# This presentation premiered at WaterSmart Innovations

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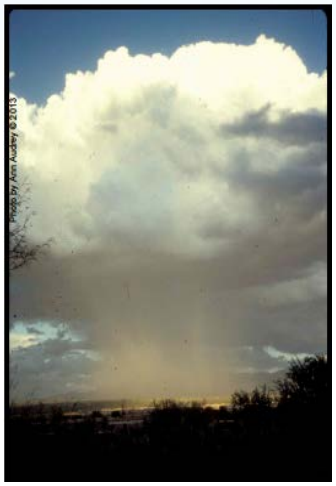

# New Water Harvesting Assessment Toolbox for the Desert Southwest

WaterSmart Innovations '15
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With Jenna Cleveland, Research Associate and Jackie Moxley, University of Arizona (ret)

DESERT LANDSCAPE CONSERVATION COOPERATIVE

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

# *Guide to Assessing Rainwater and Stormwater Harvesting Potential to Meet Multiple Challenges and Provide Multiple Benefits*


**A project funded under a grant from the Desert Landscape Conservation Cooperative through the U.S. Bureau of Reclamation WaterSMART Program**

Conducted by

University of Arizona Water Resources Research Center

with input from Technical Advisory Committee,

Water Harvesting and Landscape Consultants, and

Regional Water Providers

U.S. Department of the Interior Bureau of Reclamation

Desert Landscape Conservation Cooperative

WRRC Water Resources Research Center

The University of Arizona College of Agriculture & Life Sciences

Desert Water Harvesting Initiative

# PROJECT GOAL

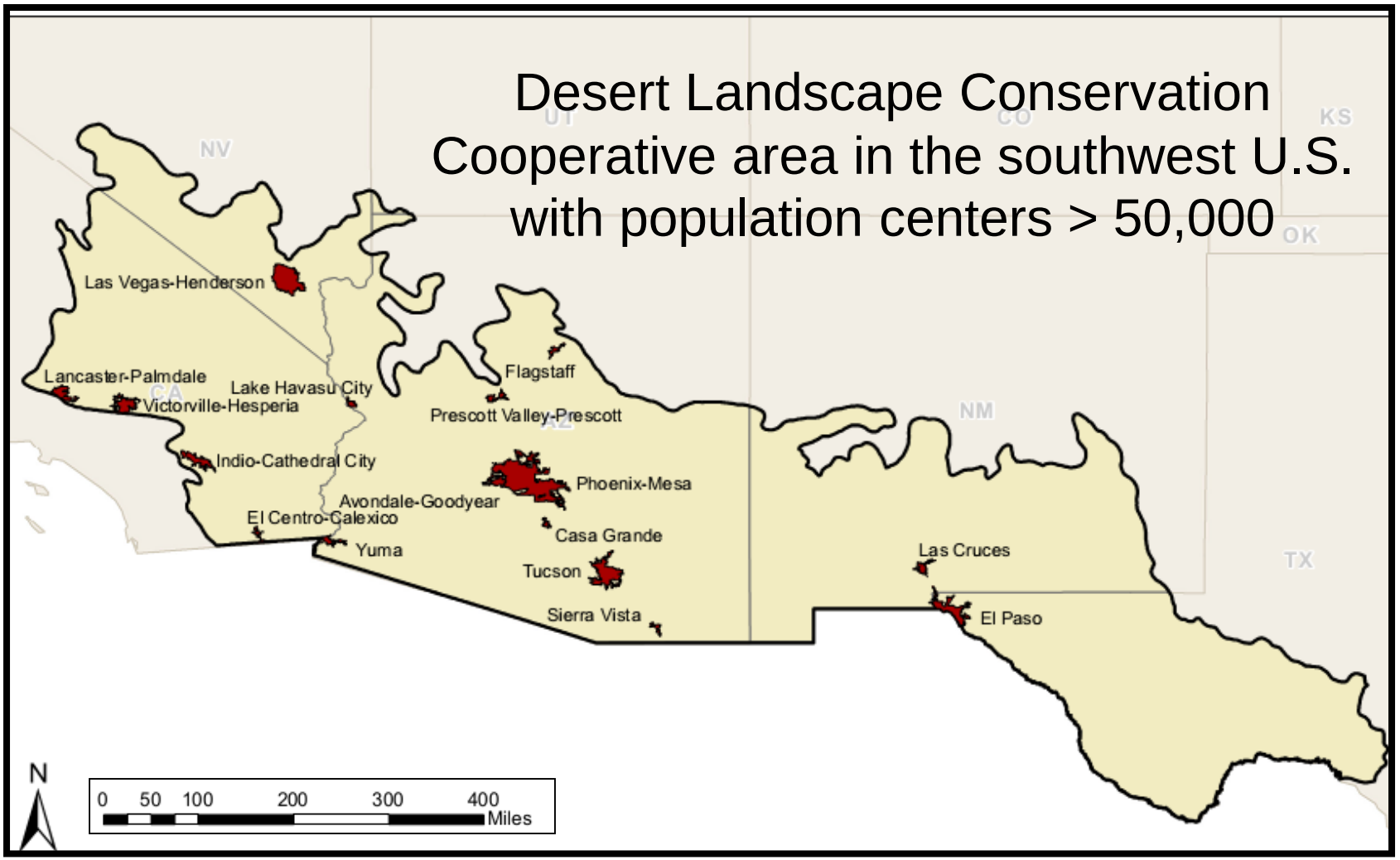
Identify water harvesting solutions to your water resource challenges

- Insufficient potable supply
- Peak demand > supply
- Improve stormwater quality
- Reduce environmental impacts
- Reduce stormwater volume
- Climate change impacts to supply and demand
- Other?

Provide TOOLS & STEPS to gain multiple benefits at multiple scales

# GEOGRAPHIC AREA

Desert Landscape Conservation Cooperative area in the southwest U.S. with population centers > 50,000



# FACILITATOR INSTRUCTIONS

**How to use the Toolbox**

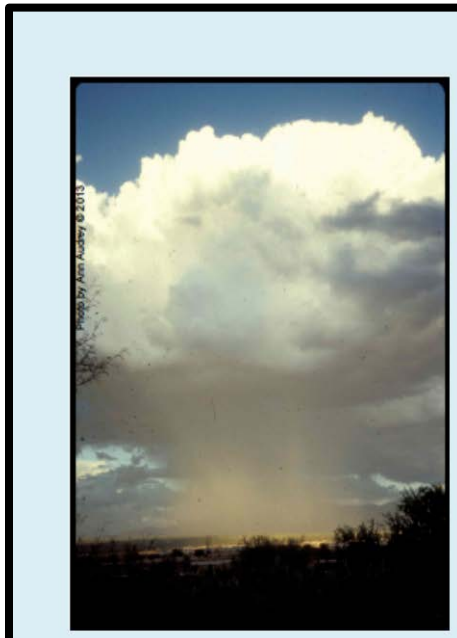
A local facilitator or water harvesting expert convenes varied technical and planning personnel for an area (water supply management, stormwater management, transportation, planning, engineering, etc.) to undertake the water harvesting assessment process together


Facilitator Instructions detail how to guide the assembled group through the 8-step assessment process using the 5 tools provided

# TOOL 1 NARRATED PRESENTATION

*Water Harvesting Assessment Presentation*

A narrated slide presentation guides you through as assessment of water harvesting for your community



