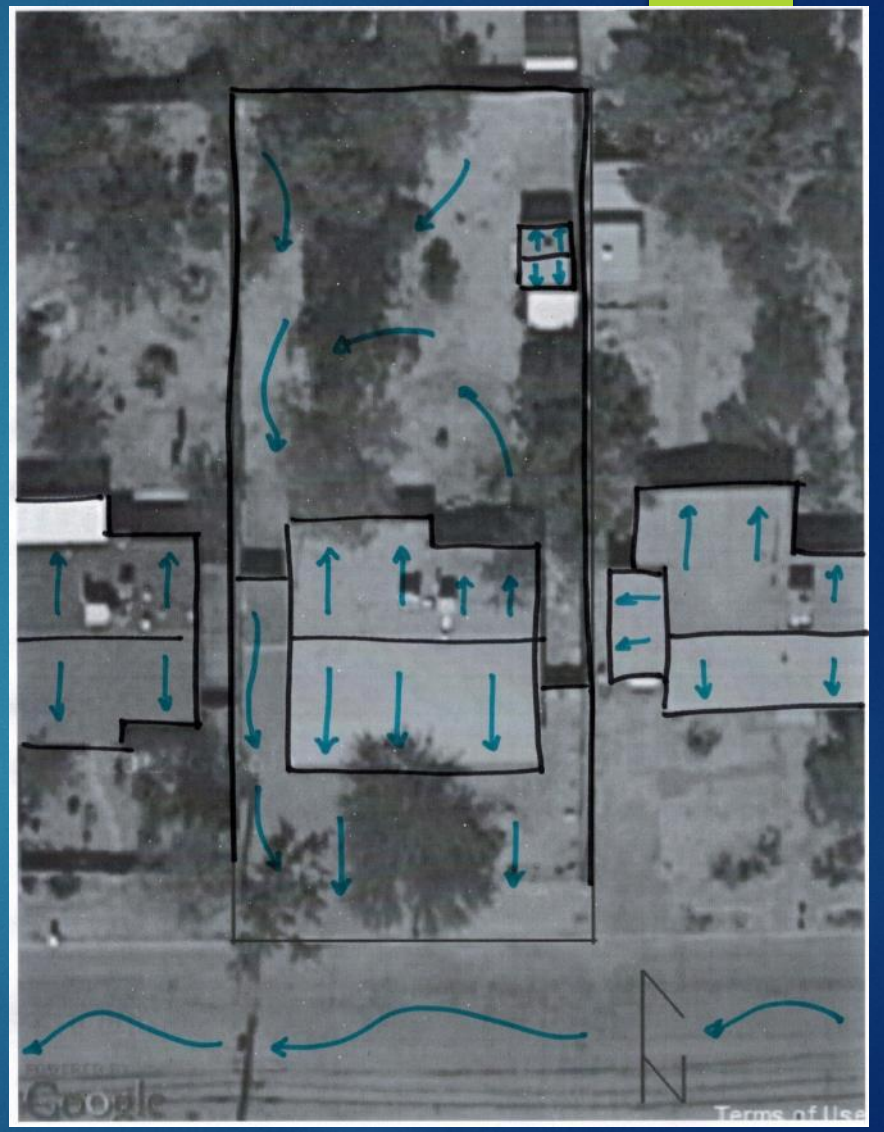
- Roof, 1000sf = **6,000 gallons/yr**
- Landscape, 1000sf = **3,000 gallons/yr**

- 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



Calculation Resources

Measuring Roof Area:

- Map Tucson
- Google earth
- Pima Maps - Create printable base map to draw over for site plan

Calculating Roof Runoff and basin size

- WMG - Rainwater Rebate Site Plan calculator

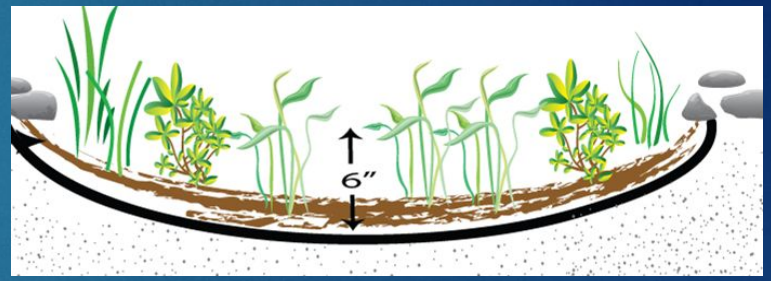
Measuring Your Basins

TW asks for 1" capacity as a minimum to get $1.00/gallon rebate
For large rain events you can design for 2.5" rain events to address flooding or other problems caused by too much water

(Basin Longest Length)*(Basin Widest Width)*(Basin Average Depth)*7.48 gal/cuft

EXAMPLE:
10ft long * 12ft wide * 0.67ft deep * 7.48 gal/cuft = 601 gallons

With infiltration multiplier
601gal * 1.5 = 901 gal = $901



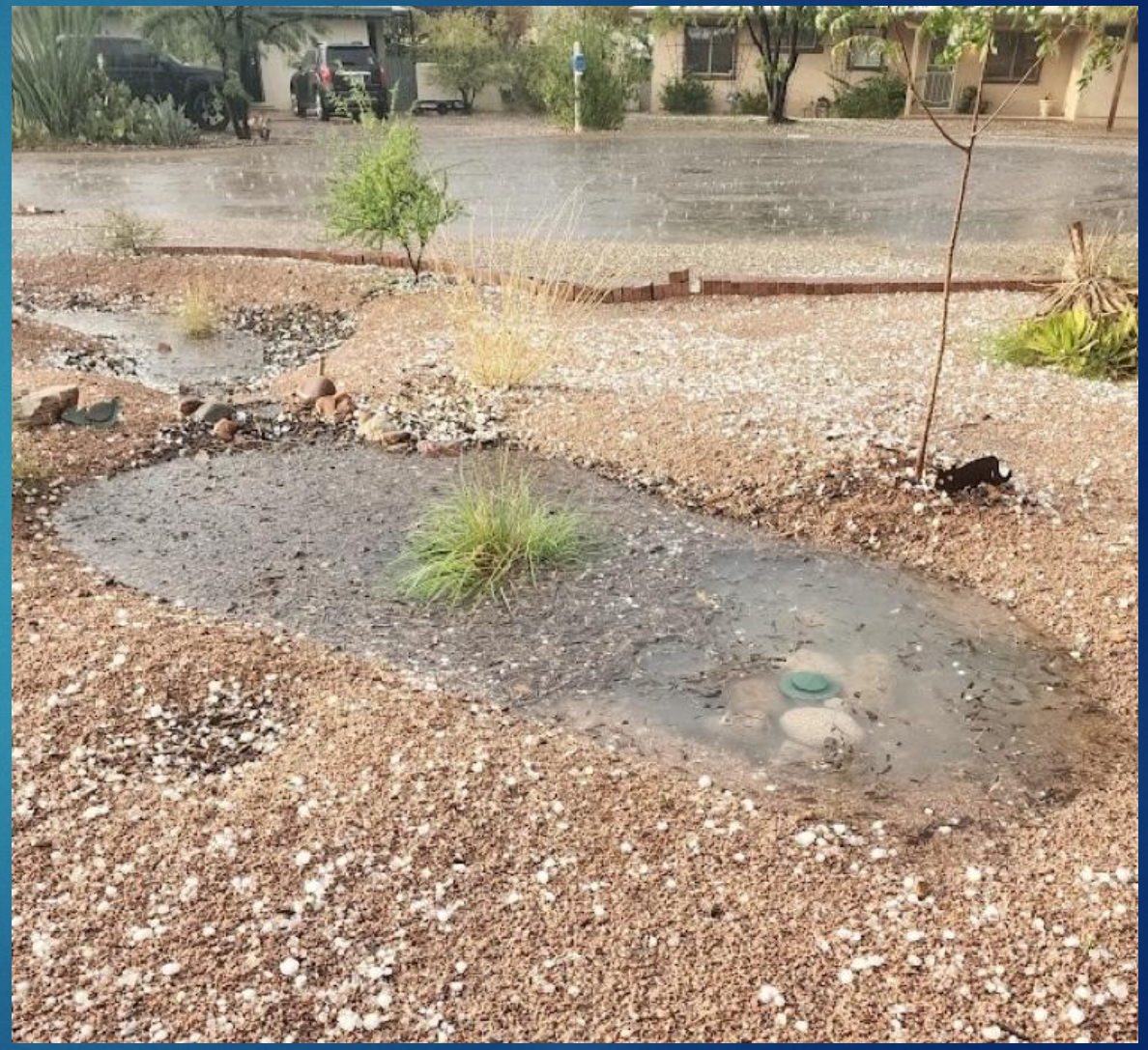
1,000 sq ft

1" rain

~ 600 gallons!

Ensure Passive RWH Systems Best Practices:

- Infiltrate all water within 24 hours
- Berm height > 4 inches above overflow
- Mulch should be at least 4 inches below overflow spillway e levation
- Berms 2 to 4 times as wide as they are tall
- Use organic mulch for infiltration areas
- Use rock mulch for conveyance areas if ne eded - areas where there is water flow
- Basins 10ft from home foundation



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RAINWATER HARVESTING REBATE

Runoff Calculations & Site Elements

Required Site Plan Elements

The following elements are required for site plan submittal. Please label accordingly.

