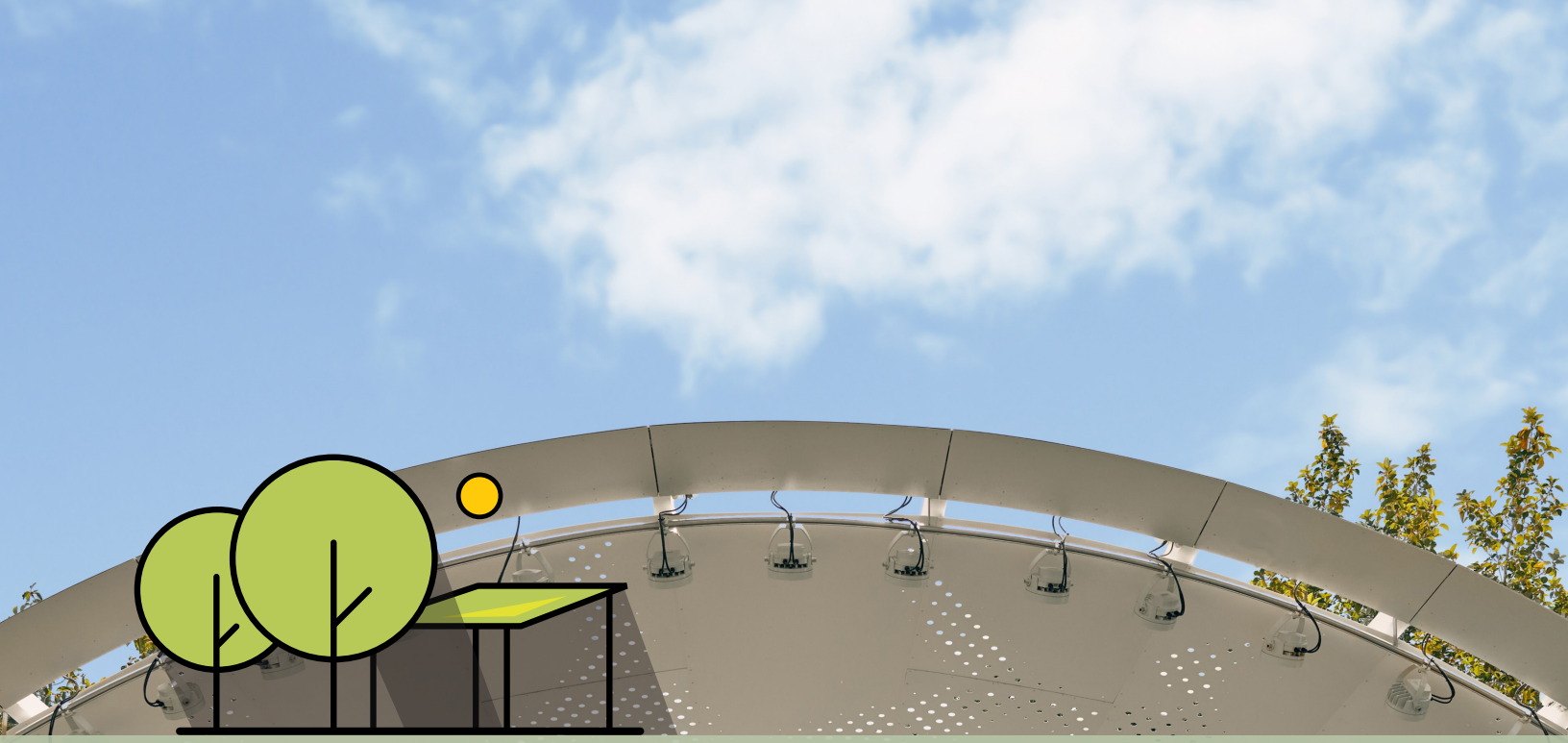

SHADE & TREE PLAN FOR THE BUILT ENVIRONMENT

Development Review Board Resolution No. 10, Adopted May 7, 2026

CITY OF SCOTTSDALE

ACKNOWLEDGMENTS

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INTRODUCTION

WHY A SHADE & TREE PLAN?

The Scottsdale Shade & Tree Plan for the Built Environment document is a resource developed to help the community maintain, increase, and collaborate on shade infrastructure across our desert city. Shade infrastructure is an integrated system—trees, water-harvesting practices, and shade structures—to cool Scottsdale, improve comfort, and strengthen long-term resilience. Through public outreach and citywide analysis, it has been determined that shade infrastructure is fundamental to daily life in Scottsdale. This Plan provides practical guidance for how shade resources can be integrated into the community over time, applying across Scottsdale's built environment, spanning public infrastructure and civic spaces and private development sites.

The Scottsdale Shade & Tree Plan for the Built Environment document serves as an implementation item of Scottsdale General Plan 2035, which emphasizes effective operations, maintenance, and resource investment in community facilities and vegetation; the expansion of tree canopy and shade infrastructure; and broad-based community engagement to achieve community objectives. The Plan also responds to findings from the *Identifying Strategies for a Cooler Scottsdale* study, which highlighted the need for enhanced shade and cooling strategies throughout the community.

What this Plan is

- A strategic, design-oriented framework to maintain and expand shade infrastructure citywide.
- Practical guidance for selecting and placing trees, integrating water-harvesting practices, and using shade structures across different locations, site types and contexts.
- A resource that can inform more detailed, site-specific plans and project designs.

What this Plan <u>is not</u>

- A regulatory ordinance or replacement for adopted codes, engineering standards, or other City policies.
- A streetscape or construction plan that prescribes exact tree locations, spacing, or project-level designs for individual corridors or sites.
- A guarantee of City funding, installation, or maintenance for any specific site, project, or neighborhood.

This Plan is intended to enhance shade infrastructure citywide by optimizing shade elements and focusing on the selection and placement of appropriate shade infrastructure in public and private spaces. Through actionable strategies and guiding practices, it supports the creation of heat-resilient properties and neighborhoods for residents, businesses, developers, and visitors.

Plan Process & Outreach

Development of the Scottsdale Shade & Tree Plan for the Built Environment document began in early 2024 through a collaborative and data-informed process designed to reflect community priorities and Scottsdale's unique desert context. The effort focused on understanding existing shade conditions, identifying opportunities for improvement, and ensuring strategies that would be both practical and effective over the long term.

Research included analysis of tree canopy distribution, surface heat data, and historical temperature trends, complemented by best practices from other desert cities and regional partners. These sources helped establish a foundation of existing conditions and needs related to shade, comfort, and resilience.

Extensive public engagement was central to shaping the Plan. Through six pop-up events and two open houses held in south and north Scottsdale, more than 1,000 residents and community members were asked a simple question: "Where do we need shade?" The response was consistent and emphatic—the community wants shade everywhere.

Residents identified neighborhoods, parks, paths and trails, and public or shared spaces as top priorities for additional shade. Many also emphasized the importance of selecting appropriate, desert-adapted tree species and maintaining a strong commitment to water efficiency. This feedback guided the creation of practical, balanced strategies that maintain, expand, and encourage collaboration on shade infrastructure citywide.

The Plan transforms data, design guidance, community feedback, and best practices into actionable strategies that advance Scottsdale's shade goals. These strategies work collectively to maintain existing assets, expand shade citywide, and strengthen collaboration on care and maintenance.

Public pop-up event.


Public open house.

UNDERSTANDING HEAT

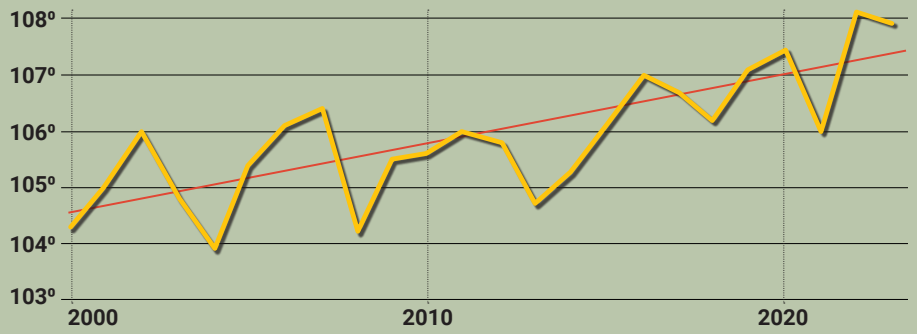
On average, Scottsdale generally experiences 314 days of clear skies each year, resulting in roughly 3,870 hours of direct sunlight. During the longest summer days, the city receives up to 14 hours of daylight, elevating temperatures that peak in July and August, when heat reaches its most extreme levels.

Heat continues to shape life across the Valley. In 2023, the region recorded both record-breaking summer temperatures and the highest number of heat-related fatalities on record as reported by Maricopa County Health. Globally, it was also the hottest year documented. These conditions reflect a long-term trend in the Sonoran Desert, where communities like Scottsdale have experienced steadily rising average temperatures for more than a century.

Yet averages alone don't tell the full story. The city now faces longer, more frequent heat waves and warmer overnight lows, which compound the effects of daytime highs. The result is prolonged periods of heat that impact daily life around the clock.

Extreme heat places strain on public health systems, increases utility costs, and discourages outdoor activity. For desert cities, addressing heat is not just about comfort—it is essential to resilience, livability, and long-term prosperity.

Figure 0-1. Average July High Temperature, Scottsdale



Source: National Oceanic and Atmospheric Administration (NOAA)

Impact of Shade

Shade plays a critical role in moderating surface and ambient temperatures. Providing shade over heat-absorbing surfaces - such as pavement, walls, and turf - can significantly improve comfort and safety in outdoor spaces. For example, the City of Phoenix Cool Pavement and Cool Corridor Programs found that shaded pavements were up to 12°F cooler than unshaded ones during the day (phoenix.gov).

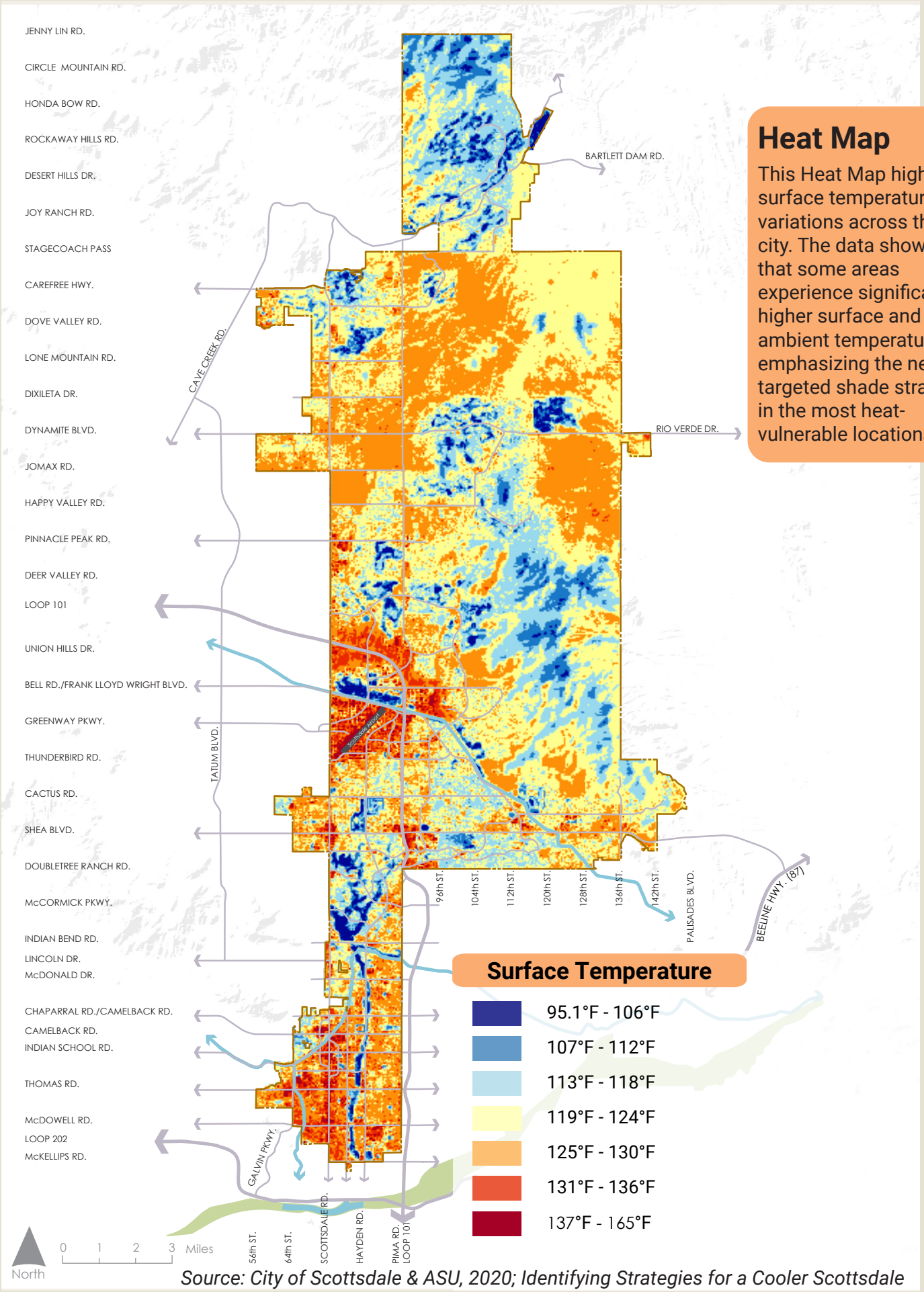
By recognizing how surface materials respond to sunlight, developers, business owners, and residents can make informed decisions about trees, structures, and materials that reduce heat exposure. Thoughtful integration of natural and built shade improves outdoor comfort, reduces energy demand, and enhances Scottsdale's unique character.

Understanding how heat interacts with Scottsdale's built and natural environments also helps reveal where shade is most needed. By mapping surface temperatures and existing shade coverage, patterns emerge—showing areas that stay significantly hotter throughout the day and those already benefiting from shade. The maps on the following pages illustrate these conditions citywide, providing the foundation for how and where shade and cooling strategies can be focused.

Heat-Absorbing Surfaces

In Scottsdale's summer heat, materials such as concrete, asphalt, and artificial turf absorb and retain large amounts of solar energy, reaching temperatures far above the surrounding air. These surfaces intensify heat in outdoor spaces and highlight the need for effective shade to reduce exposure and improve comfort.

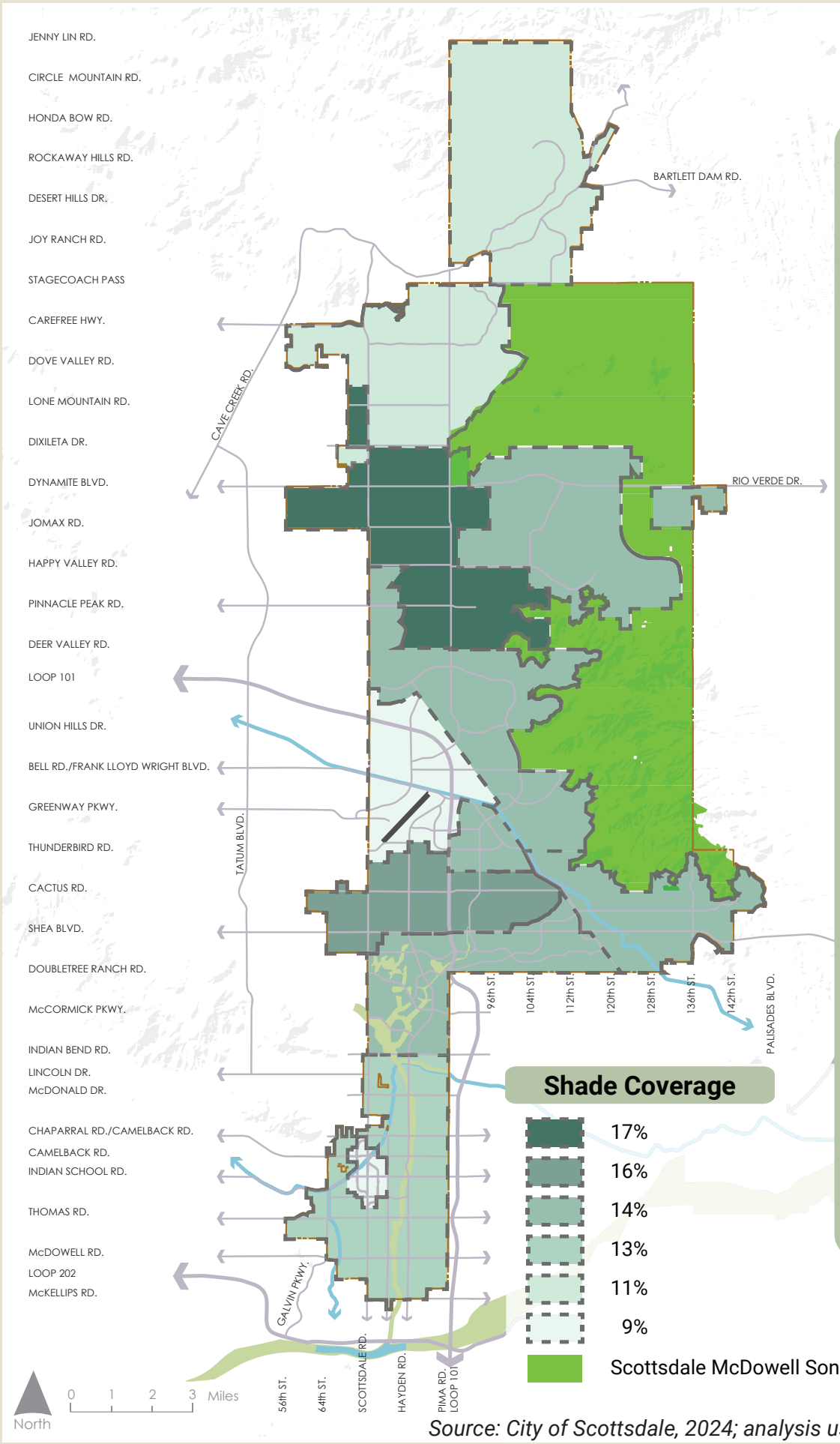
Figure 0-2. Surfaces vary in heat retention.



Heat Map

This Heat Map highlights surface temperature variations across the city. The data shows that some areas experience significantly higher surface and ambient temperatures, emphasizing the need for targeted shade strategies in the most heat-vulnerable locations.

Source: City of Scottsdale & ASU, 2020; Identifying Strategies for a Cooler Scottsdale



Source: City of Scottsdale, 2024; analysis using i-Tree (USFS)

Shade Map

The City of Scottsdale currently has an **estimated shade coverage of 13%,** excluding the McDowell Sonoran Preserve. Of this total, 12.4% is provided by trees and 0.6% by shade structures. Coverage varies by area, reflecting differences in land use, vegetation, and urban form. In comparison with the Heat Map, areas that experience the highest temperatures, such as the Airpark, Old Town and portions of south Scottsdale, also tend to have the least shade coverage, highlighting the importance of targeted shade expansion to improve comfort and reduce heat exposure.

This Plan establishes citywide guidance that can be applied on individual projects. In lower-shade areas, future corridor- or area-specific shade planning can be useful to identify the most effective locations and approaches for targeted shade expansion.

BENEFITS OF SHADE INFRASTRUCTURE

Shade infrastructure, *an interconnected system of trees, shade structures, and water-harvesting practices*, creates a cooler, healthier, and more resilient Scottsdale. Together, these elements reduce heat, improve comfort, and support both environmental and community well-being.

Trees are the cornerstone of a shade system, providing natural cooling through and evapotranspiration while improving air quality and supporting biodiversity. Trees filter pollutants, create habitat for wildlife, and enhance neighborhood character and comfort.

Water harvesting sustains landscapes and reduces reliance on potable water. By capturing and reusing rainfall, it supports plant health, replenishes groundwater, and helps manage stormwater runoff—vital functions in Scottsdale's arid climate.

Shade structures complement the city's urban canopy by extending comfort to areas where trees may not thrive or provide sufficient coverage. Well-placed structures reduce surface and air temperatures, protect people and materials from ultraviolet (UV) exposure, and encourage outdoor activity throughout the year. These structures also contribute to economic value by lowering energy use, extending the lifespan of outdoor surfaces, and enhancing the usability of public spaces.

Scottsdale's Shade & Tree Plan for the Built Environment promotes desert-adapted and native trees, efficient irrigation, and the strategic use of shade structures to balance comfort with long-term resource management, while remaining adaptable as new research, materials, and technologies improve performance over time. Collectively, these tools form an integrated approach to shade infrastructure—one that cools the city, strengthens ecological systems, and enhances livability across Scottsdale.

Trees

Trees contribute to creating cooler, healthier, and more resilient communities. They provide shade that reduces the urban heat island, lowers energy use, and improves comfort in outdoor spaces. Tree canopies filter air pollutants to improve air quality, while their roots manage stormwater and help prevent soil erosion. Trees also support biodiversity by providing habitat for wildlife, from pollinators to birds. Beyond environmental benefits, they add economic and social value by increasing property appeal, enhancing walkability, and creating welcoming community spaces. Trees contribute to well-being—encouraging outdoor activity, reducing stress, and strengthening neighborhood connections.

Biodiversity

Trees preserve biodiversity by providing habitat for birds, insects, and other wildlife. Trees help protect soil, maintain water quality, and reduce erosion, while mitigating the impacts of extreme heat in urban environments.[3]

Pollution

Trees improve air quality by capturing pollutants such as carbon dioxide and filtering fine particulates. A single mature tree can absorb up to 48 pounds of CO_2 annually[2] and remove nitrogen oxides and sulfur dioxide, making neighborhoods cleaner and healthier.

Economic Value

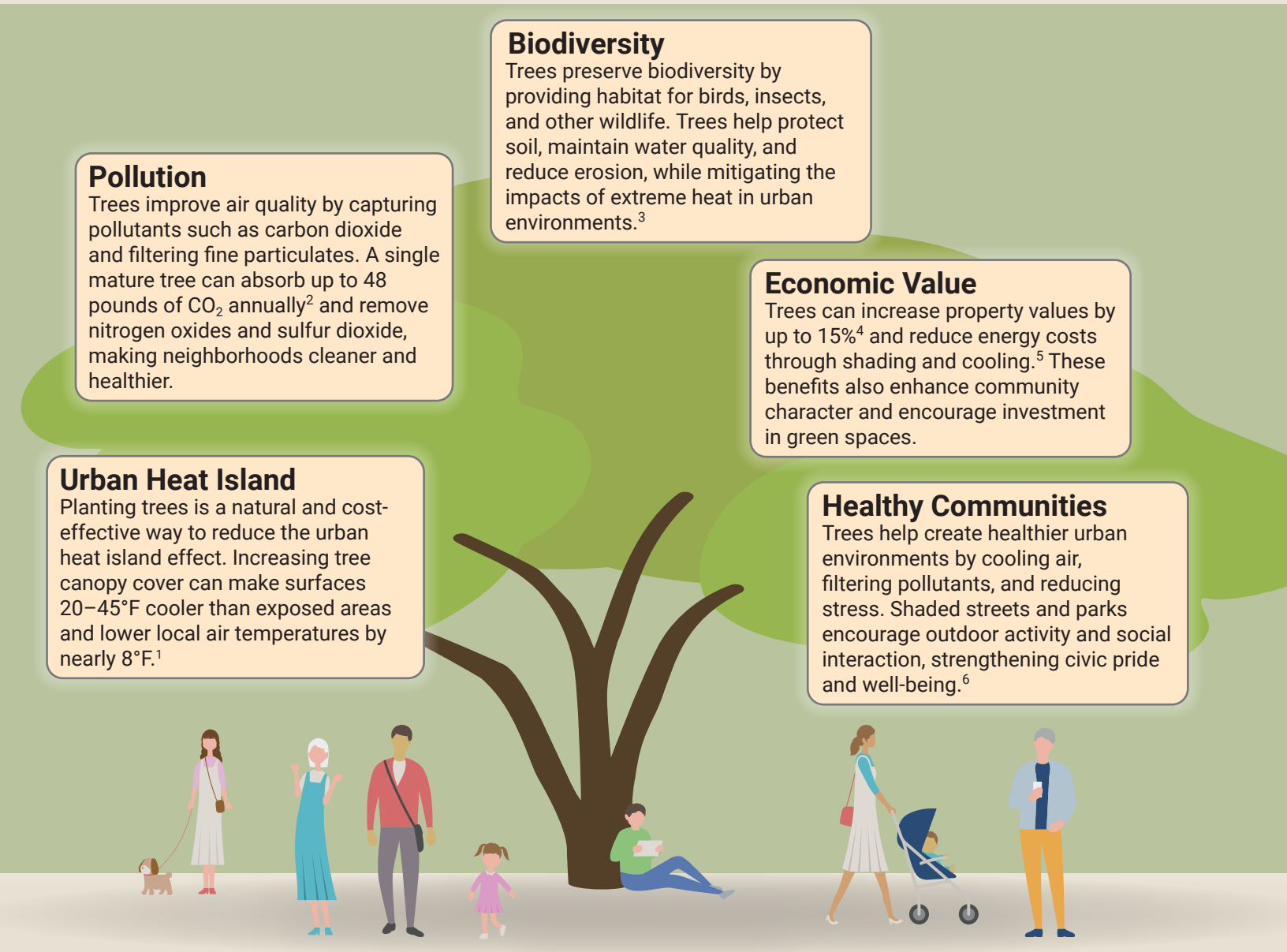
Trees can increase property values by up to 15%[4] and reduce energy costs through shading and cooling.[5] These benefits also enhance community character and encourage investment in green spaces.

Urban Heat Island

Planting trees is a natural and cost-effective way to reduce the urban heat island effect. Increasing tree canopy cover can make surfaces 20–45°F cooler than exposed areas and lower local air temperatures by nearly 8°F.[1]

Healthy Communities

Trees help create healthier urban environments by cooling air, filtering pollutants, and reducing stress. Shaded streets and parks encourage outdoor activity and social interaction, strengthening civic pride and well-being.[6]



1. Arizona State University. Identifying Strategies for a Cooler Scottsdale (2022).
2. U.S. Department of Agriculture, Forest Service. The Power of One Tree: The Very Air We Breathe (2015).
3. U.S. Department of Agriculture, Forest Service. Urban Nature for Human Health and Well-Being (2018).
4. CABE Space (Commission for Architecture and the Built Environment). The Value of Public Space (2004).
5. Akbari, H. Peak Power and Cooling Energy Savings of Shade Trees (1997).
6. American Forests. Urban Forests Fact Sheet (2013).

Water Harvesting

Water harvesting captures and reuses rainwater to support healthy landscapes, reduce heat, and conserve resources. By directing stormwater into the soil, it reduces runoff, recharges groundwater, and provides a reliable water source for trees and plants. These practices lessen dependence on potable water, improve water quality, and help manage flooding and erosion.

In Scottsdale's arid climate, integrating water-harvesting techniques sustains shade trees, enhances landscape health, and strengthens resilience to heat. Even small-scale efforts, such as contouring soil, directing roof runoff, or using permeable surfaces, can create cooler, greener, and more livable outdoor spaces while easing demand on municipal water supplies.