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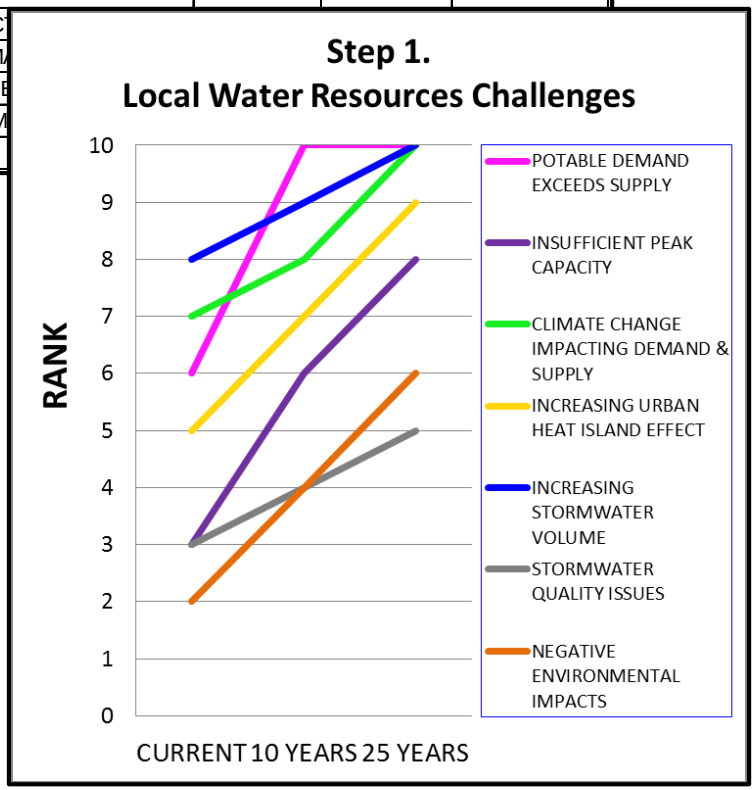
# TOOL 2 CHALLENGE-BENEFIT SPREADSHEETS

*Water Harvesting Assessment Spreadsheet*

Tables and charts to help you assess water challenges, water harvesting benefits, and other relevant factors

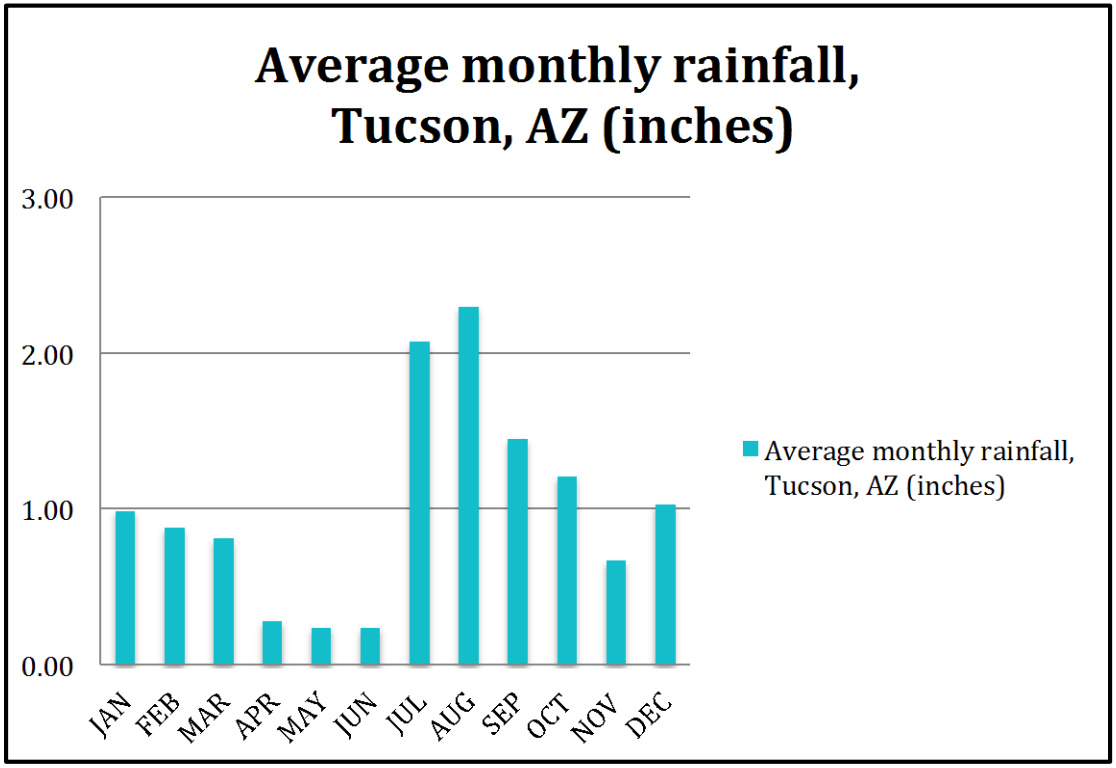
| STEP 1. LOCAL WATER RESOURCE CHALLENGES | RANK LEVEL OF LOCAL CHALLENGE AS 1 (LOW) TO 10 (HIGH) | | |
|---|---|---|---|
| | CURRENT | 10 YEARS | 25 YEARS |
| POTABLE DEMAND EXCEEDS SUPPLY | | | |
| INSUFFICIENT PEAK CAPACITY | | | |
| NEGATIVE ENVIRONMENTAL IMPAC | | | |
| CLIMATE CHANGE IMPACTING DEM | | | |
| INCREASING URBAN HEAT ISLAND E | | | |
| INCREASING STORMWATER VOLUM | | | |
| STORMWATER QUALITY ISSUES | | | |



# TOOL 3 WH POTENTIAL SPREADSHEETS

*Catchment-to-Canopy Area Ratio Spreadsheet*

Tables and charts to help you estimates your water harvesting potential



# TOOL 4 WEBSITE

*Water Harvesting Resource Website*

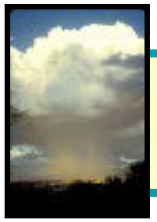
A source of data, articles, photos, examples, links, and additional information for your water harvesting efforts


**wrrc.arizona.edu/DWHI**

# TOOL 5 PRESENTATION TEMPLATE

*Decision-Maker Presentation Template*

Presentation template you can fill in with your own data, photos, and recommendations to present to decision-makers



WATER HARVESTING
IN YOUR AREA

*YOUR LIST OF CHALLENGES & SOLUTIONS*

**YOUR PICTURE HERE**

# *Step 1. Identify the challenges you face*

***Potable demand exceeds supply***

***Insufficient capacity to meet peak demand***

***Negative environmental impacts***

***Climate change impacting supply & demand***

***Increasing urban heat island effect***

***Increasing stormwater volume***

***Stormwater quality issues***

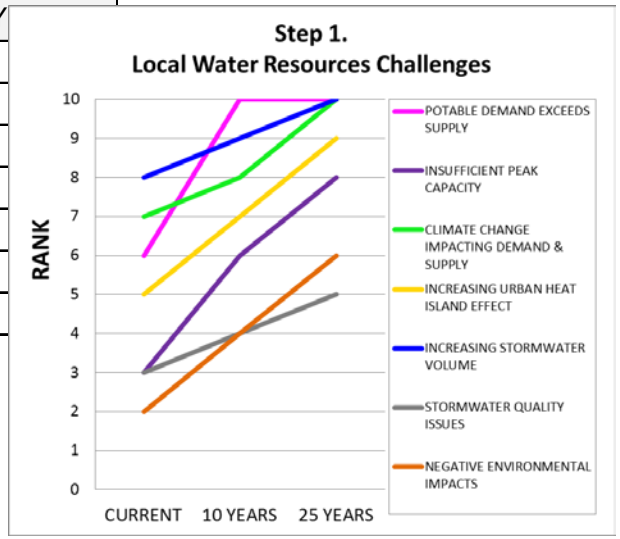
**Meet multiple challenges with multi-function solutions**

# PAUSE THE PRESENTATION

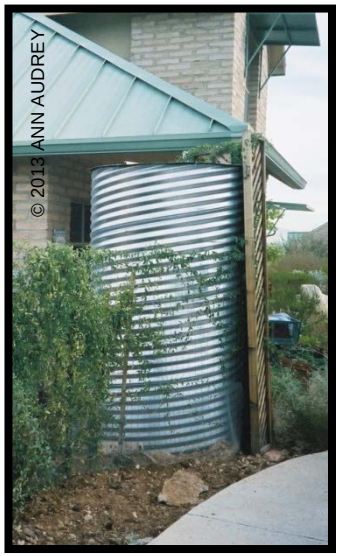
## Step 1. IDENTIFY THE CHALLENGES YOU FACE