- ❑ **ROOF AREA(S)** - Include square foot **TOTALS** of areas of your roof you are planning to collect and re-direct runoff from.
- ❑ **TANK(S)** - Show placement and capacity of your tank(s).
- ❑ **BASIN(S)** - Show placement of basins and measurements. Show on-ground water flow direction towards basin(s).
- ❑ **GUTTER** – Show placement of gutter and direction of water flow.
- ❑ Show roof rainwater runoff flow direction.
- ❑ Note where the **FRONT** of the property is.
- ❑ Number your basins

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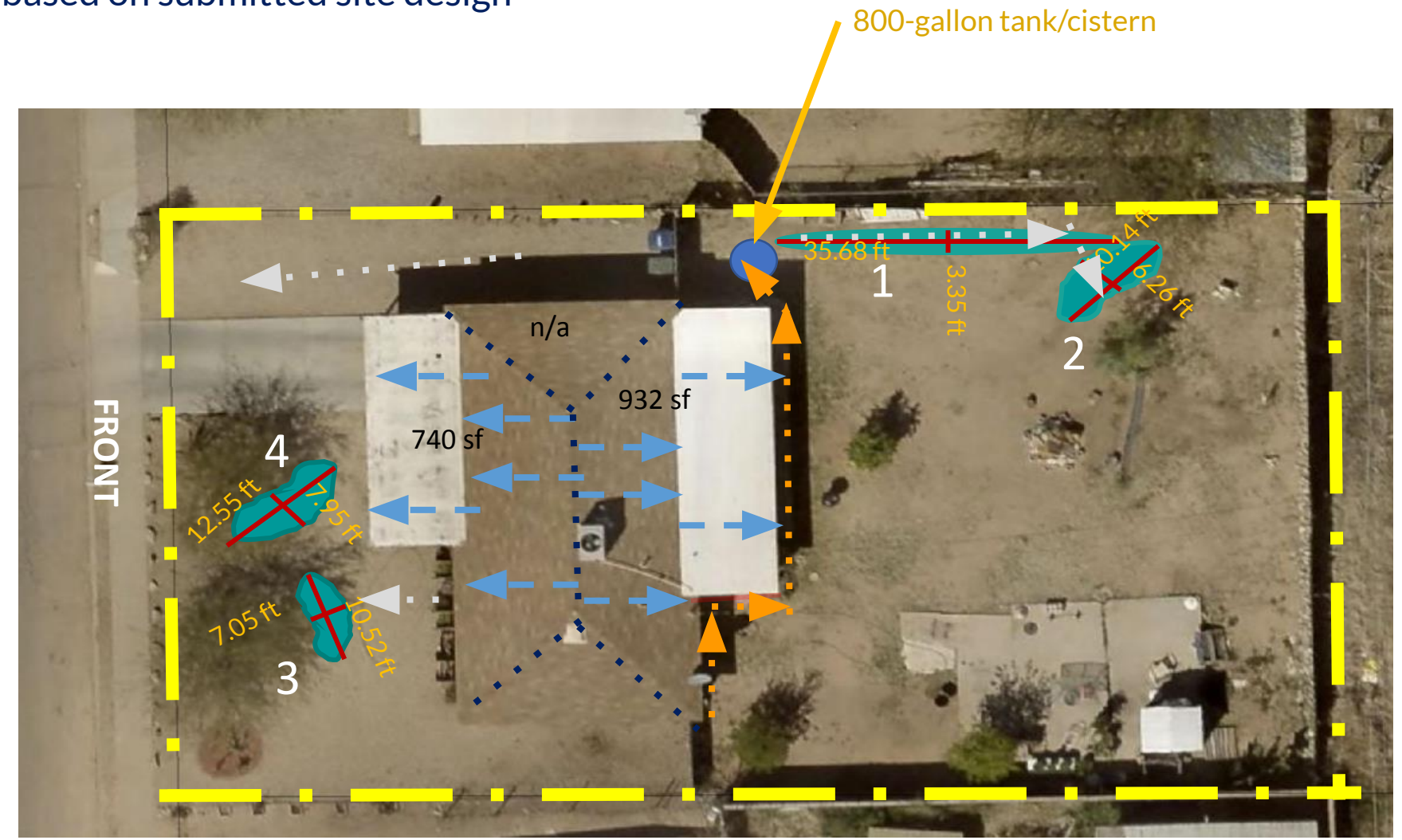
Site Plan Submittal

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

IMPORTANT:
* Include roof area square footage **totals** (only those you are collecting and re-directing runoff from)
* Note where the FRONT of the property is

Key

- Property line
- Roof rainwater flow direction
- Onsite rainwater runoff
- Gutter
- Basin
- Basin measurement lines
- Cistern/tank
1. Number basins



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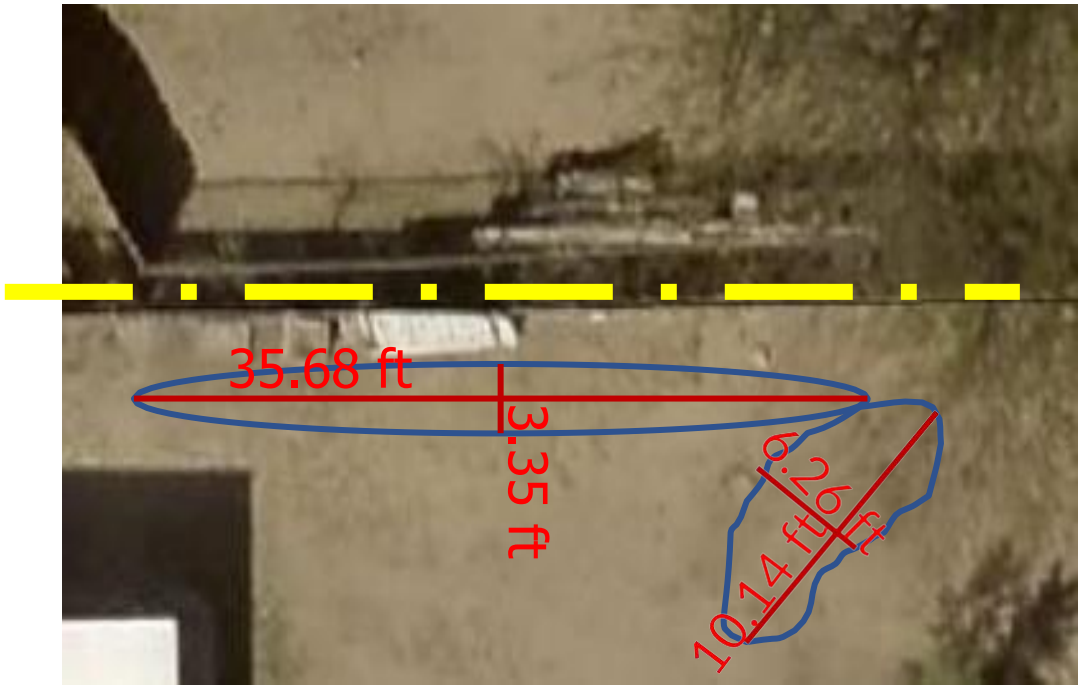
Site Plan: Measuring Basins – Backyard Detail

- Basin measurements:
  - Longest length
  - Widest width, that is perpendicular to length - During site visit 3 or 4 measurements of width may be taken to find an average size for irregular shaped basins
  - Enter in online application
- Default basin depth is 8” (0.65’)
  - 8” has been majority of residential installations
- can be manually changed on form
- Depth over 3’ requires a permit
- Minimum depth of basins 4” - basins with less than 4” depth will not be counted towards rebate amount



Backyard typical swale + basin

Hand-drawn Site Plan Example

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- **TANK(S)** - Show placement and capacity of your tank(s).
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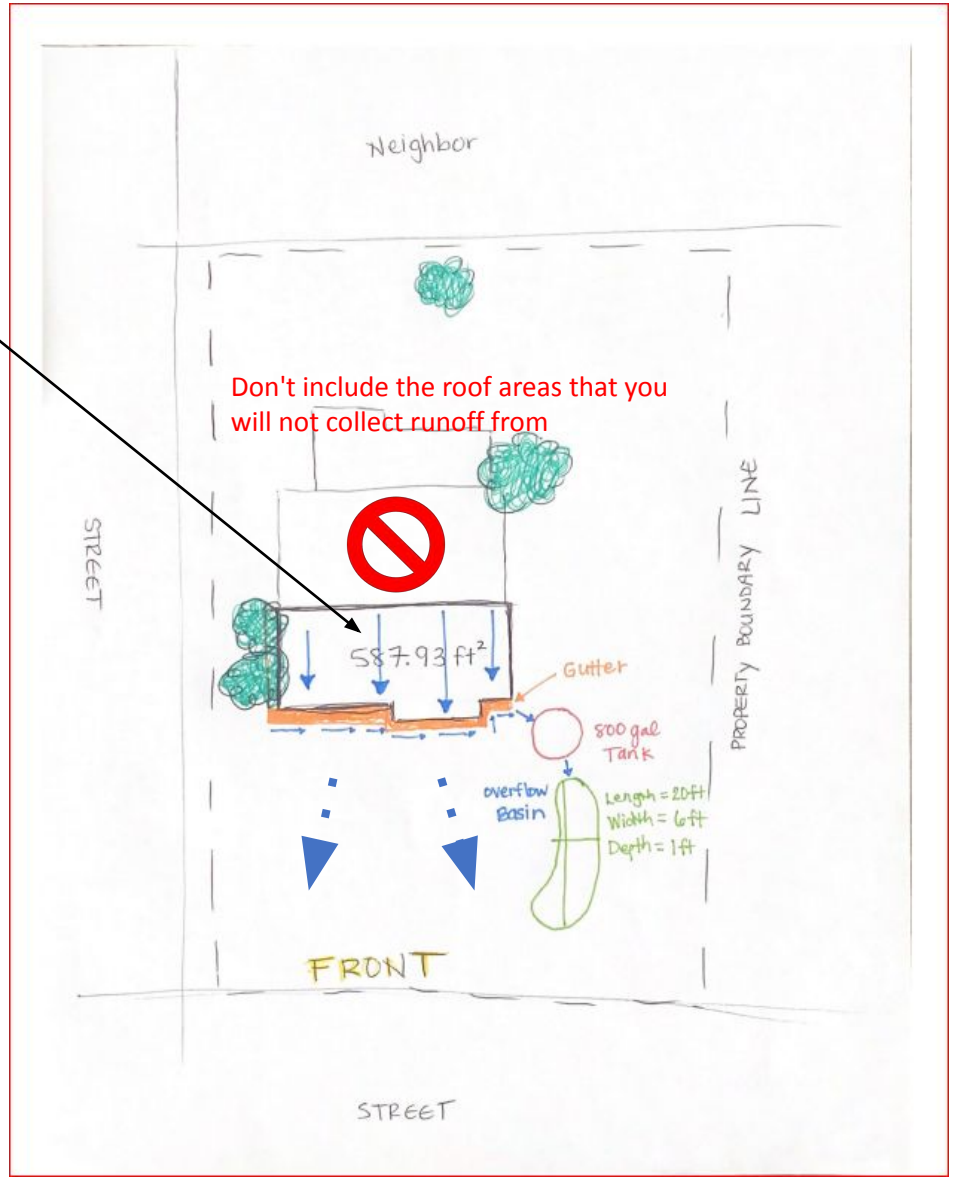