Cleans Polluted Water

Water harvesting improves water quality by reducing runoff and filtering contaminants through soil and vegetation. This process helps clean stormwater and supports healthier urban watersheds.[2]

Supports Plant Health

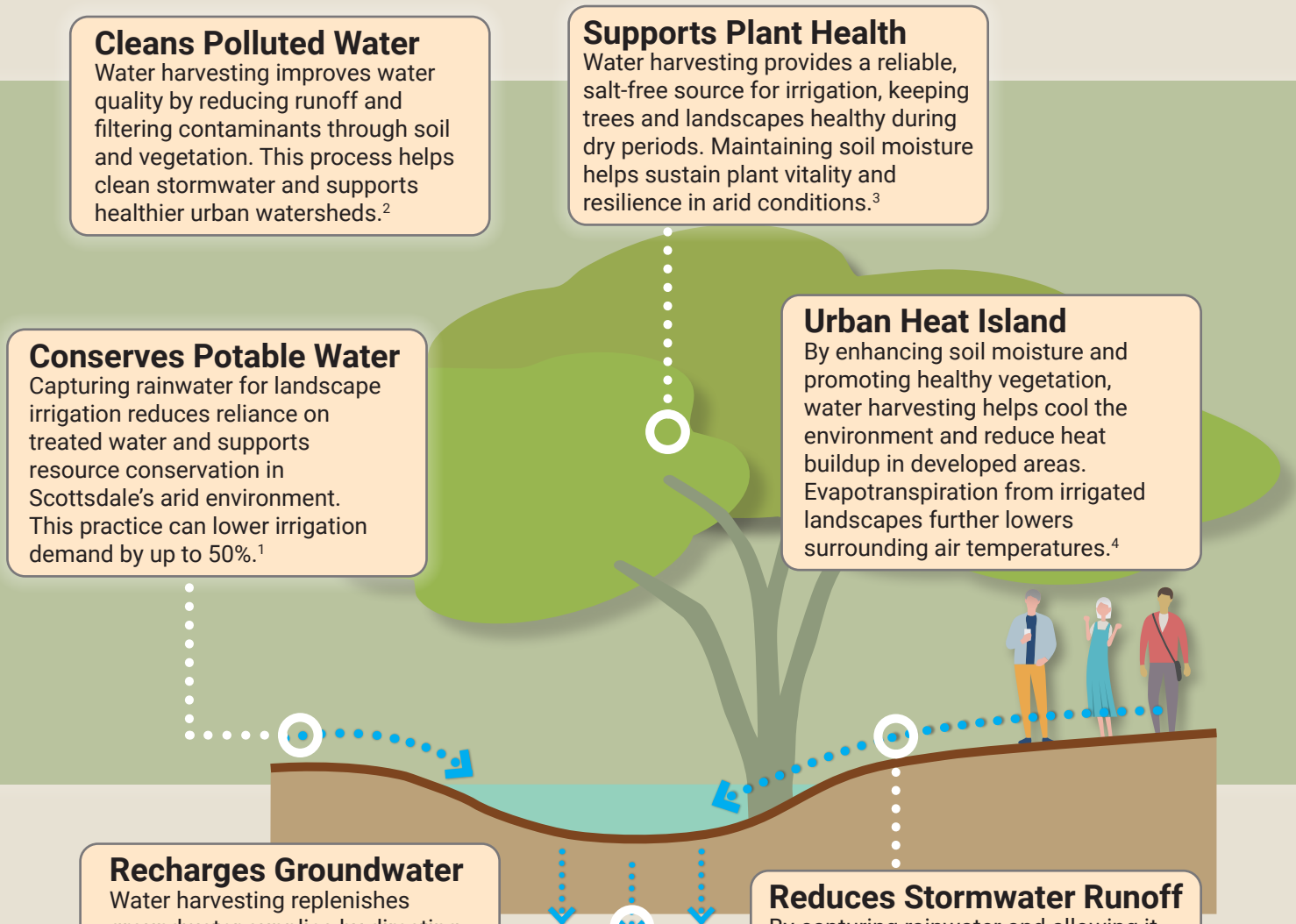
Water harvesting provides a reliable, salt-free source for irrigation, keeping trees and landscapes healthy during dry periods. Maintaining soil moisture helps sustain plant vitality and resilience in arid conditions.[3]

Conserves Potable Water

Capturing rainwater for landscape irrigation reduces reliance on treated water and supports resource conservation in Scottsdale's arid environment. This practice can lower irrigation demand by up to 50%.[1]

Urban Heat Island

By enhancing soil moisture and promoting healthy vegetation, water harvesting helps cool the environment and reduce heat buildup in developed areas. Evapotranspiration from irrigated landscapes further lowers surrounding air temperatures.[4]



Recharges Groundwater

Water harvesting replenishes groundwater supplies by directing captured rainwater into the soil, supporting long-term water availability. This process is vital for maintaining aquifer levels in desert regions.[6]

Reduces Stormwater Runoff

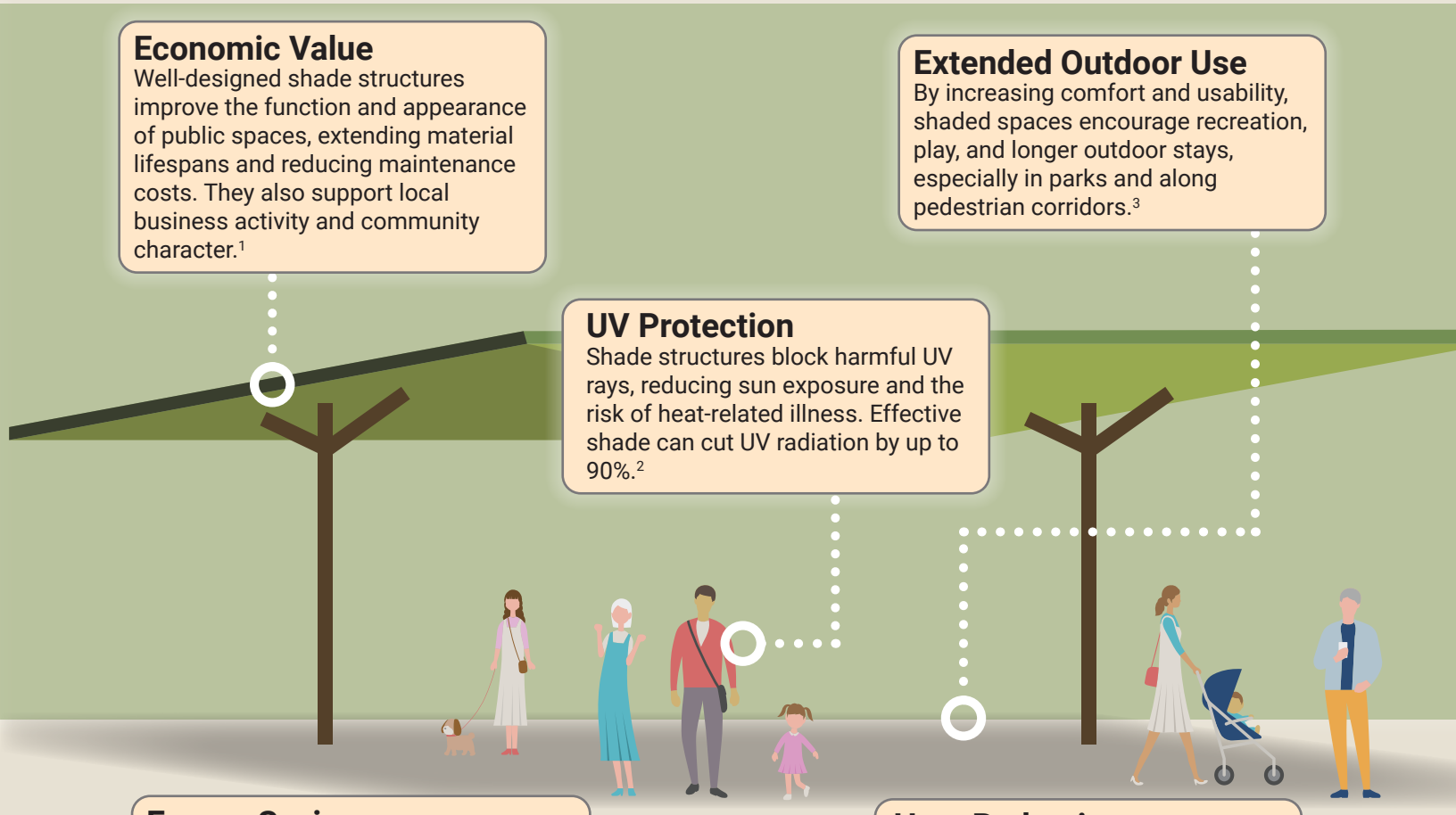
By capturing rainwater and allowing it to infiltrate the soil, water harvesting mitigates runoff and helps prevent flooding and erosion. It also slows the flow of stormwater and promotes groundwater recharge.[5]

1. University of Arizona Water Resources Research Center. Harvesting Rainwater for Landscape Use (2026).
2. U.S. Department of Agriculture, Forest Service. Urban Forests (n.d.).
3. U.S. Department of Agriculture, Natural Resources Conservation Service. Conservation Practice Standard: Water Harvesting Catchment, Code 636 (2020).
4. U.S. Environmental Protection Agency. Using Trees and Vegetation to Reduce Heat Islands (2025).
5. U.S. Environmental Protection Agency. What is Green Infrastructure? (n.d.).
6. U.S. Environmental Protection Agency. Soak Up the Rain: The Benefits of Green Infrastructure (2026).

Shade Structures

Shade structures provide far more than relief from just the sun. They enhance comfort, extend outdoor usability, and add long-term value to public and private spaces. By reducing surface and air temperatures, they make streets, parks, plazas, and gathering spaces more comfortable throughout the year. Shade structures also reduce UV exposure, protecting public health and improving quality of life.

Well-placed shade enhances walkability, encourages recreation, and supports social interaction by making outdoor environments usable even during the hottest months. These improvements promote community engagement, safety, and economic activity. Shade structures also contribute to energy savings by reducing cooling demands for nearby buildings and vehicles, while durable materials and thoughtful design extend the lifespan of outdoor spaces and amenities.



Economic Value

Well-designed shade structures improve the function and appearance of public spaces, extending material lifespans and reducing maintenance costs. They also support local business activity and community character.[1]

Extended Outdoor Use

By increasing comfort and usability, shaded spaces encourage recreation, play, and longer outdoor stays, especially in parks and along pedestrian corridors.[3]

UV Protection

Shade structures block harmful UV rays, reducing sun exposure and the risk of heat-related illness. Effective shade can cut UV radiation by up to 90%.[2]

Energy Savings

Shade around buildings, parking areas, and walkways lowers surface and vehicle temperatures, decreasing cooling costs by up to 20%. Solar-integrated canopies can further enhance efficiency by generating renewable energy.[5]

Heat Reduction

Shade structures lower surface temperatures by 20–45°F, making outdoor areas cooler and more comfortable while reducing the urban heat island effect.[4]

1. U.S. Environmental Protection Agency. Using Trees and Vegetation to Reduce Heat Islands (2025).
2. U.S. Environmental Protection Agency. Using Trees and Vegetation to Reduce Heat Islands (2025).
3. Urban Land Institute. Ten Principles for Building Healthy Places (2013).
4. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Urban Heat island. (n.d.).
5. U.S. Department of Agriculture, Forest Service. Quantifying Urban Forest Structure, Function, and Value (1997).

SHADE & WATER

Ongoing drought conditions and rising temperatures across the American Southwest make efficient coordination between water use and shade infrastructure important in Scottsdale. Expanding shade coverage must be balanced with responsible water management to reduce heat exposure while conserving limited water resources. An integrated approach combining appropriate tree selection, efficient watering strategies, and water harvesting supports long-term cooling for long-term viability and a livable desert community.

Tree Selection

Prioritize desert-native and desert-adaptive species to expand canopy cover while aligning with Scottsdale's water conservation goals (See Tree Guidelines, pages 37 - 47).

Watering Strategies

Use efficient irrigation methods such as drip systems, smart controllers, and seasonal scheduling to support tree health while minimizing water waste (See Tree Guidelines, pages 51 - 52).

Water Harvesting

Capture and reuse stormwater to supplement irrigation, reduce reliance on potable water, and support tree establishment and long-term growth (See Water Harvesting Guidelines, pages 59 - 75).

Water-Efficient Landscape Design

Grass, Artificial Turf and Trees

Balancing grass, artificial turf, and trees is critical to managing both heat and water use. Natural grass can reduce surface temperatures and retain soil moisture around trees but typically requires more water. Artificial turf conserves water yet can significantly increase surface temperatures, potentially stressing nearby trees. Effective site design strategically combines trees with low-water-use grass species or limited areas of artificial turf to achieve cooling benefits while maintaining water efficiency.

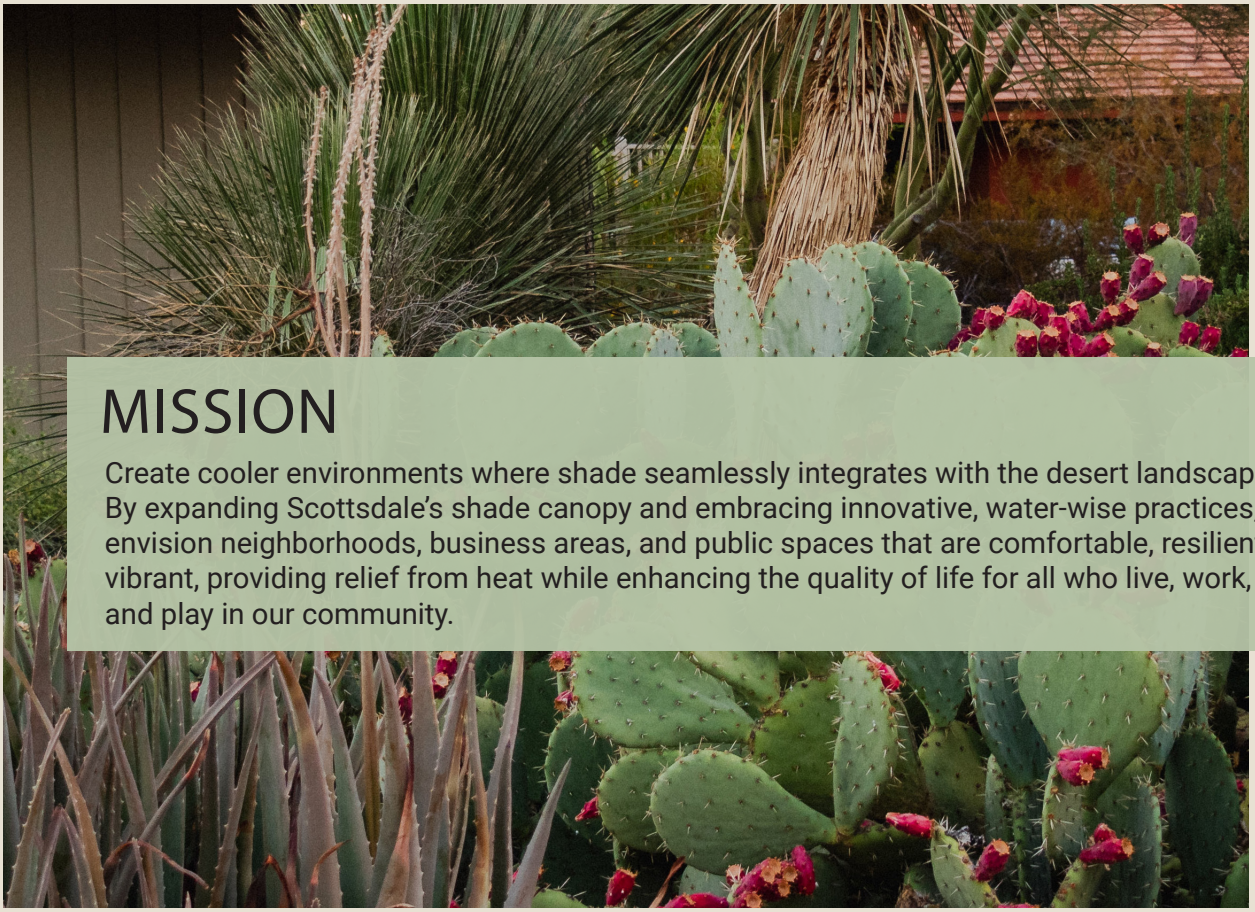
Shifting from Non-Functional Grass to Shade Solutions

Reducing non-functional grass and replacing it with tree canopy, drought-tolerant groundcovers, or shaded seating areas can significantly lower water use while improving outdoor comfort. Tree-shaded areas retain soil moisture more effectively than exposed lawns, requiring less water usage over time. This approach creates cooler microclimates, reduces the urban heat island effect, and delivers long-term water savings without sacrificing usability of outdoor spaces.

Gray Water Considerations

The City of Scottsdale does not actively promote gray water systems, as much of the community's water is already collected, recycled and reused. Scottsdale reuses water for landscape irrigation, energy cooling with valley-wide partners, and aquifer storage for future needs. While gray water harvesting can provide a supplemental water source for trees at a specific site, its overall impact on Scottsdale's water supply is limited given the City's robust existing water recycling efforts.

MISSION, VISION, GOALS

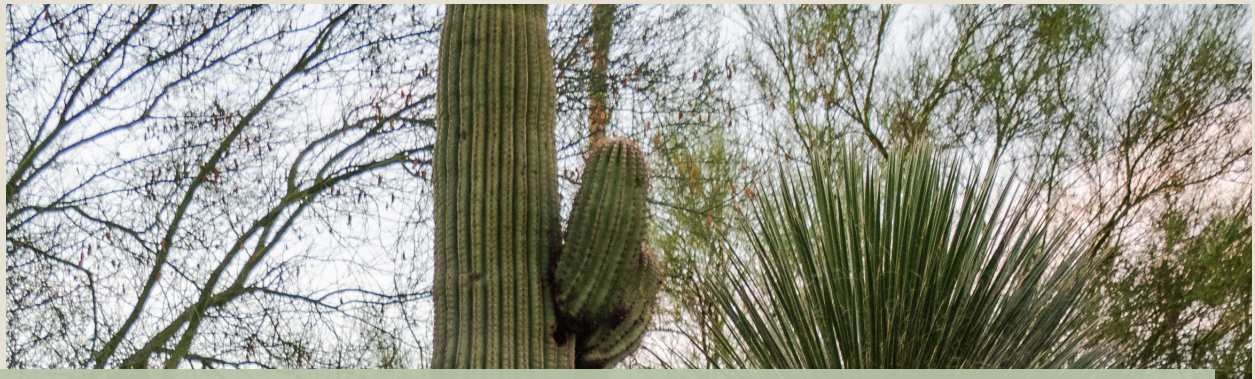


MISSION

Create cooler environments where shade seamlessly integrates with the desert landscape. By expanding Scottsdale's shade canopy and embracing innovative, water-wise practices, we envision neighborhoods, business areas, and public spaces that are comfortable, resilient, and vibrant, providing relief from heat while enhancing the quality of life for all who live, work, visit and play in our community.

VISION

Establish Scottsdale as a model of resilience in modern desert cities, where thoughtfully designed shade infrastructure creates cooler, more livable spaces. By prioritizing long-term solutions and fostering a balanced ecosystem, we envision Scottsdale as a city of comfort, beauty, and environmental stewardship, ensuring a thriving and inviting community for generations to come.



GOALS

The goals of the Scottsdale Shade & Tree Plan for the Built Environment document are centered on creating a cooler and more resilient city. The Plan provides a framework to expand and maintain shade infrastructure—trees, built structures, and water efficient elements. Through its implementation, the Plan aims to deliver long-term community benefits such as reducing heat, supporting biodiversity, lowering energy use, and improving comfort and livability in public and private spaces. The following goals guide Scottsdale's approach to shade: maintaining the city's existing shade infrastructure, increasing shade coverage through thoughtful design and placement, and collaborating with community partners to ensure the continued success of these efforts.

Maintain our Shade:

Preserve and sustain mature trees and other existing shade infrastructure to ensure their long-term health, function, and benefit. Objectives include maintaining and monitoring shade infrastructure, sustaining funding resources, enhancing water efficiency, and ensuring long-term resilience through updated policies and training.

(Cross Reference City of Scottsdale General Plan 2035 Character & Design, Open Space, Environmental Planning, Recreation, and Cost of Development Elements)

Increase our Shade:

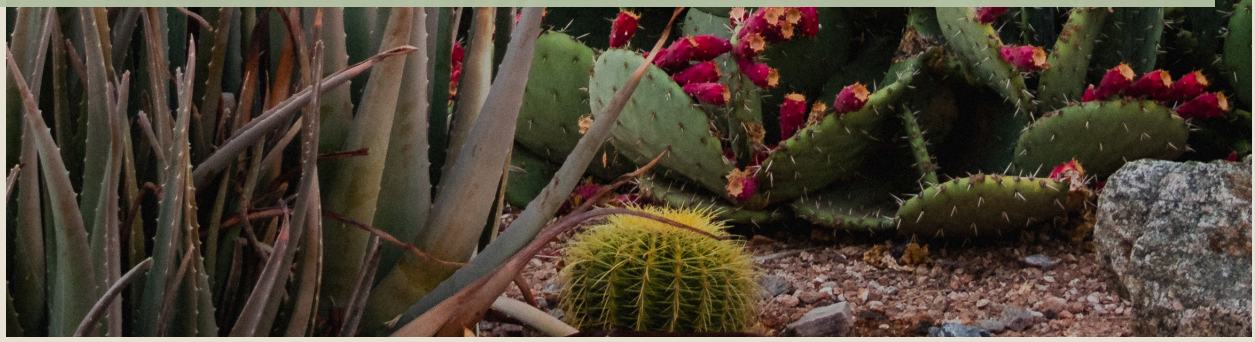
Expand shade infrastructure through strategic placement, thoughtful design, and integration into public and private projects. Objectives focus on expanding the city's tree canopy and shade structures, continuing the incorporation of shade considerations in the development process, and enhancing the aesthetic and functional quality of shade infrastructure.

(Cross Reference City of Scottsdale General Plan 2035 Character & Design, Open Space, and Environmental Planning Elements)

Collaborate on Shade:

Foster partnerships and shared responsibility to sustain and expand shade. Objectives emphasize education, community awareness, interdepartmental coordination, and participation through private developments, volunteers, and neighborhood-led efforts.

(Cross Reference City of Scottsdale General Plan 2035 Community Involvement and Public Services & Facilities Elements)



MAINTAIN OUR SHADE

Objective 1 **Maintain and monitor existing shade infrastructure.**

1.1 Develop and implement a citywide shade management program that includes periodic condition assessments, maintenance schedules, and long-term replacement planning.

1.2 Maintain an inventory of public trees, structures, and other shade infrastructure.

Objective 2 **Provide programming and collaborative support for shade maintenance.**

2.1 Provide city staff with ongoing maintenance education and training.

2.2 Create public-private partnership opportunities that encourage local businesses and community organizations to invest in and sponsor shade maintenance.

2.3 Partner with local universities or research institutions to test and improve shade maintenance techniques and best practices.

Objective 3 **Ensure long-term shade resilience.**

3.1 Establish a coordinated shade infrastructure program that supports inspection and compliance efforts, organizes maintenance priorities, and identifies potential external funding or grant opportunities.

3.2 Regularly review and update policies and guidelines to reflect emerging best practices.

Objective 4 **Enhance water efficiency and conservation.**

4.1 Expand efficient irrigation and water harvesting practices to maintain existing shade infrastructure and offset water needs.

INCREASE OUR SHADE

Objective 1 **Expand Scottsdale's shade infrastructure.**

1.1 Increase tree canopy and shade structures citywide, prioritizing high-heat, low-canopy, and prominent public areas.

1.2 Strategically select and place trees to maximize shade coverage and ensure longevity.

1.3 Increase shade in the public realm for gathering, walking, and biking.

Objective 2 **Integrate shade infrastructure in the development process.**

2.1 Recognize shade infrastructure as an essential element of city projects.

2.2 Promote shade infrastructure in private development and redevelopment.

2.3 Apply the Scottsdale Shade & Tree Plan for the Built Environment Guidelines in the design review process.

Objective 3 **Enhance the aesthetic and functional quality of shade infrastructure.**

3.1 Support shade infrastructure designs that contribute to Scottsdale's visual identity and character.

3.2 Provide technical guidance and examples of successful shade integration in different contexts (Greater Airpark, Old Town, commercial corridors).

3.3 Ensure shade designs increase public comfort and accessibility.

COLLABORATE ON SHADE

Objective 1 **Promote awareness and shared responsibility.**

1.1 Develop education and outreach materials highlighting the benefits of shade and clarifying shared responsibilities for maintenance.

1.2 Offer workshops, guides, and materials on the importance of selecting and implementing appropriate shade infrastructure.

Objective 2 **Strengthen partnerships and shared stewardship.**

2.1 Establish an interdepartmental coordination group to align city shade initiatives with community priorities.

2.2 Build relationships with neighborhoods, HOAs, schools, nonprofits, and businesses to develop support the provision and maintenance of shade infrastructure.

Objective 3 **Support community implementation and participation.**

3.1 Encourage volunteer programs and neighborhood initiatives focused on shade projects.

3.2 Consider offering small-scale grants or tool-lending programs to empower neighborhood-led shade projects.

3.3 Recognize and incentivize community contributions.

ADVANCING CITYWIDE SHADE GOALS

Increasing shade begins with understanding where shade delivers the greatest benefit and how sun exposure shapes daily comfort. Building from the citywide heat and shade baseline, this page summarizes where shade matters most and how to prioritize it.

Desired Shade Canopy Coverage
A key focus of the Scottsdale Shade & Tree Plan for the Built Environment document is expanding citywide shade. The categories below identify high-priority locations with corresponding long-term shade goals. The ranges provided are planning targets—not mandatory, minimum requirements—and may help inform how shade performance is evaluated and communicated through site plans and related project materials, based on site context, constraints, and project type.

Critical Shade Zones (75–100% Coverage)
Playgrounds, gathering areas, school pick-up/drop-off zones, seating in parks, and bus stops.

Active Use Areas (50–75% Coverage)
Parking lots, streetscapes along major corridors, off-street paths/sidewalks.

Functional Shade Areas (25–50% Coverage)
Commercial areas, streetscapes, residential sidewalks, open spaces in retention basins.

Natural Integration Areas (30–60% Coverage)
Retention basins, green corridors, and other multipurpose areas.

Supplemental Shade Areas (10–25% Coverage)
Industrial areas and residential yards.

Sun Path & Shade Prioritization
Sun orientation is one of the most important drivers of thermal comfort in Scottsdale. Because afternoon sun is most intense, the west and southwest sides of streets, buildings, and public spaces typically create the greatest heat exposure for pedestrians, gathering areas, and building frontages.

Prioritize shade placement where people walk, wait, and linger during peak heat, especially along sidewalks, paths, plazas, transit stops, and entries. When trees are not feasible or need time to mature, shade structures and water-harvesting strategies can help deliver near-term relief and long-term canopy success.