1. *Individually rank your perspective on challenges on the Step 1 Check Lists*
2. *Discuss results and reach group consensus on these challenges*
3. *Facilitator enter the group consensus ranking in the Assessment Spreadsheet*
4. *Facilitator print the Local Water Resources Challenges chart*

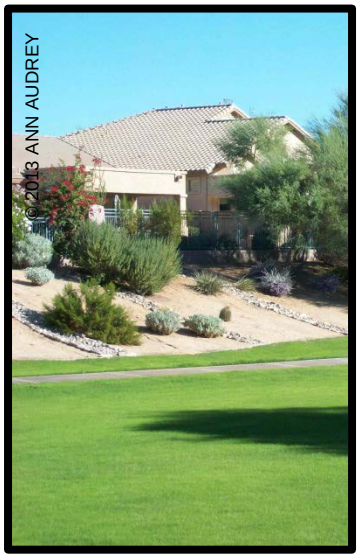
| STEP 1. LOCAL WATER RESOURCE CHALLENGES | RANK LEVEL OF LOCAL CHALLENGE AS 1 (LOW) TO 10 (HIGH) | | |
|---|---|---|---|
| | CURRENT | 10 YEARS | 25 Y |
| POTABLE DEMAND EXCEEDS SUPPLY | | | |
| INSUFFICIENT PEAK CAPACITY | | | |
| NEGATIVE ENVIRONMENTAL IMPACTS | | | |
| CLIMATE CHANGE IMPACTING DEMAND & SUPPLY | | | |
| INCREASING URBAN HEAT ISLAND EFFECT | | | |
| INCREASING STORMWATER VOLUME | | | |
| STORMWATER QUALITY ISSUES | | | |



# *Step 2. Evaluate land use sectors that have water harvesting potential*

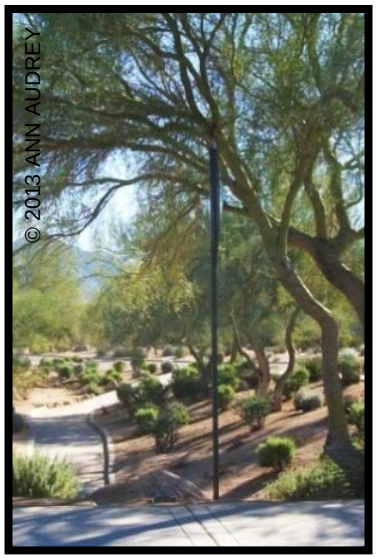



*Single family residential*




*Multifamily + Subdivision common area*


*Commercial-scale building*




*Street right-of-way*

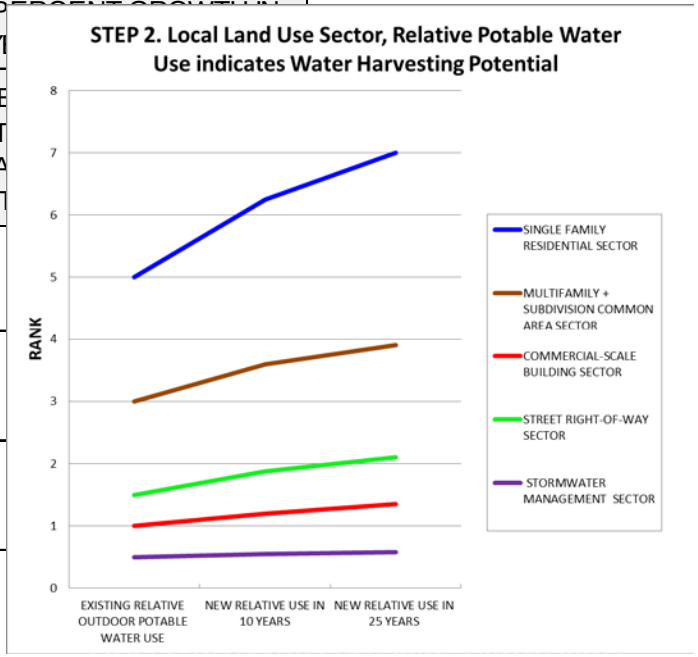

*Stormwater management*

# PAUSE THE PRESENTATION

## *Step 2. EVALUATE LAND USE SECTORS THAT HAVE POTENTIAL TO REPLACE POTABLE WATER USE WITH HARVESTED WATER*

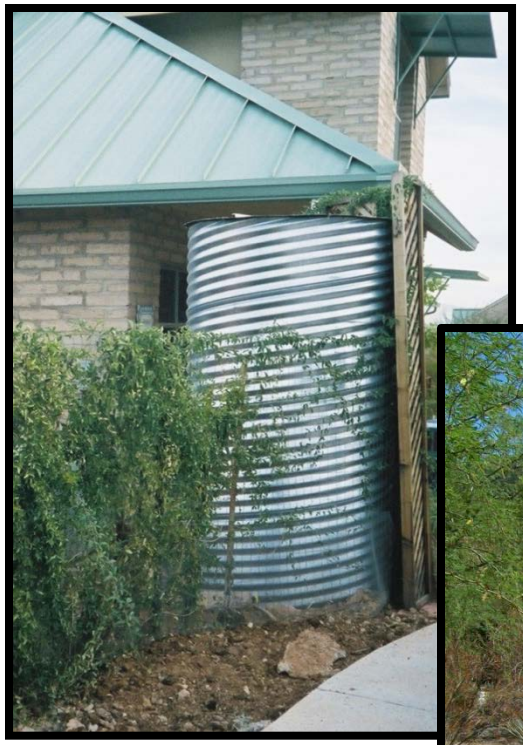
1. *Each person rank your perspective of the relative existing outdoor potable water use for each land use sector, then estimate potential sector growth for 10 years and 25 years*
2. *Discuss the results and reach a group consensus for your area*
3. *Facilitator enter consensus ranking & growth in the Assessment Spreadsheet*
4. *Print your Local Land Use Sector, Relative Potable Water Use chart*

| **STEP 2. LAND USE SECTOR - POTABLE WATER USE AND GROWTH RATES INDICATING WATER HARVESTING POTENTIAL** | RANK THE RELATIVE EXISTING OUTDOOR POTABLE WATER USE BY THESE SECTORS FROM 1 (LOW) TO 10 (HIGH), AND ESTIMATE P[illegible] THESE SECTORS IN 10 YEARS AND 25 YI | | | |
|---|---|---|---|---|
| | SINGLE FAMILY RESIDENTIAL SECTOR | MULTIFAMILY + SUBDIVISION COMMON AREA SECTOR | COMMERCIAL-SCALE BUILDING SECTOR | STRE RIGHT WA SECT |
| EXISTING RELATIVE OUTDOOR POTABLE WATER USE | | | | |
| PROJECTED PERCENT GROWTH OF SECTOR IN 10 YEARS | | | | |
| PROJECTED PERCENT GROWTH OF SECTOR IN 25 YEARS | | | | |



# *Step 3. Understand the benefits of water harvesting strategies and techniques*

Passive and Active water harvesting definitions, costs and design needs, benefits, and techniques for each sector



PAUSE THE PRESENTATION

## *Step 3. UNDERSTAND THE BENEFITS OF WATER HARVESTING STRATEGIES AND TECHNIQUES*

1. *Review the graph below summarizing the ability of water harvesting strategies and techniques to meet a range of water resource challenges*
2. *Which meet the challenges your area faces?*
3. *Go on to Step 4 to prioritize appropriate water harvesting approaches*