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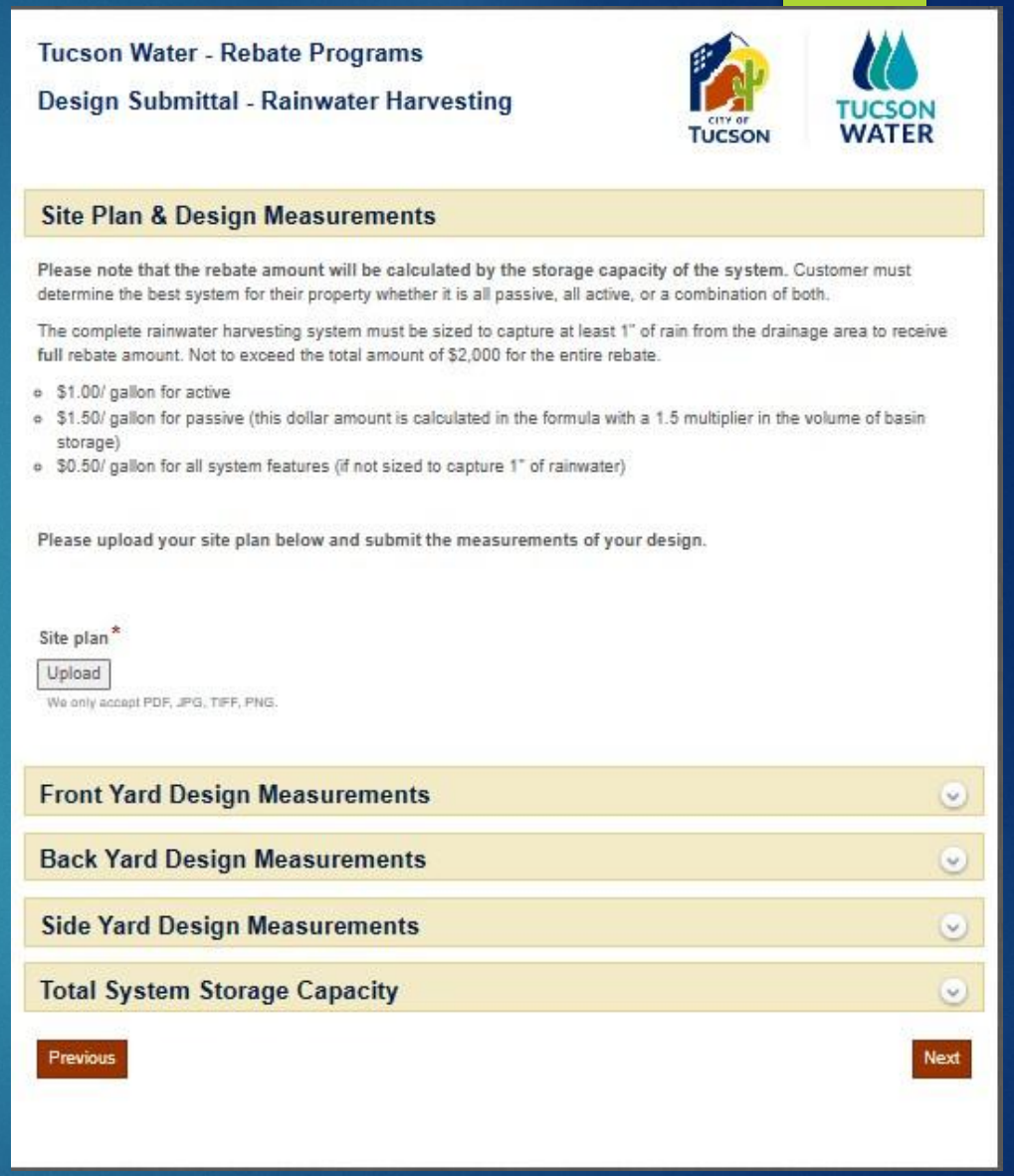
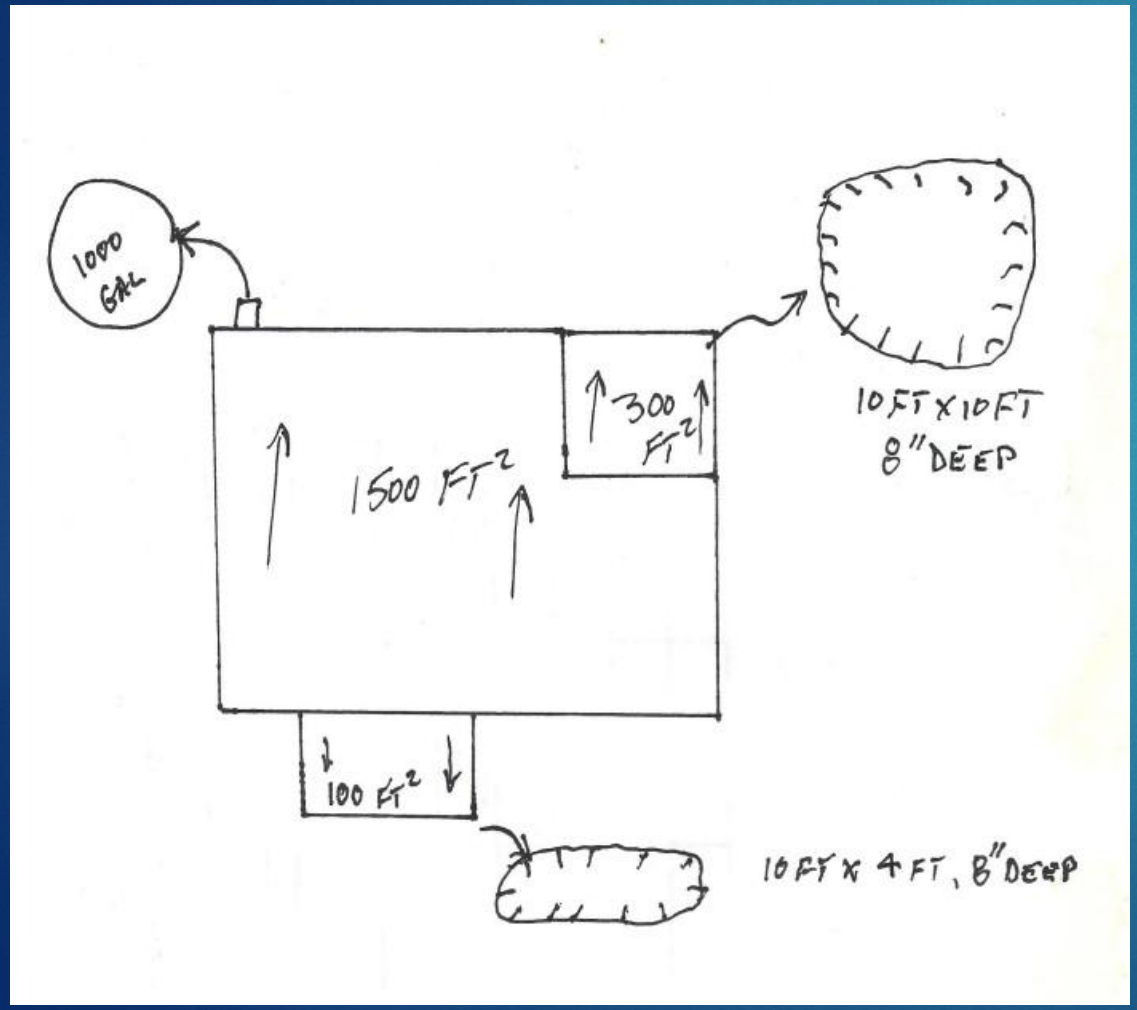
On-line application

- Computer or phone compatible
- Need basic info & site plan ready for upload
- Labeled measurements must include:
  - All rooftop areas
  - Tank capacity for any tanks
  - Basin/swale dimensions for all passive features
- Tucson Water review ~2 weeks



