Native Trees for Tucson

A PROJECT OF TREES FOR TUCSON and TUCSON CLEAN & BEAUTIFUL

# Ten Best Practices for Using Native Trees in Urban Environments to Improve Urban Climate Change Resilience

## *The climate challenges we face in Tucson*

***ITS HOT!***

- Tucson is the 3rd fastest warming city in the U.S.
- 2019 and 2020 were our hottest summers on record
- Projections show a 10 degree increase in average annual temperature by 2100 in Pima County

***ITS DRY!***

- Most of Arizona is in extreme drought
- The long drought in the Colorado River watershed (where we get our CAP water) continues
- Water shortages are anticipated in Arizona in the coming year

***WE NEED MORE SHADE!***

- As it gets hotter, health and well-being concerns are greatest in neighborhoods with <10% shade
- Eastern Pima County averages 8% shade canopy
- City of Tucson averages <6% shade canopy, with some City wards <4% shade canopy

## *Planting native trees can help meet these challenges and provide many other benefits*

***Native trees…***

- Thrive in Sonoran Desert heat and seasonal drought with adaptations such as
  - Small velvety sun-deflecting leaves
  - Wide, multitrunk canopies that shade branches, trunks and soil
  - The ability to drop leaves in extreme droughts to save water then grow them back when it rains
- After receiving water to get established, many native trees need only occasional watering during hot dry periods to provide good shade in urban areas
- When they receive extra harvested water, native trees grow faster and larger
- Native trees provide other benefits as well
  - Serve as shady "nurse plants" for small saguaros and other native plants
  - Have edible fruits, seeds and pods, increasing local food supplies
  - Provide beneficial food, shelter and habitat to many co-evolved native insects, birds and other wildlife
  - Grow well in low-nutrient desert soils
  - Add nitrogen to improve soil quality
  - Screen wind, dust and noise
  - Cool and calm our environment
  - Reduce the energy needed to cool shaded buildings
  - Serve as thorny security barriers
  - Honor our cultural and historic traditions
  - And some live for hundreds of years or more

DESERT IRONWOOD

VELVET MESQUITE

FOOTHILL PALO VERDE

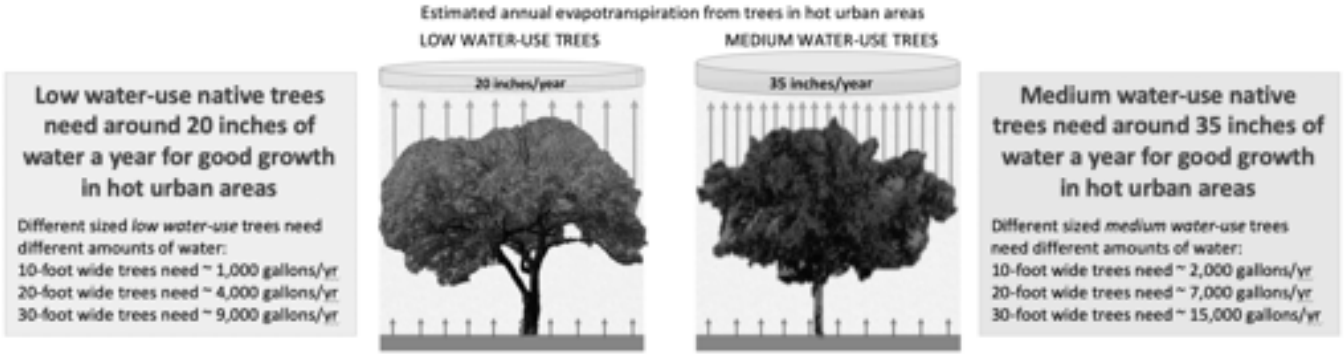
*Major funding provided by the Arizona Department of Forestry and Fire Management's Urban and Community Forestry Program and USDA Forest Service. These institutions are equal opportunity providers.*

Learn more at
**tucsoncleanandbeautiful.org/native-trees-for-tucson**

## BEST PRACTICE 1. To save drinking water, grow native trees using harvested rainwater, stormwater, graywater and condensate water

### Different types of native trees growing in hot urban areas need different amounts of water

- Tree water needs are based on *evapotranspiration*—the amount of water transpired from tree leaves and evaporated from soil
- Water needs vary depending on the time of year, temperature, wind, humidity, tree type and other factors
- Annual average water needs for low water-use native trees and medium water-use native trees are shown below



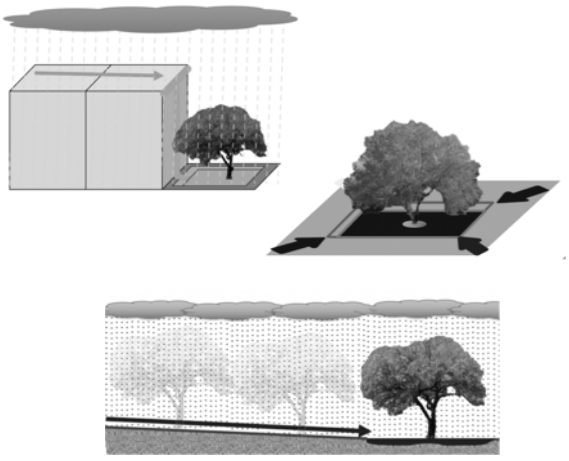

### To provide native trees the water they need, start by harvesting rainfall and runoff

- The volume of rainfall and runoff water you can harvest depends on rainfall and the type, slope and area of the surface you are harvesting water from. More water runs off paved or roof surfaces than runs off earthen or vegetated surfaces.

### Visualizing catchment ratios can help you provide runoff to support trees (no tape measure needed)

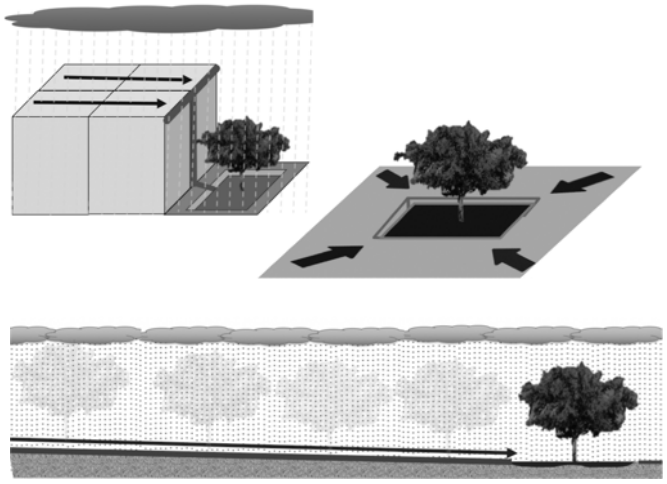
- A catchment ratio (CR) compares the land area from which rainfall and runoff water is harvested to the canopy area of the (eventually) full-grown tree using the water. The larger the land area, the more water is provided to the tree.