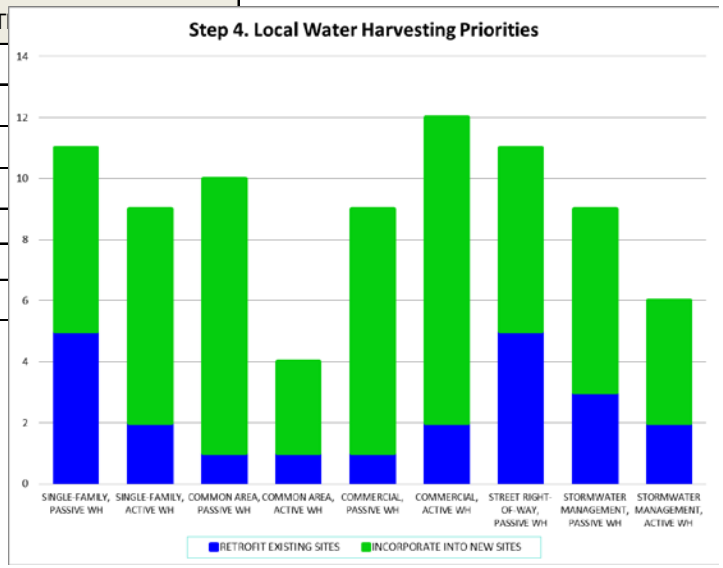
| **STEP 3. BENEFITS PROVIDED BY WATER HARVESTING** | SINGLE FAMILY RESIDENTIAL SECTOR | | MULTI-FAMILY & SUBDIVISION COMMON AREA SECTOR | COMMERCIAL-SCALE BUILDING SECTOR | | STREET RIGHT-OF-WAY SECTOR | STORMWATER MANAGEMENT SECTOR |
|---|---|---|---|---|---|---|---|
| | Passive | Active | Passive | Passive | Active | | |
| REDUCE TOTAL ANNUAL POTABLE WATER DEMAND | | | | | | | |
| REDUCE PEAK PERIOD POTABLE WATER DEMAND | | | | | | | |
| REDUCE ENVIRONMENTAL IMPACTS FROM POTABLE WATER USE | | | | | | | |
| PROVIDE MORE WATER TO MEET CLIMATE CHALLENGES | | | | | | | |
| PROVIDE MORE WATER FOR TREES TO MITIGATE HEAT ISLAND EFFECTS | | | | | | | |
| REDUCE STORMWATER RUNOFF VOLUME AND FLOODING | | | | | | | |
| INTERCEPT CONTAMINANTS TO IMPROVE STORMWATER QUALITY | | | | | | | |

PAUSE THE PRESENTATION

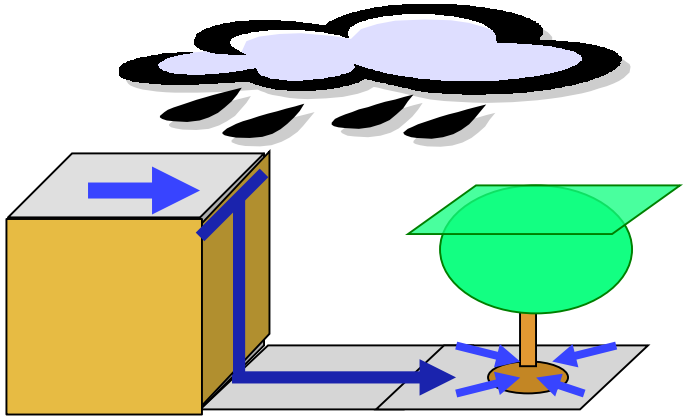
## *Step 4. PRIORITIZE WATER HARVESTING APPROACHES BASED ON ASSESSMENT RESULTS & DISCUSSION*

1. *Based on review of Steps 1 through 3 results, rank your water harvesting priorities for land use sectors, water harvesting strategies, and retrofit vs. new construction*
2. *Discuss the results and reach a group consensus for your area*
3. *Facilitator enter the consensus results in the Assessment Spreadsheet*
4. *Facilitator print your Local Water Harvesting Priorities chart*

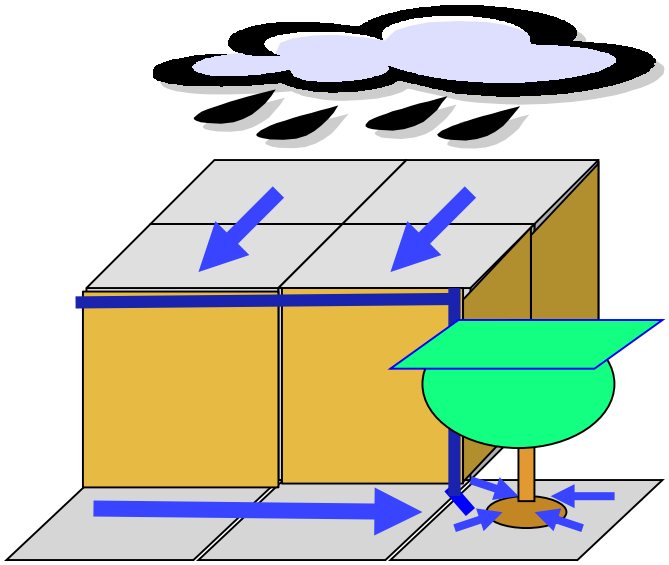
| STEP 4. LOCAL WATER HARVESTING PRIORITIES | RANK YOUR WATER HARVESTING PRIORITIES FROM 1 (LOW) TO 10 (HIGH) FOR SPECIFIC LAND USE SECTORS, WATER HARVESTING STRATEGIES AND RETROFIT VS NEW CONSTRUCTION | |
|---|---|---|
| | RETROFIT EXISTING SITES | INCORPORAT |
| SINGLE-FAMILY, PASSIVE | | |
| SINGLE-FAMILY, ACTIVE | | |
| COMMON AREA, PASSIVE | | |
| COMMERCIAL, PASSIVE | | |
| COMMERCIAL, ACTIVE | | |
| STREET RIGHT-OF-WAY, PASSIVE | | |
| STORMWATER MANAGEMENT, PASSIVE | | |



# *Step 5. Estimate an effective catchment-to-canopy-area ratio for your area*



3:1 ratio of catchment-area (gray) to tree canopy-area (green)



7:1 ratio of catchment-area (gray) to tree canopy-area (green)