Questions: email conservation@tucsonaz.gov or call 520-791-4331

Entering Calculations



Back Yard Design Measurements

Are you collecting water from a back yard roof?*

- (•) Yes
- ( ) No

Back Yard Roof Areas

Roof Area 1 — area (square feet): 1,500.00

Roof Area 2 — area (square feet): 300.00

Click here to add another roof area

Total Back Yard Roof Area (sq ft): 1,800.00

Are you collecting water in a tank(s) located in your back yard?*

- (•) Yes
- ( ) No

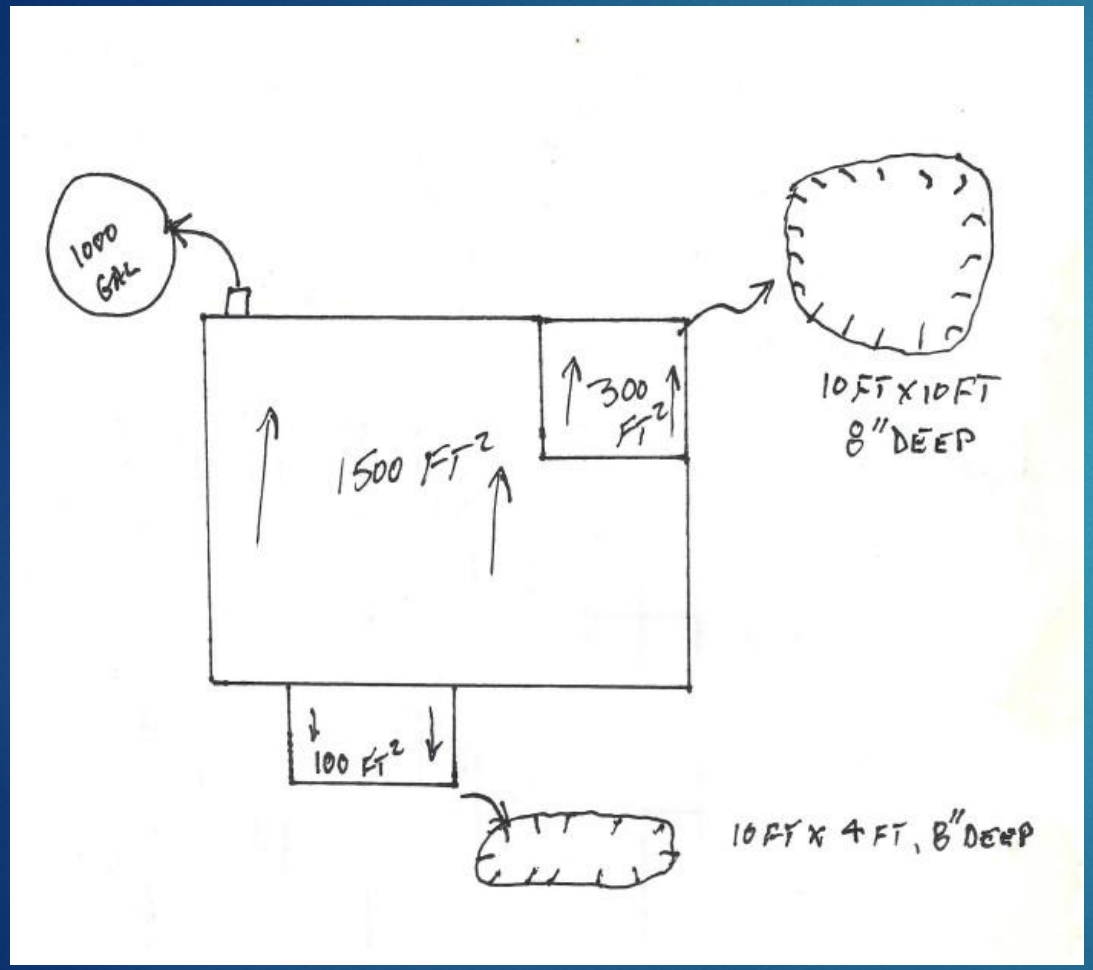
Back Yard Tank Storage

Tank 1 — (gallons): 1,000

Click here to add another tank

Back Yard Tank Storage Total (gallons): 1,000

Entering Basin Capacity



Do you have back yard basin(s)?*

- (●) Yes
- ( ) No

Back Yard Basin Storage

*Note that default depth is 0.67 feet (8 inches). Please modify if different.

	Depth (ft)	Length (ft)	Width (ft)	Basin Cubic Feet	Gallons of Basin Storage
Basin 1	0.67	10.00	10.00	33.50	375.87

Add another basin

Back Yard Basin Storage Total (gallons)

376

Total System Storage Capacity

Total Roof Area (sq ft)
1,900

Design Storm, 1 inch*
1.00

Total Volume Runoff (cu ft)
158.33

Total Required Storage (gallons)

Consider sizing your system to capture this to receive full rebate amount.

1,184

Total Tank Storage (gallons)
1,000

Total Basin Storage (gallons)
526

Total System Storage in 1" storm (gallons)
1,526

Fields estimating calculated rebate amount - to be added

Previous

Next

Questions?

Remember those…

Water Harvesting PRINCIPLES

From Brad Lancaster's, Rainwater Harvesting for Drylands and Beyond

Analyze your site

- **Where is water already gathering?**
- **How can you get the water to where you need it?**
- **Are their any additional sources of water *(e.g. AC condensate, greywater, stormwater, etc)***
- ***Do you have future plans for a casita, RV, shed, patio?***

Water Harvesting Principles

1. Begin with Long and Thoughtful Observation

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

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

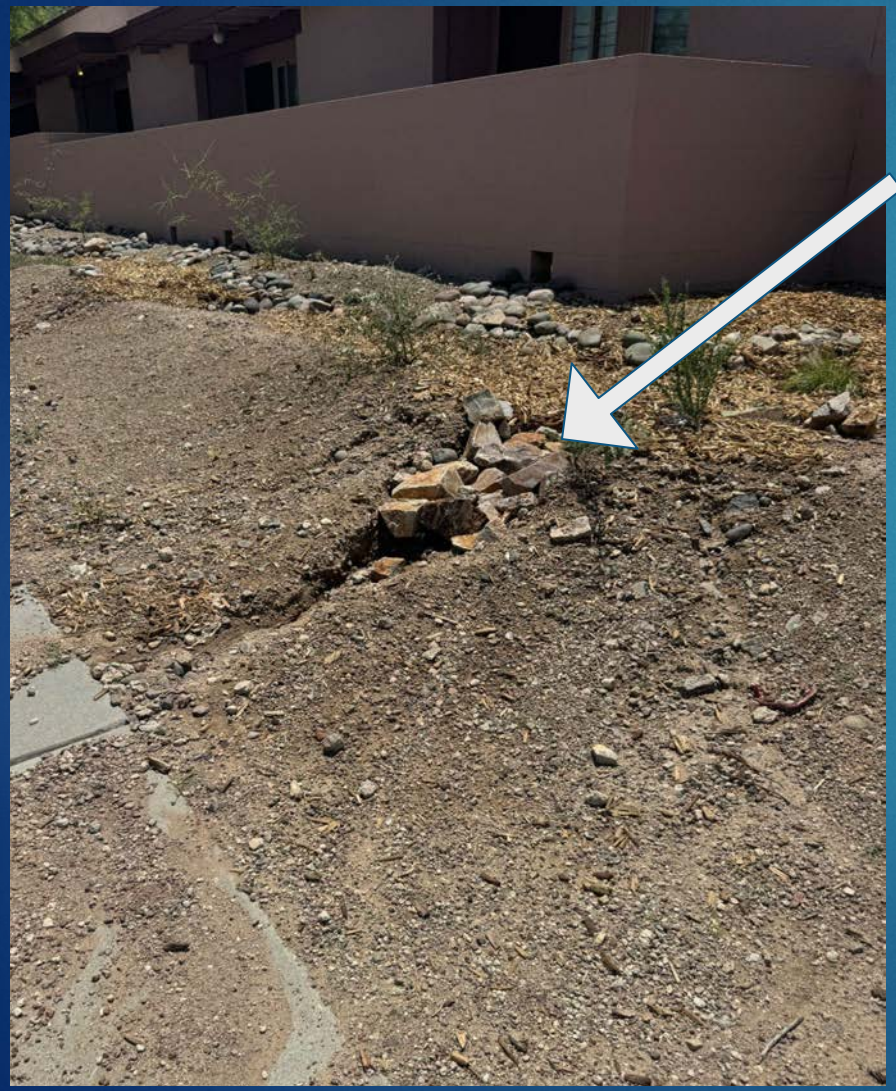
6. Maximize living and organic groundcover