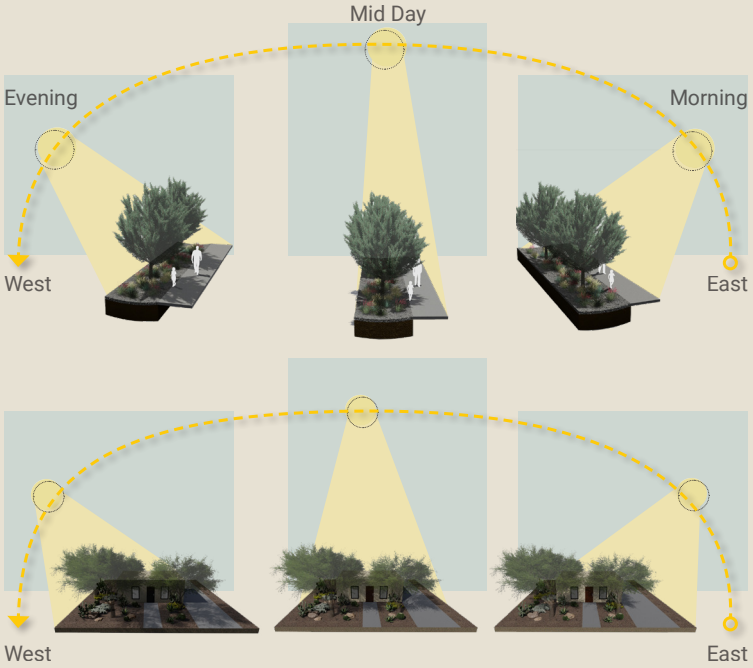


Figure 0-3. Effective shade placement based on sun orientation.

THE GUIDELINES

INTRODUCTION TO THE GUIDELINES

Effective shade infrastructure requires a multi-faceted approach that integrates trees, water harvesting, and structures to maximize cooling, comfort, and long-term livability. Each component contributes uniquely to reducing heat exposure and supporting a resilient community.

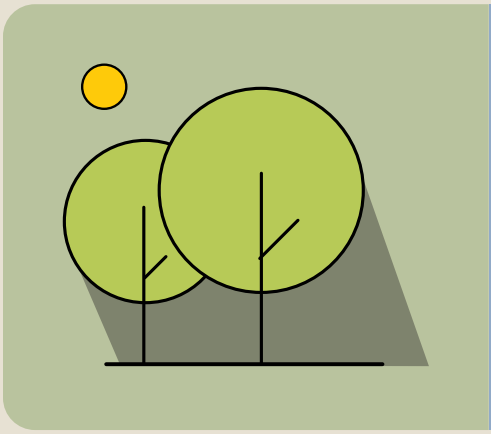
The Guidelines offer a highly visual, easy-to-use resource for residents, developers, planners, and policymakers. Their purpose is to provide clear, practical direction on maintaining and expanding the city's shade infrastructure.

To achieve these goals, the Guidelines refine complex strategies into applicable solutions tailored to Scottsdale's desert context, while the Design Scenarios illustrate how those strategies can be combined on typical sites. The Old Town section further illustrates shade solutions for Scottsdale's most walkable, urban setting, aligning shade infrastructure with the existing character plan and downtown urban design expectations.

Developed collaboratively with multiple city departments and industry experts, the Guidelines reflect Scottsdale's commitment to community-focused solutions that enhance livability and the environment.

Use the icons on this page to navigate directly to each section.

TREES



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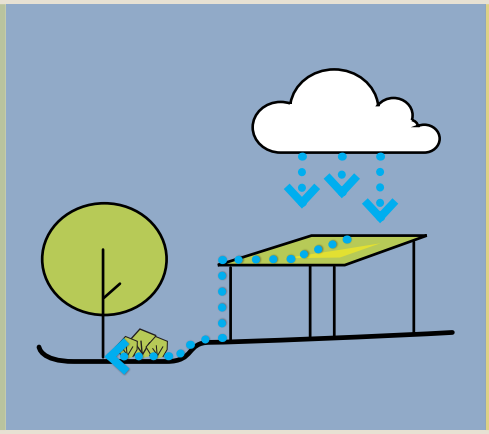
WATER HARVESTING



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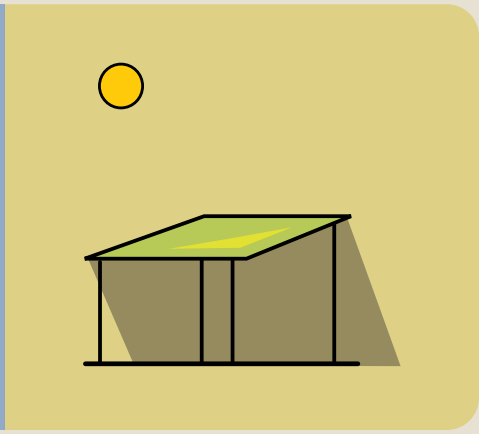
SHADE STRUCTURES



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DESIGN SCENARIOS

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OLD TOWN SCOTTSDALE

PAGE 99

TREES

Trees are the cornerstone of Scottsdale's shade infrastructure, providing natural cooling along with other environmental, economic and aesthetic benefits. They create habitat for wildlife, enhance neighborhood character, and improve comfort in outdoor spaces. In combination with shade structures and water-harvesting practices, trees contribute to a cooler, healthier, and more resilient community.

The Tree Guidelines provide direction for every stage in the life cycle of a tree to promote healthy growth, structural stability, and effective canopy coverage. The guidelines are intended for use by city departments, developers, and design teams to inform project planning and review, ensuring that landscaping contributes to Scottsdale's broader shade goals.

Design and Implementation Framework

The Tree Guidelines outline expectations for selecting, placing, establishing, and maintaining trees that are suited to Scottsdale's desert conditions. Rather than prescribing a single species or approach, they establish consistent, citywide expectations for a healthy, durable canopy.

Working in tandem with the Shade Structure and Water Harvesting Guidelines, the Tree Guidelines form one of the three technical foundations of the Shade & Tree Plan.

The Guidelines provide detailed direction organized under the following seven topics:

Tree Placement outlines how to approach spatial constraints and surrounding context so trees can reach their full canopy without conflicts.

Soil Volume defines the preparation and minimum soil requirements needed to support root growth and canopy health.

Tree Diversity sets the stage for tree selection by prioritizing the use of multiple species for ecological and aesthetic benefits.

Tree Selection offers details for choosing species appropriate to site conditions, spatial constraints, water requirements and maintenance needs.

Tree Staking describes methods to support young trees while allowing natural structural development.

Efficient Watering Strategies identify practices that maximize water efficiency and tree performance.

Tree Pruning & Maintenance establishes standards for canopy maintenance to promote safety, longevity, and aesthetic quality.

Protect Mature Trees

Mature trees are a large part of Scottsdale's existing shade infrastructure. While these guidelines support adding new shade trees to **Increase Our Shade**, it is just as important to protect the trees we already have and **Maintain Our Shade**. The Tree Guidelines are not intended to replace existing mature trees. Whenever feasible, plan and design around mature trees and focus on keeping them healthy and safe.

TREE PLACEMENT

Place trees to maximize shade benefits, ensure long-term tree health, and avoid conflicts with surrounding infrastructure.

TR 1 For pedestrian areas and street frontages, ensure proper mature canopy overlap while allowing sufficient room for growth.

TR 1.1 A maximum of 25’ measured from trunk to trunk is recommended (25’ O.C. - on center). Refer to the Tree Lists and Tree Guides beginning on page 38 for recommended placement on individual species.

TR 1.2 Closer spacing may be evaluated for smaller tree species.

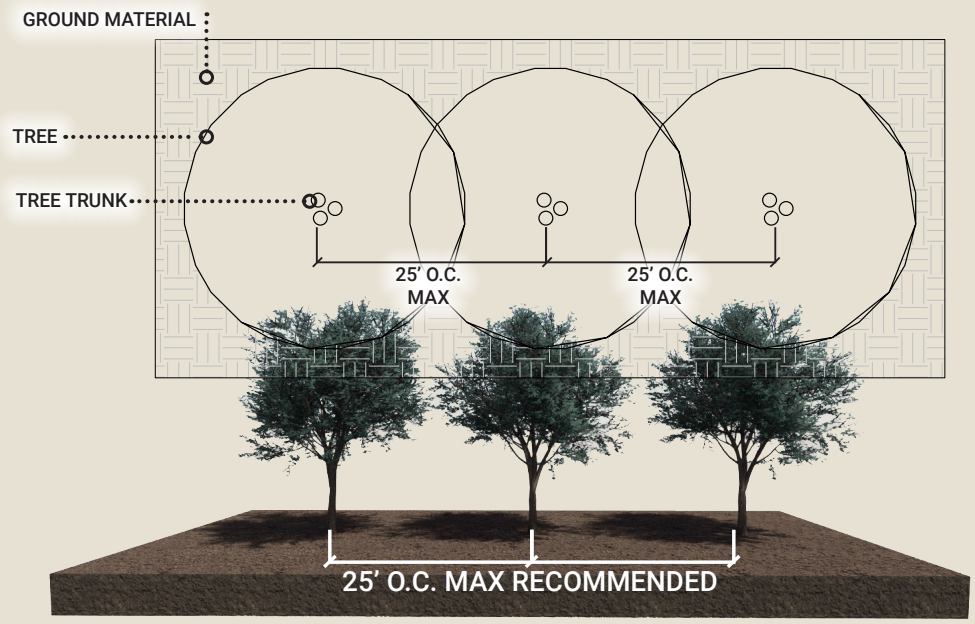


Figure 1-1. Guideline TR1.1.

TR 2 Prevent damage to structures and allow for healthy root and canopy development.

TR 2.1 10’ minimum measured from building/structure to a tree trunk is recommended.

TR 2.2 5’ minimum may be appropriate for smaller trees with non-invasive root systems. Refer to the Tree Lists and Tree Guides beginning on page 38.

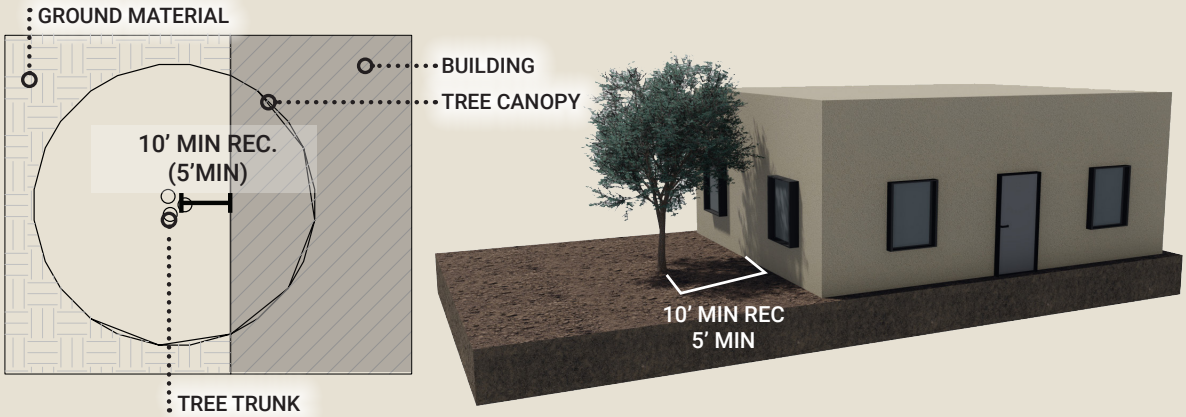


Figure 1-2. Guidelines TR 2.1 and TR 2.2.

TR 3 Minimize heat retention and reduce the risk of root conflicts with nearby hardscape.

TR 3.1 5’ minimum measured from hardscape to trunk is recommended.

TR 3.2 3.5’ minimum may be acceptable for smaller trees with non-invasive root systems.

TR 3.3 Provide a minimum of 50% shade coverage over hardscape surfaces through a combination of trees at maturity and shade structures.

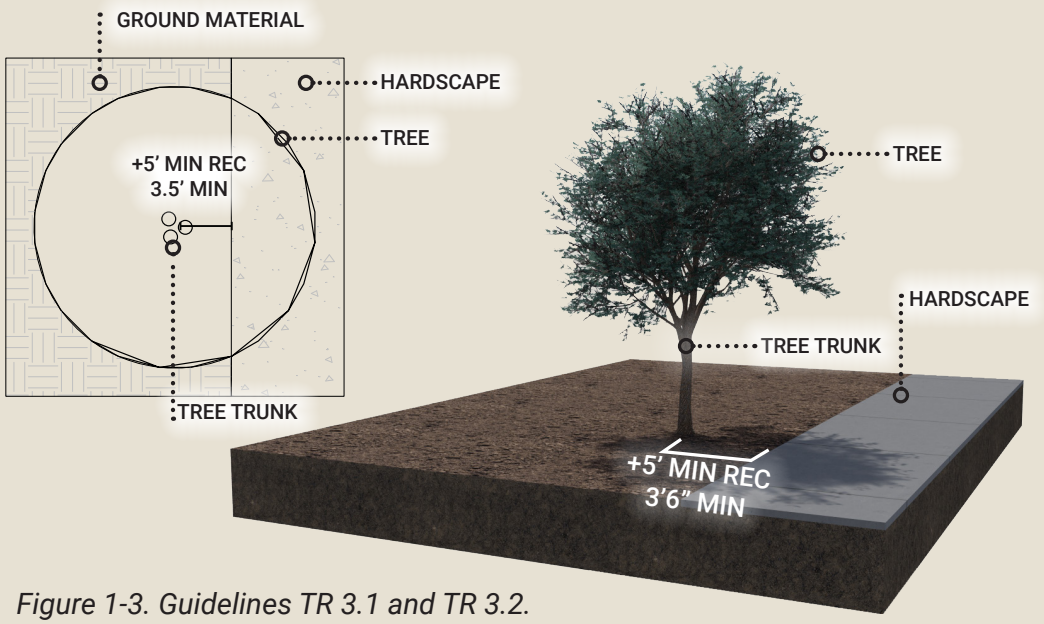


Figure 1-3. Guidelines TR 3.1 and TR 3.2.

TR 4 Maintain safe sightlines and unobstructed movement.

TR 4.1 8’ minimum vertical clearance from a pedestrian facility (sidewalks, paths, etc.) is recommended at maturity.

TR 4.2 13.5’ minimum vertical clearance from drivelanes is recommended.

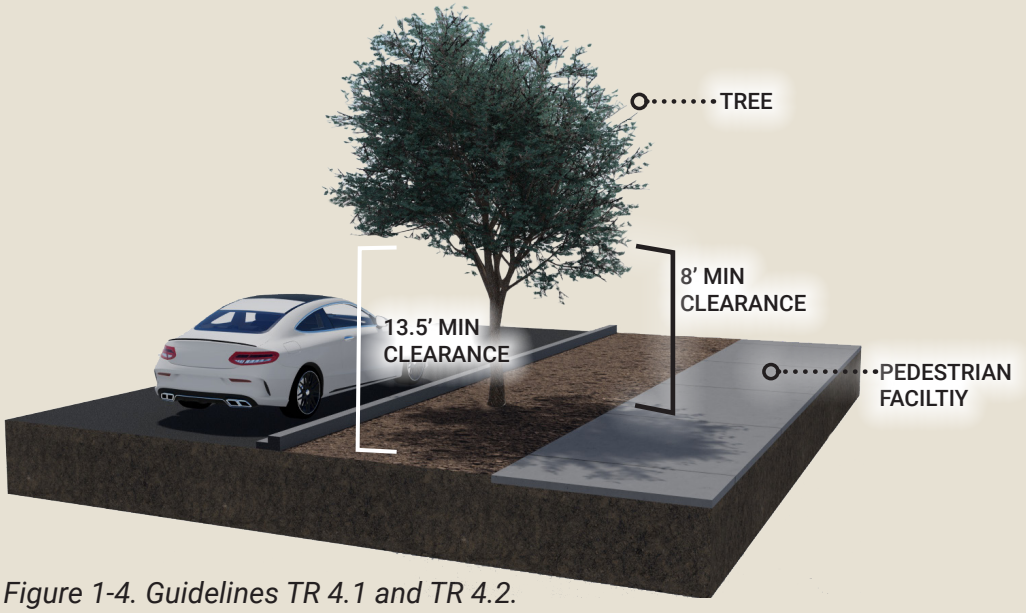


Figure 1-4. Guidelines TR 4.1 and TR 4.2.

TR 5 Avoid conflicts with buildings, power lines, underground utilities, drainage systems, and other infrastructure.

TR 5.1 Consult utility providers to avoid conflicts. Call 811 prior to digging.

TR 5.2 Use trees with limited invasive roots (Refer to the Tree Lists and Tree Guides beginning on page 38).

TR 5.3 Root barriers may be utilized for added underground protection.

TR 5.4 The trunk of a tree should be a minimum of 7' from underground utilities.

TR 5.5 In areas where trees may not be feasible, evaluate the practical use of shade structures.

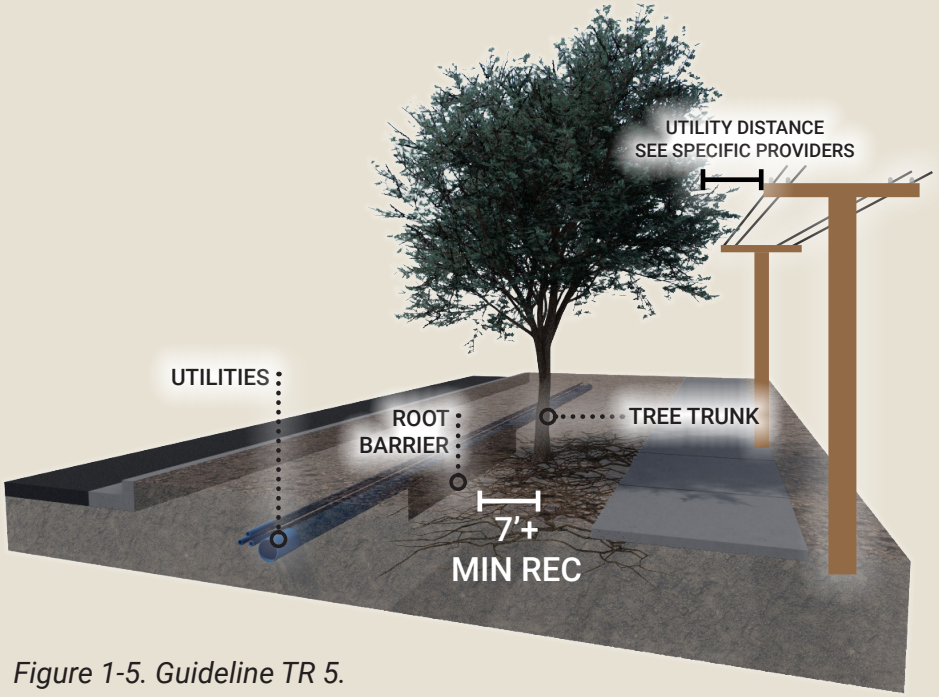


Figure 1-5. Guideline TR 5.

TR 6 Prioritize tree placement to provide shade in pedestrian areas.

TR 6.1 Locate trees so mature canopy provides shade along pedestrian routes and connections, including sidewalks, paths, crossings, and primary and secondary building entries.

TR 6.2 Locate trees so mature canopy provides shade where people gather or wait, including seating areas, plazas, playground edges, transit stops, and community facilities.

TR 6.3 Locate trees, or groupings of trees, to minimize large unshaded gaps along pedestrian routes and gathering areas.

TR 6.4 Avoid placing higher-allergen tree species adjacent to seating areas, entries, and other gathering or waiting areas with sustained pedestrian activity.

SOIL VOLUME & QUALITY

Ensure adequate soil volume and quality to support tree growth, health and longevity.

Limited soil volume restricts root expansion, resulting in stunted growth and diminished vitality—a condition often described as "bonsai-ing." Trees under chronic stress are more susceptible to pests and diseases, increasing the need for maintenance and replacement. In urban environments, where soil is frequently compacted or constrained by pavement and structures, providing adequate soil volume is essential to support healthy, mature tree development.

Figure 1-6. illustrates how soil volume directly influences tree size and canopy potential. Trees planted in approximately 120 cubic feet of soil remain substantially smaller than those provided with 500 or 1,000 cubic feet, where they can achieve their full growth potential and contribute meaningful shade.

Additional soil-related considerations, including soil quality, compaction and planting practices, are addressed in the following guidelines.

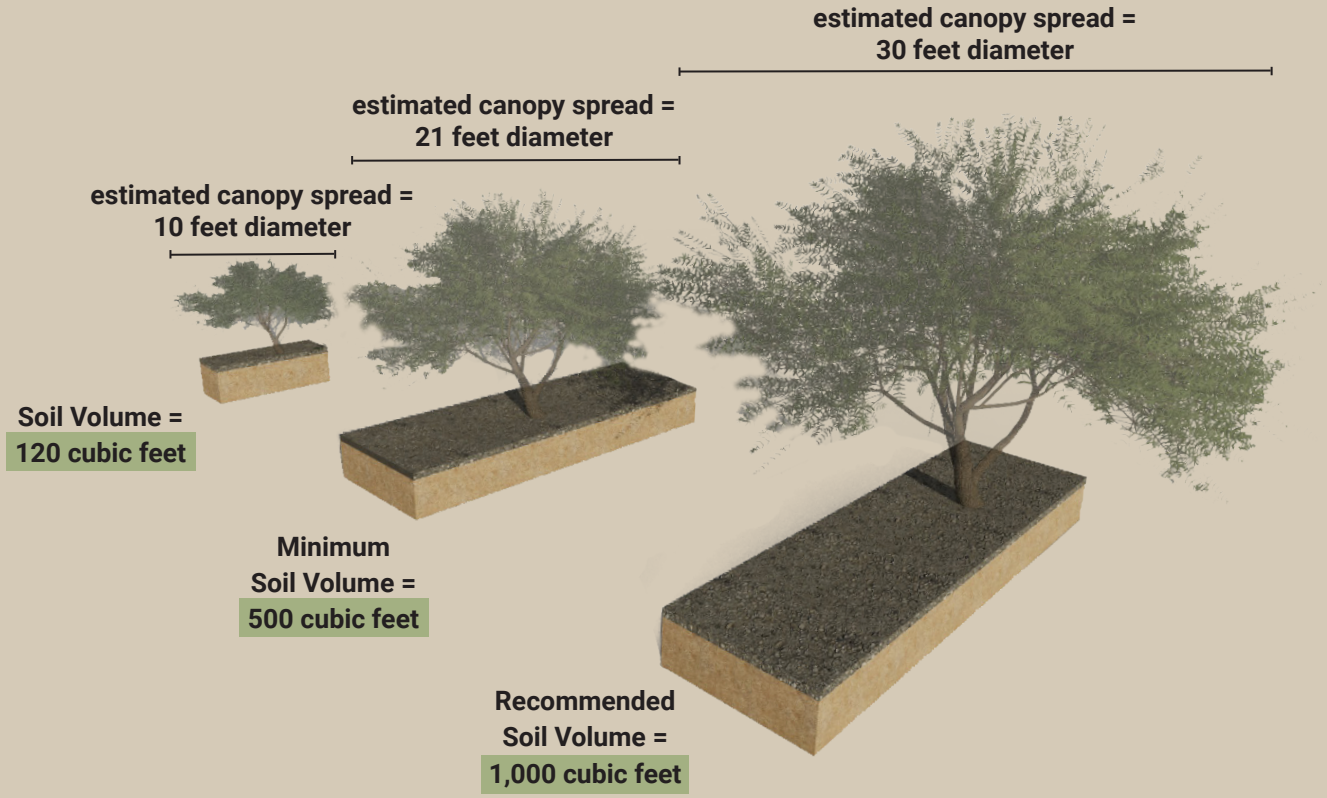


Figure 1-6. Diagram illustrating the relationship between soil volume and canopy potential.

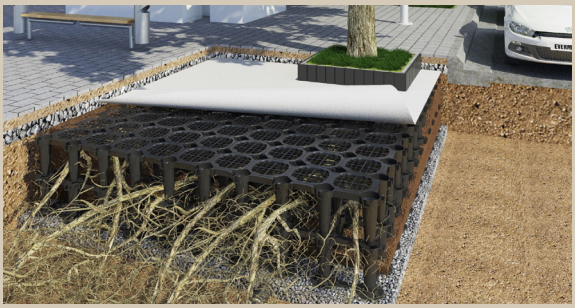
TR 7 Provide adequate soil volume in paved or compacted areas to support tree canopy and root growth.

TR 7.1 Provide a minimum of 500 cubic feet (CF) with a recommended 1,000 CF of soil volume. Soil volume calculations should generally assume 3 feet of rootable soil depth unless otherwise justified by the planting system. See Figures 1-6 and 1-7.

TR 7.2 Suspended pavement may be utilized in hardscaped areas or areas where 1,000 CF of soil volume cannot be achieved.

TR 7.3 When planting trees near hardscapes, use structural soil or suspended pavement to allow roots to grow beneath pavements while preventing soil compaction.

TR 7.4 Incorporate permeable paving or larger planting pits to increase available soil volume.



SUSPENDED PAVEMENT: SOIL CELLS

In hardscaped areas, soil cells provide uncompacted, nutrient-rich soil to support healthy tree root growth. These modular systems stabilize pavement while allowing roots to expand. Studies show trees in soil cells grow larger and healthier than those in compacted soils (EPA).

Figure 1-7. Description of soil cells.

TR 8 Prepare compacted soils when necessary to ensure healthy tree establishment.

TR 8.1 Amend compacted soils with organic matter or mulch to improve water retention and nutrient availability (around rootball only and not below to avoid sinking as the organics break down). Utilize suitable native soil where feasible.

TR 8.2 Use techniques like deep tilling, air spade, or soil fracturing to break up compacted layers and increase infiltration.

TR 8.3 Design passive water harvesting systems (e.g., bioswales, rain gardens) to integrate water flow into planting areas, reducing water stress and enhancing soil health (see Water Harvesting Guidelines, pages 59 - 75).

TREE DIVERSITY

Promote biodiversity to support healthier ecosystems and enhance visual variety.

TR 9 Prevent monocultures (plantings dominated by a single species or family) by providing a balanced mix of tree varieties.

TR 9.1 For roadway, civic, and large-scale private developments that may affect or alter the context area through landscape design, consider applying the 30/20/10 Rule, where no more than 30% of plants in a landscape plan belong to the same family, no more than 20% belong to the same genus, and no more than 10% belong to the same species.

Tree Diversity Benefits include:

- **Pest and Disease Resilience:** Diverse plantings reduce the risk of a single pest or disease wiping out large portions of the landscape.
- **Adaptability to Environmental Changes:** Mixed plantings are more likely to thrive under changing environmental conditions.
- **Ecosystem Support:** Biodiversity supports a wider range of pollinators, birds, and other wildlife, enhancing ecological health.
- **Aesthetic Appeal:** Varied plantings create more visually dynamic landscapes with seasonal interest, textures, and colors.

WHAT ARE FAMILY, GENUS & SPECIES?

Plants are classified by their family, genus and species, which group them based on shared characteristics.

Family

A group of plants that share broad characteristics about leaf shape, flower type, etc.
(All Mesquite are in the Fabaceae family)

Genus

Closely related trees within a family that share specific similarities, like growth habit or bark type
(Mesquite trees fall under the Genus 'Prosopis')

Species

The most specific level, referring to one exact type of tree
(Honey Mesquite species is '*glandulosa*')

Fabaceae Prosopis glandulosa **Example - Honey Mesquite**

Figure 1-8. Explanation of family, genus, and species classifications.

TREE SELECTION

Choose site-appropriate, desert-adaptive trees that support both project objectives and shade and water conservation goals.

TR 10 Tree selection should support shade and water conservation goals.

TR 10.1 Projects should utilize tree species included in the Tree Guides (pages 38 - 47); when alternatives are proposed, use ADWR's Low Water Use and Drought Tolerant Plant List to support water-efficient selection and confirm equivalent canopy potential.

TR 10.2 Trees should be selected based on site-specific conditions and species attributes.