**LOW WATER-USE native trees benefit from a roof/paved CR of around 3-to-1 (3:1) or more or an earthen CR of around 7:1 or more**



THIS IS WHAT ROOF OR PAVED 3:1 CATCHMENT RATIOS LOOK LIKE FOR ***LOW WATER-USE TREES***

**MEDIUM WATER-USE native trees benefit from a roof/paved CR of around 5:1 or more or an earthen CR of around 13:1 or more**



THIS IS WHAT ROOF OR PAVED 5:1 CATCHMENT RATIOS LOOK LIKE FOR ***MEDIUM WATER-USE TREES***

### However, harvesting rain and runoff can't meet the needs of all native trees in April, May and June

- Rainfall varies year-to-year—Tucson's average rainfall is around 11.5 inches/year
- In 2020 Tucson received less than 5 inches of rain
- Low and medium water-use native trees growing in hot urban areas may need additional water in April, May and June to maintain urban shade
- Harvesting graywater and condensate water can help meet tree needs when rainwater isn't available
- Collecting rainwater in tanks can provide rainwater to plants in dry seasons

# BEST PRACTICE 1. To save drinking water, grow native trees using harvested rainwater, stormwater, graywater and condensate water

***NOTE: For catchment ratios to support trees, water harvesting basins must be large enough to hold and infiltrate rainfall and runoff in large storms. Wide, 12-inch deep basins can typically accomplish this.***

***Passive water harvesting* captures and infiltrates large volumes of rainwater directly into the soil via a living sponge of water-harvesting earthworks, vegetation and mulch**

### Guidelines for harvesting rainfall and runoff

- Harvest rainwater in earthen basins, called "earthworks"
- Work your way from higher to lower areas of a site
- Zigzag water flow down through multiple basins, each one infiltrating more water into the soil
- Use the soil dug from basins to construct adjacent berms and/or to raise adjacent paths
- Build wide overflow spillways to move excess water safely downhill when basins overflow in large storms
- You can install a tank to store rooftop runoff for later use

### Guidelines for harvesting stormwater

- Stormwater is the large volume of rainwater that runs off large roofs, streets, parking lots, and other large impermeable "hardscapes"
- Runoff from streets and parking lots can be harvested through cuts made in curbs to lead water into basins to support tree growth. Check with your jurisdiction for curb cut specifications applicable to streets in your area

### Guidelines for harvesting graywater

- Arizona Department of Environmental Quality (ADEQ) provides common sense guidelines for use of graywater
- Graywater is drain water that originates from bathroom sinks, showers, bathtubs and clothes washers that is collected separately from sewage flow.
- Graywater can be piped outside and delivered at the base of trees via drip or flood irrigation
- Direct graywater into basins that also collect rainwater to dilute salts found in graywater
- Avoid human contact with graywater and graywater-irrigated soils. DO NOT spray graywater or apply graywater to leaves or fruits of trees
- Use special soaps and detergents that are safe for plants
- Don't use graywater if your house has a water softener
- Divert washing machine water to sewer if you are washing diapers
- Keep surface accumulation of graywater to a minimum

### Guidelines for harvesting condensate water

- Moisture in humid air condenses on cooling coils inside air conditioners, ice machines and other cold-producing machines. This water must be discharged from the machines. The discharged condensate water can be harvested to support native trees.
- Locate your condensate outlet pipe and see if you can safely divert this water to support trees. *CAUTION: DO NOT ALLOW WATER TO BACK UP IN THE CONDENSATE DISCHARGE PIPE—THIS COULD DAMAGE MACHINERY*

SIMPLE DEPRESSION HARVESTS DIRECT RAINFALL

MICROBASIN COLLECTS DIRECT RAINFALL PLUS RUNOFF FROM SLOPE

A SWALE CONSTRUCTED ALONG LAND CONTOUR HARVESTS LARGE VOLUMES OF RUNOFF WATER

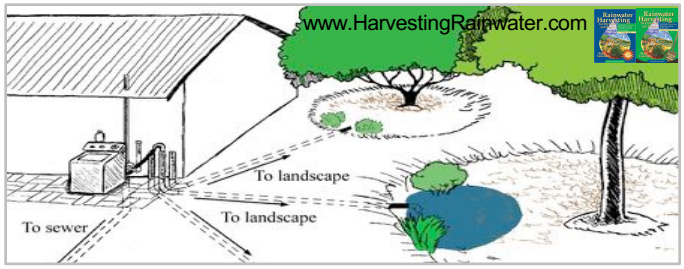
BASINS FILL WITH RUNOFF WATER FROM ADJACENT SIDEWALK

DIRT REMOVED FROM BASINS WAS USED TO RAISE THE PATH BETWEEN THE BASINS

IN THIS SERIES OF BASINS, ONE OVERFLOWS TO THE NEXT LOWER ONE OVER ROCK-LINED SPILLWAY

RUNOFF FROM PARKING LOT GOES THROUGH CURB CUTS TO LARGE WATER HARVESTING BASIN

CURB CUTS LEAD STREET RUNOFF INTO STREET-SIDE BASIN THAT SUPPORTS A TREE



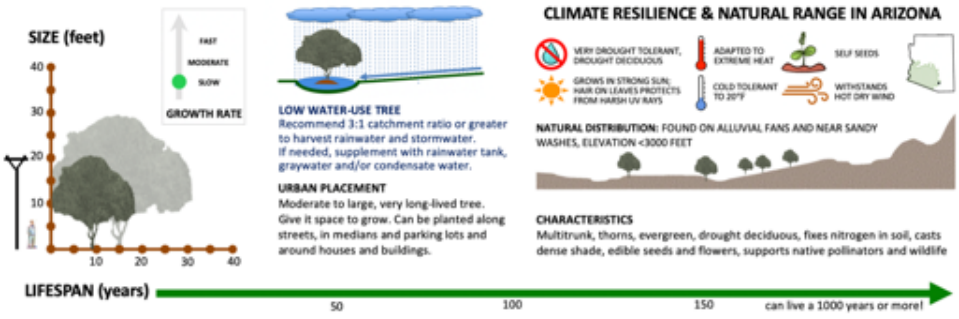

GRAYWATER HARVESTING STRATEGY THAT ALSO HARVESTS RAINWATER

# BEST PRACTICE 2. Learn native tree needs and characteristics

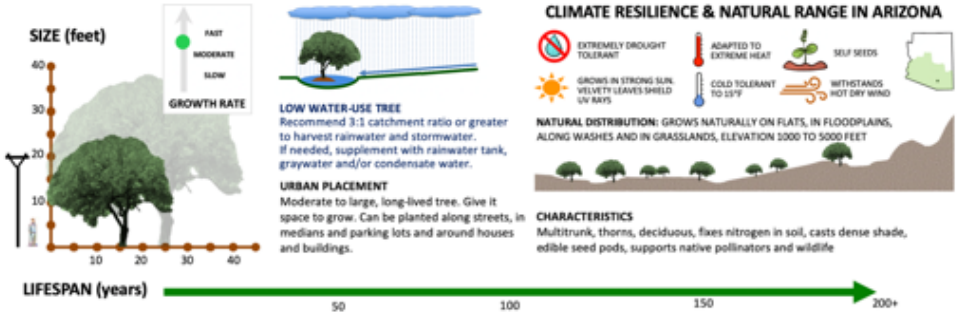
**The 14 native Sonoran Desert trees described here are listed in order of their drought-tolerance and resilience in the urban environment, starting with the hardy desert ironwood tree**

- **SIZE:** Tree size varies considerably depending on water supply, growing location, age, climate, weather conditions and other variables. In unique cases, individual long-lived trees may grow substantially larger than the general ranges shown here.
- **GROWTH RATE:** These are typical rates of growth in natural areas. Native trees often grow faster in urban areas with supplemental water.
- **LIFESPAN:** Tree lifespans are estimates—it can be difficult to determine the age of desert trees as they typically lack distinct growth rings.
- **WATER USE:** Water use information includes recommended catchment ratios and urban water supplies to support different types of trees.
- **URBAN PLACEMENT:** Recommendations are based on water needs, tree size and other factors.
- **CLIMATE RESILIENCE:** Information addresses tree adaptations and their tolerance of extreme conditions.
- **NATURAL RANGE IN ARIZONA:** Maps show where trees naturally occur geographically in Arizona.
- **NATURAL DISTRIBUTION:** Describes and illustrates the topography and elevation where trees naturally occur.
- **CHARACTERISTICS:** Information includes tree form, thorns, shade, edible food and other information useful when selecting trees.