Water Harvesting Principles

7. Maximize beneficial relationships and efficiency – STACKING FUNCTIONS

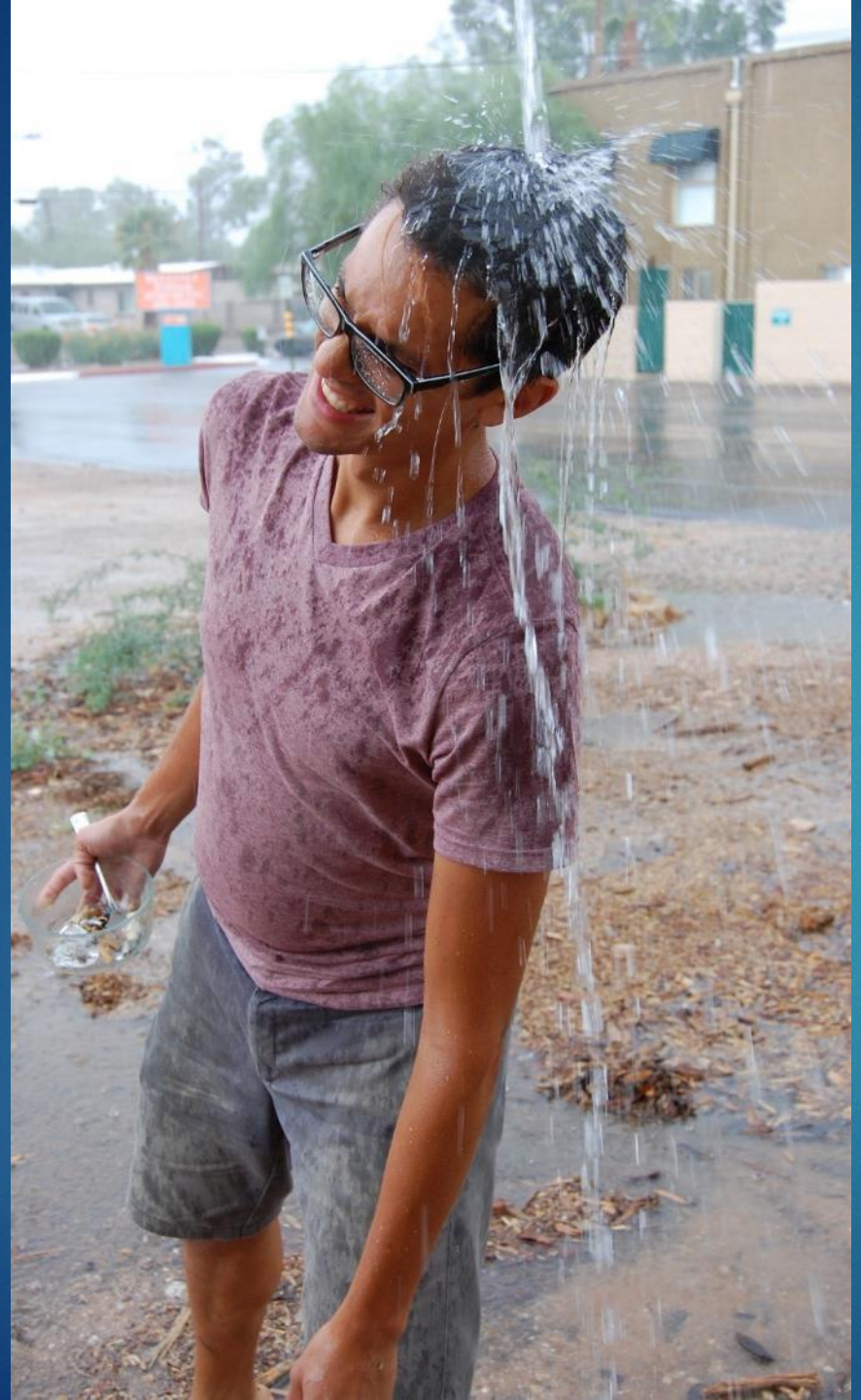
Water Harvesting Principles

8. Continually reassess your system



Unplanned overflow with erosion

Mulch clogged planned overflow



And be sure to have FUN!


Questions?