TR 10.3 In areas with special operational constraints (for example, the Scottsdale Airpark), select tree species compatible with the setting and coordinate with the appropriate stakeholders or City departments.

TR 10.4 In areas with sustained pedestrian activity (for example, schools, playgrounds, and community facilities), tree selection should consider pollen and allergen potential.

Choose site-appropriate, desert-adaptive trees.

SITE-SPECIFIC TREE LISTS

These lists recommend tree species based on location; however, final tree selection should account for site-specific environmental conditions and constraints. The lists are intended as guidance, and no guarantees are implied regarding performance at any individual site.

Near Building

- Anacacho Orchid
- Texas Mountain Laurel
- Palo Blanco
- Mulga
- **Desert Willow** ☀
- Mexican Bird of Paradise
- Fruitless Olive
- **Palo Verde** ☀
- **Ironwood** ☀
- Texas Ebony
- Sweet Acacia
- Chinese Elm
- Ghost Gum

Parking lots

- **Mesquite** ☀
- Mulga
- Mexican Bird of Paradise
- Texas Ebony
- Chinese Pistache
- Fruitless Olive
- **Desert Willow** ☀
- Live Oak
- **Palo Verde** (Edge) ☀
- Palo Blanco

☀ **Appropriate for Environmentally Sensitive Lands (ESL)**

Street - Back of Curb

- Mulga
- Chinese Pistache
- **Desert Willow** ☀
- Palo Blanco
- Ghost Gum

Street - Back of Sidewalk

- **Desert Willow** ☀
- **Palo Verde** ☀
- **Mesquite** ☀
- Mexican Bird of Paradise

Street - Median (6'-12' Wide)

- Mulga
- **Desert Willow** ☀
- Cascalote
- Date Palm

Street - Median (12'-20' Wide)

- Date Palm
- Fruitless Olive
- Willow Acacia
- Cascalote
- Mulga
- Mexican Bird of Paradise
- **Desert Willow** ☀
- Chaste Tree
- Featherbush
- Texas Mountain Laurel
- Mastic Tree
- Anacacho Orchid

Path/Sidewalks

- Chinese Pistache
- Mulga
- **Desert Willow** ☀
- Ghost Gum
- Shoestring Acacia
- Willow Acacia
- Chinese Elm
- **Mesquite** ☀
- Sweet Acacia

TREE GUIDES

Tree Guides feature recommended species and are intended to be used in conjunction with the subsequent design scenarios to assist in selecting the right tree species for a project.

- **Tree Name (Botanical and Common):** Identifies the species by both common and scientific names for accurate selection.
- **Size & Growth:** Indicates the mature height and width (h x w) and growth rate (Slow, Moderate, Fast).
- **Shade Type:** Defines the kind of shade the tree provides (High, Medium, or Dappled).
- **Water Needs:** Helps in selecting trees based on irrigation requirements (Low, Lower, Lowest).
- **Litter:** Assesses the level of maintenance required for fallen debris (Low, Medium, High).
- **Pool-friendly (Root Damage Potential):** Highlights the likelihood of roots causing issues with pools, sidewalks, utilities, or nearby structures.

Photo of tree

Appropriate for Environmentally Sensitive Lands (ESL)

Scientific name

MEXICAN BIRD OF PARADISE

Caesalpinia mexicana

Ⓑ	Size(h x w)	10’ x 10’
	Growth Rate	fast
	Shade Type	medium
	Deciduous	no, evergreen
	Flower	yes, summer
	Fruit	no
	Water	lower
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	8’ O.C.
Ⓐ	Min Sidewalk Dist.	4’
Ⓐ	Min Street Dist.	8’
Ⓓ	Min Building Dist.	4’
	Parking Lot	no
	Allergenic	non-allergenic

Common name

Water usage

Low

Lower

Lowest

Letters correspond to callouts in Design Scenarios (pages 89 - 98)

Color corresponds to tree size

Small trees

Medium trees

Large trees

Figure 1-9. Explanation of Tree Guide elements.

Small Trees

- Small trees grow up to 25’ tall, ideal for areas with size limits or close to buildings and infrastructure.
- Well suited to residential yards, patios, courtyards, driveways, walkways, neighborhood streets, and areas near utility lines.
- Provide filtered shade, color, and habitat without overpowering smaller spaces or creating excessive debris.

MULGA

Acacia aneura

Ⓑ	Size(h x w)	20’ x 15’
	Growth Rate	moderate
	Shade Type	dappled
	Deciduous	no, evergreen
	Flower	subtle
	Fruit	no
	Water	lower
	Litter	low
	Thorns	no
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	12’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	5’
Ⓓ	Min Building Dist.	5’
	Parking Lot	yes
	Allergen	non-allergenic

ANACACHO ORCHID

Bauhinia lunarioides

Ⓑ	Size(h x w)	10’ x 10’
	Growth Rate	moderate
	Shade Type	dappled
	Deciduous	yes, semi-evergreen
	Flower	yes, spring/summer
	Fruit	no
	Water	lower
	Litter	low
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	6’ O.C.
Ⓐ	Min Sidewalk Dist.	6’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	5’
	Parking Lot	no
	Allergen	non-allergenic

TEXAS MOUNTAIN LAUREL

Dermatophyllum secundiflorum

Ⓑ	Size(h x w)	15’ x 15’
	Growth Rate	slow
	Shade Type	dappled
	Deciduous	no, evergreen
	Flower	yes, spring
	Fruit	yes
	Water	lower
	Litter	medium
	Thorns	no
	Poisonous	yes, seedpods
	Pool-friendly	yes
Ⓒ	Distance Apart	8’ O.C.
Ⓐ	Min Sidewalk Dist.	4’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	6’
	Parking Lot	no
	Allergen	non-allergenic

MEXICAN BIRD OF PARADISE

Caesalpinia mexicana

Ⓑ	Size(h x w)	10’ x 10’
	Growth Rate	fast
	Shade Type	medium
	Deciduous	no, evergreen
	Flower	yes, summer
	Fruit	no
	Water	lower
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	8’ O.C.
Ⓐ	Min Sidewalk Dist.	4’
Ⓐ	Min Street Dist.	8’
Ⓓ	Min Building Dist.	4’
	Parking Lot	no
	Allergen	non-allergenic

DESERT WILLOW*

*Seedless Varieties

Chilopsis linearis

Ⓑ	Size(h x w)	25’ x 20’
	Growth Rate	fast
	Shade Type	dappled
	Deciduous	yes
	Flower	yes, spring/fall
	Fruit	no
	Water	lowest
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	15’ O.C.
Ⓐ	Min Sidewalk Dist.	6’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	non-allergenic

CASCALOTE

Caesalpinia cacalaco

Ⓑ	Size(h x w)	15’x15’
	Growth Rate	slow
	Shade Type	moderate
	Deciduous	yes, semi-evergreen
	Flower	yes, winter/spring
	Fruit	no
	Water	lower
	Litter	low
	Thorns	yes
	Poisonous	yes
	Pool-friendly	no
Ⓒ	Distance Apart	20’ O.C.
Ⓐ	Min Sidewalk Dist.	7’
Ⓐ	Min Street Dist.	5’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	non-allergenic

FEATHER BUSH

Lysiloma watsonii

Ⓑ	Size(h x w)	15’ x 15’
	Growth Rate	moderate
	Shade Type	moderate
	Deciduous	no, evergreen
	Flower	yes, spring/summer
	Fruit	no
	Water	lower
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	15’ O.C.
Ⓐ	Min Sidewalk Dist.	6’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	non-allergenic

MASTIC

Pistacia lentiscus

Ⓑ	Size(h x w)	15’ x 20’
	Growth Rate	slow
	Shade Type	high
	Deciduous	no, evergreen
	Flower	yes, spring
	Fruit	no
	Water	lower
	Litter	low
	Thorns	no
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	10’ O.C.
Ⓐ	Min Sidewalk Dist.	6’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	8’
	Parking Lot	yes
	Allergen	non-allergenic

CHASTE TREE

Vitex agnus-castus

Ⓑ	Size(h x w)	15’ x 15’
	Growth Rate	slow
	Shade Type	high
	Deciduous	yes
	Flower	yes, spring/summer
	Fruit	no
	Water	lower
	Litter	medium
	Thorns	yes
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	10 O.C.
Ⓐ	Min Sidewalk Dist.	6’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	5’
	Parking Lot	yes
	Allergen	non-allergenic

PALO BLANCO

Mariosousa willardiana

Ⓑ	Size(h x w)	20’ x 10’
	Growth Rate	slow
	Shade Type	dappled
	Deciduous	yes, semi-evergreen
	Flower	yes, spring
	Fruit	no
	Water	lowest
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	10’ O.C.
Ⓐ	Min Sidewalk Dist.	6’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	5’
	Parking Lot	yes
	Allergen	non-allergenic

Medium Trees

- Medium trees grow 25’ – 40’ tall and are highly versatile in streetscapes and neighborhoods.
- Ideal for sidewalks, medians, parking areas, and residential yards, offering shade for pedestrians, vehicles, and outdoor spaces.
- Can be planted near streets or buildings with careful attention to root space, canopy spread, and maintenance needs.

SWEET ACACIA

Acacia farnesiana

Ⓑ	Size(h x w)	30’ x 30’
	Growth Rate	moderate
	Shade Type	medium
	Deciduous	no, evergreen
	Flower	yes
	Fruit	no
	Water	lower
	Litter	high
	Thorns	yes
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	24’ O.C.
Ⓐ	Min Sidewalk Dist.	7’
Ⓐ	Min Street Dist.	5’
Ⓓ	Min Building Dist.	8’
	Parking Lot	yes
	Allergen	allergenic, seasonal

CHINESE PISTACHE

Pistacia chinensis

Ⓑ	Size(h x w)	30’ x 25’
	Growth Rate	moderate
	Shade Type	medium
	Deciduous	yes, semi-evergreen
	Flower	yes, fall color change
	Fruit	yes, female species
	Water	lower
	Litter	low
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	20’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	5’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	non-allergenic

FRUITLESS OLIVE

Olea europea ‘Wilsonii’

Ⓑ	Size(h x w)	25’ x 25’
	Growth Rate	slow
	Shade Type	medium
	Deciduous	no,evergreen
	Flower	yes, spring
	Fruit	no
	Water	lower
	Litter	low
	Thorns	no
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	20’ O.C.
Ⓐ	Min Sidewalk Dist.	6’
Ⓐ	Min Street Dist.	8’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	allergenic, low pollen

IRONWOOD

Olneya tesota

Ⓑ	Size(h x w)	25’ x 25’
	Growth Rate	slow
	Shade Type	medium
	Deciduous	no, evergreen
	Flower	yes, spring
	Fruit	no
	Water	lowest
	Litter	low
	Thorns	yes
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	20’ O.C.
Ⓐ	Min Sidewalk Dist.	7’
Ⓐ	Min Street Dist.	5’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	non-allergenic

TEXAS EBONY

Ebenopsis ebano

Ⓑ	Size(h x w)	20’ x 15’
	Growth Rate	slow
	Shade Type	high
	Deciduous	no, evergreen
	Flower	yes, spring/summer
	Fruit	no
	Water	lower
	Litter	medium
	Thorns	yes
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	10 O.C.
Ⓐ	Min Sidewalk Dist.	6’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	8’
	Parking Lot	yes
	Allergen	non-allergenic

COOLIBAH

Eucalyptus microtheca

Ⓑ	Size(h x w)	35’ x 25’
	Growth Rate	fast
	Shade Type	high
	Deciduous	no, evergreen
	Flower	yes, spring/summer
	Fruit	no
	Water	lower
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	24’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	5’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	non-allergenic

DATE PALM

Phoenix dactylifera

Ⓑ	Size(h x w)	80’ x 20’
	Growth Rate	slow
	Shade Type	dappled
	Deciduous	no, evergreen
	Flower	no
	Fruit	yes
	Water	low
	Litter	medium
	Thorns	yes, base of frond
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	16’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	8’
Ⓓ	Min Building Dist.	5’
	Parking Lot	no
	Allergen	non-allergenic

PALO VERDE

Parkinsonia spp.

Ⓑ	Size(h x w)	25’ x 25’
	Growth Rate	moderate
	Shade Type	dappled
	Deciduous	yes
	Flower	yes, spring
	Fruit	no
	Water	lowest
	Litter	high
	Thorns	yes
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	20’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	8’
	Parking Lot	yes
	Allergen	non-allergenic

MESQUITE

Neltuma Spp. [formerly Prosospis spp.]

Ⓑ	Size(h x w)	30’ x 30’
	Growth Rate	moderate
	Shade Type	medium
	Deciduous	yes, semi-evergreen
	Flower	subtle
	Fruit	no
	Water	lowest
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	24’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	allergenic, seasonal

MESQUITE (SEEDLESS)

Neltuma seedless hybrid [formerly Prosopis spp.]

Ⓑ	Size(h x w)	30’ x 30’
	Growth Rate	moderate
	Shade Type	medium
	Deciduous	yes, semi-evergreen
	Flower	subtle
	Fruit	no
	Water	lowest
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	24’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	6’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	allergenic, seasonal

Large Trees

- Large trees grow over 40’ tall and play a key role in expanding citywide canopy and cooling.
- Best for large residential lots, parks, open spaces, and wide rights-of-way, where they can provide deep shade, reduce heat, and support biodiversity.
- Must be carefully sited to avoid conflicts with buildings, sidewalks, and overhead or underground utilities.

LIVE OAK

Quercus virginiana

Ⓑ	Size(h x w)	40’ x 50’
	Growth Rate	slow
	Shade Type	high
	Deciduous	yes, semi-evergreen
	Flower	no
	Fruit	yes, nut
	Water	lower
	Litter	low
	Thorns	no
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	24’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	5’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	allergenic, seasonal

CHINESE ELM

Ulmus parvifolia

Ⓑ	Size(h x w)	45’ x 45’
	Growth Rate	fast
	Shade Type	medium
	Deciduous	yes, semi-evergreen
	Flower	no
	Fruit	yes, poison
	Water	low
	Litter	medium
	Thorns	no
	Poisonous	yes, berries
	Pool-friendly	no
Ⓒ	Distance Apart	24’ O.C.
Ⓐ	Min Sidewalk Dist.	5’
Ⓐ	Min Street Dist.	5’
Ⓓ	Min Building Dist.	10’
	Parking Lot	yes
	Allergen	non-allergenic

GHOST GUM

Corymbia aparrerinja [formerly Eucalyptus papuana]

Ⓑ	Size(hxw	40’ x 25’
	Growth Rate	fast
	Shade Type	medium
	Deciduous	no, evergreen
	Flower	no
	Fruit	no
	Water	lower
	Litter	medium
	Thorns	no
	Poisonous	semi
	Pool-friendly	no
Ⓒ	Distance Apart	20’ O.C.
Ⓐ	Min Sidewalk Dist.	4’
Ⓐ	Min Street Dist.	4’
Ⓓ	Min Building Dist.	4’
	Parking Lot	yes
	Allergen	non-allergenic

SHOE STRING ACACIA

Acacia stenophylla

Ⓑ	Size(h x w)	40′ x 30′
	Growth Rate	fast
	Shade Type	high
	Deciduous	no, evergreen
	Flower	yes, fall/
	Fruit	winter
	Water	no
	Litter	low
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	24′ O.C.
Ⓐ	Min Sidewalk Dist.	5′
Ⓐ	Min Street Dist.	5′
Ⓓ	Min Building Dist.	8′
	Parking Lot	yes
	Allergen	non-allergenic

WILLOW ACACIA

Acacia salicina

Ⓑ	Size(h x w)	40′ x 30′
	Growth Rate	fast
	Shade Type	medium
	Deciduous	no, evergreen
	Flower	yes
	Fruit	no
	Water	lower
	Litter	high
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	24′ O.C.
Ⓐ	Min Sidewalk Dist.	5′
Ⓐ	Min Street Dist.	5′
Ⓓ	Min Building Dist.	10′
	Parking Lot	yes
	Allergen	non-allergenic

TIPU

Tipuana tipu

Ⓑ	Size(h x w)	35′ x 50′
	Growth Rate	fast
	Shade Type	high
	Deciduous	yes, semi-evergreen
	Flower	yes, summer
	Fruit	yes
	Water	low
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	no
Ⓒ	Distance Apart	30′ O.C.
Ⓐ	Min Sidewalk Dist.	6′
Ⓐ	Min Street Dist.	6′
Ⓓ	Min Building Dist.	15′
	Parking Lot	no
	Allergen	allergenic, seasonal

TREE STAKING

Stake trees properly to provide stability during early growth while the root system establishes.

TR 11 Implement proper staking techniques at planting to support tree growth and health according to Maricopa Association of Governments (MAG) Uniform Standard Details for Public Works Construction.

TR 11.1 When planting, maintain the root flare above finished grade (soil level) to ensure the tree gets enough oxygen and has proper drainage (Figure 1-10).

TR 11.2 Remove nursery stakes promptly, unless otherwise specified, to prevent restriction of trunk growth and encourage natural movement.

TR 11.3 For small to medium-sized trees in moderate wind conditions, use two stakes placed on opposite sides of the tree (Figure 1-11. MAG Detail 601-1).

TR 11.4 For tall, heavy, or wind-sensitive trees, use three stakes evenly spaced around the tree (Figure 1-12. MAG Detail 601-3).

TR 11.5 Position stakes outside the root ball to avoid root damage.

TR 11.6 Use soft, flexible tree ties to prevent girdling (when the tie cuts into the tree).

TR 11.7 Use stakes and guy lines (typically cable, cord, or rope) to provide stability and support while allowing the tree to sway naturally in the wind.

TR 11.8 Remove stakes as soon as the tree can stand upright and withstand normal wind conditions.

Planting Depth to Maintain Root Flare

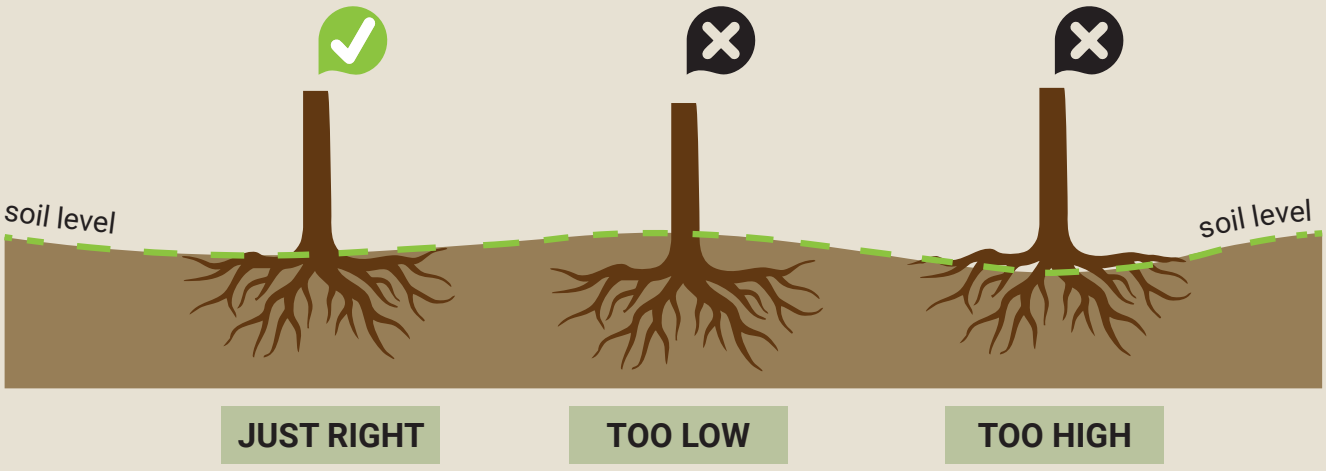


Figure 1-10. Depictions of possible root flare scenarios.

Figure 1-11. Double Stake Tree (MAG Detail 601-1)

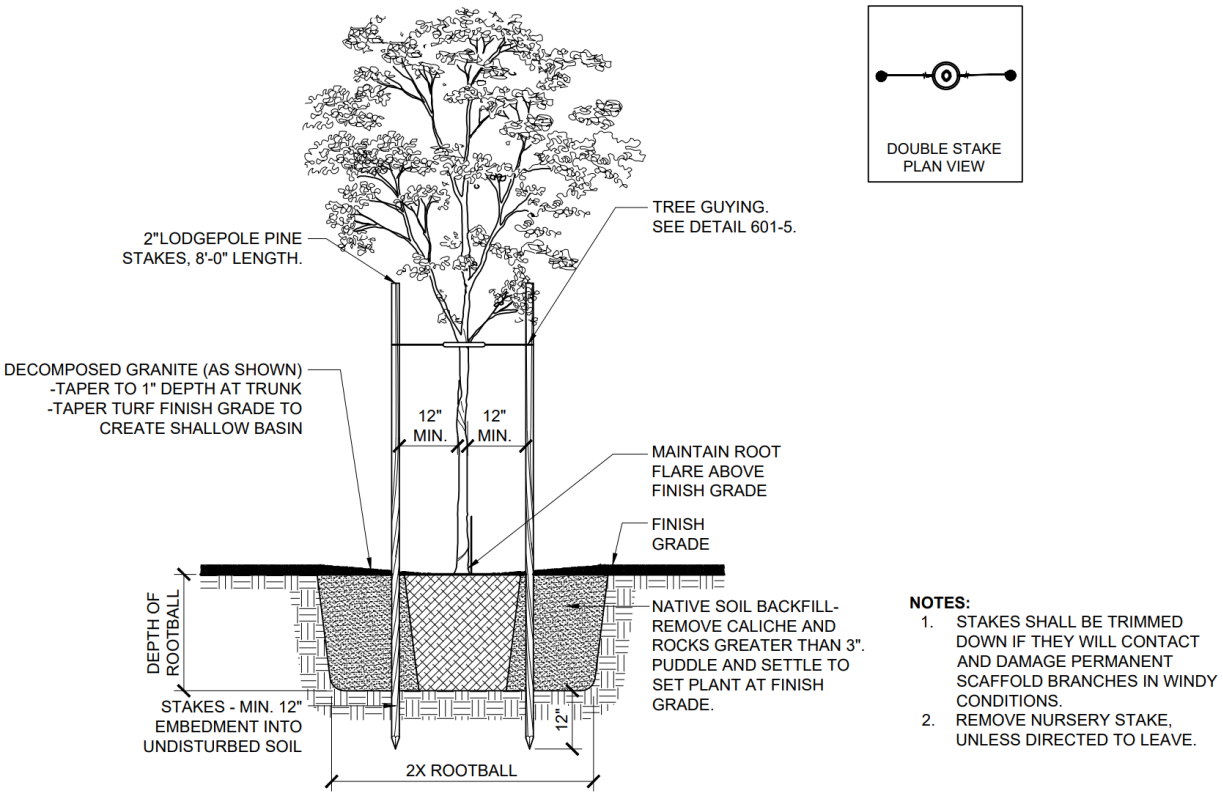


Figure 1-12. Triple Stake Tree (MAG Detail 601-3)

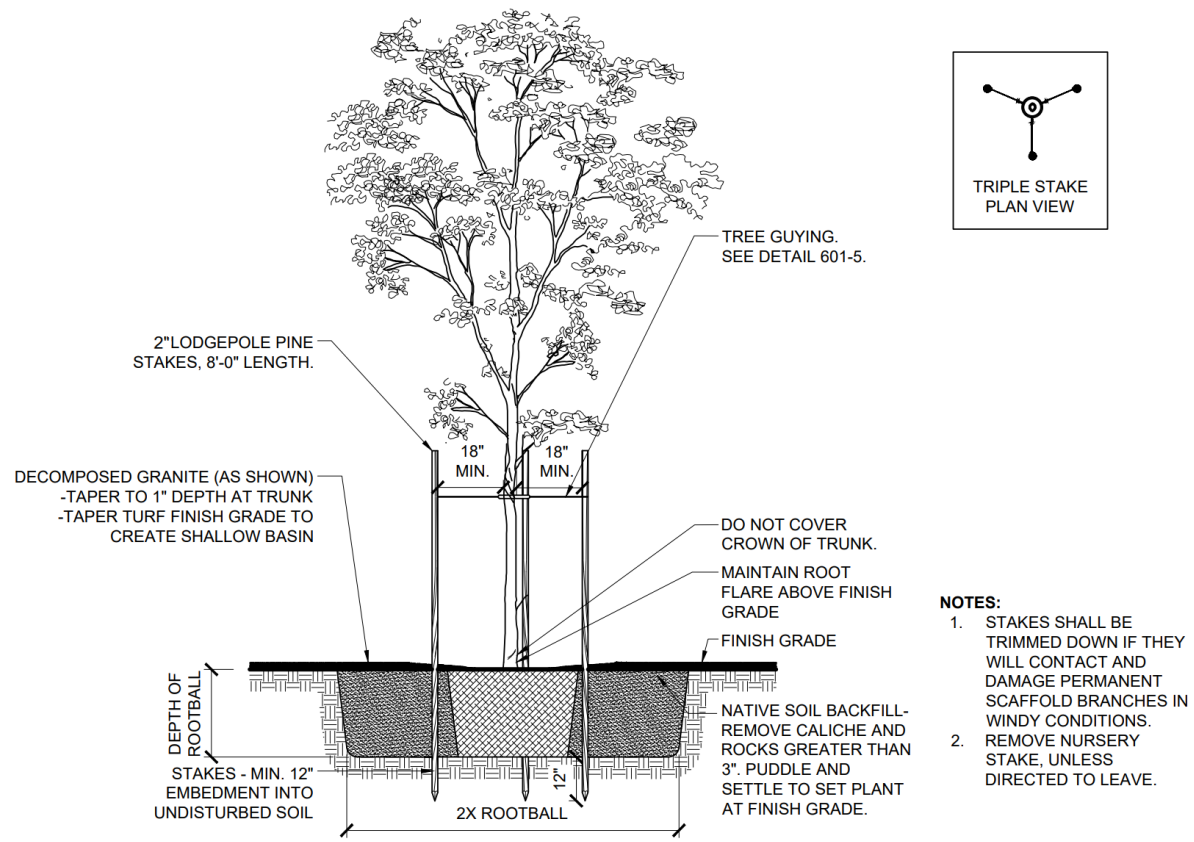
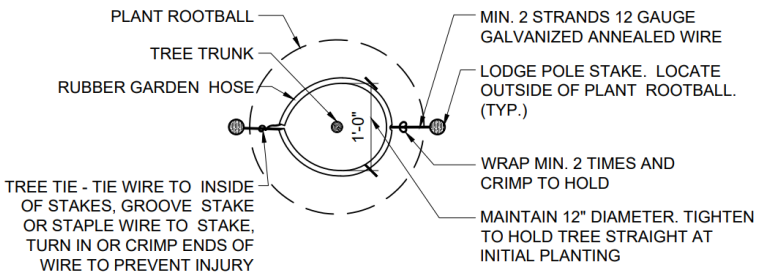
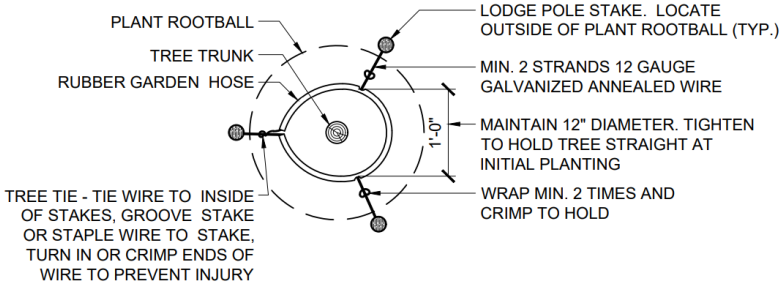


Figure 1-13. Tree Staking and Guying for Single Trunks (MAG Detail 601-5)



TREE STAKING PLAN - DOUBLE



TREE STAKING PLAN - TRIPLE

Proper Staking Timeline

First 6-12 Months - Initial Stabilization:

- Use stakes to stabilize the tree until the root system is established.
- For most trees, 6-12 months is sufficient to provide the necessary support.