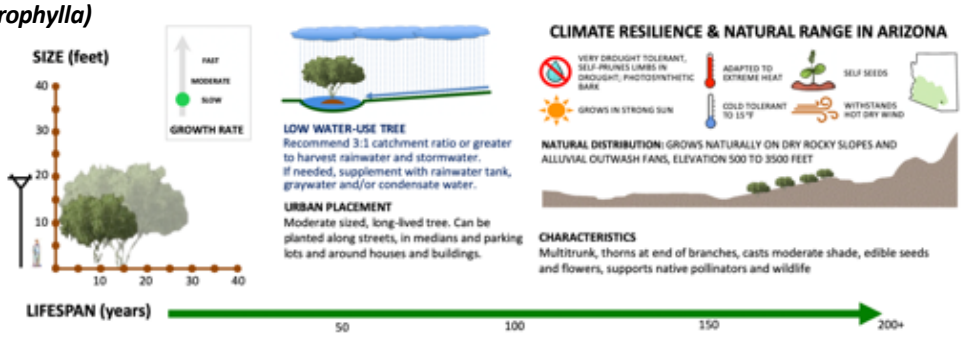
## Desert Ironwood *(Olneya tesota)*



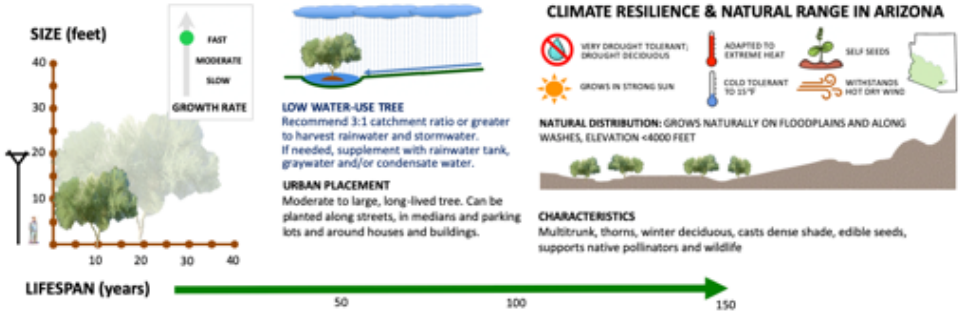

## Velvet mesquite *(Prosopis velutina)*




## Foothill palo verde *(Parkinsonia microphylla)*

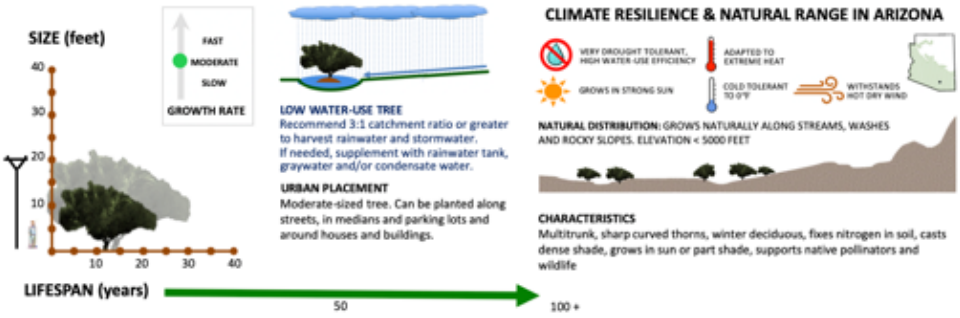



## Blue palo verde *(Parkinsonia florida)*

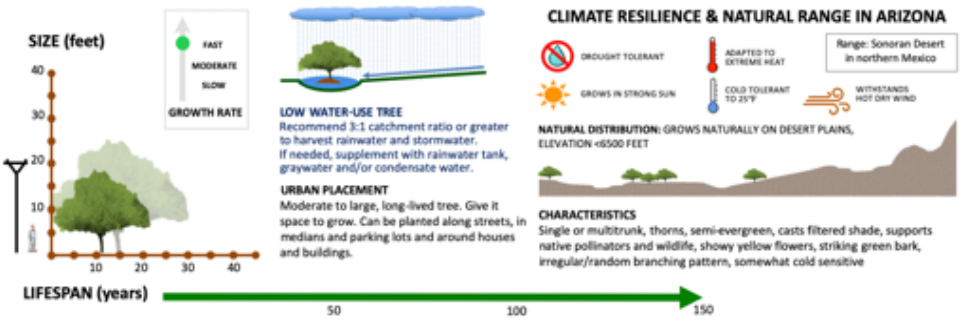


# BEST PRACTICE 2. Learn native tree needs and characteristics

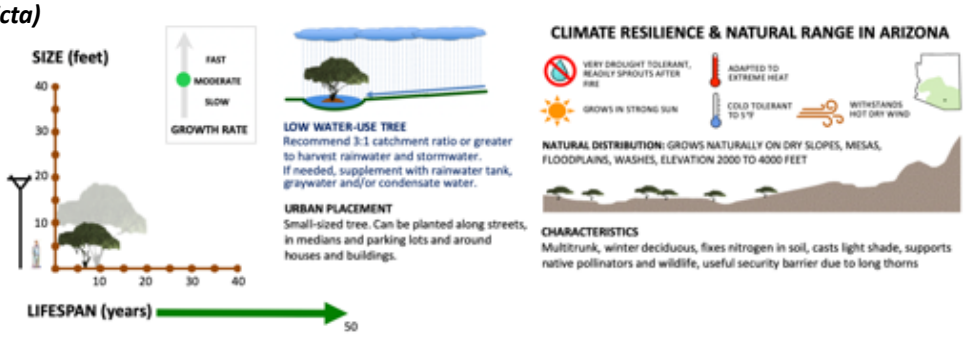
## Catclaw acacia *(Senegalia greggii)*



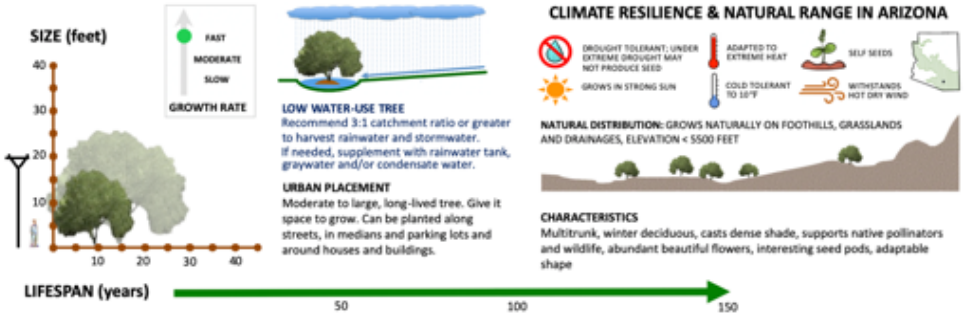

## Palo brea *(Parkinsonia praecox)*



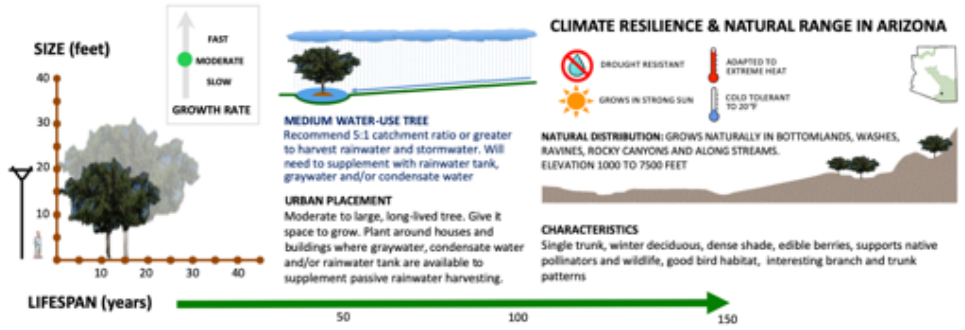

## Whitethorn acacia *(Vachellia constricta)*




## Desert willow *(Chilopsis linearis)*

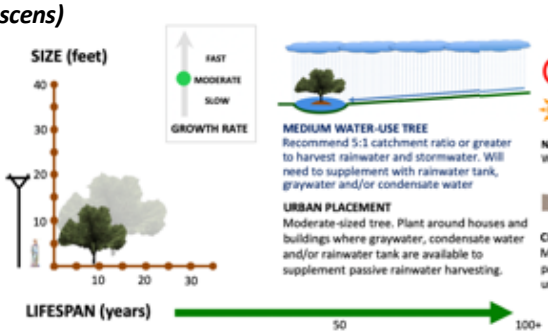



## Canyon hackberry *(Celtis reticulata)*

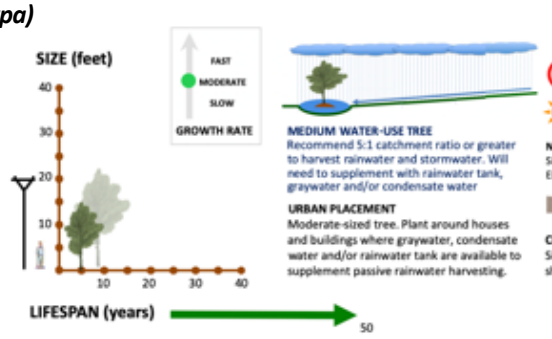


# BEST PRACTICE 2. Learn native tree needs and characteristics

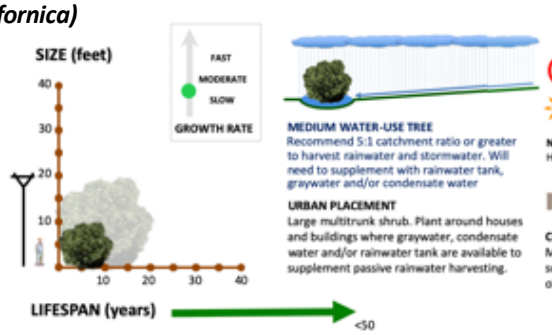
## Screwbean mesquite *(Prosopis pubescens)*



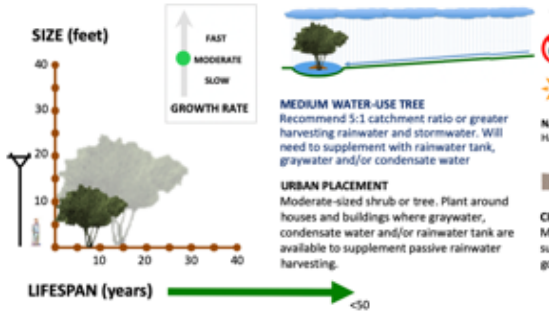

## Kidneywood *(Eysenhardtia orthocarpa)*



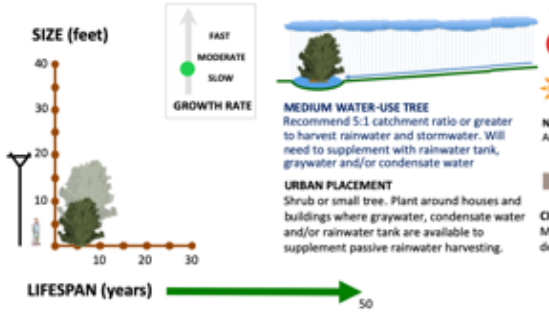

## Arizona rosewood *(Vauquelinia californica)*




## Feather tree *(Lysiloma watsonii)*




## Little leaf ash *(Fraxinus greggii)*



## BEST PRACTICE 3. Plant native trees and native understory plants together

**Plant trees and understory plants at the same time for faster development of shade, cooling and diverse native habitat**

- When supported by concentrated runoff, native trees and understory plants can grow close together in natural settings, casting deep shade
- Recreate the natural pattern of close-growing native plants in the urban environment by providing abundant rainwater, stormwater, graywater and condensate water to grouped trees and understory
- Grouped plants provide dense continuous shade, cool the soil and support more wildlife and soil life