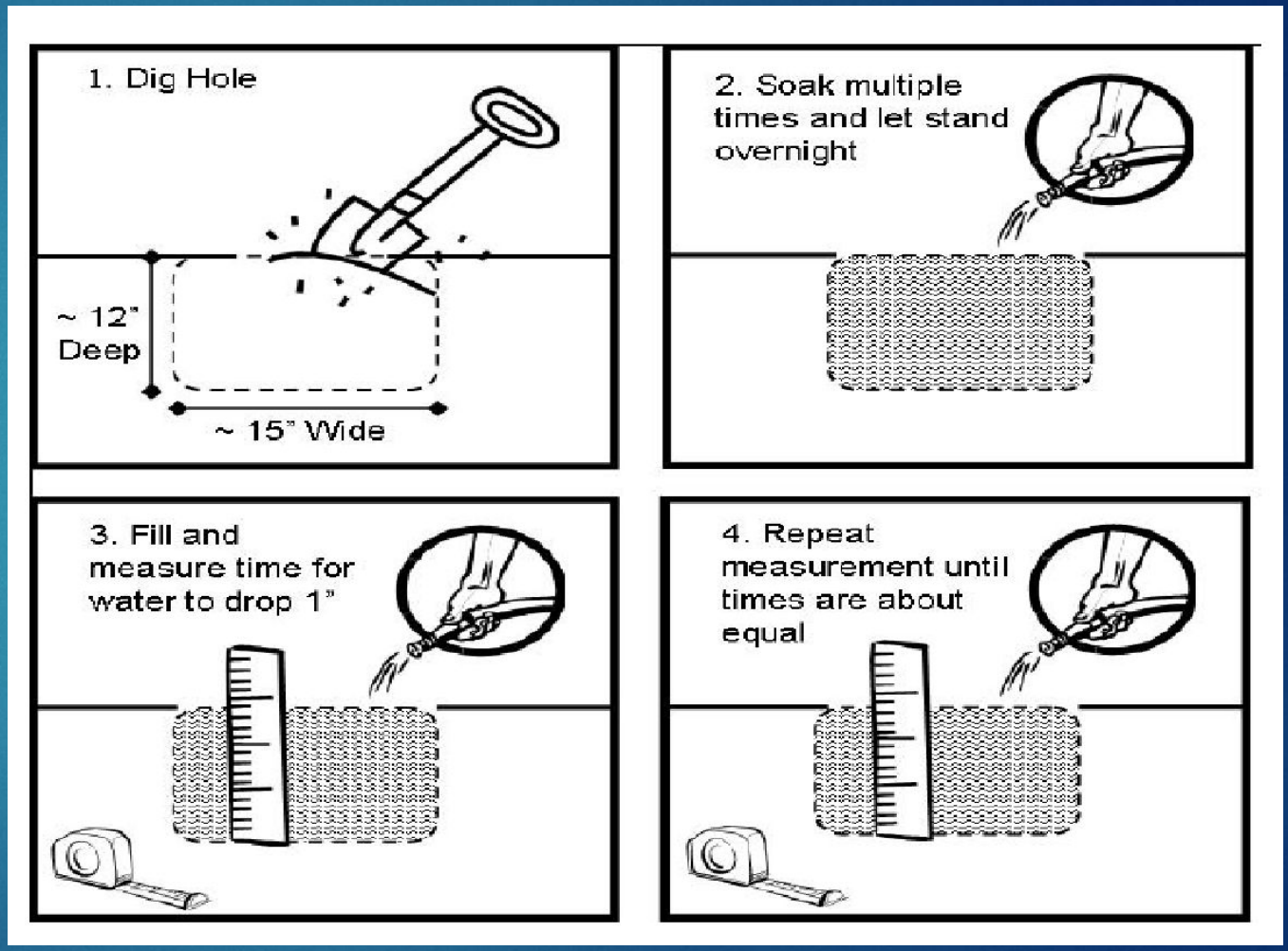
Passive Systems/Earthworks

Use gravity to distribute rain runoff

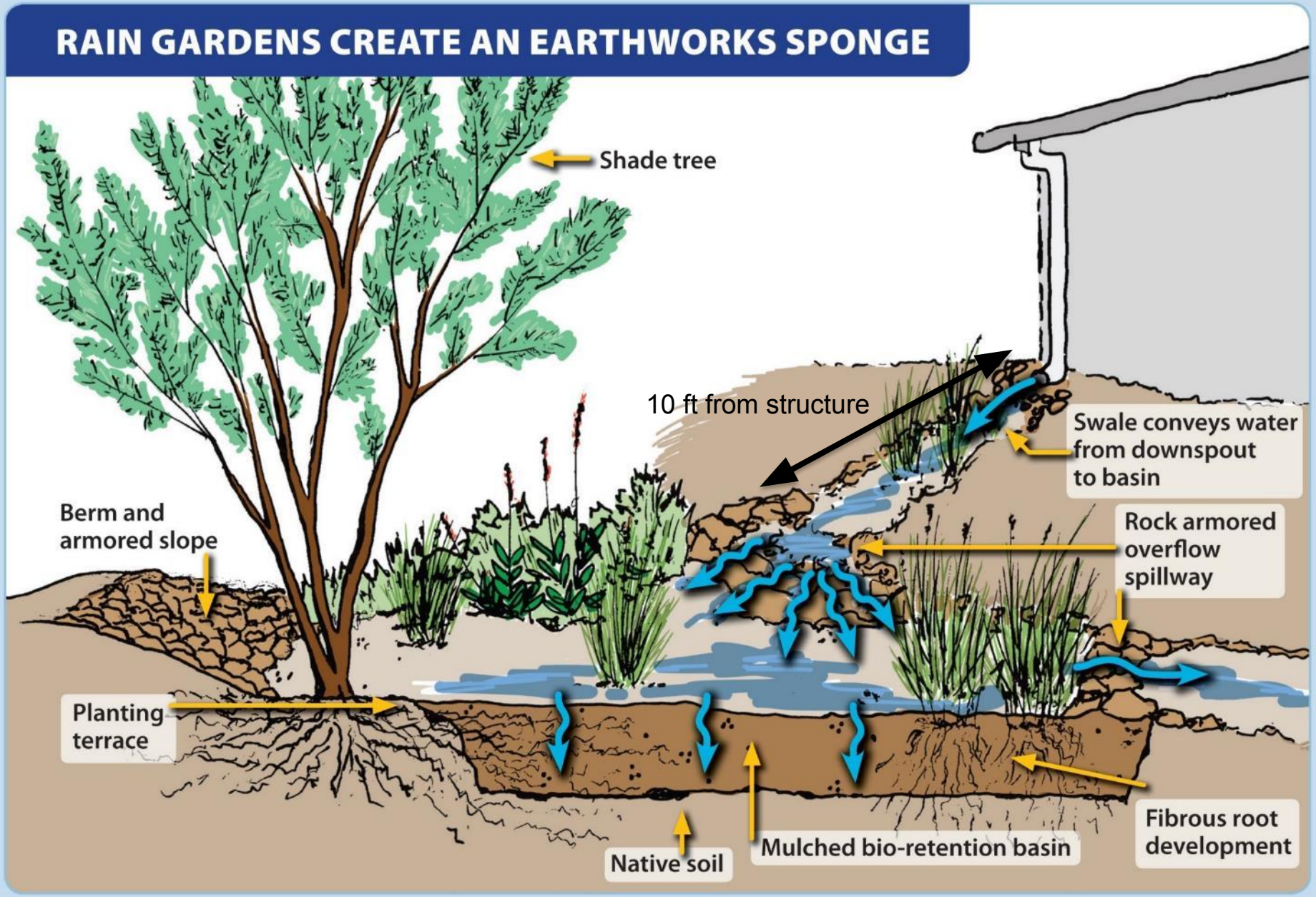
- SLOW
- SPREAD
- SINK

Cheapest storage option for large amounts of rainwater

Explore Your Soils



*Basins must infiltrate water in 24 hours or less

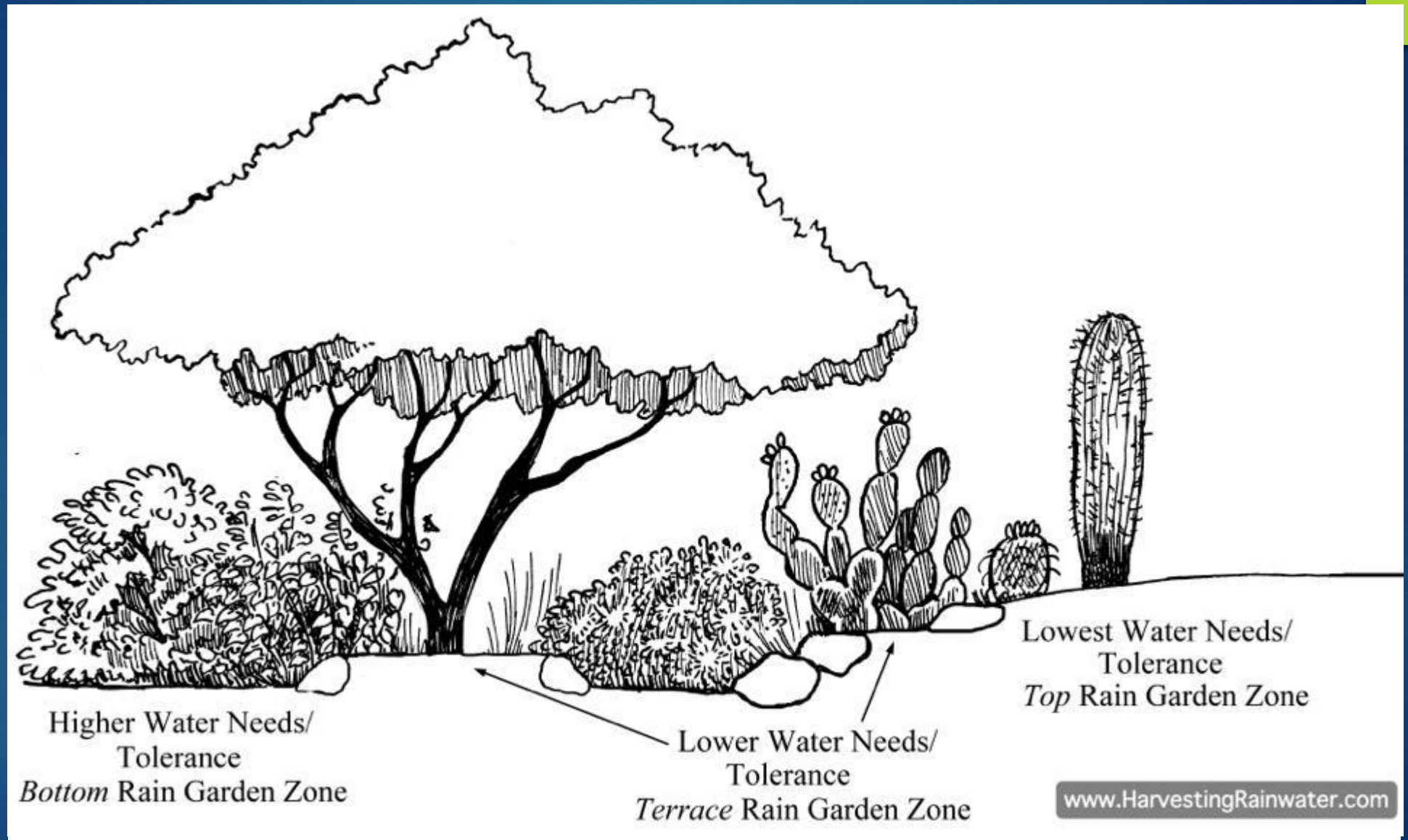


Organic mulch is applied to basins, 2 – 4 inches thick, to help infiltrate more water, reduce evaporation of soil moisture, and replenish nutrients in the soil.

Basin Edge Slopes


Let’s Plant the Water!
Benefit/Cost: $4.4 returned for every $1 invested

Right Plant, Right Place



http://www.harvestingrainwater.com/2014/07/12/revised-multi-use-rain-garden-lists-for-tucson-arizona-and-a-template-for-anywhere-else/

Say NO to Mow, Blow, & Go!

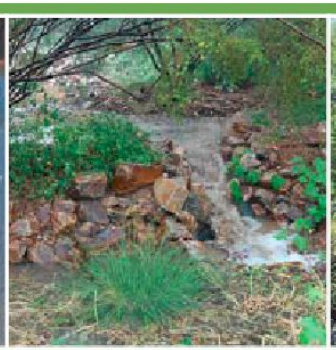
Grass is a water hog and is maintained with loud mowers and chemical fertilizers.

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

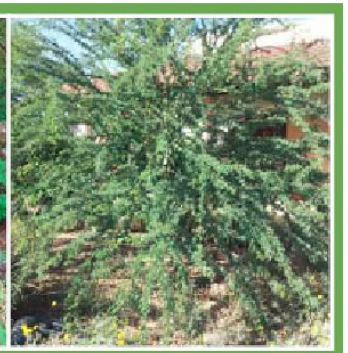
Chemical weed killer is sprayed frequently on public landscapes (often seen as blue/green coloring). These chemicals are harmful to our soil, water, and wildlife.

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.

watershedmg.org/document/field-guide-rain-garden-care

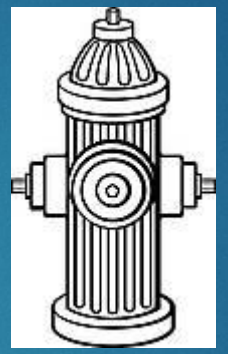
Right of Way Basins

- Harvests Stormwater
- Support shade in your neighborhood
- Curb cut details and Required permit information
- Rebate 50 cents/gallon

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

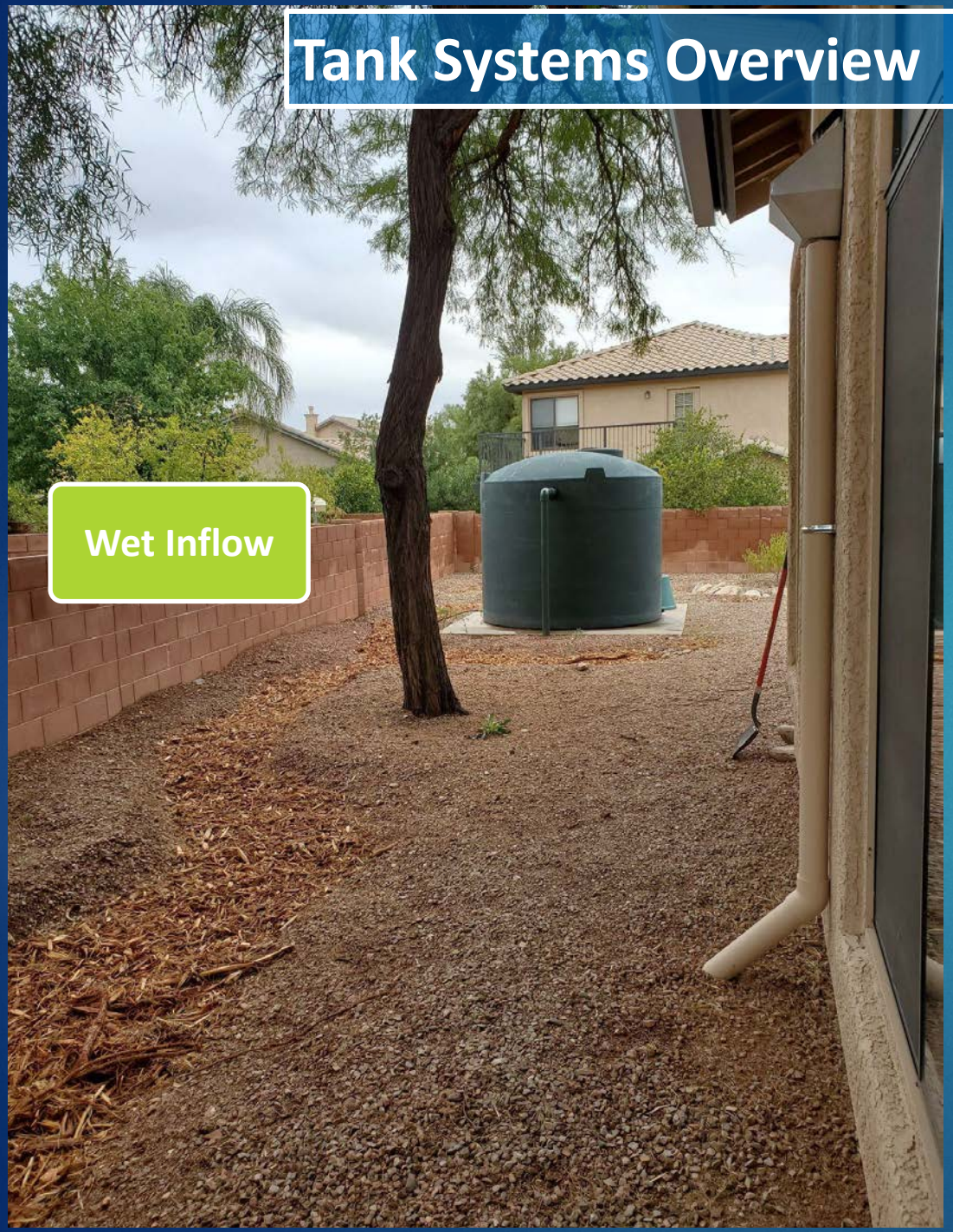
- Water demand required over length of dry period, 4 months (March – June)
- Available seasonal rooftop supply (~4-6” per rainy season)
- Available space
- Budget
- Meet 1 inch demand requirement