After 6 Months - Tree Health Check:

- Inspect the stakes and ties regularly to ensure they are not causing bark damage or girdling the tree.
- Gently wiggle the tree. If it stands upright without excessive movement, the stakes may no longer be needed.

Up to 2 Years - Extended Staking:

- For trees in windy areas or with weak root systems, stakes may remain necessary for up to 2 years.
- Adjust ties as the tree grows to prevent girdling and ensure proper support.

EFFICIENT WATERING STRATEGIES

Apply watering strategies that match species needs, site conditions, and seasonal variability to optimize resources and support long-term tree health.

TR 12 Implement efficient irrigation practices to ensure trees receive adequate water without unnecessary waste.

TR 12.1 Account for species-specific water needs and soil types when planning irrigation.

TR 12.2 Use drip irrigation and deep root watering methods to deliver water directly to the root zone, minimize evaporation and reduce runoff.

TR 12.3 Position emitters or deep root watering devices at the drip line, the outer edge of the tree canopy where active roots are concentrated.

TR 12.4 Adjust emitter placement outward as trees mature to promote expanding root systems and healthier trees.

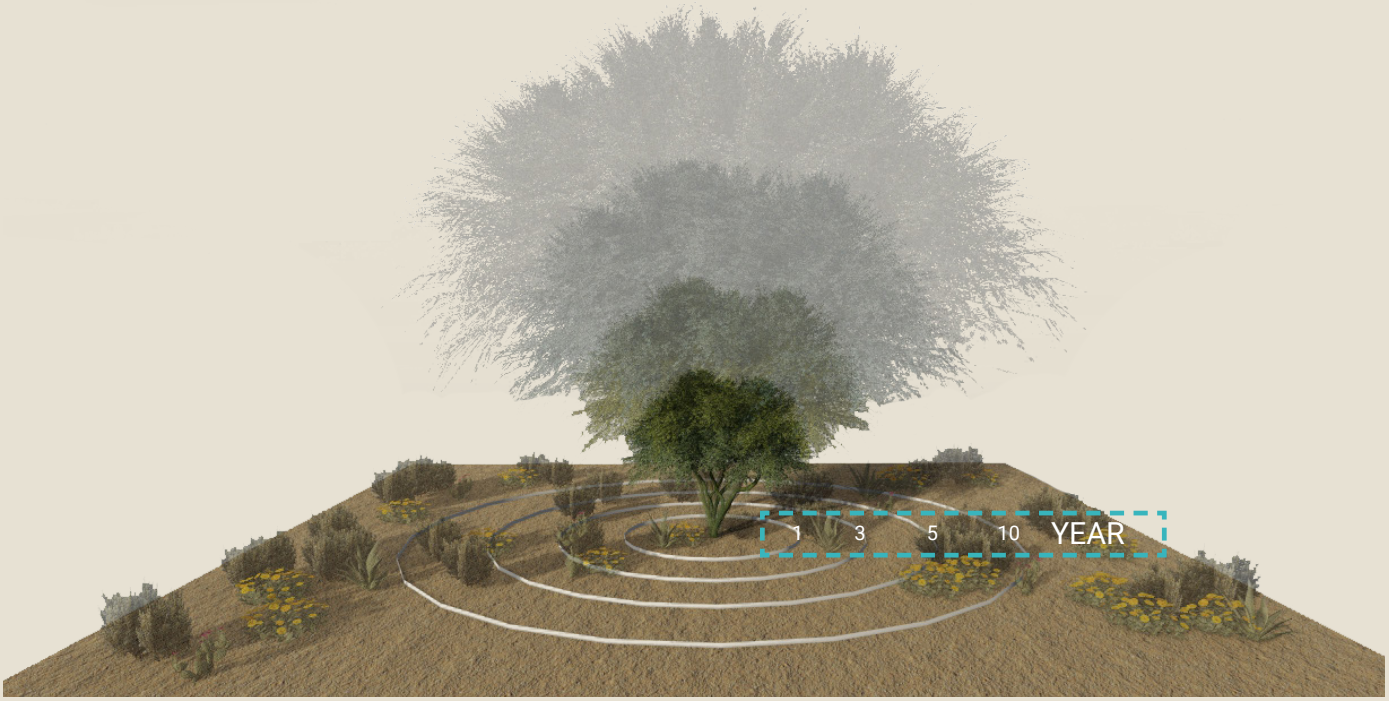


Figure 1-14. Diagram illustrating the placement of emitters over time as a tree matures (Guideline TR 12.4).

TR 13 Utilize smart irrigation controllers to automate watering schedules.

TR 13.1 Adjust watering frequency based on tree age.

TR 13.2 Adjust watering frequency based on weather and seasonal conditions.

Tree Irrigation Basics

YOUNG TREES

Young trees have small, shallow root systems and dry out quickly. They need more frequent, focused watering at the root zone to support establishment. The goal is to keep soil consistently moist—but not waterlogged—to promote strong root growth and canopy expansion.

MATURE TREES

Mature trees have larger, deeper root systems and can access moisture from a wider area. They typically need less frequent, deeper watering and can tolerate short dry periods. However, they may still need supplemental irrigation during extended heat or drought. Watering decisions for older trees should be based on soil moisture, seasonal climate, and species needs. Overwatering can compromise tree limbs.

Table 1-1. Recommended Irrigation Minimums

GROWTH STAGE	TREE AGE (YEARS)	WATERING FREQUENCY (DAYS)
Establishment	1	Every 4-10 Days
Young Tree	2-3	Every 14-21 Days
Maturing Tree	3-5	Every 21-30 Days
Mature Tree	5+	Once Every 30-45 Days (or after significant dry periods)

Spring

- Begin deep watering as trees emerge from dormancy and start active growth.
- Monitor rainfall; supplemental irrigation may still be necessary if the weather is dry.
- Focus on moisture levels for specific species to encourage new root development.

Summer

- Increase watering frequency due to higher temperatures and evapotranspiration.
- Water deeply and early in the morning to reduce evaporation and avoid disease.
- Mulch under the tree canopy can help to retain soil moisture and regulate temperature.

Wet Summer

- Water only if there are prolonged dry periods and high temperatures.
- Focus on maintaining minimal soil moisture to prevent root rot and other issues in many species.
- Avoid fertilizing & watering as it can overly accelerate weak growth; just ensure roots aren't drying out entirely.

Fall

- Fall can be hot here in the desert with continuing high tempatures from summer. Continue your summer watering as needed.
- Gradually reduce watering as temperatures cool, but don't stop too early.
- Deep watering in early fall helps trees store moisture for dormancy.

Winter

- Lessen your watering during wet winters & adjust for dry and warm weeks or extended spells.
- Avoid watering when soil is saturated.
- Protect young or newly planted trees with mulch to insulate roots from potential frosts.

TREE PRUNING & MAINTENANCE

Conduct pruning according to best practices to maintain tree health and reduce hazards.

This section outlines maintenance standards to support the long-term viability of Scottsdale's tree canopy. The pruning guidelines align with the American National Standards Institute (ANSI) A300 Pruning Standards and the International Society of Arboriculture (ISA) Best Management Practices: Tree Pruning. While these serve as a baseline, Scottsdale's guidelines are further optimized for the unique conditions of the Southwest, emphasizing shade optimization, tree longevity and resilience to the region's climate.

Benefits of Pruning

- **Health:** Removing diseased or insect-infested branches, thinning the crown to improve airflow, and eliminating crossing or rubbing branches all promote stronger and healthier trees.
- **Safety:** Pruning prevents potential hazards by removing weak or damaged branches that could fall and by maintaining clearance for streets, sidewalks, and signage.
- **Aesthetics:** Strategic pruning enhances natural form and character, contributing to Scottsdale's distinctive landscape identity.

Appropriate pruning maintains tree health and supports sense of place.

TR 14 Pruning and related maintenance decisions should be conducted in a manner that preserves tree health, protects public safety, and maintains functional clearance and natural form.

Pruning methods should support tree health.

TR 14.1 ISA-Certified Arborist supervision is recommended for pruning on City-owned property.

TR 14.2 Maintain required vertical clearances, including 8' minimum over sidewalks and 13.5' minimum over vehicular areas.

TR 14.3 Remove dead, diseased, broken, crossing, weakly attached, or hazardous branches to maintain safety and tree vitality.

TR 14.4 Avoid excessive summer pruning to prevent sunburn on newly exposed areas.

TR 14.5 Do not apply pruning sealants, which can trap bacteria and compromise health.

TR 14.6 Evaluate volunteer trees early and retain those that are healthy and appropriately located, or remove them when they are incompatible with the setting or likely to create conflicts with sightlines, pedestrian facilities, infrastructure, or drainage.

TR 14.7 Avoid the relocation or removal of mature trees except when the tree is dead, failing, or unsafe and cannot be mitigated, or when improvements cannot reasonably be designed around it.

TR 14.8 In Environmentally Sensitive Lands, maintain and prune trees in a manner that supports fire defensible space.

TR 15 Pruning should align with species characteristics, growth habits, and appropriate seasonal timing to support long-term structural integrity.

TR 15.1 Prune deciduous trees during winter dormancy to support vigorous spring growth.

TR 15.2 Prune desert trees selectively and periodically to maintain a natural form.

TR 15.3 Avoid practices that create unnatural or structurally weak forms.

TR 15.4 Prioritize structural development in young trees during the first 5–10 years after planting:

- TR 15.4.1 Retain lower branches for the first three years to promote trunk strength and caliper growth.
- TR 15.4.2 Encourage strong leader development (one leader for single-trunk trees; three to four leaders for multi-trunk specimens).
- TR 15.4.3 Remove branches with narrow or excessively wide attachment angles.
- TR 15.4.4 Reduce branch length only when necessary for clearance or to limit storm damage.

TR 16 Standardized pruning methods should be applied appropriately to address specific objectives while preserving tree structural stability and natural appearance.

TR 16.1 Crown Cleaning: Remove dead, diseased, broken, weak, or low-vigor branches; remove suckers and water sprouts as appropriate.

TR 16.2 Crown Raising: Remove lower branches to achieve required clearance for pedestrians, vehicles, structures, or signage; evaluate species tolerance and consider tree age.

TR 16.3 Crown Reduction: Reduce height and/or spread where trees conflict with structures or utilities.

TR 16.4 Crown Thinning: Selectively remove live branches to reduce crown density while maintaining a balanced, natural appearance.

TR 16.5 Weight Reduction: Reduce end-weight on long or heavy limbs to minimize the risk of limb or trunk failure.

TR 16.6 Crown Restoration: Restore form and structural integrity in trees damaged by topping, storms, or vandalism; multiple sessions may be required.

TR 16.7 Palm Pruning:

- TR 16.7.1 Trim annually between May 15 and June 15, prior to flowering.
- TR 16.7.2 Do not remove green fronds above the horizontal trunk line
- TR 16.7.3 Remove hazardous fronds, fruit, or loose petioles as needed.
- TR 16.7.4 Avoid cutting all fronds below a 45-degree angle and avoid creating carrot or pencil-pointed forms.

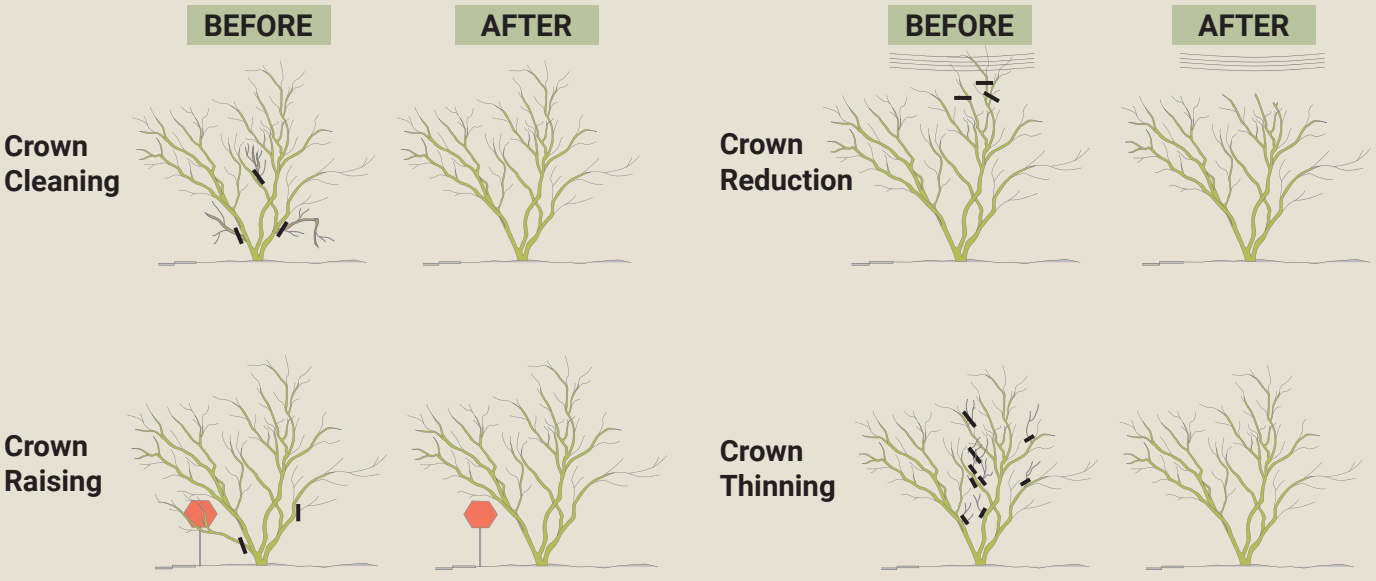


Figure 1-15. Graphic depicting before and after conditions for standardized pruning methods.

PRUNING BEST PRACTICES

Pruning Cuts

Proper pruning starts with using the right tools and making clean cuts that protect the tree.

- Use clean, sharp tools sized appropriately for each cut; disinfect between trees to reduce spread of disease.
- Use bypass hand pruners for cuts up to ¾ inch, loppers for branches up to 2 inches, and hand saws for branches up to 4 inches; use pruning saws for larger branches, cutting on the pull stroke.

Pruning should follow ANSI A300 and ANSI Z133.1 standards and ISA Best Management Practices: Tree Pruning, under the supervision of an ISA Certified Arborist.

THE 3 STEP PRUNING CUT

1. Cut one-third of the way through the branch on the underside.
2. Go 2-4 inches beyond the undercut to remove the branch.
3. Make the final cut just outside the branch bark ridge and trunk collar.

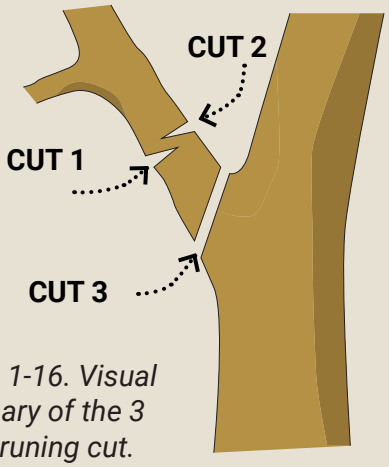


Figure 1-16. Visual summary of the 3 step pruning cut.

Harmful Practices to Avoid

Certain pruning methods cause long-term damage and should not be used on trees in Scottsdale.

- Improper cuts can cause bark ripping, decay, and long-term structural problems.
- Avoid tools or techniques that crush bark or damage the tree.
- Avoid the use of climbing spikes or spurs.
- Avoid flush cuts that remove the branch collar and injure stem tissue.
- Avoid stub cuts that leave long stubs, delay wound closure, and invite pests and disease.
- Avoid anvil-type pruners, which can cause tree damage rather than making clean cuts.
- Do not use topping (removing large upright branches between nodes) or tipping (cutting lateral branches between nodes to reduce length or crown width); these practices create weak sprouts and can kill branches back to the next lateral.
- Avoid poodling, balling, squaring, and lions tailing (removing most interior branches and leaving foliage only at the tips).
- Avoid removing more than about 25% of the live canopy during any single pruning.

WATER HARVESTING

Water conservation and efficiency are critical components to managing Scottsdale's water supply. Long-term drought and limited water resources are an ongoing challenge in our desert community. To balance economic growth with water needs, prioritizing landscape practices such as selecting low-water-use trees and plant material will help ensure long-term viability and a livable desert community. In that context, water harvesting is a foundational component of Scottsdale's approach to shade, comfort, and long-term landscape resilience. By treating stormwater as a resource, water harvesting expands the city's ability to sustain healthy trees, support vegetation, and cool the built environment. When paired with strategic planting and shade infrastructure, these systems strengthen Scottsdale's urban canopy and improve livability in both public and private spaces.

This section provides technical guidance and design direction for incorporating water harvesting and Green Stormwater Infrastructure (GSI) across Scottsdale. Passive systems—such as bioswales, rain gardens, curb cuts, and permeable surfaces—slow, capture, and infiltrate rainfall directly into the landscape, supporting root growth and reducing runoff. Active systems, including cisterns, collect excess stormwater for targeted reuse, reducing demand on potable water for irrigation in the process.

The Water Harvesting Guidelines establish a unified framework for designing, locating, and maintaining these systems so they function effectively in Scottsdale's desert conditions. The guidelines are intended to inform project planning and review, ensuring that new and retrofitted landscapes align with the city's broader shade and water capture goals.

Well-designed water harvesting systems strengthen the health and longevity of trees, expand rootable soil volume, and enhance the cooling performance of landscape and shade features. By integrating stormwater management with site planning, these guidelines support a greener, cooler, and more resilient Scottsdale.

Design and Implementation Framework

The Water Harvesting Guidelines outline expectations for stormwater capture, infiltration performance, and integration with site design, while allowing flexibility for context-sensitive and innovative solutions. Rather than prescribing a single approach, these guidelines establish a shared understanding of how effective water harvesting systems function across Scottsdale's varied urban environments.

Water harvesting works in tandem with the Trees and Shade Structure Guidelines, together forming the technical foundation of the Shade & Tree Plan. Passive systems provide natural infiltration that supports tree health and reduces runoff, while active systems offer opportunities to store and reuse water during dry periods. An integrated site design ensures stormwater reaches landscape areas where it can provide the greatest ecological and cooling benefits.

The Water Harvesting Guidelines provide detailed direction organized under three primary categories:

Location & Application ensures that water harvesting systems are integrated into site planning so runoff is routed into GSI features that maximize infiltration, support shade trees and pedestrian comfort, and reduce reliance on potable water for irrigation.

Stormwater Context & Performance sets expectations for capturing and managing runoff, matching designs to site drainage and infiltration conditions, and selecting from appropriate GSI practices to protect water quality and nearby infrastructure.

Maintenance & Longevity ensures that water-harvesting systems can be inspected, maintained, and adjusted over time so they continue to support shade and long-term performance.

Curb cut and bioswale.

Runoff vs. Infiltration

Low runoff, high infiltration

Permeable surfaces and GSI features slow stormwater down, spread it out, and soak it into the soil. This keeps water on-site to support trees, improve shade performance, and reduce demand on storm drains and potable water for irrigation.

High runoff, little to no infiltration

Large impervious areas shed most rainfall as fast-moving runoff. Water is quickly routed to pipes and outfalls instead of infiltrating, which limits soil moisture for trees, increases erosion potential, and misses an opportunity to cool the site.

Projects should aim to convert as much area as possible from high-runoff to high-infiltration conditions.

Gray Water

Scottsdale does not actively promote gray water systems, as wastewater from homes and businesses is already collected, treated, and reused through the City's reclamation program. Reclaimed water is used for landscape irrigation and regional partnerships, with additional supplies stored underground for future needs. While gray water can provide an additional on-site water source for trees, its citywide impact is limited given Scottsdale's existing water recycling and reuse efforts.

LOCATION & APPLICATION

Locate and configure water-harvesting systems so stormwater supports shade trees, planted areas, and comfortable public spaces.

WH 1 Integrate GSI into site planning.

WH 1.1 Route runoff from roofs, plazas, parking, and roadways to basins, bioswales, rain gardens, tree trenches, or similar GSI features before the storm sewer system.

WH 1.2 Align GSI locations with desired shade areas, pedestrian routes, and gathering spaces.

Curb cut and mini check dam.

WH 2 Direct stormwater to support tree health and pedestrian comfort.

WH 2.1 Locate basins and other GSI features so that tree root zones serving public spaces and pedestrian areas receive harvested water.

WH 2.2 Provide defined overflow paths that protect buildings, walkways, and adjacent properties from erosion and ponding.

WH 2.3 Use pretreatment (e.g., sediment traps or rock mulch) at curb cuts and inlets to protect infiltration areas from sediment and debris.

WH 2.4 Select appropriate trees for inundation areas and side slopes.

WH 3 Match water-harvesting strategies to the surrounding land-use context.

WH 3.1 In commercial and mixed-use areas, direct roof and plaza runoff to bioretention swales, basins, rain gardens, and tree planters near entries and outdoor seating.

WH 3.2 In pedestrian environments, use linear bioswales, tree trenches, and rain gardens adjacent to walkways to provide continuous shade and cooler walking conditions.

WH 3.3 In parking areas, grade pavements toward properly designed depressed landscape islands and perimeter basins rather than drive aisles.

WH 3.4 Along roadways, use bioswales, rain gardens, curb cuts, or curb extensions to intercept gutter flow and irrigate street trees.

WH 3.5 On industrial sites, use larger basins and pre-treatment where runoff volumes or pollutant loads are higher. Select appropriate microbiotic consuming plants for basin and swale bottoms to cleanse the water as it percolates into subsoils.

WH 4 Prioritize passive water harvesting systems.

WH 4.1 Use grading, curb cuts, and drainageways to feed depressed landscaped areas, bioswales, and rain gardens as the primary strategy.

WH 4.2 Add cisterns, tanks, or underground storage only where roof catchment, irrigation demand, or space constraints justify active systems.

Passive and Active Water Harvesting

Passive Systems

Systems that slow, capture, and direct water into the landscape for on-site infiltration and reuse at the surface.

- Bioswales, rain gardens, and tree trenches
- Bioretention areas
- Permeable pavements
- Curb extensions and curb cuts with sediment traps
- Street planters and other vegetated basins

Maintenance

Pros

- Easy to observe and inspect; most issues are visible at the surface.
- Fewer mechanical components, reducing risk of sudden failure.
- Routine maintenance can be done with basic tools and skills.
- Lower upfront costs and generally easier to retrofit.
- Vegetated systems support habitat, shade, and visual quality.

Cons

- Performance declines if sediment, trash, or vegetation are not routinely managed.
- Require surface space, which can be difficult on constrained or dense sites.
- May require more frequent manual cleanouts of trash, debris, and sediment.

Active Systems

Systems that collect and store water for later use, often requiring pumps, controls, or manual redistribution.

- Above-ground and below-ground cisterns
- Rain barrels and modular storage tanks
- Rainwater capture systems, first-flush diverters, and filters
- Pumps, valves, and control equipment associated with storage

Maintenance

Pros

- Stores water for intentional reuse.
- Works well on compact or urban sites with limited surface area for basins.
- Helps meet water conservation or reuse objectives.
- Storage volume can be scaled vertically or underground to achieve higher capacities on small sites.

Cons

- Harder to access and monitor; many components are out of sight or underground.
- Requires specialized equipment and technical knowledge to operate and maintain.
- More mechanical parts increase potential for malfunction or service interruption.
- Higher installation and replacement costs, with more complex design and coordination.

STORMWATER CONTEXT & PERFORMANCE

Respond to Scottsdale's rainfall patterns, drainage behavior, and soil conditions so water-harvesting systems reliably capture, infiltrate, and store runoff to support shade and landscape health.

WH 5 Apply a standard GSI toolbox to achieve predictable performance.

WH 5.1 Select from defined GSI practices as detailed on pages 66 - 75.

WH 5.2 Combine multiple practices where needed to meet capture, infiltration, and storage targets for larger drainage areas - together, these form a treatment train.

WH 6 Size systems to capture the first flush (at minimum) to manage runoff and support shade.

WH 6.1 Size GSI features to capture and infiltrate a minimum of 0.5 - 1.0 inch of rainfall from the contributing impervious area.

WH 6.2 Increase storage capacity where site area, grading, and infrastructure constraints allow, while maintaining safe overflow conditions.

WH 6.3 Coordinate water-harvesting volumes with anticipated irrigation demand for trees and planting areas.

Vegetated bioswale.

Pedestrian bridge integration with GSI.

UNDERSTANDING SCOTTSDALE RAINFALL

Scottsdale rainfall patterns provide important context for understanding how stormwater moves across different surfaces, why certain areas generate more runoff, and how GSI features can be positioned to capture and use this water effectively.

Rainfall in Scottsdale is limited but can produce meaningful volumes of stormwater during events. The city receives an average of 7.66 inches of rain each year. While some lower-intensity storms provide prolonged infiltration and deep soil recharge, others arrive in short, high-intensity bursts that generate significant runoff across rooftops, roadways, and paved areas. When directed efficiently, this runoff becomes a valuable resource for supporting vegetation, improving soil moisture, and reducing reliance on potable water for irrigation.

Stormwater availability depends on rainfall depth, intensity, and the size and type of the contributing surface. Because many storm events are relatively small, managing the initial 0.5 inch, "first flush" runoff can deliver meaningful water-quality benefits. Hardscape areas such as rooftops, parking lots, and paved corridors shed most of the water they receive; GSI is one method of capturing and treating such before runoff is conveyed to downstream infrastructure. When directed into GSI features, this runoff can also support healthier landscapes by improving plant health, expanding rootable soil moisture, and strengthening Scottsdale's broader shade infrastructure.

Rainfall & Water Harvesting

Stormwater captured from built surfaces can provide supplemental moisture for trees and landscape areas. For example, a 25,000-square-foot asphalt parking lot can generate approximately 152,000 gallons of runoff per year if directed to GSI features.

Capturing this water reduces runoff, replenishes soil moisture, and helps planted areas perform more effectively.
When used as a local resource, rainfall supports healthier, longer-lived landscapes and strengthens the cooling benefits of Scottsdale's shade system.

Typical Storm Depth Across Scottsdale

Rainfall data collected from five Flood Control District of Maricopa County monitoring stations across Scottsdale indicate that the 90th percentile rainfall depth is consistently 1", representing the type of storm event that GSI features most often experience during heavier rainfall. This storm size provides a reliable basis for planning and sizing water harvesting systems so they function effectively under larger rainfall conditions.

How Stormwater Behaves on Different Surfaces

Stormwater moves differently depending on the surfaces it encounters:

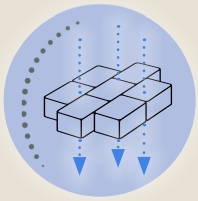
- Impermeable surfaces—such as roadways, rooftops, and parking lots—generate runoff that must be conveyed through gutters, scuppers, or channels.
- Permeable and planted areas allow stormwater to infiltrate the soil, recharge moisture, and support vegetation.
- GSI features help slow, filter, and route this water so it can be used beneficially before reaching storm infrastructure or overflowing to downstream areas.