- Planting native understory plants with each newly planted tree adds color, diversity and edible foods

Dense understory plants grow under an ironwood tree along a natural wash

Ironwood tree and abundant understory plants grow along an urban street

## BEST PRACTICE 4. Plan where to plant to meet your needs and the needs of trees

**What do you want & need from native trees?**

- Year-round shade? Seasonal shade?
- Trees you can walk under?
- Windbreak trees to reduce strong winds?
- Trees that produce edible fruits, seeds, pods?
- Trees that fit in small yards?
- Thorny trees that act as security barriers?
- Bushy trees that provide visual barriers?
- Shady, thornless trees for play areas?
- Trees that buffer traffic noise
- Trees that attract native pollinators?
- Beautiful flowers, leaves, bark and pods?

**Give trees the space they need**

- Find out how large trees could grow and give them sufficient room around buildings, walls, powerlines, etc.
- Given sufficient water, it is OK to space native trees so their mature canopies eventually grow to touch one another to provide more continuous shade

**Keep trees away from utility lines**

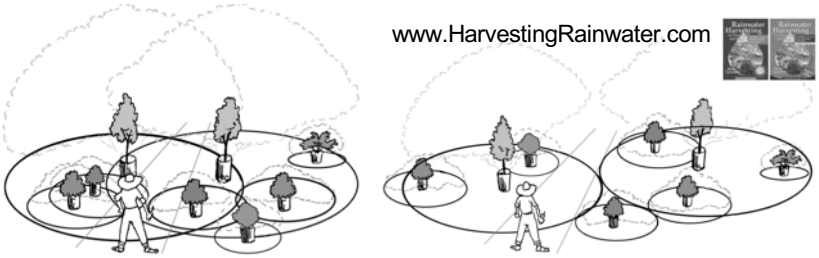
- Don't plant trees under overhead power lines
- Don't plant over buried lines.
- Call 811 to locate buried lines leading to site
- Hire private companies to locate buried lines on your site if you don't know where they are

**Plant a safe distance from traffic corners**

- Don't plant trees where they will block traffic signs or signals—trimming could distort trees

**Shading your home can save 20-30% of energy costs**

- For maximum summer cooling, plant dense-canopy native trees in an arc to the east, north and west of the house, and plant deciduous native trees southeast, south and southwest of the house
- OR, to have summer cooling plus maximum winter warmth and sun access to solar panels, leave the south side free of trees