1000sq.ft roof

4”-6” rain

2400 - 3000 gallons!

Tank Systems Overview



Wet Inflow

Catchment

Collection

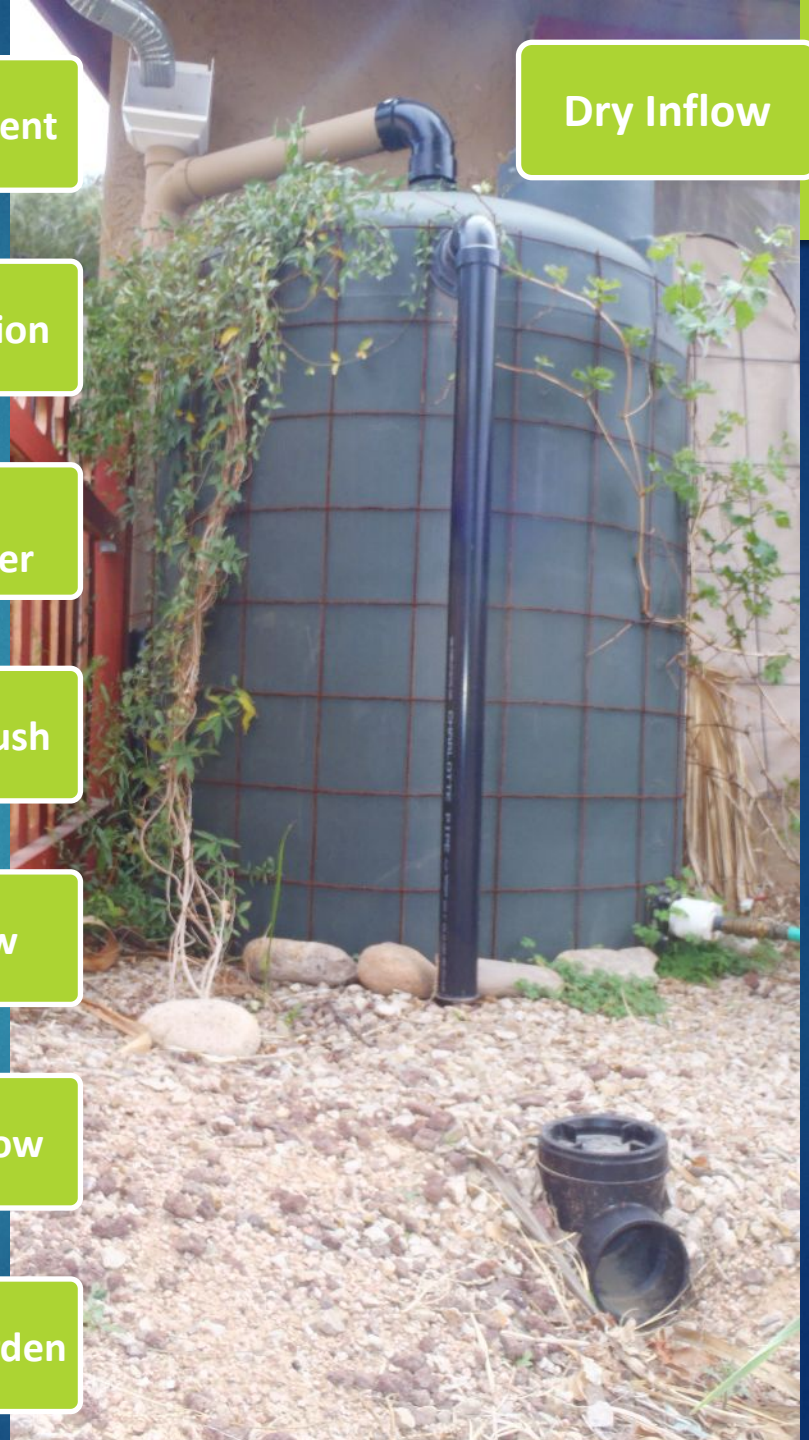
Leaf Diverter

First Flush

Inflow

Overflow

Rain garden



Dry Inflow

Rain Tank Best Management Practices

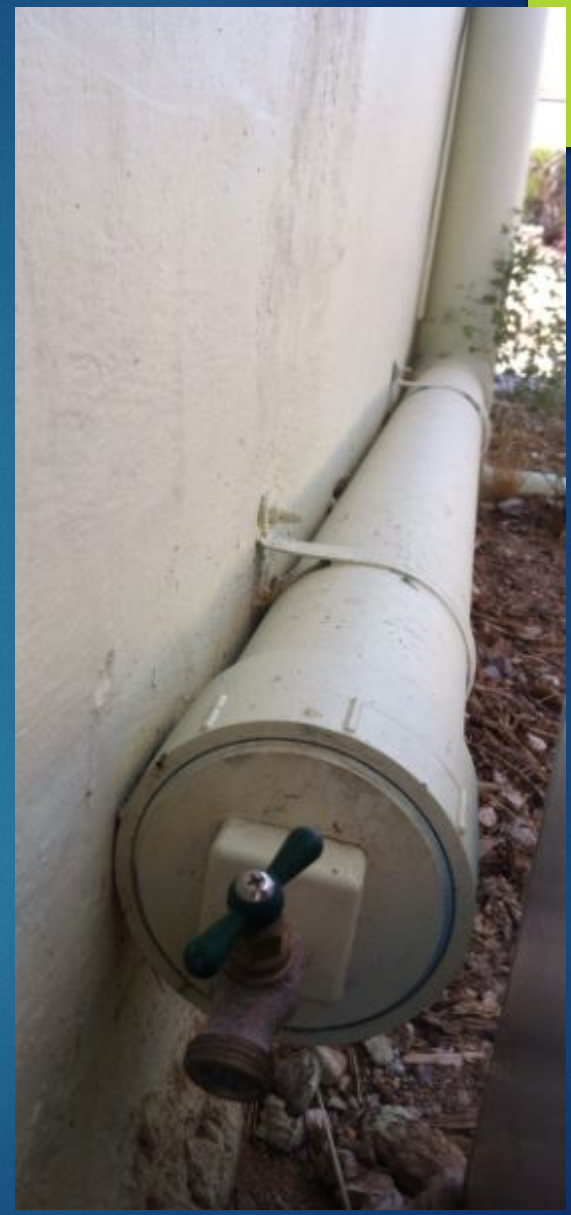
- Use high-quality materials (Schedule 40 PVC & ensure painted to withstand UV; sheet metal leaf catcher)
- Install closed systems (no light into tank, screen tanks)
- Install systems to minimize maintenance (accessible debris filters & first flush devices)
- Install tanks on level pads (concrete or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

Leaf Diverters

Gutter Screens

Strainer Baskets

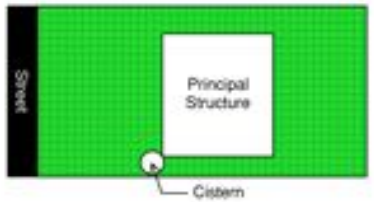
First Flush



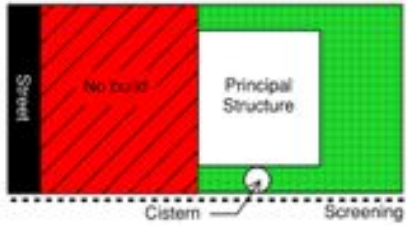
Overflow – End of Pipe Critter Preventers

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

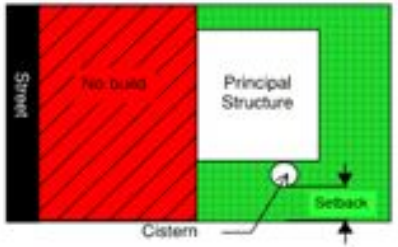
- **A cistern 5' or less in height and 10 sq ft or less in area (~3.5' in diameter)** UDC Standard 6.6.2.A.1
  - No required site reviews
  - No setback required
  - No screening requirement
  - May be located anywhere within the property lines



- **A cistern between 5'1" and 6' in height and 10 sq ft or less in area (~3.5' in diameter)** UDC Standard 6.6.2.D
  - No required site review
  - No setback requirement, if screened by a wall or fence of equivalent height
  - May be in the defined side and backyard
  - Cannot be in the defined front, street perimeter yard



- **A cistern exceeding 6' in height or is more than 10 sq ft (~3.5' in diameter)**
  - Required site review – a permit application and site plan are required for review[2]
  - Subject to the perimeter yard setback requirements applicable to the zone[3] (UDC, Section 6.3.4)
  - May be in the defined side and backyard
  - Cannot be in the defined front, street perimeter yard



- The **maximum permitted height** of the cistern in a **Residential zone** is 12' (UDC, Standard 6.6.3.C)
- The **maximum permitted height** of a cistern in a **Commercial zone** is equal to the maximum height permitted for the principal building (UDC, Standard 6.6.4.C)

County or other jurisdiction or HOA = CHECK!