Understanding how rainfall becomes runoff is essential for determining where water harvesting features should be placed, how they should be sized, and how they work with Scottsdale's landscape and shade systems.

How Does Stormwater Move?

Rain Event

Rainfall begins as precipitation falling across both permeable and impermeable surfaces. Permeable surfaces allow water to infiltrate naturally, while impermeable surfaces generate runoff that is conveyed toward landscape or GSI areas designed to capture it. From there, stormwater may infiltrate into planted areas, be held temporarily in stormwater storage systems, or flow into stormwater drainage infrastructure if excess water cannot be absorbed or stored on-site.



Permeable Surface

Permeable surfaces—such as landscaped areas, rain gardens, bioretention basins, or natural ground—allow stormwater to infiltrate into the soil. As water moves slowly through these areas, it increases soil moisture and supports vegetation. Excess water may continue downslope into other GSI features or planted areas.

Impermeable Surface

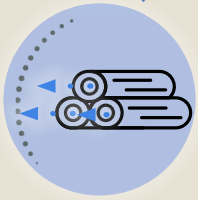
Impermeable surfaces like roofs, roadways, and paved areas do not allow infiltration. Nearly all rainfall landing on them becomes runoff that moves quickly across the surface. Gutters, scuppers, or surface grading then direct this runoff toward permeable areas, planted areas, underground storage, or storm drainage systems.

Planted Areas

Planted areas are the preferred destination for stormwater. Here, water infiltrates the soil, supports root growth, enhances plant health, and reduces irrigation needs. Infiltration in these areas also helps filter pollutants and contributes to cooler microclimates. Excess water may continue downslope into underground storage, or storm drainage systems.

Stormwater Storage

In some systems, stormwater is temporarily captured and held in storage features such as cisterns or underground tanks. Stored water can be used later to irrigate planted areas, helping reduce demand for potable water. Excess water may continue downslope into storm drainage systems.



Stormwater Drainage Infrastructure

Any water that cannot be absorbed or stored on-site eventually flows into storm drainage systems designed to convey excess runoff safely downstream. Properly designed overflow routes ensure GSI features function as intended without causing flooding or damage.

WH 7 Use site-specific drainage and infiltration conditions to set basin dimensions and drawdown times.

WH 7.1 Design basin footprint, depth, and side slopes based on contributing drainage area, surface slopes, soil infiltration rates, and available planting area.

WH 7.2 Design water harvesting features so that captured stormwater infiltrates or drains within 36 hours under typical soil conditions to meet county vector control requirements.

WH 7.3 Maintain adequate separation from buildings, utilities, and pavement subgrades.

WH 8 Route runoff to protect water quality and adjacent infrastructure.

WH 8.1 Provide pre-treatment elements—such as sediment forebays, stabilized inflow points, or trench drains—where higher sediment or pollutant loads are expected

WH 8.2 Convey stormwater from pre-treatment into infiltration or filtration features, then to clearly defined overflow or outfall locations sized for larger storm events.

WH 8.3 Stabilize inflow and outfall points to prevent erosion, protect nearby improvements, and maintain long-term system performance.

Rainfall Capture Calculator

Use this quick tool to estimate how much runoff a typical, larger Scottsdale storm can provide. Higher gallon values mean that the surface produces more runoff and is a good candidate to divert to water-harvesting systems. Lower gallon values mean less runoff and smaller harvesting opportunities from that surface.

Inputs:

- **Storm Depth** (1 inch): The amount of rain that falls during a single storm, measured in inches. Use 1 inch for a typical larger Scottsdale storm (a 90th-percentile event).
- **Conversion Factor** (0.623): Converts inches of rain on a square foot of surface into gallons. One inch of rain on 1 square foot produces about 0.623 gallons of water.
- **Catchment Area** (square feet): The horizontal area of a hard surface that produces runoff that could drain toward your water-harvesting feature.
- **Runoff Coefficient** (see Table below): The fraction of rain that turns into runoff from a surface. A value of 1.0 means almost all of the rain runs off; 0.5 means about half runs off and half soaks in. To keep it simple, use the value that best matches your surface type.

Formula

Storm Depth × 0.623 × Catchment Area × Runoff Coefficient = Gallons of Runoff

Example

45,000 sq. ft. parking lot, 90th-percentile storm of 1.00”, and a runoff coefficient of 0.95 (pavement):

1.00 × 0.623 × 45,000 × 0.95 ≈ 26,633 gallons from a single storm.

Table

Material	Runoff Coefficient
Roof or covered structure	0.95
Pavement (concrete/asphalt)	0.95
Landscaping (typical turf/soil)	0.50
Vegetable/flower garden	0.35

MAINTENANCE & LONGEVITY

Ensure water-harvesting systems can be maintained and adjusted over time so they continue to function as designed and support healthy trees, shade, and landscapes.

WH 9 Design GSI features for clear visibility and access to support efficient maintenance.

- WH 9.1 Locate inlets, outlets, overflow structures, sediment traps, and cleanouts where they are visible from grade and easy to identify in the field.
- WH 9.2 Avoid locating key components in locations that would limit access or conceal problems such as clogging or erosion.

WH 10 Select plants and materials that support long-term function and tree health in GSI systems.

- WH 10.1 Use desert-adapted plant species, mulch, and surface treatments that tolerate periodic inundation, sediment deposition, and drought conditions.
- WH 10.2 Avoid species and materials that are likely to clog inlets, permeable pavements, or outlet structures with excessive litter, thatch, or aggressive root systems (e.g., tree species that drop seedpods or large leaves, fine sediment or decomposed granite fines).
- WH 10.3 Coordinate plant selection, soil amendments, and mulch types with the intended maintenance approach (e.g., hand tools vs. mechanized equipment).
- WH 10.4 Where infiltration is desired, use soils and other media that balance permeability, moisture retention, and plant health.

WH 11 Establish inspection and maintenance schedules and assign responsibilities for each GSI practice.

- WH 11.1 Define inspection frequencies (e.g., after major storms, seasonally, and annually) appropriate to each GSI feature type.
- WH 11.2 Identify specific routine tasks such as sediment removal, trash and debris clearing, vegetation management, mulch replacement, and surface vacuuming for permeable pavements.

WH 12 Monitor system performance and adjust maintenance or design details as conditions change.

- WH 12.1 Modify maintenance practices, plant palettes, or specific design details (e.g., rock armoring at inlets, sediment trap sizing, overflow protection) when field conditions show that adjustments are needed to maintain performance.
- WH 12.2 Conduct periodic assessments of structural components and vegetation health to confirm ongoing functionality of water-harvesting systems.

GSI PRACTICES

Effective water harvesting depends on choosing the right mix of GSI features for the site, capturing and treating stormwater as close as possible to where it falls, slowing runoff to promote percolation and absorption, and linking multiple practices together as "treatment trains" so water is managed in stages as it moves downstream. Well-designed systems maximize stormwater capture, support vegetation, and improve outdoor comfort.

Permeable Pavement

Passive GSI practice

Permeable pavement is a paved surface that allows stormwater to pass through joints or pores into a gravel storage layer and underlying soil. It reduces runoff, supports nearby trees, and helps recharge the ground.

Benefits

- Reduces surface runoff by promoting on-site infiltration.
- Provides subsurface storage and slow release of stormwater.
- Supports tree and planting health by increasing soil moisture.
- Can reduce the need or size of separate surface basins.
- Useful in retrofits where surface space is limited, and low/moderate vehicular areas.

Use Case

- Parking stalls or parking bays with light to moderate traffic.
- Sidewalks, multi-use paths, courtyards, and pedestrian plazas.
- Avoid heavy vehicles and areas of increased vehicular traffic.

Maintenance Considerations

- Vacuum sweep the surface twice a year to remove fine sediment from joints or pores.
- Inspect after storms for ponding, clogged areas, loss of infiltration, or surface damage.
- Remove weeds and debris from joints and edges without damaging the surface.
- Repair settled, cracked, or displaced units and replenish joint or infill material as needed.

Permeable interlocking concrete pavers.

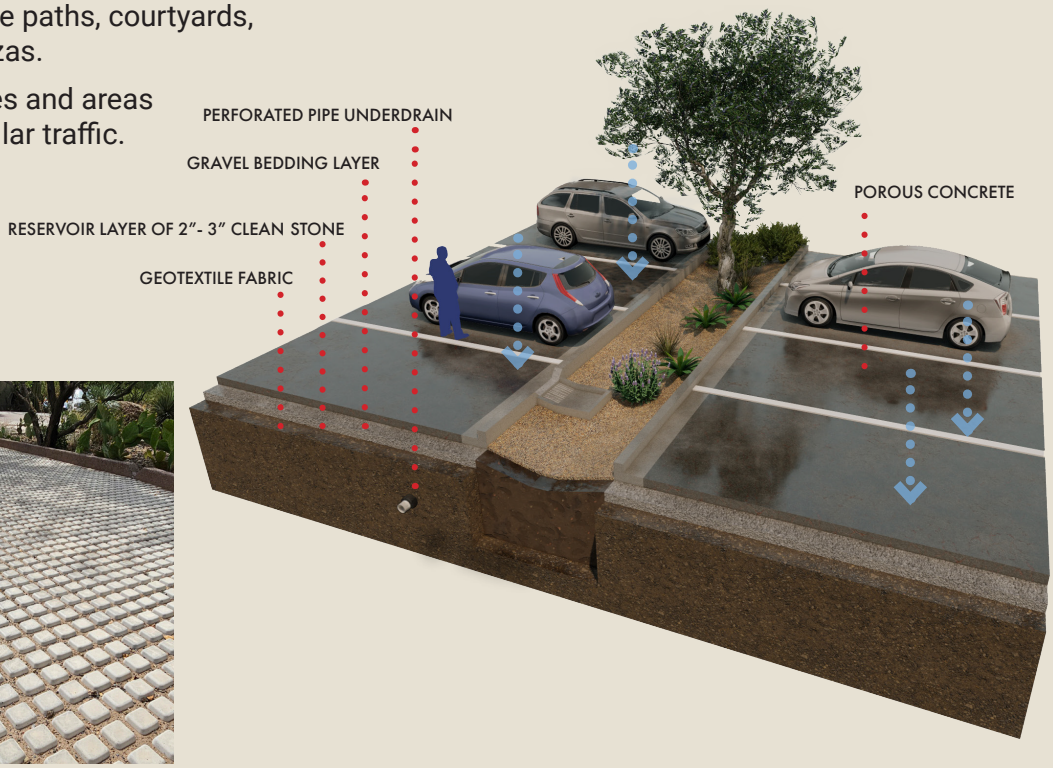


Figure 2-1. Permeable pavement.

Curb Openings, Curb Cuts, & Sediment Traps

Passive GSI practice

Curb cuts are openings in the curb that let stormwater leave impermeable surfaces and flow into adjacent landscape basins. Sediment traps are shallow depressions or rock pockets at the inlet that slow water and capture debris before it reaches planted areas.

Benefits

- Directs runoff from paved areas into basins, bioswales, or rain gardens.
- Reduces localized street and parking-lot flooding.
- Protects downstream GSI features by capturing sediment, trash, and leaf litter.
- Simple, low-cost elements suitable for both new and retrofit projects.

Use Case

- Along streets and within parking lots, draining into landscape islands or basins.
- Within curb extensions and stormwater planters as part of traffic-calming projects.
- Within civic or commercial plazas.

Maintenance Considerations

- Keep curb openings clear of trash, leaves, sediment, and overgrown plants so water can enter freely.
- Remove accumulated sediment and debris from sediment traps and forebays twice a year to maintain capacity.
- Check rocks or splash pads at outlets for erosion or undercutting and repair as needed.
- Watch for blocked inlets, full sediment traps, and erosion at discharge points.
- Replace fill materials as needed.

Curb cut and bioswale.

Curb cut and landscape basin.

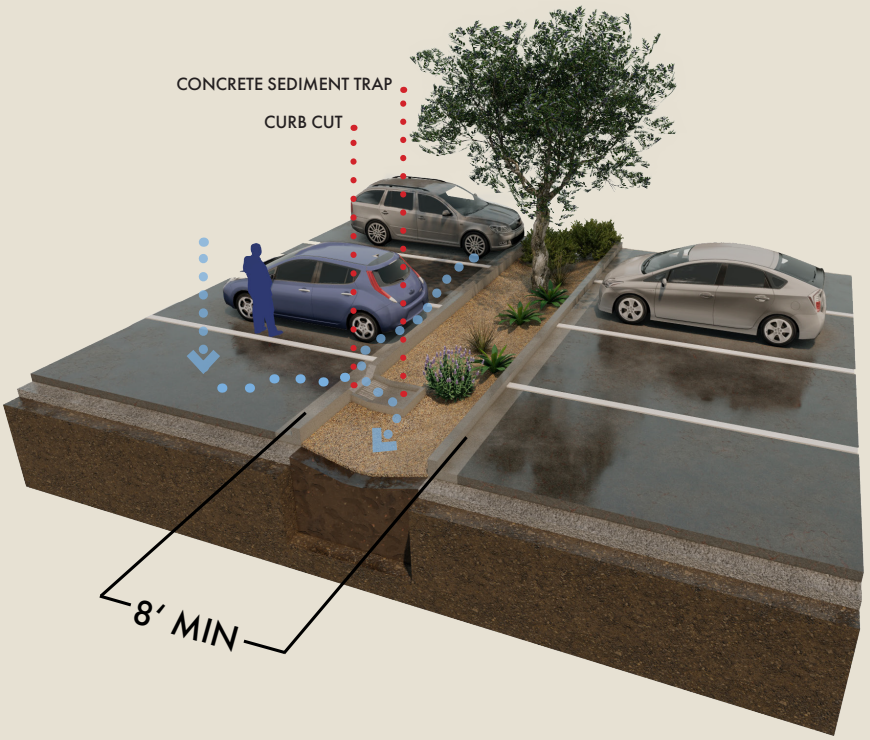


Figure 2-2. Curb openings, curb cuts, & sediment traps.

Suspended Pavement

Passive GSI practice

Suspended pavement systems, such as soil cells, support sidewalks, plazas, or parking areas on a structural deck or frame so that soil beneath remains largely uncompacted and usable for tree roots and stormwater infiltration. They often work with structural soils to provide both loading capacity and high-quality rooting volume.

Benefits

- Provides substantial rooting volume for street and plaza trees beneath paved areas.
- Reduces pavement heaving and cracking caused by shallow surface roots.
- Allows stormwater to be directed into soil below pavement for infiltration and tree uptake.
- Supports larger, mature trees that provide significant shade and cooling.

Use Case

- Urban streetscapes, often as continuous tree trenches along sidewalks.
- Plazas, courtyards, and transit stops with trees integrated into paved areas.
- Parking lots or drop-off areas where trees are surrounded by pavement.

Maintenance Considerations

- Monitor tree health (canopy vigor, dieback, rooting issues) and adjust irrigation or soil management as needed.
- Inspect adjacent pavement for settlement, cracking, or trip hazards and repair as needed.
- Keep surface inlets, openings, or adjacent planting areas clear so water can reach the structural soil zone.
- Avoid heavy equipment or activities that exceed the system's design loading over root zones.
- Watch for poor tree performance or localized pavement failure that may indicate issues within the system.

Suspended pavement soil cells.

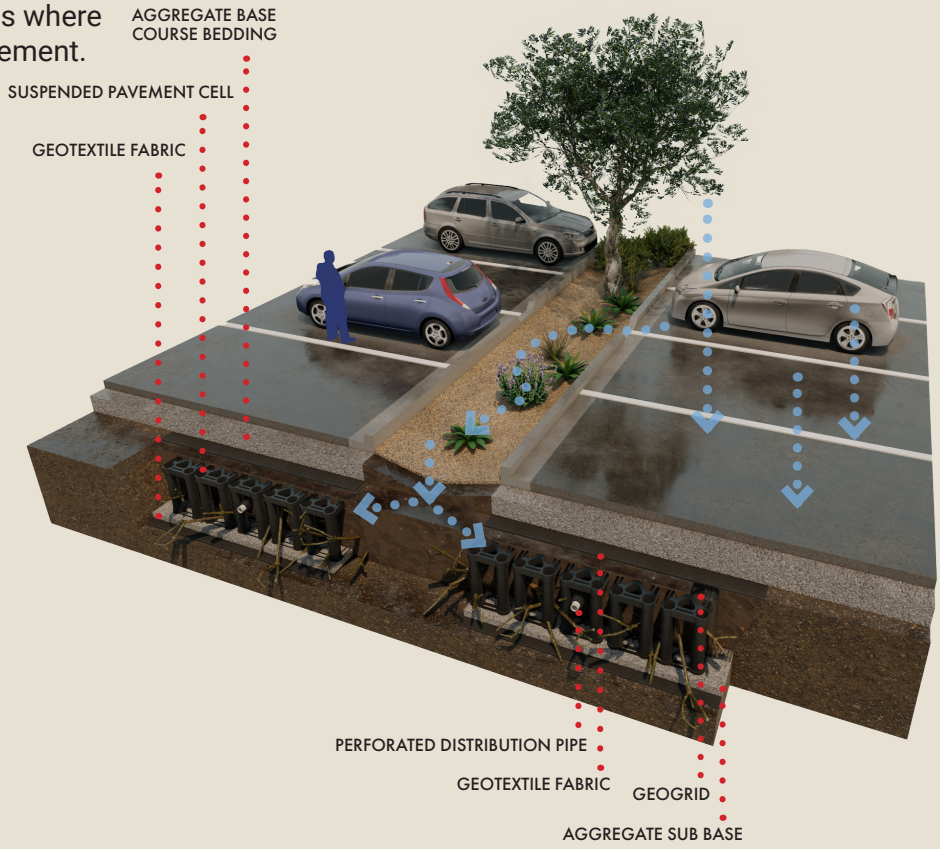


Figure 2-3. Suspended pavement.

Structural Soil

Passive GSI practice

Structural soil is an engineered mix (typically angular stone with a soil component) designed to support pavement loads while still providing limited rooting space for trees. It allows tree roots to grow under or adjacent to pavement where conventional, uncompacted soil is not feasible.

Benefits

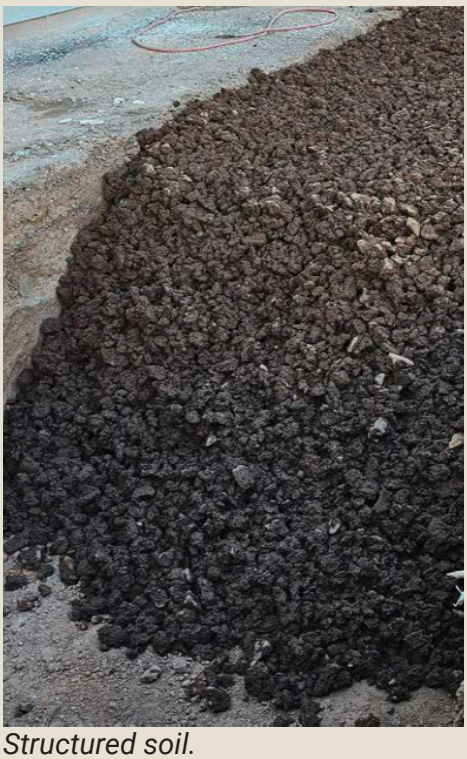
- Provides rootable volume in locations that must also support pavement or light vehicular loads.
- Reduces pavement heaving and cracking caused by shallow surface roots.
- Can be used to connect tree wells or create tree trenches, improving root spread and stability.
- Useful in retrofits where existing subgrade conditions constrain planting options.

Use Case

- Beneath sidewalks or plaza paving between tree wells.
- In narrow street planters or medians where space for open soil is limited.
- Around street trees adjacent to parking lanes or drop-off areas where trees are surrounded by pavement.

Maintenance Considerations

- Monitor tree health (canopy vigor, dieback, stability) to confirm that rooting conditions are adequate. Poor tree performance may signal the need for soil remediation or additional rooting volume.
- Inspect adjacent pavement for settlement, cracking, or trip hazards and repair as needed.
- Keep surface inlets, openings, or adjacent planting areas clear so water can reach the structural soil zone.
- Avoid over-compacting surface areas beyond intended design loads, which can further restrict rooting and infiltration.



Structured soil.

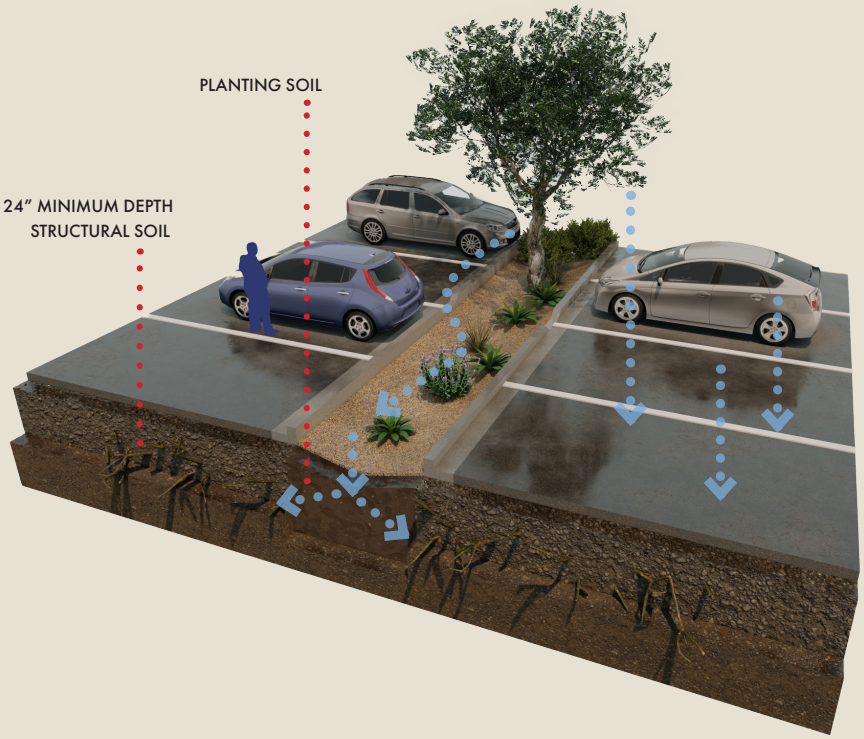


Figure 2-4. Structural soil.

Bioswale

Passive GSI practice

A bioswale is a shallow, gently sloped, vegetated channel that slows, filters, and absorbs stormwater as it moves across a site. Water spreads out through the swale, allowing sediment to settle and pollutants to be filtered by soil and plants before infiltrating or flowing to another GSI feature.

Benefits

- Moves and captures stormwater on the surface instead of in pipes.
- Provides cost-effective, passive drainage for large contributing areas.
- Filters sediment and pollutants through soil and vegetation.
- Supports desert-adapted planting, shade, and habitat along streets and edges.

Use Case

- Adjacent to streets and within medians.
- Parking lot edges and between parking bays.
- Larger swales in parks, campuses, and open space areas.
- Along multi-use paths or at the base of sloped landscaped areas.

Maintenance Considerations

- Remove trash, leaves, and sediment from inlets, forebays, and low points—especially after monsoon or large rain events.
- Regrade compacted or eroded areas and replenish decomposed granite or rock in high-flow zones to restore flow and infiltration.
- Prune or replace vegetation to maintain clear flow paths and visibility while keeping good plant cover.
- Watch for common issues such as blocked inlets, dead or overgrown vegetation, erosion, and mulch washing out of the swale.

Bioswale.

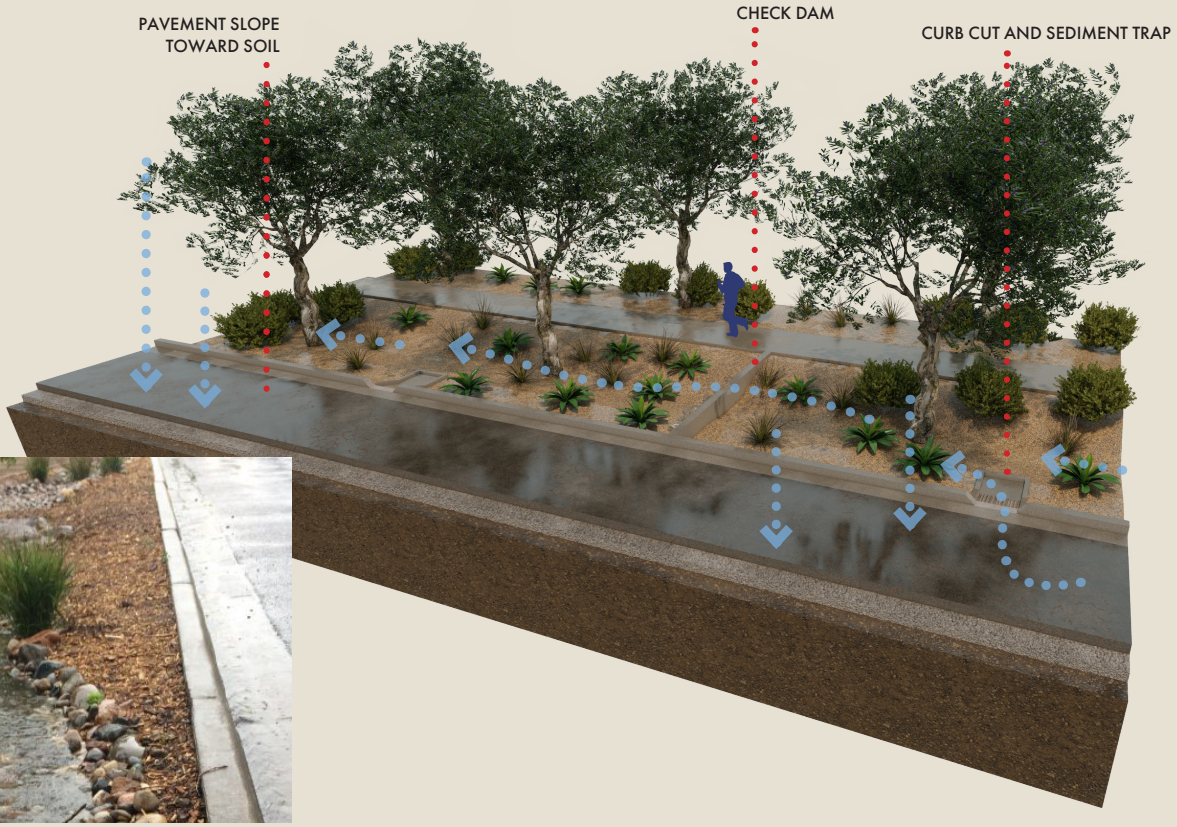


Figure 2-5. Bioswale.

Rain Garden

Passive GSI practice

A rain garden is a shallow, planted basin that captures runoff from nearby roofs, sidewalks, or paved areas and allows water to pond temporarily, soak into the soil, and be taken up by plants. It is typically smaller and more contained than a bioswale, serving as a focal landscape feature as well as a stormwater facility.

Benefits

- Captures and infiltrates runoff close to where it falls.
- Reduces peak flow and erosion by slowing and storing water on-site.
- Filters sediment and pollutants through soil and vegetation.
- Supports desert-adapted plants, shade, habitat, and visual interest in small spaces.

Use Case

- At roof downspouts near building entries or courtyards.
- In parking lot islands or along the edges of small lots.
- Along sidewalks, multi-use paths, or between buildings.
- In residential or neighborhood-scale landscape areas.