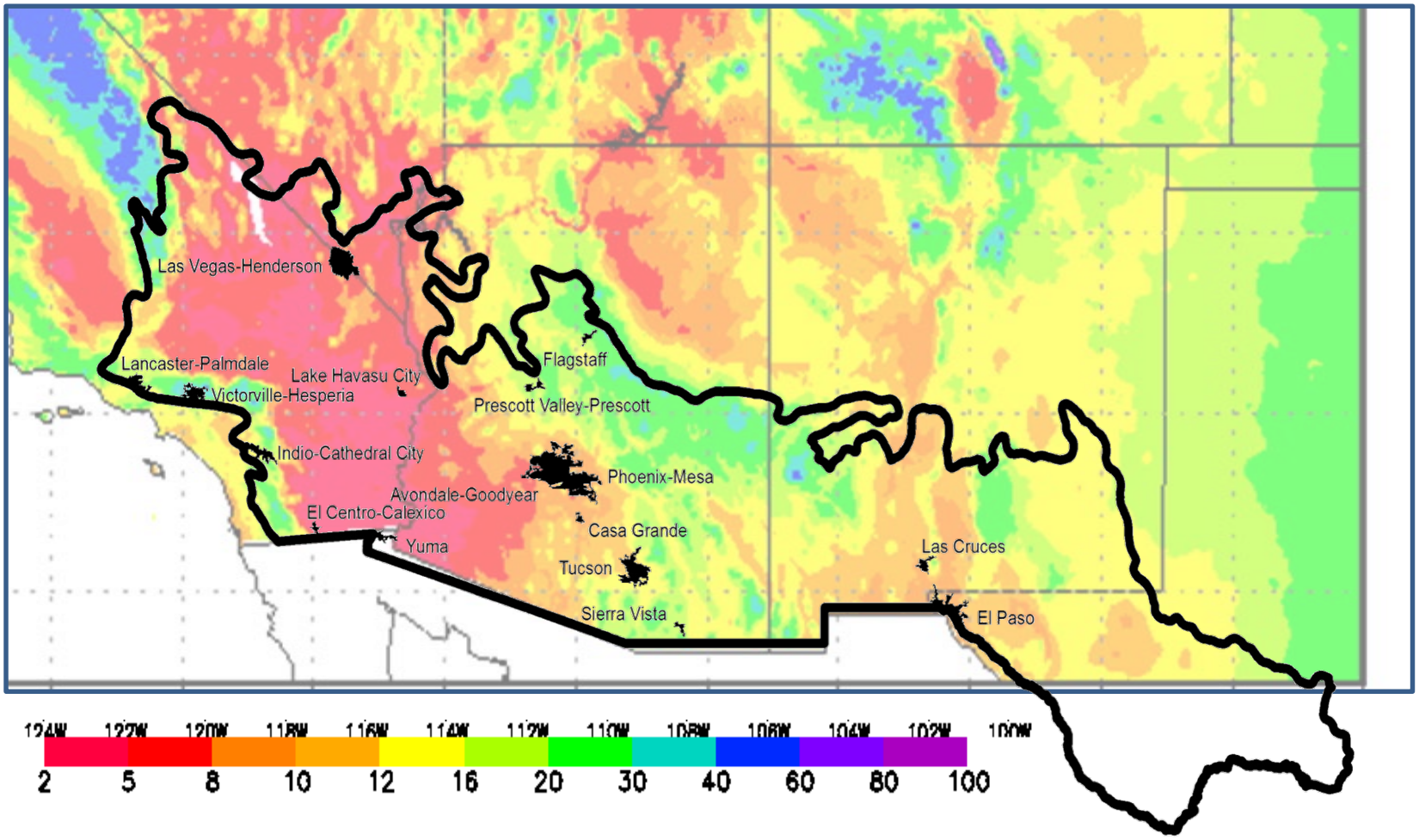
***Catchment areas include roofs, sidewalks, parking lots, patios, driveways, and other hardscapes PLUS rain falling on plant canopy***

PAUSE THE PRESENTATION

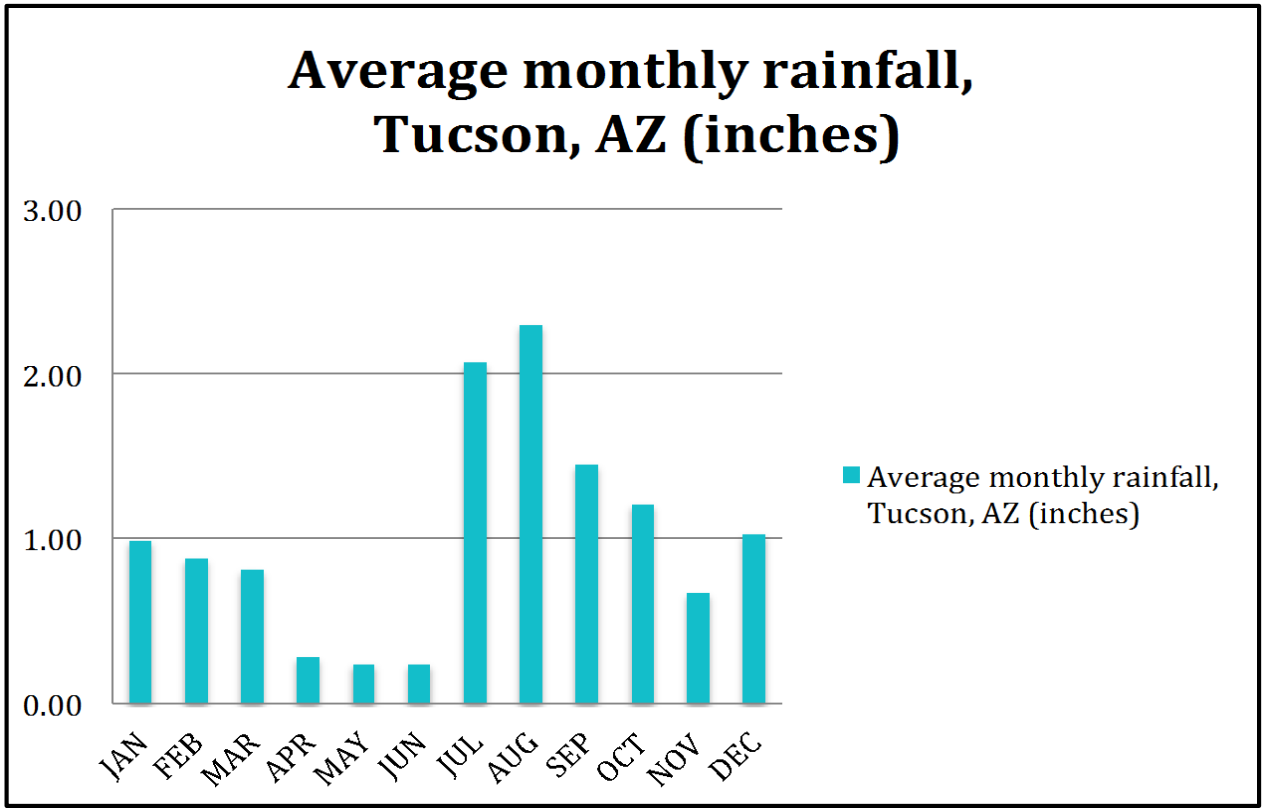
***Step 5. ESTIMATE THE CATCHMENT-TO-CANOPY-AREA RATIO THAT WOULD EFFECTIVELY HELP SUPPORT VEGETATION UNDER YOUR RAINFALL AND PLANT WATER DEMAND CONDITIONS***

1. *Facilitator enter rainfall and plant water use information into the Tool 3, Catchment-to-Canopy Spreadsheet, and print charts showing 1) local average monthly rainfall, 2) effective monthly rainfall, 3) rainfall/plant water demand comparison chart, and 4) range of catchment-to-canopy-area ratios and months when water harvesting can meet demand*
2. *Group review and discuss the charts, and select an effective catchment ratio that balances your needs for canopy area versus reduction in potable water demand*
3. *Facilitator can now print the specific catchment-to-canopy-area ratio chart selected for your area*