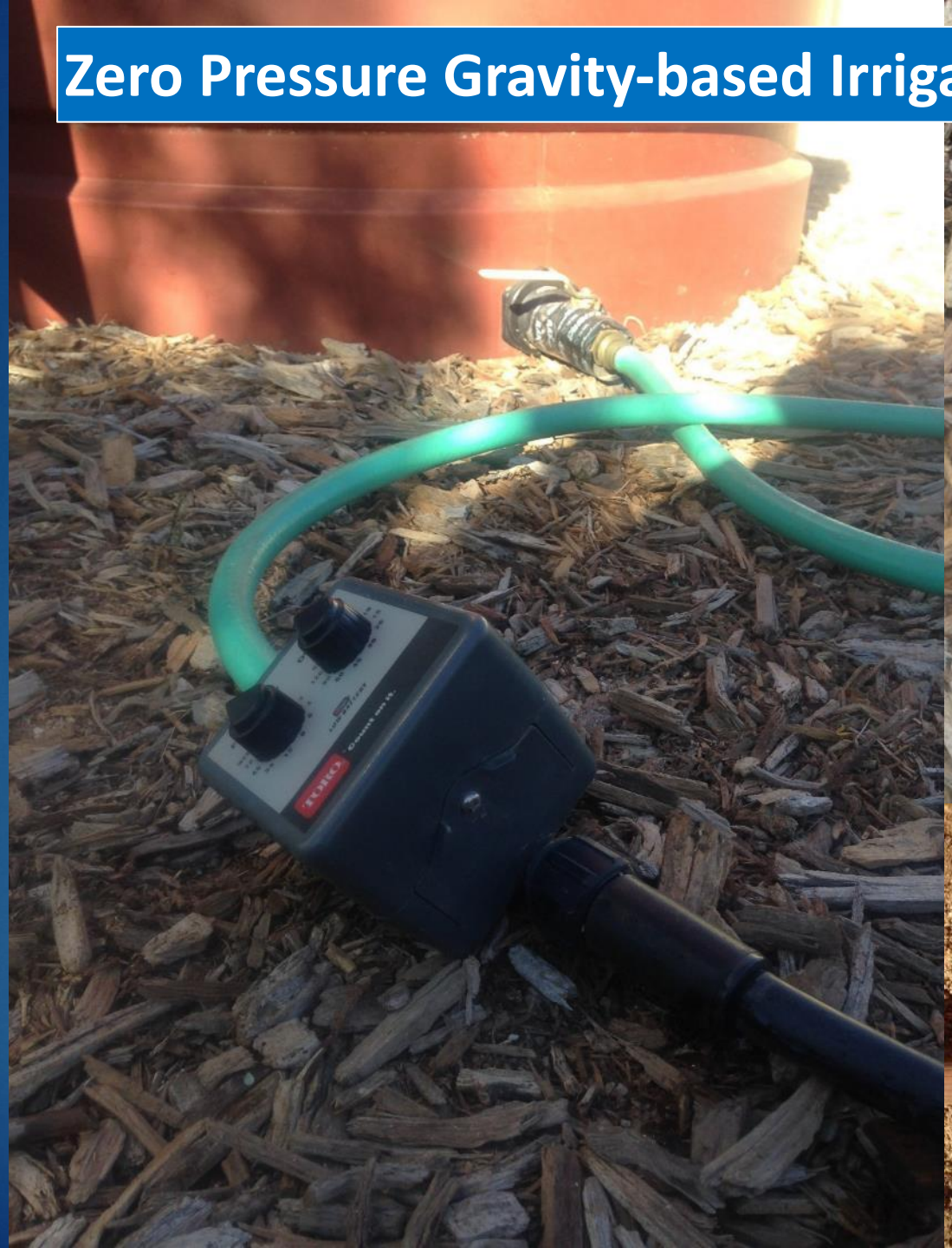
Recycled *(Eligible for rebate if pre-approved)* – not rated for potable use

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

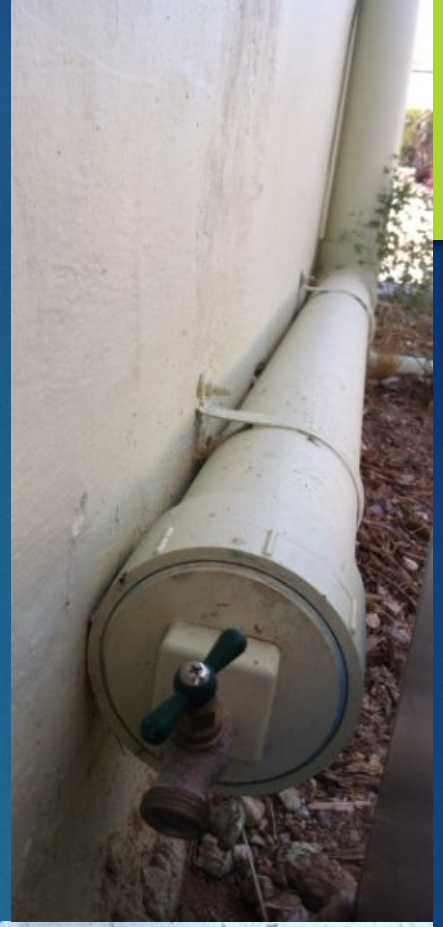
Below Ground Tanks

Living Lab: 10,000gal Rain Tank

Maintenance

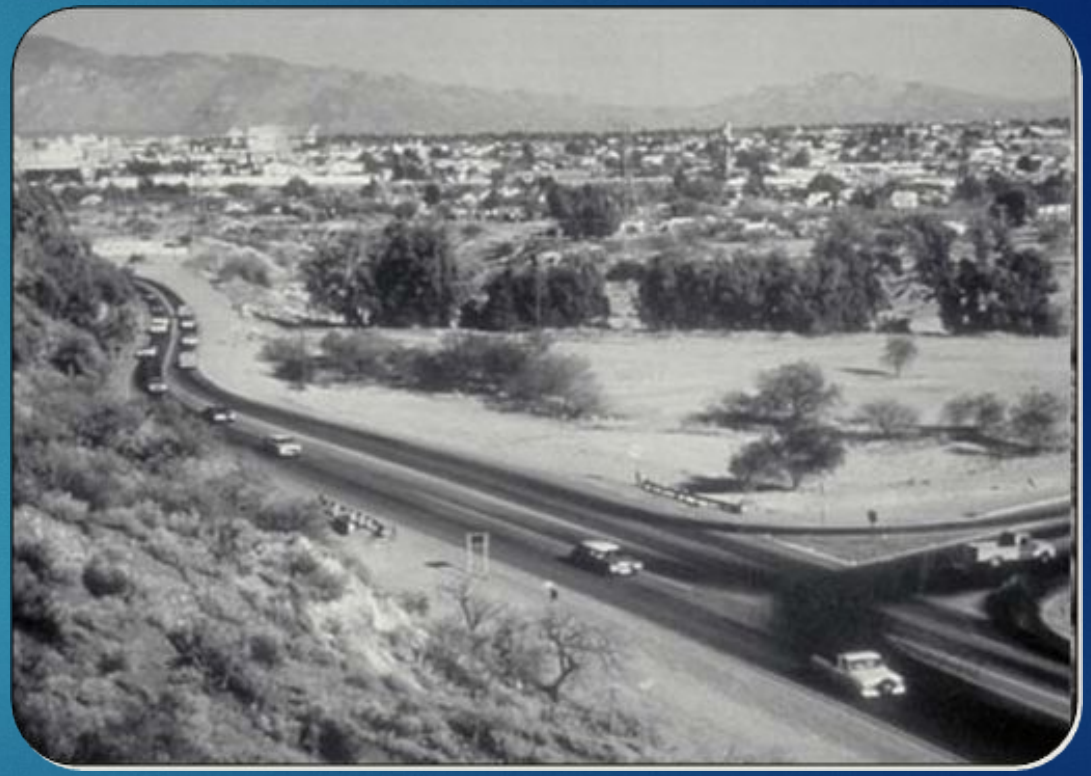
Have a specific plan!

- 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)



Let's work towards a hydro local future

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



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


DENNIS CALDWELL 2018

GIVE US FEEDBACK ON THIS CLASS

SCAN ME

THANK YOU FOR JOINING

https://docs.google.com/forms/d/e/1FAIpQLSdX-RG9qEXb3Nxc1c5M1lGohKUXmUzfT9dVv-iKBBZn7JmmZQ/viewform?usp=sf_link

Thank you for joining!

Please give us your feedback and fill out the Tucson Water Form

SCAN ME

Don't forget to report your attendance!

Scan QR Code or visit:

docs.tucsonaz.gov/Forms/Water-Rebate-Workshop-Attendance