SPACING TOO CLOSE

APPROPRIATE SPACING

**Harvest as much water at your site as possible**

- Observe where rainfall flows and pools throughout the site
- Shape multiple water harvesting earthworks starting from the "top" (highest elevation at your site) and going to the "bottom" (lowest elevation) to harvest as much rainfall and runoff as possible
- Take advantage of existing slopes and low spots to create natural-shaped basins set efficiently in the landscape
- Water harvesting basins can stand alone or they can interconnect with one basin overflowing to the next
- Basins can be any shape—they do not have to be round, rectangular or linear
- Direct the water flowing off roofs, driveways, sidewalks, patios and other hardscapes into nearby basins
- You can install rainwater harvesting tanks to collect valuable rooftop runoff from gutters and downspouts to store for later use
- Integrate water harvesting tanks with water harvesting earthworks, delivering water to tree basins using a hose or other distribution system
- Since tanks will periodically overflow, design overflow piping to deliver water to nearby tree basins as well
- Access condensate water from air conditioners and graywater from washing machines, tubs, showers and bathroom sinks. Direct this water to basins planted with trees that need additional support
- Given your site goals, place the native trees you select according to their water needs and the available water supply
  - Place medium water-use trees in basins close to rainwater tanks and graywater and condensate water sources
  - Place low water-use trees in basins throughout the site to provide maximum shade and meet other goals
  - Trees that are planted southeast, south and southwest of structures should be winter deciduous to allow winter sun to warm walls and enter south-facing windows

## BEST PRACTICE 5. Start with healthy young plants

### Be selective when purchasing trees from nurseries

- Some native trees cross-pollinate with other species, creating hybrids
- Ask for true native velvet mesquite (feel for "velvety leaves"), blue palo verde, foothill palo verde and palo brea trees to get true native tree characteristics
- Large trees in small pots may have coiled tap roots that need to be straightened when planted
- Container plants "hardened" out in full sun and cold weather will be hardier when planting

### Nurture native plant "volunteers"

- Many native trees and understory plants readily self seed and grow into strong, healthy plants
- Trees that self-seed, and tree seeds planted in the ground, grow deeper tap roots than transplants
- If plants "volunteer" in good locations, add water harvesting basins and mulch to support them

Blue palo verde tree "volunteering" from seed

## BEST PRACTICE 6. Shape your tree's water harvesting area

### Prepare your planting site in the best season for planting the tree

- Ideally, plant when native trees naturally germinate—often the monsoon season. It is easier to dig water harvesting basins once rains have started
- Avoid planting in the hot dry period before monsoons, but if you must plant then, water frequently
- If you plant in the winter, don't plant if there is freeze danger. Protect cold-sensitive trees from hard freezes
- Plant trees and understory plants at the same time

### Plan width and depth of tree's water harvesting basin

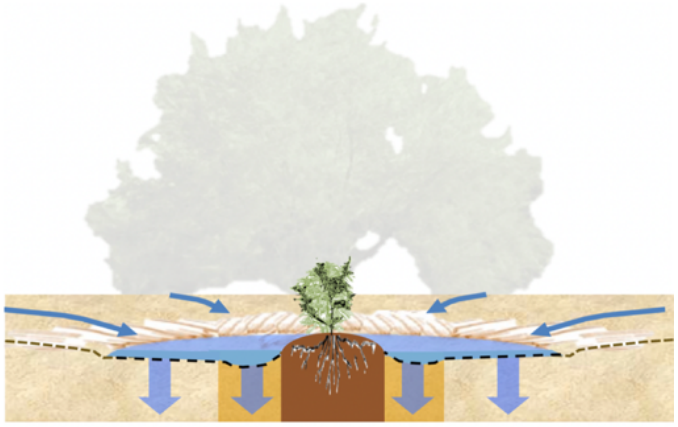
- Well-developed roots eventually grow beyond the drip line of a mature tree canopy, so ideally construct wide basins
- Wide basins around 12 inches deep typically store ample rain and runoff
- Or, can dig multiple small basins, planting the tree in the middle basin so roots can grow toward adjacent basins
- Make basin side slopes gradual
- Can dig deep, narrow basins if space is limited
- Stabilize steep banks of deep basins with large rock—the rocks also alert pedestrians to the presence of basins
- DO NOT compact the bottom of basins
- Do compact the tops and sides of berms

### Place the tree on a raised pedestal or terrace to reduce inundation

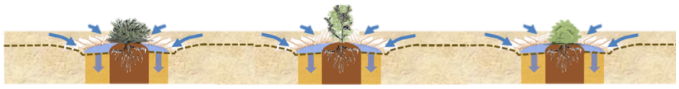
- To avoid inundating a desert tree trunk, plant the tree on a built-up pedestal in the bottom of the basin or on a raised terrace at the side of the basin
- Tree will temporarily be inundated in very large rainfall events, but water will quickly drain below the exposed trunk

### Be careful digging around existing trees

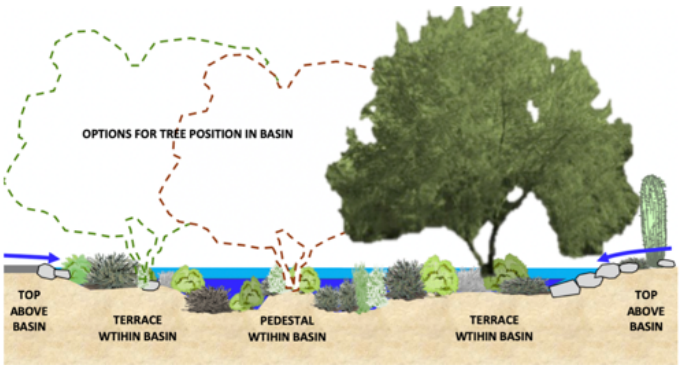
- Avoid disturbing existing tree roots as much as possible—roots may extend well beyond outer edge of tree canopy
- If you must dig near existing trees, make sure trees are well watered and not stressed at the time of year you dig



PROFILE OF RAISED PEDESTAL INSIDE A WIDE BASIN



PROFILE OF MULTIPLE SMALL BASINS WITH TREE PLACED IN THE MIDDLE BASIN. TREE ROOTS WILL GROW OUTWARD TO ADJACENT BASINS TO GET MORE HARVESTED WATER




OPTIONS FOR TREE POSITIONS IN LARGE BASIN

**CAUTION: BEFORE YOU DIG** water harvesting basins and tree planting holes, **CALL 811** to locate buried utility lines in the right-of-way next to your property. Hire a private utility locating service to mark buried lines on your property. Always dig slowly and carefully, and stop if you encounter any buried utility lines.

## BEST PRACTICE 7. Plant your tree carefully

### Shape the tree pedestal or terrace within the basin and dig the planting hole

- Create a pedestal or terrace within the basin to plant the tree on in order to keep the trunk above the level of frequent inundation
- Dig a planting hole in the chosen position
- The planting hole should be no deeper than the depth of the root ball
- The hole should be 2 to 3 times as wide as the root ball
- Put the dirt you remove from the planting hole outside the basin to maintain space inside the basin to hold harvested water

### Before you plant, check the water harvesting basin and planting hole for proper drainage

- If possible, fill the planting hole and basin with water, then check back every few hours to see if the water has drained
- If the planting hole drains within a few hours, proceed with tree planting
- If it has not drained, break up, fracture or dig through caliche or any other impeding layers to improve drainage