# *Based on your area's average annual rainfall and plant water use data*

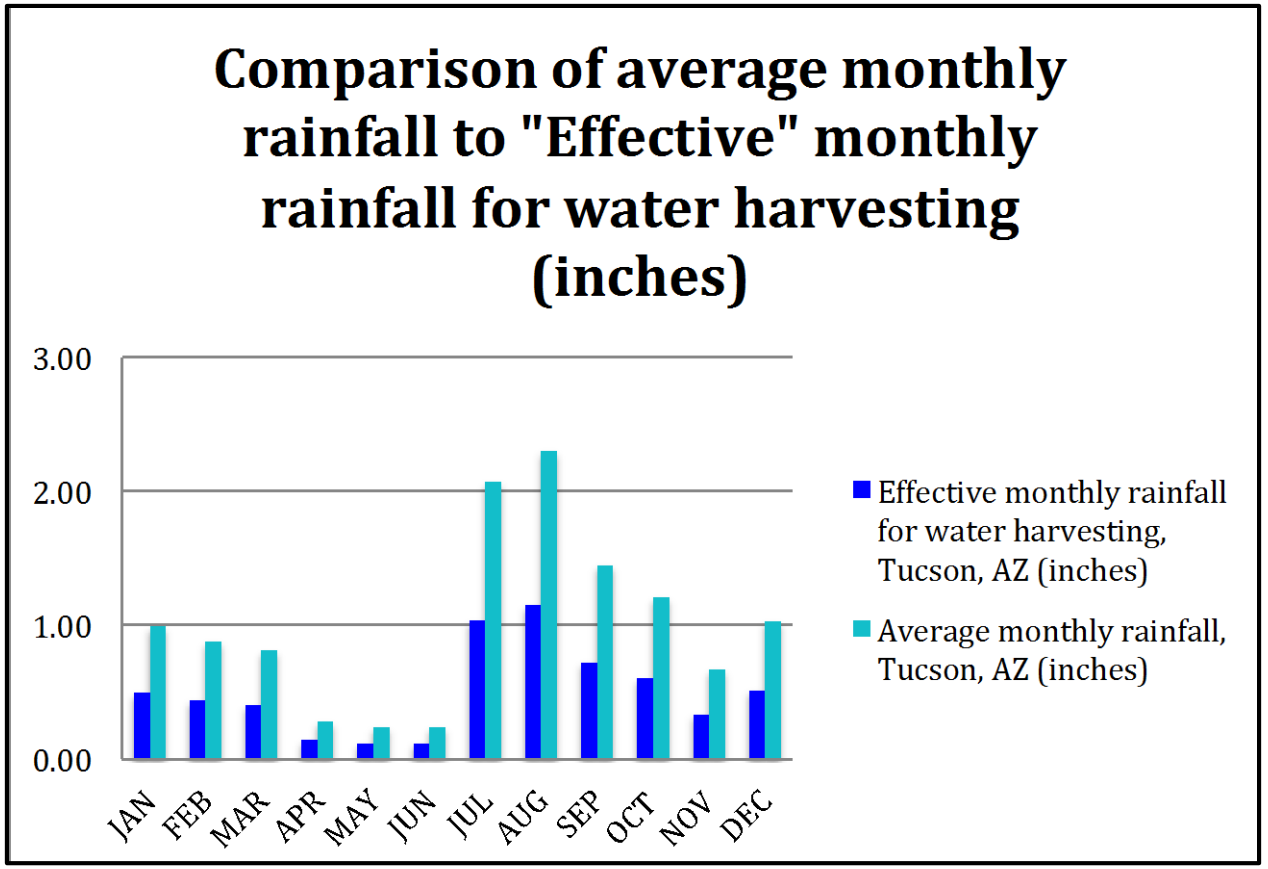


# Graph average monthly rainfall




EXAMPLE: Tucson, Arizona
Annual average rainfall = 12 inches/year

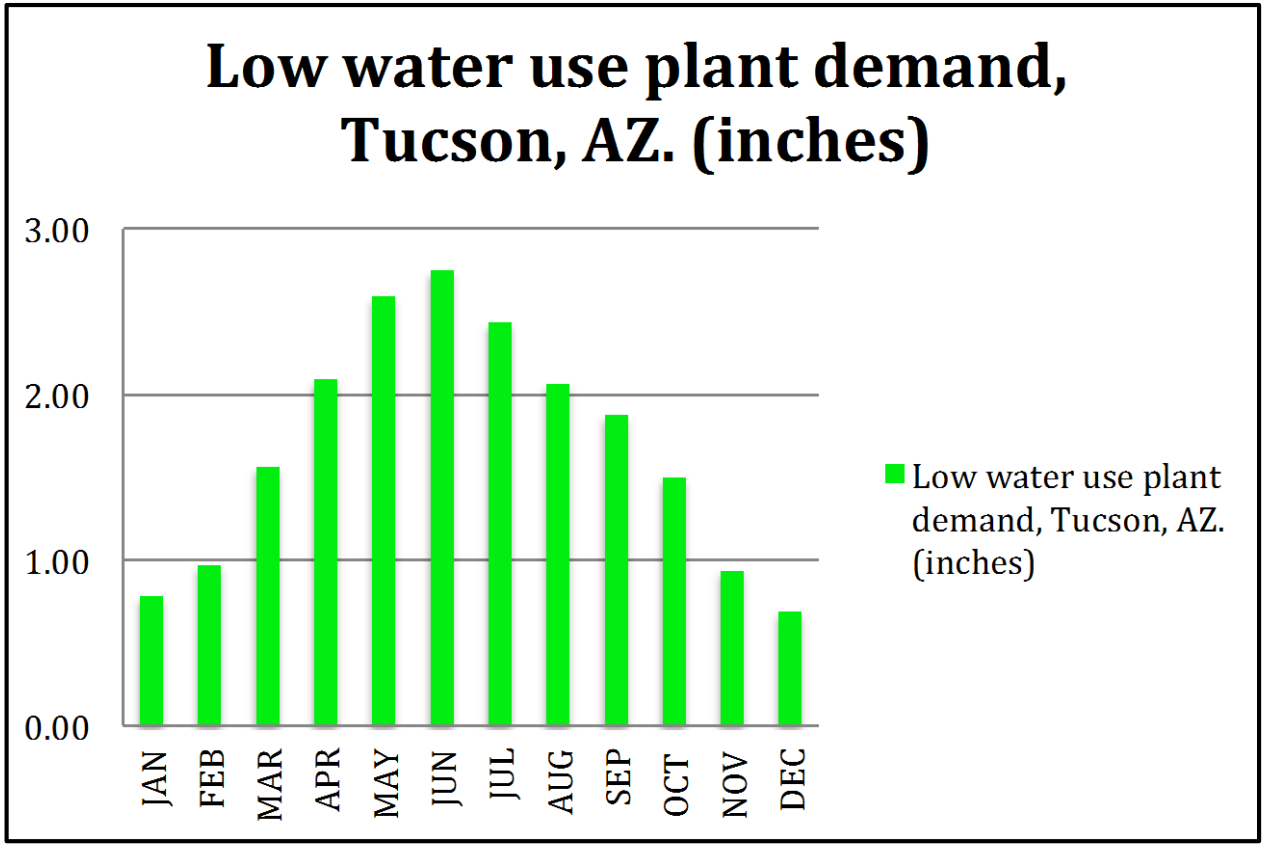
# Graph 50% less rain each month




Example: Tucson, AZ

Effective rainfall= 6 inches/year

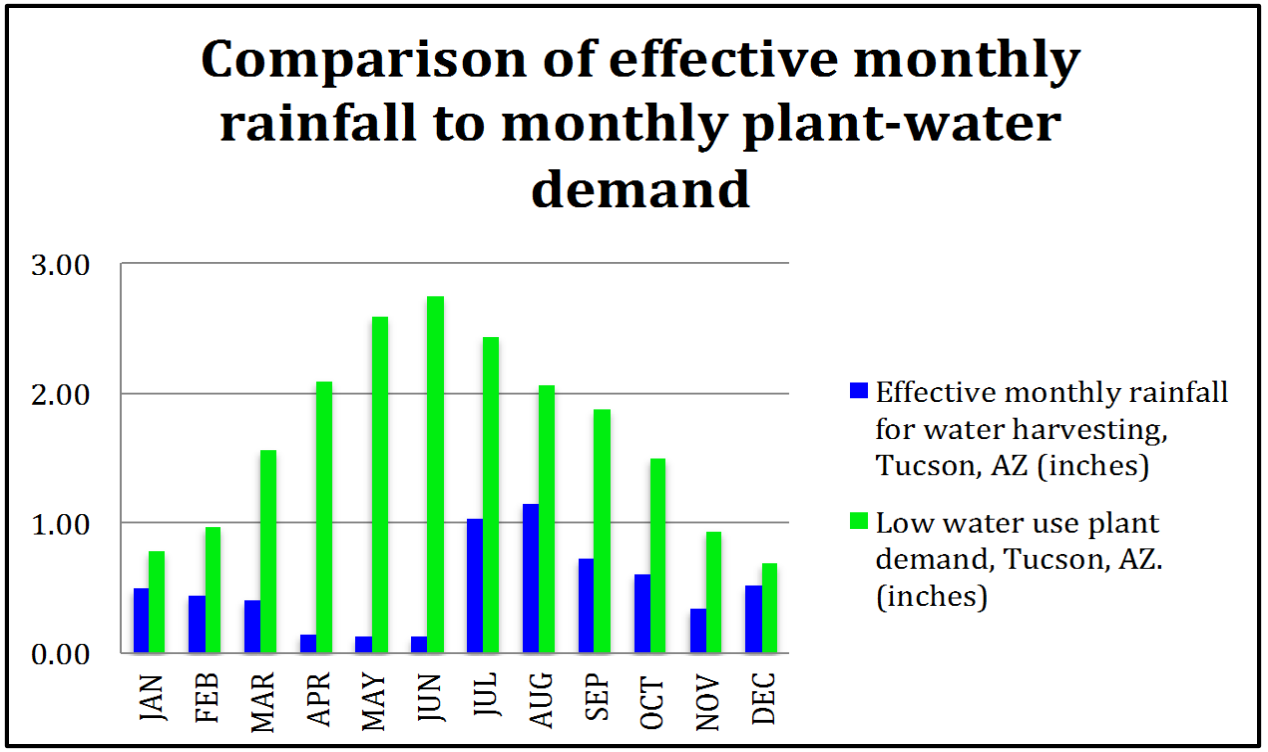
# Graph low-water-use plant water demand