Maintenance Considerations

- Remove trash, leaves, and sediment from inlets, forebays, and the basin surface—especially after storms.
- Replace dead or stressed plants and prune as needed to maintain coverage, sightlines, and clear inflow paths.
- Replenish mulch or surface treatments that wash out or break down over time.
- Repair localized erosion at inlets or overflows and regrade low spots if needed to restore even ponding and infiltration.
- Watch for common issues such as bare or compacted soil, persistent standing water, and declining vegetation.

Rain garden.

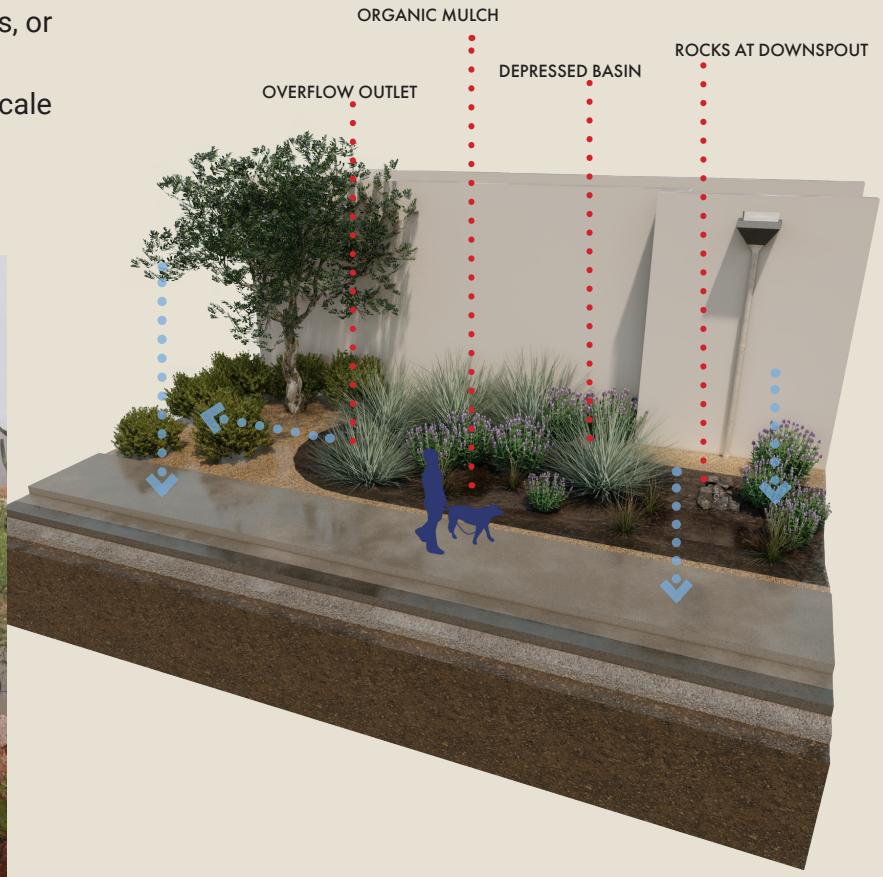


Figure 2-6. Rain garden.

Pedestrian Bridge

Access over GSI features

Pedestrian bridges or grates span bioswales, rain gardens, or basins to maintain continuous walking routes while leaving the underlying GSI feature open to water, light, and air. They provide crossings in specific locations to protect vegetation and soils from compaction.

Benefits

- Provides safe, accessible crossings over GSI features.
- Protects planted areas and soil structure by limiting informal footpaths.
- Allows stormwater to continue flowing and infiltrating beneath the structure.
- Can be integrated as a visible design element along streetscapes and trails.

Use Case

- Across bioswales or rain gardens along sidewalks and multi-use paths.
- Between parking lots and building entries where GSI features run parallel to walkways.
- At access points in plazas, courtyards, or parks with linear basins.

Maintenance Considerations

- Keep bridge decks and grates clear of leaves, trash, and sediment so water and light can pass through.
- Inspect rails, supports, and fasteners for damage, corrosion, or trip hazards and repair as needed.
- Check approaches and abutments for erosion, settlement, or ponding and stabilize if required.
- Ensure the underlying GSI feature remains accessible for vegetation care and sediment removal.

Pedestrian bridge over bioswale.

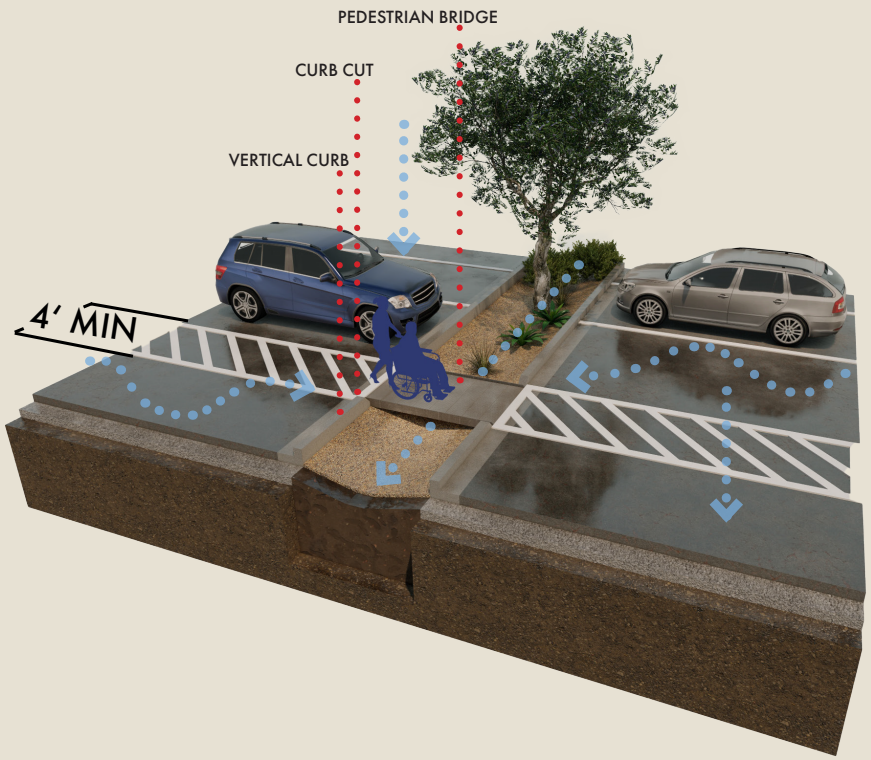


Figure 2-7. Pedestrian bridge.

Curb Extension

Can be combined with other GSI features

A curb extension narrows the roadway to slow traffic and shorten pedestrian crossing distances, while inlets - typically curb cuts with sediment traps - capture gutter flow. When combined with basins, bioswales, or rain gardens, curb extensions direct stormwater into planted areas.

Benefits

- Calms traffic and improves visibility at crossings.
- Reduces pedestrian crossing distance and exposure to vehicles.
- Captures and infiltrates street runoff in integrated planting areas.
- Provides opportunities for trees, shade, and streetscape greening.

Use Case

- In streetscapes, at intersections, or mid-block crossings.
- Near schools, transit stops, and commercial main streets where lower speeds are desired.
- In traffic-calming projects.

Maintenance Considerations

- Keep inlets, curb cuts, and gutter approaches clear of trash, leaves, and sediment so water can enter the extension.
- Remove accumulated sediment and debris from the planted basin and any forebays to maintain capacity.
- Maintain plants, mulch, and soil to prevent bare spots, overgrowth, or blocked sightlines for pedestrians and drivers.
- Inspect curb edges, pavement, and pedestrian routes for settlement, cracking, or trip hazards and repair as needed.

Curb extension with curb cut and bioswale.

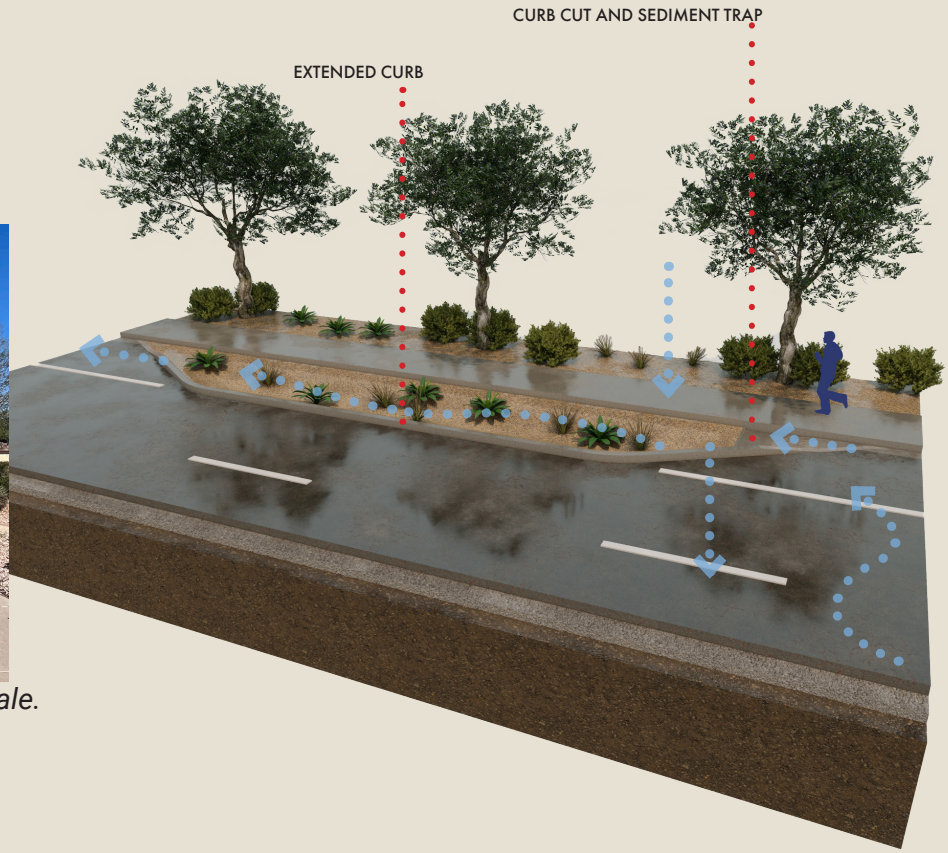


Figure 2-8. Curb extension.

Above Ground Cistern

Active water harvesting practice

An above-ground cistern is an enclosed tank that collects and stores stormwater, typically from roof downspouts, for later non-potable use such as landscape irrigation. It is visible at the surface and includes inlets, overflows, and outlets or hose connections.

Benefits

- Stores captured rainwater for intentional reuse.
- Works well on sites with limited space for basins or swales.
- Can be located and detailed as an educational or design feature.
- When combined with passive GSI, helps extend water availability for trees and planting.

Use Case

- Near building downspouts in courtyards, side yards, or service areas.
- At commercial or civic buildings where tanks can be integrated into façades or screened enclosures.
- In schools, parks, and community facilities as demonstration systems.

Maintenance Considerations

- Keep inlet screens, gutters, and first-flush devices clear of leaves, sediment, and debris.
- Inspect the tank, fittings, and supports for leaks, corrosion, and structural stability.
- Check overflows and splash pads to ensure water is safely conveyed away from buildings and accessible routes.
- Periodically drain and clean the cistern to remove accumulated sediment and organic material.
- Ensure lids, vents, and screens remain secure to prevent mosquitoes, algae, animal entry, and safety hazards.
- For pumped systems, test pumps, valves, and controls regularly.

Above ground cistern.

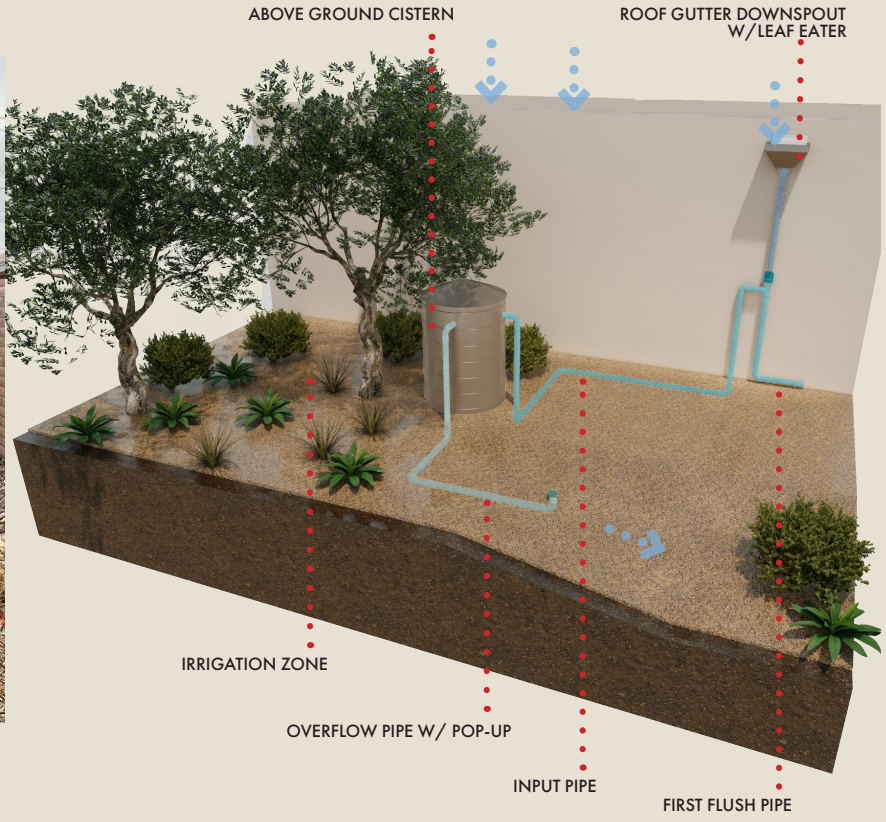


Figure 2-9. Above ground cistern.

Below Ground Cistern

Active water harvesting practice

A below-ground cistern is a buried tank that collects and stores stormwater, typically from roof drains or surface inlets, for later non-potable use such as landscape irrigation. It is concealed below grade and includes access hatches, inlets, overflows, and outlet piping or pump connections.

Benefits

- Stores significant volumes of captured rainwater without using surface space.
- Preserves usable area for parking, plazas, or playgrounds while providing water storage.
- Helps reduce peak runoff and potable water demand for irrigation.
- Can be paired with passive GSI features that receive overflow or supplemental irrigation.

Use Case

- Sites with limited above-ground space.
- Under parking lots, plazas, or courtyards near contributing roofs.
- Beneath landscape areas where tanks or modular units can be covered by soil and planting.
- At commercial, civic, or institutional sites with larger roof areas and irrigation needs.

Maintenance Considerations

- Inspect inlets, pretreatment devices, and access risers for sediment, trash, and blockages.
- Periodically remove accumulated sediment and organic material in the tank.
- Check pumps, valves, float switches, and control systems regularly to confirm operation.
- Check overflows and splash pads to ensure water is safely conveyed away from buildings and accessible routes.
- Inspect lids, hatches, and vents.
- Settlement, surface cracking, or sinkholes above the cistern may indicate structural or subsurface issues.

Below ground cistern.

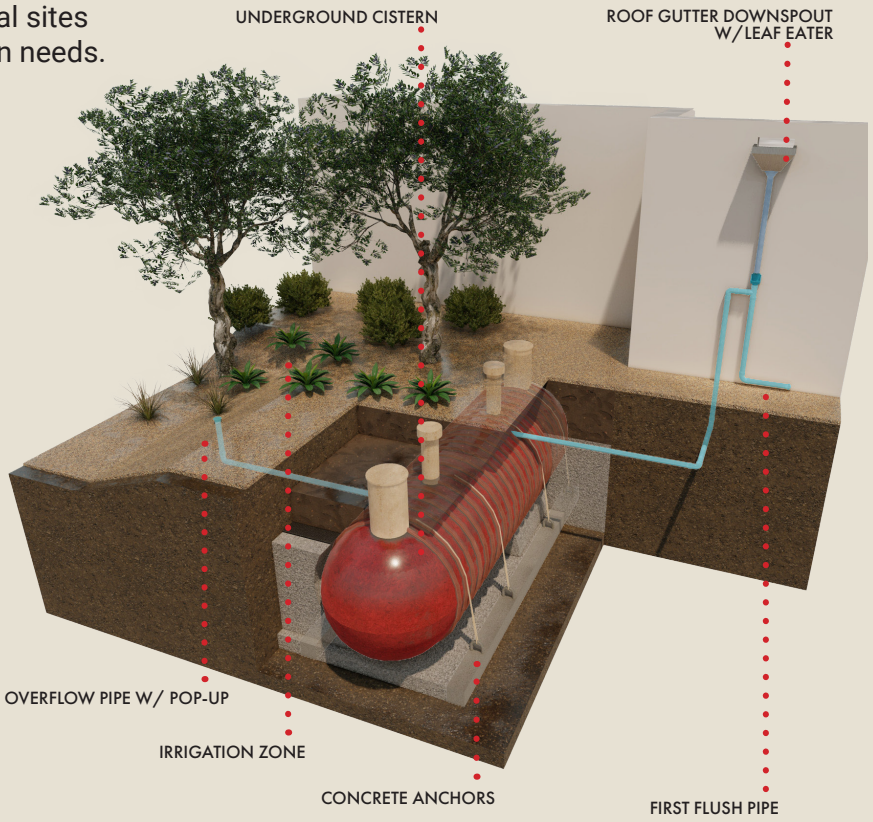


Figure 2-10. Below ground cistern.

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SHADE STRUCTURES

Shade structures are a vital component of Scottsdale's citywide approach to comfort, livability, and heat resilience. Together with trees and landscape design, they form the city's built canopy system, expanding usable outdoor spaces, improving comfort, and enhancing visual quality in both public and private settings.

This section provides technical guidance and design direction for integrating shade structures in Scottsdale. While trees remain the city's primary source of natural canopy, built structures play an essential complementary role, offering immediate, durable shade in areas where vegetation is limited or where high activity levels demand year-round comfort.

The Shade Structure Guidelines establish a unified framework for designing, locating, and maintaining shade structures that respond to Scottsdale's climate, architectural character, and community expectations. They are intended to inform project planning and review, ensuring that new and retrofitted structures contribute to broader shade goals.

Well-designed shade structures extend the usability of public and private spaces, promote outdoor activity, and contribute to shade goals. These guidelines balance function, aesthetics, and performance, ensuring that structural shade integrates seamlessly with surrounding landscape, architecture, and site design.

Design and Implementation Framework

The Shade Structure Guidelines outline expectations for coverage, performance, and material resilience, while allowing flexibility for innovation and context-sensitive solutions. Rather than prescribing a single style, they establish a shared understanding of what effective, functional, and durable shade looks like across Scottsdale.

This framework complements the Trees and Water Harvesting Guidelines, together forming the three technical foundations of the Shade & Tree Plan. Each works in tandem—the tree canopy providing natural cooling and ecological benefits, the shade structures supplying immediate and adaptable protection, and the water harvesting systems ensuring efficient irrigation and runoff capture.

Partial shade reduces direct midday sun.

The Shade Structure Guidelines provide detailed direction organized under three primary categories:

Functional Design & Orientation defines how shade structures should be positioned and configured to respond to solar conditions. It introduces principles for analyzing sun angles, determining optimal placement, and achieving effective shade coverage at peak heat hours.

Integration & Context establishes how shade structures relate to their surrounding environment, including trees, landscapes, buildings, and public spaces. It emphasizes consistency, visibility, pedestrian comfort, and coordination with utilities, circulation, and architectural character.

Materials & Maintenance outlines recommended material types, coatings, and construction methods suited to Scottsdale's desert climate. It provides guidance on durability, heat performance, and long-term maintenance practices that ensure structural safety and lifespan.

Shade Canopy Balance

The most effective shade designs layer tree canopy and shade structures to maintain coverage consistency throughout the day and across seasons.

FUNCTIONAL DESIGN & ORIENTATION

Design shade structures to respond to solar patterns, reinforce site function, and work with natural canopy to provide effective, comfortable, and well-oriented shade where people need it most.

SS 1 Design shade structures to respond to sun path.

SS 1.1 Prioritize south- and west-facing areas for shade coverage.

SS 1.2 Incorporate both horizontal and vertical shading elements to address shifting solar angles — vertical structures for morning and late-afternoon sun, and overhead structures for midday protection.

SS 1.3 Optimize shade coverage between 10 a.m. and 4 p.m.

SS 1.4 Assess seasonal shade patterns to ensure maximum summer protection while providing intentional winter solar exposure.

Overhead shade structure provides midday protection.

SS 2 Balance shade structures with natural canopy to achieve site coverage goals.

SS 2.1 Provide a minimum of 50% shade coverage over hardscape surfaces through a combination of trees at maturity and structures.

SS 2.2 Place structures to strengthen overall shade coverage and serve sites where tree planting or root space is limited.

SS 2.3 Coordinate structural placement with water-harvesting and irrigation systems to prevent conflicts and ensure trees can grow and function alongside structures to meet sitewide shade coverage goals.

Shade structures and tree canopy strengthen shade coverage.

HORIZONTAL SHADE

Horizontal shade structures moderate direct overhead sunlight by creating cool, usable spaces during the hottest portions of the day. Their effectiveness depends on how well they are aligned with activity patterns, seasonal comfort needs, and sun path.

Paired with vertical elements, horizontal shade ensures consistent comfort across the solar cycle.

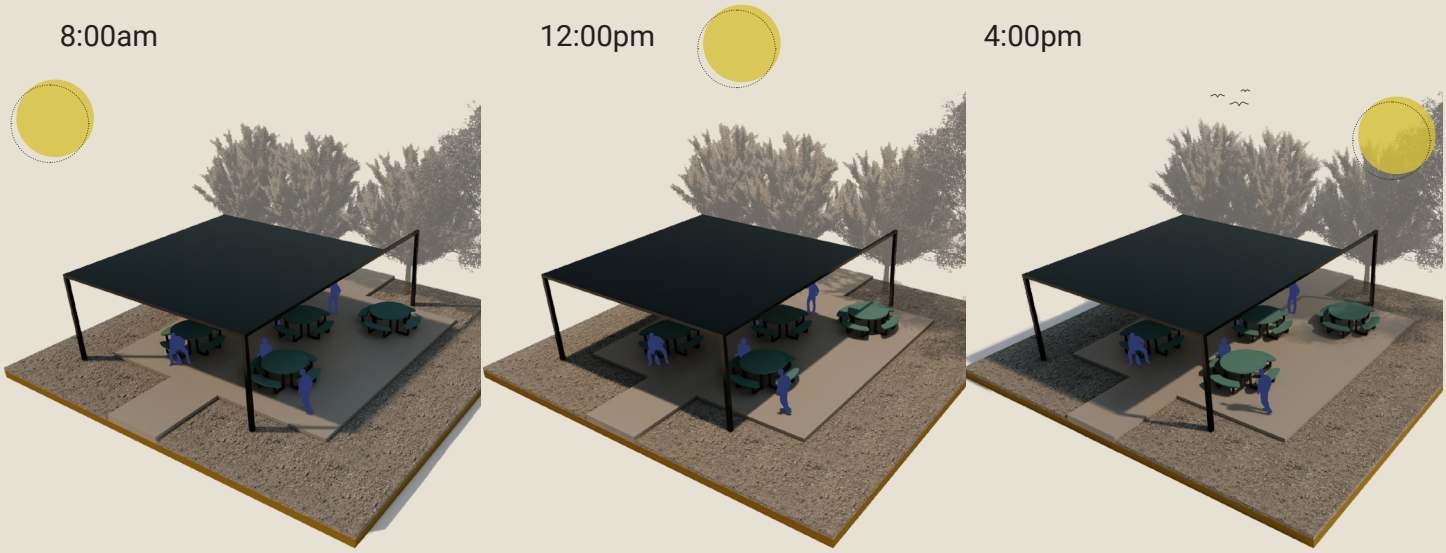


Figure 3-1. Horizontal shade structure performance relative to sun path.

Horizontal Shade

Horizontal shade structures, such as canopies, pergolas, fabric systems, and solar-panel arrays, provide broad overhead protection and are most effective during the middle of the day, when the sun is highest and radiant heat peaks. They are well suited for plazas, walkways, patios, playgrounds, and outdoor seating areas, where reducing direct overhead exposure significantly cools surfaces and improves comfort.

Because the sun's position shifts throughout the day and across seasons, fixed horizontal structures must be carefully placed to align with the intended use of the space. The diagram above demonstrates how a fixed horizontal structure casts shade throughout the day. While this can be effective for midday activity, horizontal systems provide little to no shade in the early morning or late afternoon when the sun is low on the horizon.

Louvered Shade Systems: A Flexible Year-Round Strategy

Louvered systems offer adaptable, climate-responsive shading across seasons. By adjusting tilt, spacing, or rotation, louvers can balance effective summer shade with desirable winter sunlight, supporting year-round comfort, visibility, and usability. Their flexibility makes them well-suited for plazas, walkways, seating areas, and other locations with continuous activity throughout the year.

VERTICAL SHADE

Vertical shade elements target the low-angle morning and late-afternoon sun, reducing glare and heat when overhead structures offer limited protection. Their effectiveness depends on how they are oriented in relation to the sun's path and nearby site features, particularly along southwest and west exposures.

Used alongside horizontal shade, vertical elements complete the full range of daily sun protection.

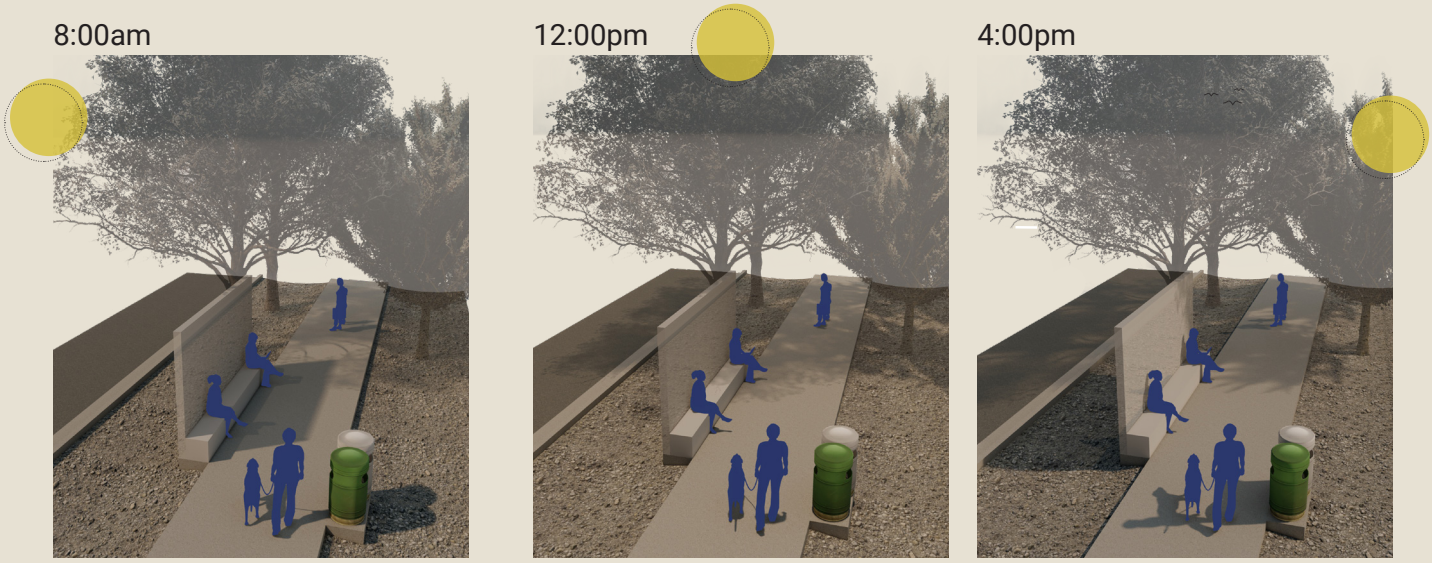


Figure 3-2. Vertical shade structure performance relative to sun path.