### Remove tree from pot and check the root ball

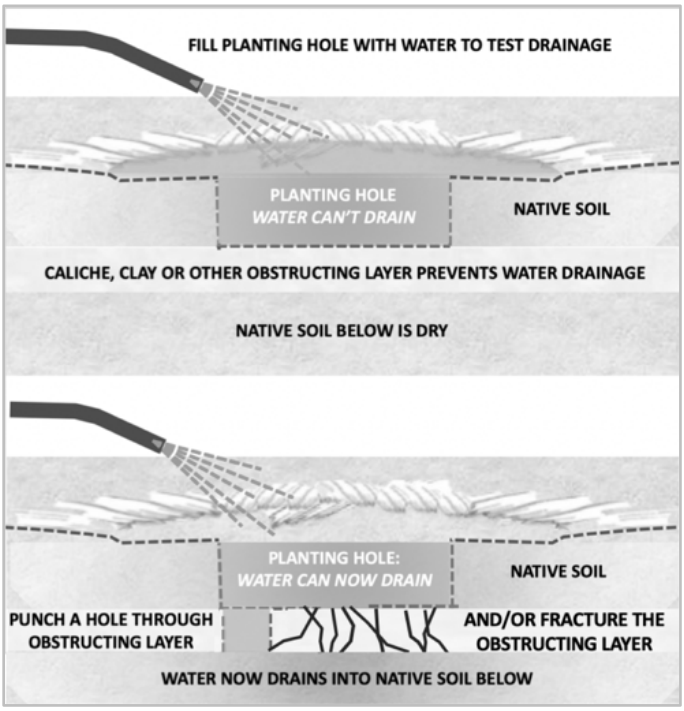
- Gently squeeze the tree pot to loosen soil; if soil is too loose, cut down the side of the pot to release the tree; if the root ball is sturdy, ease the tree out of the pot
- If roots tightly bind the bottom or side of the root ball, loosen roots gently by hand or slice along the bottom and/or side of the root ball to unbind the roots
- If the main root is coiled in the bottom of the pot, try to stretch it downward. If needed, cut off the coiled root portion so the remaining root can grow downward

### Plant the tree and provide the first watering

- Position the tree so it will grow straight up
- Check the height of the tree in the planting hole and add or remove soil in the hole to achieve desired height
- Backfill planting hole with native soil, removing big rocks
- Compress backfilled soil slightly to remove air pockets
- Create a donut-shaped depression just outside the root ball to pool water and increase infiltration next to roots
- Water the root ball and surrounding soil during and just after planting
- If watered soil sinks below root ball level, add more native soil
- Final soil level should not exceed top of root ball
- Avoid staking trees—swaying in the wind strengthens trunks
- Native trees typically do not require soil amendments but do benefit from organic-matter mulch added to basins

### Promote long-term infiltration in the basin

- It takes three days to breed mosquitos, so work with slow-draining basins to get them to drain within 24 hours
- Plant understory plants to help perforate the soil
- Use organic-matter mulch to create a living sponge to soak up water and support the growth of soil life
- If necessary, reduce the catchment area draining to basin




If water is slow to drain, you can dig down to punch a hole through any obstructing layer and/or fracture obstructions

Desert ironwood tree formed a mat of roots in the bottom of the pot

Roots are gently loosened by hand to allow roots to grow more easily into the soil

Root ball is set in hole to check for correct height. Then hole is backfilled and soil is lightly compressed to remove air holes

Donut-shaped depression formed just outside the root ball focuses water in and around the roots

## BEST PRACTICE 8. Add mulch when you plant to keep moisture in the ground

### Mulch reduces evaporation from soil

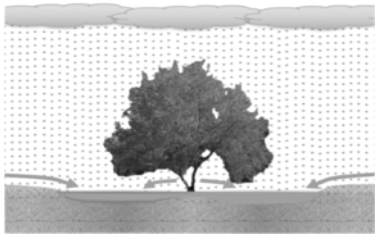
- Average Tucson rainfall is around 11.5 inches/year
- Potential evaporation loss of standing water (such as from a swimming pool) averages 90 inches a year
- When the sun comes out after a rainfall, water quickly evaporates
- Mulching soil reduces evaporation, leaving more water in soil for trees
- Trees naturally lose water through transpiration from leaves, cooling the tree and the surrounding area

### Organic matter mulch

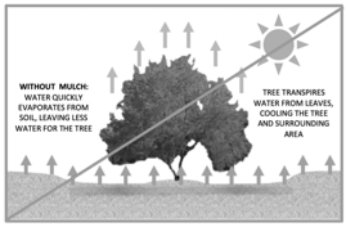
- Types of organic-matter mulch used in water harvesting basins include the leaves, flowers, pods and twigs that drop from native trees and shrubs; wood chips; compost and straw
- Organic-matter mulch provides multiple benefits
  - Reduces evaporation from soil
  - Insulates the soil from extreme temperatures
  - Decomposes to enrich the soil
  - Provides a moist environment for soil life (microorganisms, insects and wildlife), which in turn penetrate soil, add organic nutrients and increase infiltration
- Apply organic-matter mulch at a thickness that can be penetrated in an average storm
  - For basins that receive only direct rainfall, place just 1 inch of mulch to allow small rainfall amounts to penetrate down to the soil
  - For basins that receive direct rainfall plus runoff, place around 2 inches of mulch, since runoff water can flow under mulch to the soil
- Be sure the top of the mulch is lower than the elevation of water inlets to basins—too much mulch at inlets could reduce water entering basins
- Keep mulch 3 to 6 inches away from tree trunks to protect tree bark from excessive moisture
- Organic-matter mulch might need to be replenished occasionally because it decomposes and can be carried out of basins with overflow water

### Inorganic mulch

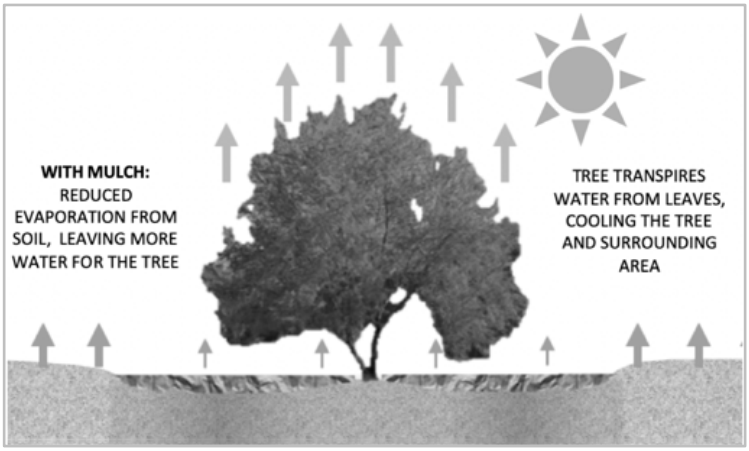
- Inorganic mulch, such as rock or gravel, reduces evaporation loss from soil and generally stays in place—though fast moving water can carry it away
- However, it does not contribute nutrients to trees, does not promote soil life, is hot in summer, is hard to walk on and makes it difficult to remove accumulated sediment and weeds
- If you decide to use inorganic mulch
  - Select clean, washed rock or gravel and place inorganic mulch in a single layer just one rock high
  - Do NOT use decomposed granite (DG) as mulch in water harvesting basins or on the catchment areas that flow to them because DG sheds clay particles that clog soil pores, reducing water infiltration



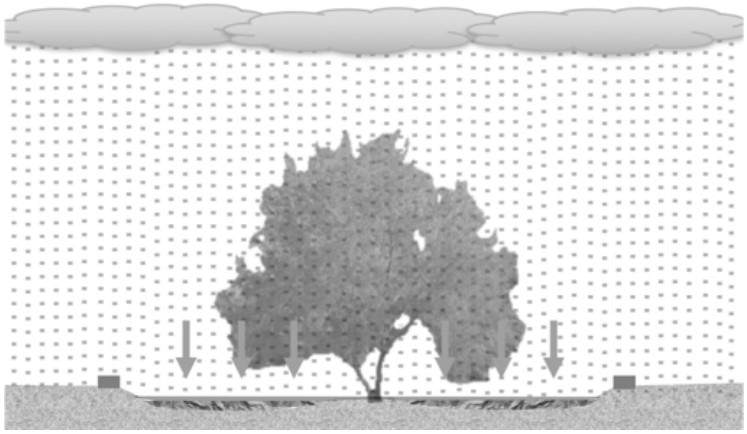
Rainfall and runoff infiltrate deeply into water harvesting basin