Example: Tucson, AZ

Low-water-use plant demand = 20 inches/year

# Compare low-water-use plant water demand to effective rainfall

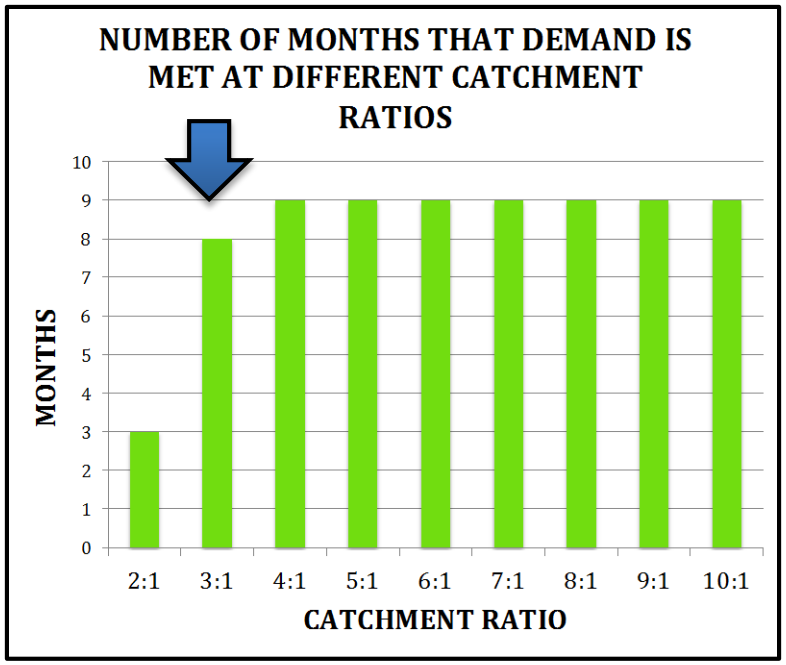



Example: Tucson, AZ

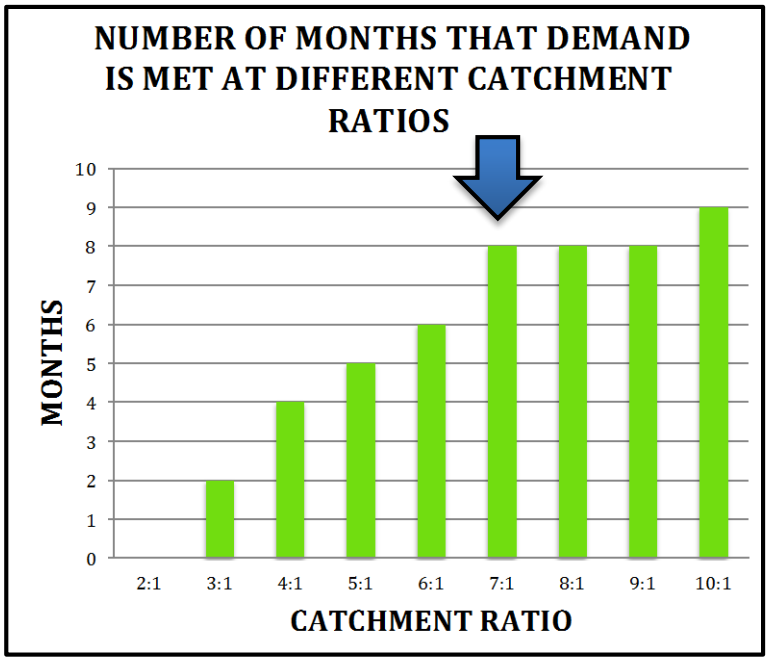
Low-water-use plant demand = 20 inches/year

Effective rainfall= 6 inches/year

# Calculate and select effective catchment-to-canopy-area ratios

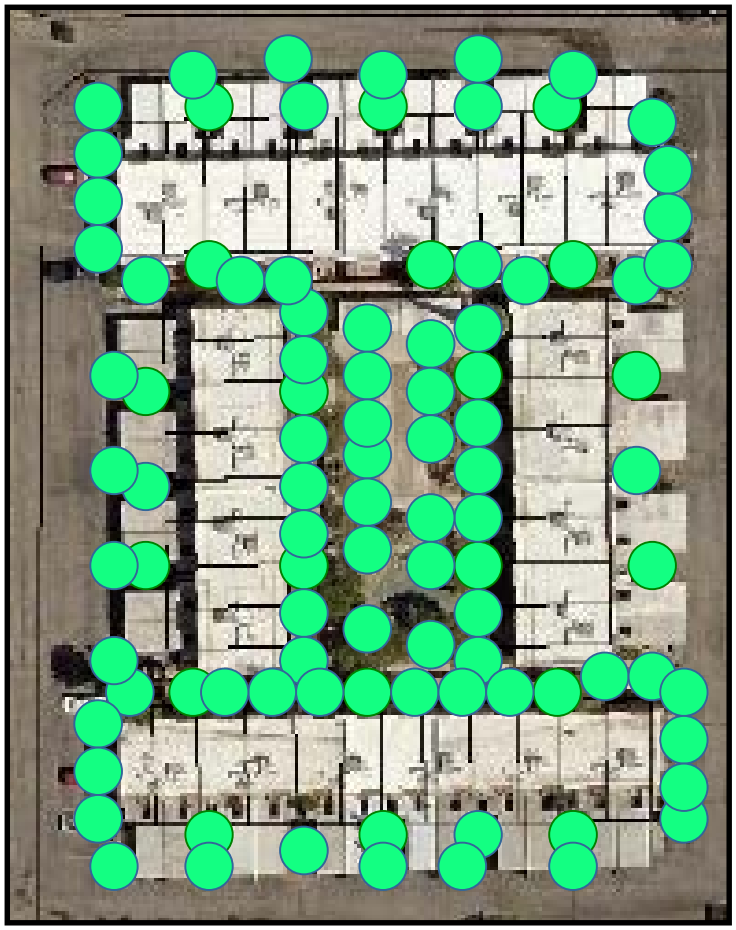



EXAMPLE:
SEMI-ARID AREA >10" PPT/YR,
SELECTED 3:1 RATIO, MEETS
PLANT DEMAND 8 MONTHS/YR

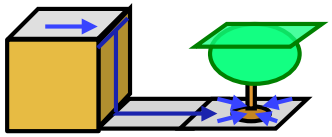



EXAMPLE:
ARID AREA <10" PPT/YR,
SELECTED 7:1 RATIO, MEETS
PLANT DEMAND 8 MONTHS/YR

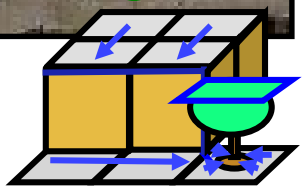
# Example: Apply catchment-to-canopy area ratios to trees to Multifamily Residential



**3:1 CATCHMENT RATIO**



**7:1 CATCHMENT RATIO**



# Multifamily Residential Example

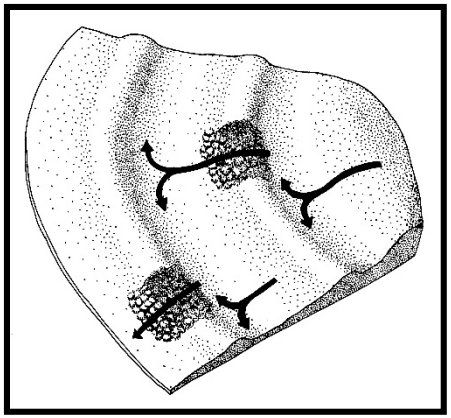

Water harvesting-based landscape at multifamily site, Tucson, AZ

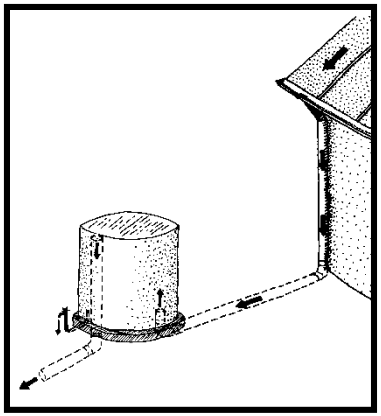
Standard landscape at adjacent multifamily site, Tucson, AZ

# *Step 6. Follow important design guidelines to ensure water harvesting benefits*

***PREPARE FOR OVERFLOW***

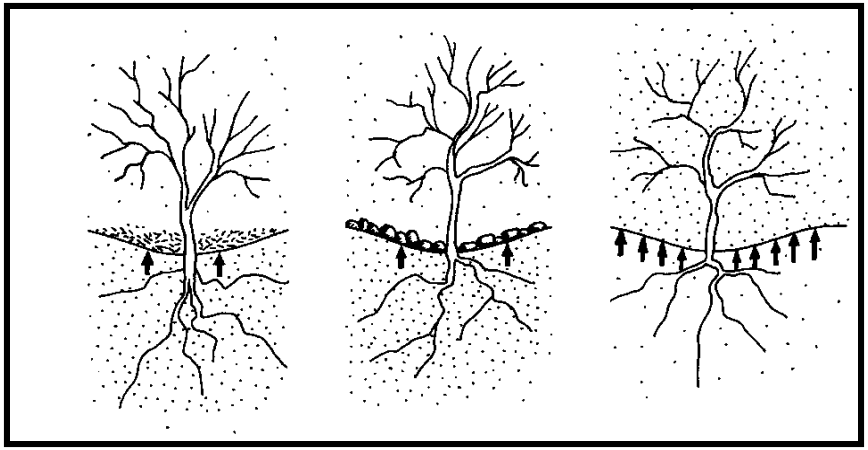
- *Tanks and large volume passive features must have overflow outlets to safely discharge excess rainwater and avoid damage and erosion*





***MULCH TO REDUCE EVAPORATION LOSS***

- *Water evaporates quickly from desert soils. Mulch using organic materials or rock to reduce water loss*



# *Step 7. Manage water harvesting using key implementation steps*

***Remove impediments; develop policy***

***Provide education and guidance***

***Refine water harvesting potential data***

***Demonstrate water harvesting at model sites***

***Create tangible incentives to harvest water***

***Use water harvesting as a rezoning condition***

***Regulate water harvesting***

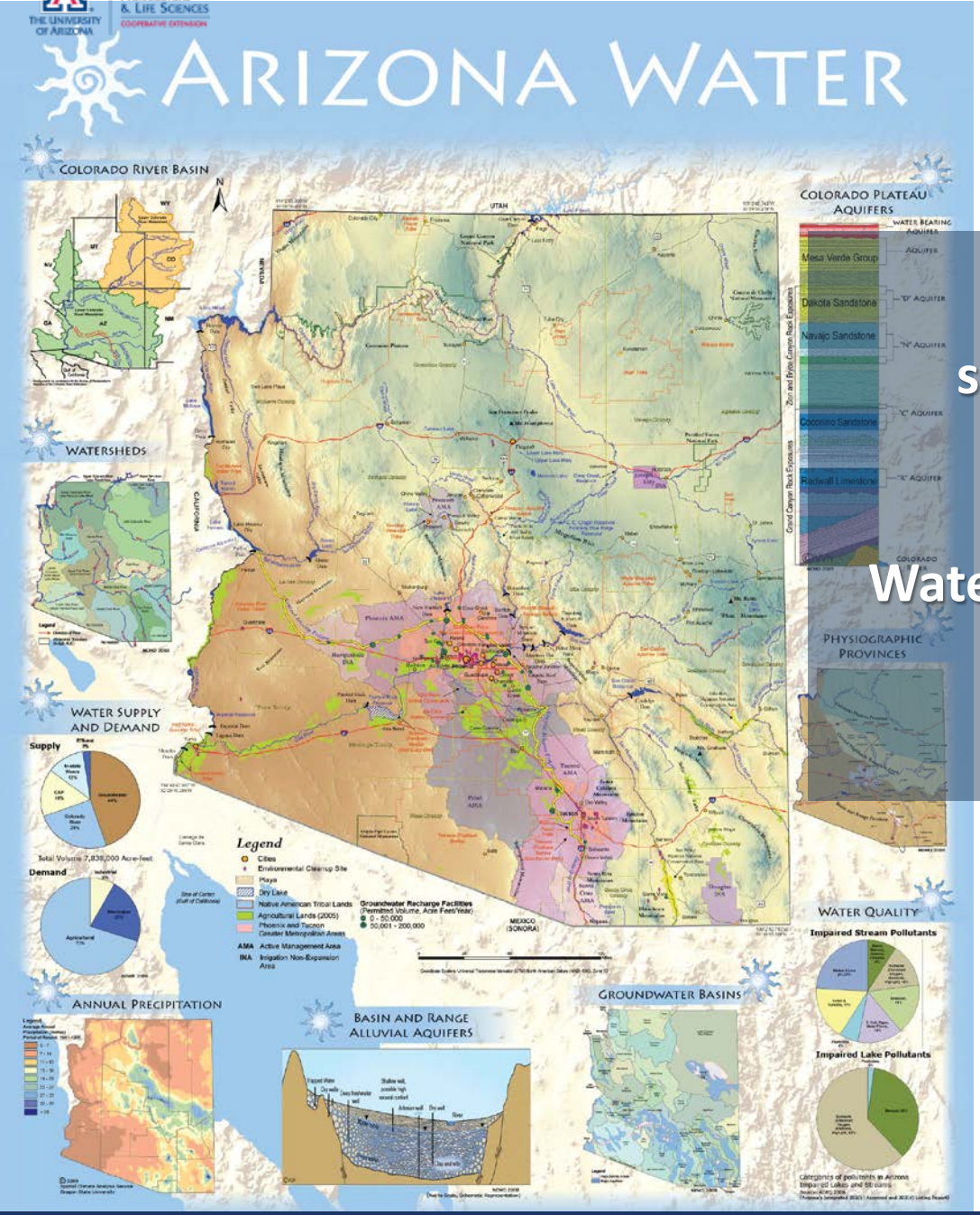
**Using multiple implementation approaches increases benefits**

# *Step 8. Communicate your water harvesting recommendations*

- *Complete check lists and graphs for your area*
- *Use the template provided to compile a site-specific presentation to address your key audiences*
- *Present recommendations to your key audiences to build support for adopting and undertaking water harvesting*

# *LESSONS LEARNED*

- *Assemble a wide group for momentum*
- *Outside tools and expertise can counteract internal stalemates*
- *Many drivers for water harvesting besides saving potable water*
- *Look for cost savings in infrastructure, transportation, landscaping, and all other government functions*




# Thank you!

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