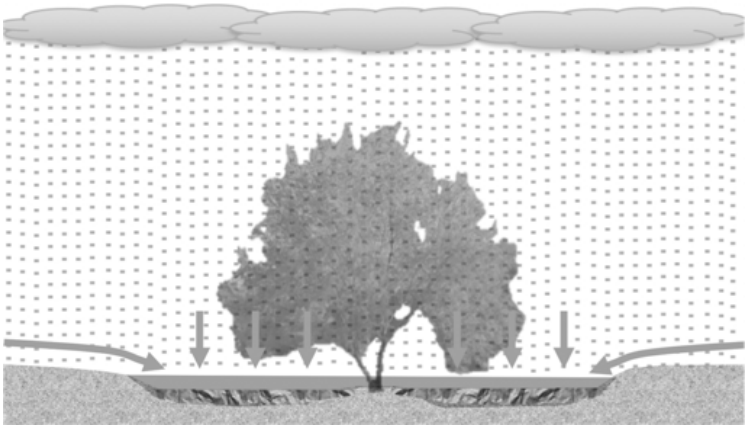

Without mulch, sun quickly evaporates water from bare soil




Place organic-matter mulch in basin to reduce evaporation from soil



Place 1 inch of organic-matter mulch in basins that receive only direct rainfall so small rainfall amounts can penetrate to the soil below

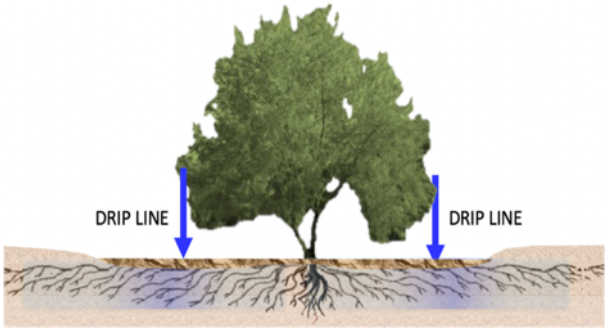


Place two inches of mulch in basins that receive direct rainfall + runoff

## BEST PRACTICE 9.
## Provide establishment watering and on-going watering using harvested water

### Water newly planted native trees to get them established

- Water newly planted native trees for one to three years to get them established
- Water to a depth of 12 to 18 inches in order to saturate the root ball and root zone
- Native trees do not require continual high soil moisture
- Watering frequency will depend on the time of year, temperature, rainfall and other factors
- To establish new plantings in hot months, water every other day for the first three weeks after planting, then cut back to a good deep watering once a week
- Eventually water once a month until trees are established
- To avoid installing a drip irrigation system, you can water by hose, or fill a drip bucket (5-gallon bucket with a small hole punched at its base) and place it next to the plant




Tree root zones may be one and a half times as wide as the tree canopy, or more. Root depth is 1 to 3 feet below land surface. Provide water at and around the drip line of mature trees.

### Provide ongoing deep watering for well-established native trees in hot dry months, if needed

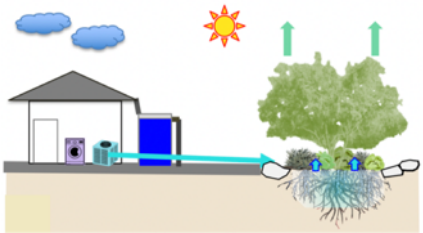
- Inspect tree for signs of drought stress such as wilting leaves, yellowing or dropping leaves and branch die-back
- If plants are stressed, if possible provide enough supplemental water to soak two to three feet of soil below mulch layer
- See a watering strategy below for using harvested water supplies

### Water your tree deeply at and around the canopy "dripline" rather than right next to the trunk

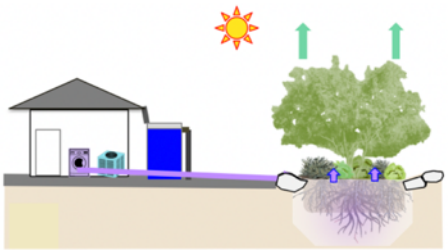
- As trees grow, tree roots zones may be one and a half times as wide as the tree canopy, or more
- Root depth is generally 1 to 3 feet below land surface
- Stabilizing tap roots may extend deeper
- As trees grow larger, apply water to soil at and around the tree's "dripline"—the outer edge of the tree canopy where rainwater drips off the leaves

### If native trees need to be watered, water deeply using condensate water, graywater and tanked rainwater first
### Use drinking water (potable water) only if necessary

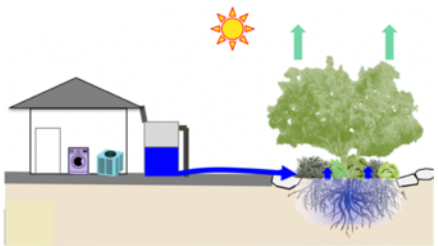
Let natural rainfall and runoff fill your tree basin (and rainwater tank if you have one).



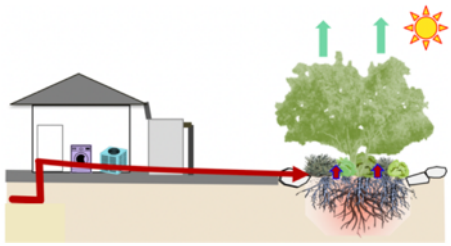
When the tree needs water again, use AC condensate water (light blue hose) if it is available.



If condensate isn't available, use graywater (purple pipe). Rainwater harvested in the basin will dilute salts found in graywater.



Use rainwater from a tank (dark blue hose) if other nonpotable supplies aren't available. An empty tank is ready to refill the next time it rains.



If no rainwater, condensate water or graywater is available, low water-use native trees can be left to adapt naturally to very dry conditions by dropping leaves, self-pruning branches, deferring leafing out or flowering, or other natural drought responses. However, to support medium water-use trees and low water-use trees that provide important shade or are showing signs of extreme stress, water with potable water (red hose).

## BEST PRACTICE 10. For good shade and tree health, follow native tree pruning principles

### NATIVE TREE PRUNING PRINCIPLES

The pruning principles described here focus on maintaining the health and beneficial functions of native multitrunk trees.
Many of these principles apply to all trees.

***The less you prune, the better off your tree will be***

- **Abundant leaves fuel growth.** Leaves, along with the green photosynthetic bark on some native trees, convert sunlight to sugar to fuel tree growth
- **Thicker tree canopies provide deep shade.** Deep shade cools the people who walk under trees, the tree's trunk and branches and soil, understory plants and wildlife under the tree
- **Broad canopies deflect strong, drying winds**
- **Hormones made in a tree's branch tips assist in root growth.** More root growth creates more drought-tolerant trees that are well anchored to withstand strong winds

***Prune only the parts of trees that are dead, damaged or in the way***

- **Wait three years before significantly pruning newly planted trees** to allow young branch tips to encourage root growth
- **Do not prune more than 20 – 25% of a tree at any one time.** Pruning more severely reduces the tree's food source
- **Reasons you might need to prune:**
  - Allow people to walk under shady trees
  - Provide access along paths and streets
  - Remove branches obstructing intersections or traffic sign/signals
  - Remove fuel in wildfire-prone areas
  - Remove limbs that might otherwise drop
  - Remove dead or damaged trunks, branches or branchlets
  - *NOTE: confirm branch is brittle before removing. Some trees drop leaves in heat and drought but branches remain pliable and leaves will grow back when water returns*

***Trees do not "heal" wounds, they "seal" wounds, so prune at the right time to help the tree seal pruning wounds***

- The best time for major, structural pruning is late winter (February) for several reasons
  - There is a higher risk of fungal infections early in the winter rainy season
  - Many native trees are winter deciduous so you can see branches clearly and easily remove mistletoe
  - Plants will soon undertake spring growth to seal wounds
- You can prune in other seasons if needed to remove rain-induced growth or obstructions
- If you are planning additional pruning, waiting until early summer will incorporate spring growth

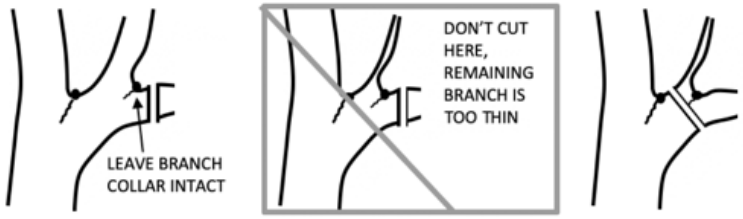
Well pruned native trees in a right-of-way provide a shady walk for pedestrians and shade for cars parked on the street. These trees and understory plants are supported by stormwater runoff from the street and path.

Dead and dying limbs need to be pruned

## BEST PRACTICE 10. For good shade and tree health, follow native tree pruning principles

### *Prune at junctions where branches divide, and where remaining branch is growing up and out*

- This maintains the flow of water and energy that supports branches and tree
- Make sure the branch you leave is at least 1/3rd the diameter of the branch you cut off so it can convey the flow of water from the cut branch up to the remaining branch and leaves
- Cut close to branch, leaving branch collar intact

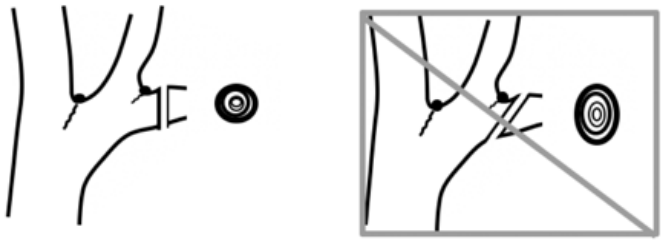



Prune lower branch since upper branch is large enough to reroute the water and energy

Do not prune lower branch since upper branch is too small to reroute the water and energy. Instead, prune off both right-side branches. Reroute water and energy through the main trunk

### *Make clean straight cuts perpendicular to branches*

- Use sharp pruning tools to make clean cuts
- Make perpendicular cuts that create small circular wounds that the tree can efficiently seal
- Do not make angular cuts creating larger oval wounds that require more work for the tree to seal

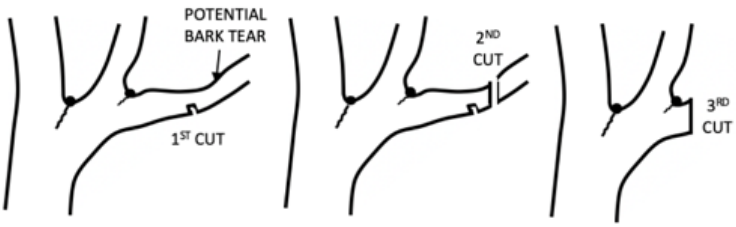


A perpendicular cut creates a small circular wound for the tree to seal

An angular cut creates a larger oval wound that the tree must seal

### *Use the three-step cut method for larger branches (greater than 5/8 inch diameter)*

- Using the three-step method avoids stripping off bark that creates a larger wound the tree must seal
- Use a pruning saw to make the three cuts:
  - 1st cut: Place the saw under the branch 3 to 5 inches from the branch collar, then cut upwards ¼ of the way into the branch
  - 2nd cut: Place the saw on top of the branch to the right of the 1st cut and finish the cut downwards
  - 3rd cut: Remove the stub with a perpendicular cut, leaving the branch collar intact




1st cut on underside of branch to the left of potential bark tear

2ND cut to the right of the first cut at potential bark tear location

3rd cut perpendicular to branch to remove stub

### *Don't leave dead-end stubs*

- If you cut a tree branch in a place that leaves a long branch stub, it's like cutting a flowing water pipe in its middle—water and energy flowing through the tree branch into the stub have nowhere to go
- Instead, at a branch junction, make a perpendicular cut just outside the branch collar of the branch you want to remove
- Water and energy are now rerouted to the remaining branch

Well-pruned branch: branch collar is retained without leaving a stub

Badly pruned branches: long branch stubs were left and are now dying back

### *After removing what must be pruned to meet your goals, leave the rest of the tree in its natural form*

- You can prune one side of a tree and leave the rest of the tree intact
- This retains more leaves that cast shade and support tree and root growth

### *Turn prunings into mulch to feed the tree*

- Cut prunings that are < 1/2-inch in diameter into lengths of 4-inches or less and lay them flat on the ground under the tree so they can decompose to help create a water-holding, nutrient-rich sponge that increases soil fertility

Desert willow pruned front and back to allow access to traffic and parking structure

Same tree is not pruned side-to-side because access is not needed. Remaining tree casts shade and supports tree and root growth

## BEST PRACTICE 10. For good shade and tree health, follow native tree pruning principles

***When pruning, determine specific tree-shaping goals you want to meet, then start small, go slow, reassess often***

- Begin with small branchlets and branches, pruning back to branch junctions from the bottom up and outside in
- Step back often to see if remaining branches "lift up," reducing the need for further pruning
- Continue pruning until you meet your specific pruning needs, then leave the rest of the tree intact

**A small multitrunk tree is having a sidewalk constructed next to it**

- Tree now needs to be pruned to provide pedestrian access on the right side

**Prune in late winter in order to see branch structure**

- Figure out needed pruning to gain sidewalk access
- Prune back to branch junctions from outside in and bottom up, starting with small diameter branchlets

**After first pruning round, reassess**

- If additional pruning is needed, again prune back to a junction, from the outside in and bottom up

**Again, reassess**

- If more pruning is needed, do another round of small cuts from the outside in and bottom up

**Continue until you gain the needed access**

- Leave the rest of the tree intact
- Cut small diameter prunings into 4-inch sticks or less and lay them flat in the bottom of basin for mulch

**Access is gained and sidewalk is partly shaded**

- The more water, the more the canopy grows, and the more shade is available
- Periodic pruning may be needed to maintain access

***Do not remove small branches that sprout from exposed native tree trunks—they feed trees and shade exposed trunks***

***Leave enough canopy to shade a tree's remaining trunks and limbs to avoid causing sunburn***

- Removing large sections of canopy can expose tender bark to intense sunlight, causing sunburn
- Palo verde trees are particularly susceptible to sunburn
- If possible, prune in late winter to reduce sun damage

Drastically over pruned foothill palo verde tree with exposed trunk

Unshaded tender photosynthetic trunk of the over pruned foothill palo verde tree is now damaged by sunburn

***You can cut a branch off, but you can't put it back on. Extreme pruning permanently distorts trees and shrubs.***

- Do not shear the tops or sides of native trees and shrubs, this creates a dense mass of leaves at the ends of cut branches, eliminating light and stressing and weakening the plant's interior structure
- Extreme pruning weakens tree health, exposes trunks to harsh sun and heat, starves trees of food and drastically reduces the shade cast by trees

Well-pruned tree, retaining natural form

Extreme pruning