Vertical Shade

Vertical shade elements are highly effective at blocking low-angle morning and late-afternoon sun, when heat and glare are most intense. Their performance relies on proper placement, further, vertical screens, slats, and louvers should be oriented perpendicular to southwest and west-facing exposures to intercept the strongest sun angles while maintaining airflow and visibility.

The diagram above illustrates how orientation influences shadow patterns throughout the day. Aligning vertical elements with the sun's path during these periods significantly improves shade coverage and comfort.

To maintain safety and clear sightlines, especially in public spaces, vertical shade features should provide at least 60% openness, allowing for adequate transparency, ventilation, and surveillance.

SS 3 Design shade to enhance pedestrian comfort and connectivity.

SS 3.1 Use shade structures to link major pedestrian routes and activity areas—including transit stops, crossings, seating, playgrounds, and building entrances—to provide continuous shade.

SS 3.2 Integrate seating and lighting within shade structures to improve comfort and usability.

SS 3.3 Avoid obstructing important sightlines for visibility, particularly near intersections and active plazas.

SS 4 Provide shade levels appropriate to the use, comfort needs, and exposure of the site.

SS 4.1 Provide **Full Shade** in high-exposure or high-dwell-time areas.

SS 4.2 Provide **Partial Shade** in moderate-activity locations.

SS 4.3 Provide **Filtered Shade** in open, transitional, or visually sensitive environments.

SS 4.4 Select shade levels based on expected user duration, directional exposure, orientation, and surface material temperatures.

SS 4.5 Use layered shade (structures and trees) in high-demand areas to maintain comfort throughout the day and across seasons.

Shade Types

Shade types vary in performance and purpose. Selecting the appropriate shade type ensures comfort, usability, and alignment with Scottsdale's heat conditions and site needs.

Full Shade

Maximum sun protection, making spaces significantly cooler.

- Playgrounds
- Transit stops
- Outdoor seating
- Building entrances

Partial Shade

Reduces direct midday sun and allows some sunlight in the morning or late afternoon.

- Community parks
- Outdoor dining and seating
- Major pedestrian routes

Filtered Shade

Dappled lighting maintains natural brightness and visibility, while still cooling an area.

- Neighborhood walkways and playgrounds
- Art plazas
- Scenic view corridors

Figure 3-3. Typical shade types and their use.

INTEGRATION & CONTEXT

Align shade structures with surrounding landscape, architecture, and circulation to create cohesive, accessible, and context-appropriate outdoor environments.

SS 5 Integrate shade structures with their site and surrounding environment.

SS 5.1 Locate structures where they complement existing or proposed trees, plantings, and site features, avoiding conflicts with root zones, water-harvesting areas, and on-site stormwater systems.

SS 5.2 Allow at least 15–20 feet of overhead clearance between structural canopies and expected mature tree canopy.

SS 5.3 Design structures to fit the scale and proportion of their setting, maintaining pedestrian scale in walkable environments and larger open spaces.

SS 5.4 Use placement and orientation to support site organization while maintaining functional shade.

SS 6 Coordinate shade structures with adjacent architecture and public realm design.

SS 6.1 Align structure geometry, scale, and materials with adjacent architectural forms to create a unified composition.

SS 6.2 Connect structural canopies to building façades or courtyard edges to maintain continuity of shade and enclosure.

SS 6.3 Complement existing streetscape palettes to maintain visual coherence.

SS 6.4 In civic and commercial settings, use shade structures to transition between interior and exterior spaces.

SS 6.5 Structures should not obstruct sightlines, building entries, or emergency access.

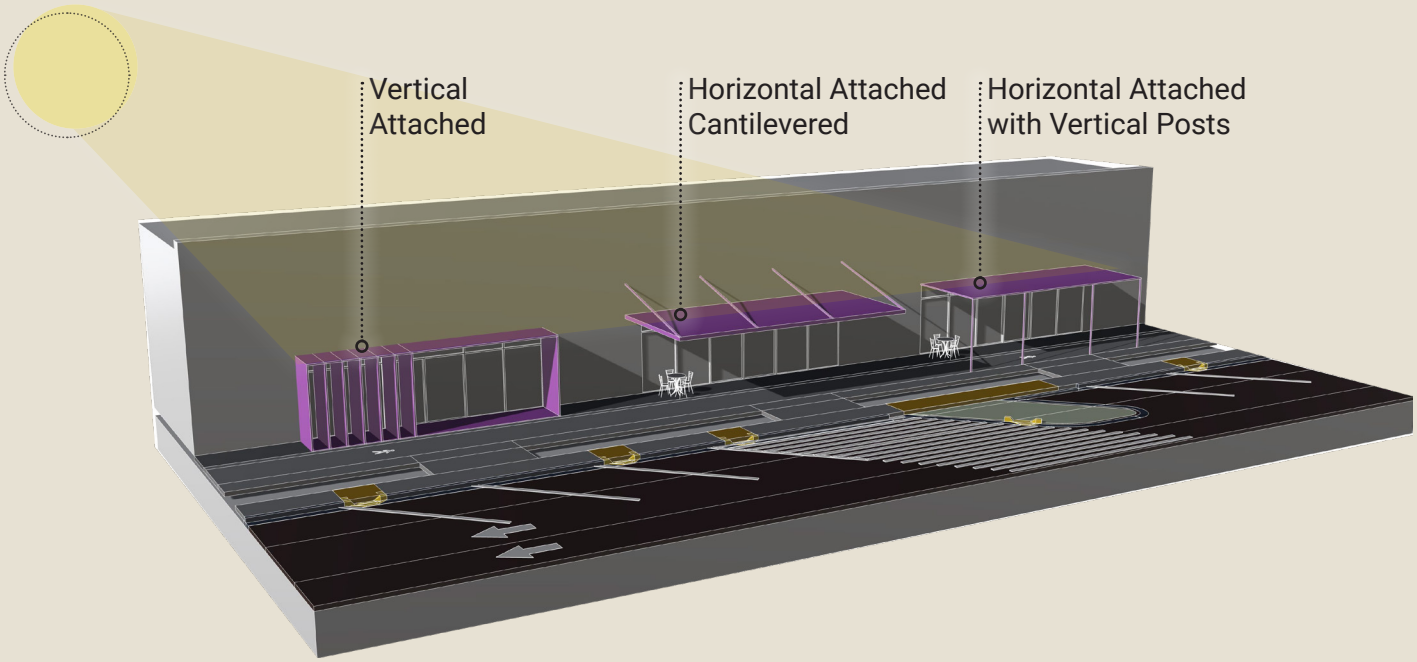


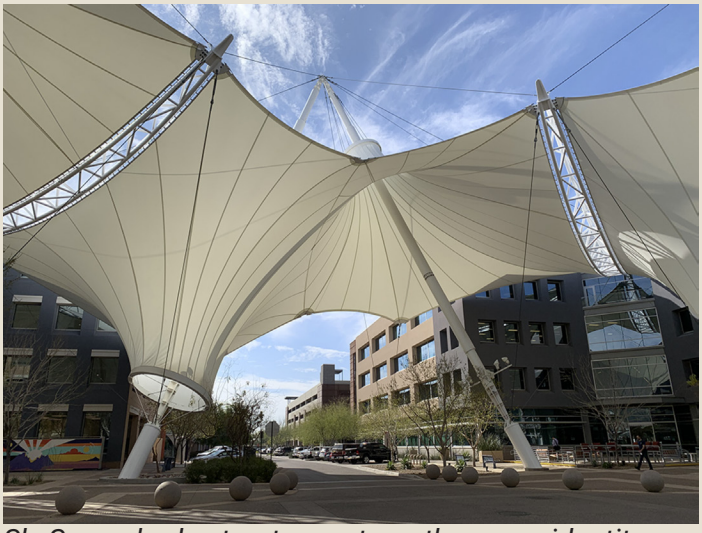
Figure 3-4. Integrating shade structures along a building frontage.

SS 7 Use shade structures to strengthen placemaking and neighborhood identity.

SS 7.1 Incorporate artistic or cultural detailing inspired by Sonoran Desert forms or the distinct character of Scottsdale's built and natural environments.

SS 7.2 Coordinate with Scottsdale Public Art or other community partners when designing large or iconic structures in civic spaces.

SS 7.3 Design structures to act as landmarks or wayfinding cues, aiding pedestrian orientation and highlighting key destinations.



SkySong shade structures strengthen area identity while providing filtered shade.

SS 7.4 Use lighting and signage integration to enhance visibility, orientation, and safety.

SS 7.5 In historic or design-sensitive areas, use materials, finishes, colors and detailing that are visually compatible with the surrounding architecture and landscape.

SS 8 Promote universal access and comfort for all users.

SS 8.1 Comply with ADA standards for clear width, head clearance, and maneuvering space beneath and around structures.

SS 8.2 Provide shade near amenities such as benches, transit stops, and play areas.

SS 8.3 Maintain visual openness (minimum 60% transparency for vertical elements) to ensure safety and natural surveillance.

Transit stop provides vertical and horizontal shade.

SS 8.4 Design shade structures to maintain horizontal airflow and avoid heat buildup.

SS 8.4.1 Provide openings along at least two sides of the structure.

SS 8.4.2 Avoid fully enclosed or low-clearance designs that trap heat.

SS 8.5 Incorporate cool-surface materials and airflow openings to maintain thermal comfort.

MATERIALS & MAINTENANCE

Select durable, climate-appropriate materials and establish proactive maintenance strategies to ensure long-term performance, safety, and visual quality.

SS 9 Select materials that perform well in Scottsdale's desert climate.

SS 9.1 Use UV-resistant metals, treated woods, masonry, or high-performance composites that can withstand temperature extremes, sun exposure, and seasonal weather variations.

SS 9.2 Apply powder-coated or corrosion-resistant finishes on metal elements to prevent rust and color fading.

SS 9.3 Avoid materials prone to warping, brittleness, or delamination under prolonged heat.

SS 9.4 Design with materials that maintain appearance and function without frequent replacement or refinishing.

Material Selection for Desert Performance

Scottsdale's desert climate presents unique challenges for shade structures: prolonged UV exposure, high summer heat, and monsoonal weather swings. The materials selected must balance durability, maintenance, and thermal comfort.

Legend

Durability (D)
Maintenance (M)
Heat Retention (H)

○ Low ◎ Moderate ● High

Metal

D M H
● ○ ○

Long-life choice for civic and commercial spaces. Use high-performance powder-coated finishes, paired with light colors to reduce surface heat, extend lifespan and reduce maintenance.

Solar Panel

D M H
● ○ ○

Long-term, dual-purpose shade and energy generation for parking or transit sites. Requires periodic cleaning to remove debris that can block sunlight and reduce efficiency.

Wood

D M H
○ ○ ○

Commonly used for pergolas and open-air structures, offering a natural aesthetic that blends well with green spaces. Requires regular maintenance to prevent deterioration.

Fabric

D M H
○ ● ○

Lightweight and flexible for play areas or plazas. Select UV-stable, PVC- or PTFE-coated fabrics with high tear strength. Attachment points should be inspected annually.

Figure 3-5. Shade structure material selection.

SS 10 Align material selection with the intended function and context of the site.

SS 10.1 Use tensile fabric or open-air pergolas for flexible recreation areas, fixed metal or solar canopies for parking and high-use civic spaces, and artistic or sculptural forms for signature public areas.

SS 10.2 Use durable materials such as steel, masonry, or concrete for civic plazas, parking areas, and other high-use spaces.

SS 10.3 In neighborhood or park settings, apply wood, fabric, or hybrid systems that convey warmth and scale appropriate to the context.

Flat roof covered walkway is constructed of wood to reinforce the pedestrian character of Old Town.

SS 10.4 For artful or signature projects, combine sculptural forms, artistic detailing, or cultural motifs.

SS 11 Integrate water efficiency and renewable energy performance into shade structures.

SS 11.1 Where feasible, integrate solar panels or other renewable energy components within shade structures, particularly in parking areas, civic facilities, or commercial properties.

SS 11.2 Design drainage and gutter systems to direct runoff into landscape basins or bioswales, supporting water harvesting and plant irrigation.

SS 12 Select materials that maintain performance and mitigate heat buildup in extreme temperatures.

SS 12.1 For materials regularly touched by users (handrails, seating, support columns), select finishes that demonstrate “safe-to-touch” surface temperatures at or below approximately 140°F during peak summer conditions.

SS 12.2 Prioritize lighter colors, cool-surface coatings, and heat-reflective finishes for metal components to reduce radiant temperatures beneath the structure.

SS 12.3 Avoid dark or high-absorptance materials.

SS 13 Design structures for Scottsdale wind and monsoon conditions.

SS 13.1 Shade structures must be designed to withstand regional high-wind events and monsoon gusts, following certified structural engineering calculations.

SS 13.2 Fabric structures should include engineered tension systems and reinforced anchor points. Redundancy connections are required for structures located in public spaces.

SS 14 Develop a proactive maintenance plan.

SS 14.1 Inspect structures annually for corrosion, loose fasteners, fading, or material deterioration.

SS 14.2 Coordinate maintenance activities with tree pruning and irrigation inspections.

Annual Structural Inspection Checklist

- **Fasteners**: corrosion, loosening,
- **Coatings & finishes**: fading, chalking, peeling, rust
- **Footings & foundations**: cracking, settlement
- **Fabric tensioning systems**: sagging, UV damage, weakened anchor points
- **Cables & turnbuckles**: rust, slack
- **Drainage systems**: clogs, sediment buildup, improper outflow
- **Solar panels**: periodic cleaning to remove dust; mounting integrity and wiring
- **Lighting**: housings, gaskets, brittle wiring

Post-Monsoon Evaluation

- Inspect canopies for wind damage
- Check all bolts for uplift stress
- Confirm that fabric or metal systems have not warped or loosened

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DESIGN SCENARIOS

Design Scenarios translate the guidelines into applied examples that illustrate how trees, water harvesting, and shade structures work together in real-world site conditions. Using annotated graphics, this section demonstrates how shade infrastructure can be configured across a range of typical development contexts. Rather than prescribing fixed solutions, the Design Scenarios provide adaptable approaches that respond to site-specific conditions while reinforcing the overarching goals of shade provision, water efficiency, and long-term performance. Together, they provide a visual framework for understanding how Scottsdale's shade infrastructure strategies can be implemented.

Site Notes / Considerations

Notes highlight design specifics and where to find related items in the plan.

1. **Tree Selection**
   - References the Site Specific Tree Lists and Guides (see pages 38 - 47)
2. **Water Harvesting**
   - References Water Harvesting systems (see pages 66 - 75)
3. **Soil Volumes**
   - References recommended Soil Volumes (see pages 34 - 35)
4. **Pedestrian Focus**
   - How to provide shade to maximize pedestrian benefits
5. **Best Practice**
   - Site-specific notes and recommendations for the space

A - B - C - D / Tree Guides

Refer to Tree Guides for detailed species attributes that inform tree selection and management.

- **A** Hardscape Buffers
- **B** Planter Dimension
- **C** Distance Between Trees
- **D** Building Distance

MEXICAN BIRD OF PARADISE

Caesalpinia mexicana

Ⓑ	Size(hxw)	10' x 10'
	Growth Rate	fast
	Shade Type	medium
	Deciduous	no, evergreen
	Flower	yes, summer
	Fruit	no
	Water	lower
	Litter	medium
	Thorns	no
	Poisonous	no
	Pool-friendly	yes
Ⓒ	Distance Apart	8' O.C.
Ⓐ	Min Sidewalk Dist.	4'
Ⓐ	Min Street Dist.	8'
Ⓓ	Min Building Dist.	4'
	Parking Lot	no
	Allergen	non-allergenic

Figure 4-1. Building frontage with onstreet angled parking.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, NEAR BUILDING - Broad, overhead canopy with adequate clearance
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Trees shade the primary sidewalk and building entrances
5. BEST PRACTICE - Combine tree, structured shade to maximize shade coverage

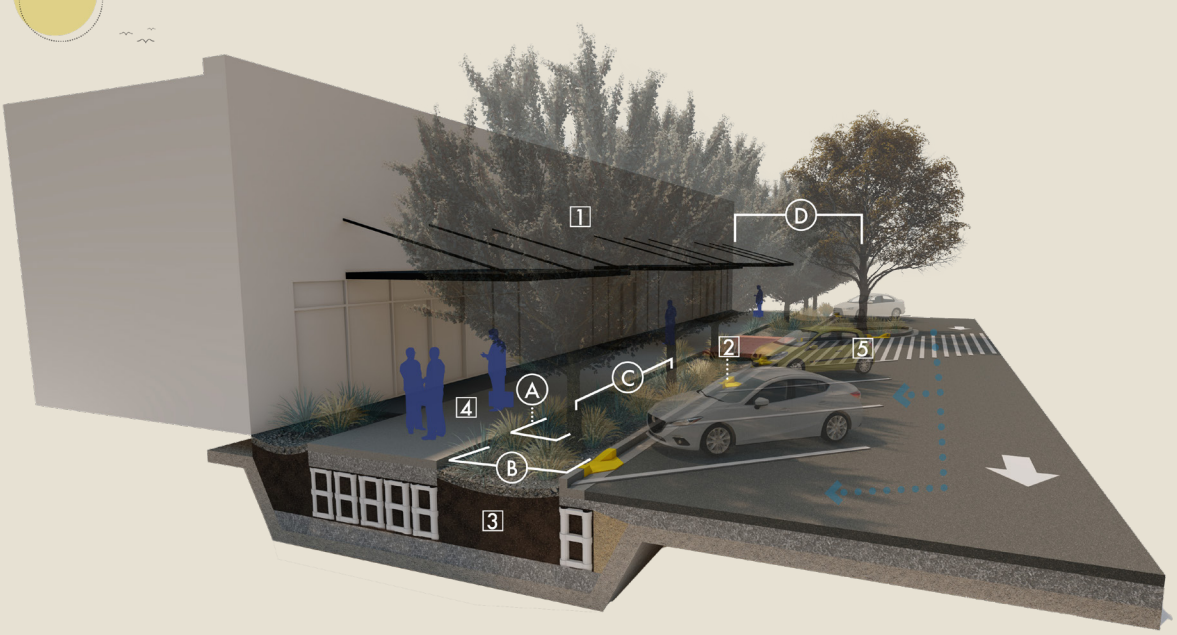

Figure 4-2. Building frontage with on-street parallel parking.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, NEAR BUILDING - Broad, overhead canopy with adequate clearance
2. WATER HARVESTING ELEMENT - Permeable pavement, curb cut, pedestrian bridge
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with structural soil
4. PEDESTRIAN FOCUS - Prioritize shade where people exit vehicles
5. BEST PRACTICE - Use continuous planting strips and structural soil beneath pedestrian and parking areas to expand shared rooting volume

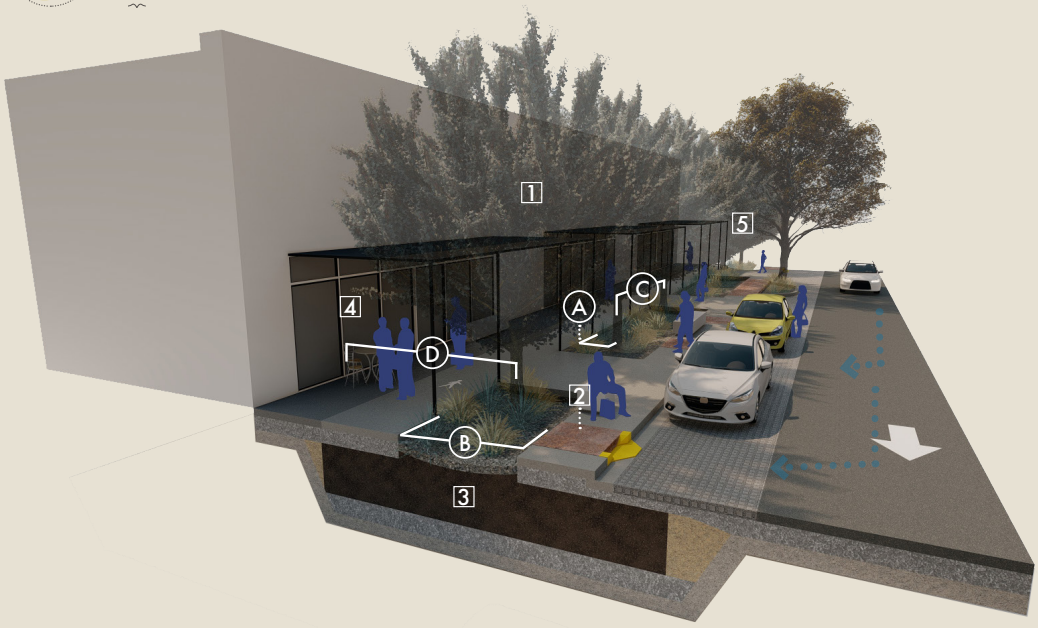

Figure 4-3. Building frontage and parking lot.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, PARKING LOTS - Broad canopy with adequate clearance and minimal litter
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, rain garden, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Trees shade the primary sidewalk and building entrances
5. BEST PRACTICE - Combine tree, structured shade to maximize shade coverage

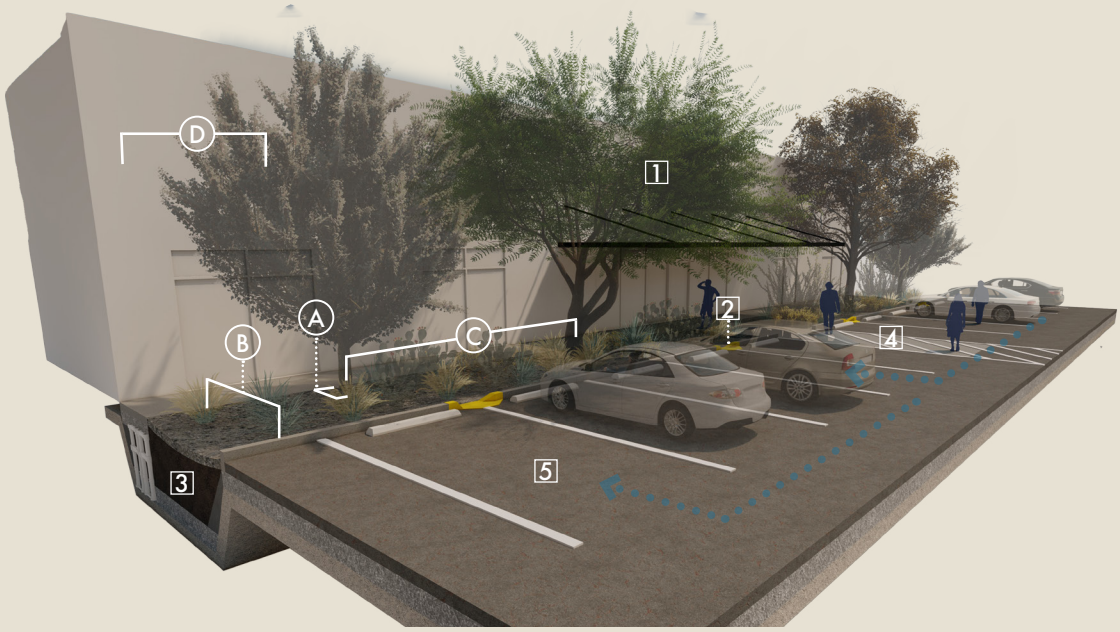

Figure 4-4. Pedestrian path.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, PATH/SIDEWALKS - Broad, overhead canopy with adequate clearance
2. WATER HARVESTING ELEMENT - Bioswale, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Prioritize shade where people exit vehicles
5. BEST PRACTICE - Avoid planting trees in lawn areas. Sprinkler irrigation discourages deep root growth

Figure 4-5. Roadway trees back of curb.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, STREET, BACK OF CURB - Prioritize clearance above travel lanes and signage
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Separate pedestrian areas from vehicular traffic
5. BEST PRACTICE - Use continuous planting strips, furnishings, or low edges to reinforce the separation from traffic while maintaining clear sightlines at driveways and intersections

Figure 4-6. Roadway trees separated by pedestrian path

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, STREET, BACK OF SIDEWALK - Larger trees in wide, back-of-sidewalk planter
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, rain garden, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Pedestrian shade prioritized by tree location
5. BEST PRACTICE - Use continuous planting strips, furnishings, or low edges to reinforce the separation from traffic

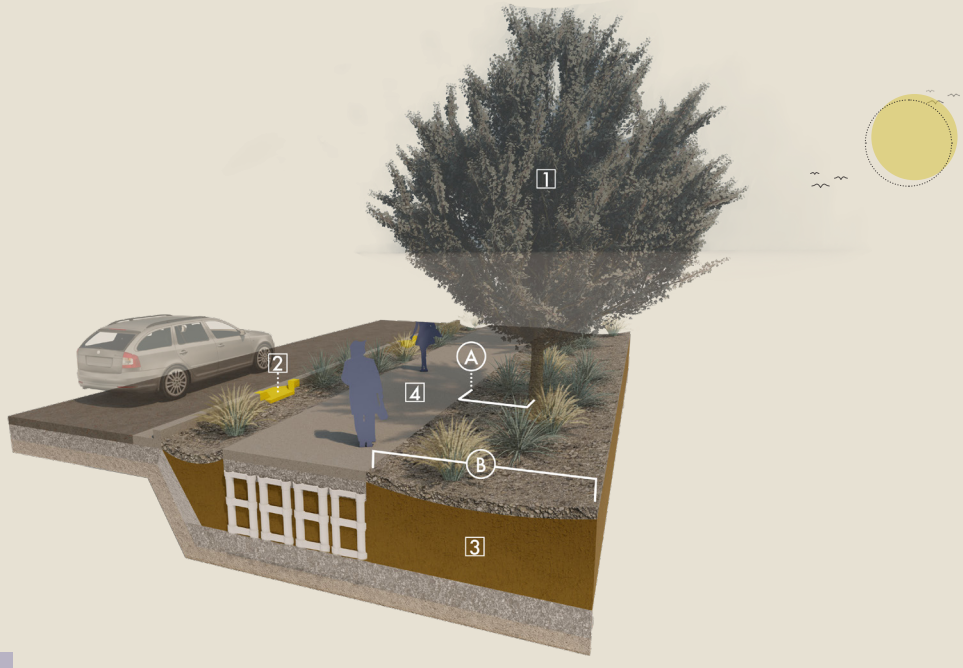

Figure 4-7. Pedestrian trail.

TREE GUIDE FOR SPECIFICS ON:

- (A) HARDSCAPE BUFFERS
- (B) PLANTER DIMENSION
- (C) DISTANCE BETWEEN TREES
- (D) BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, PATH/SIDEWALKS - Broad, overhead canopy with adequate clearance
2. WATER HARVESTING ELEMENT - Bioswale, rain garden, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Continuous shade along high-use trail segments, at rest areas
5. BEST PRACTICE - Use low, desert-adaptive understory plantings that preserve sight lines

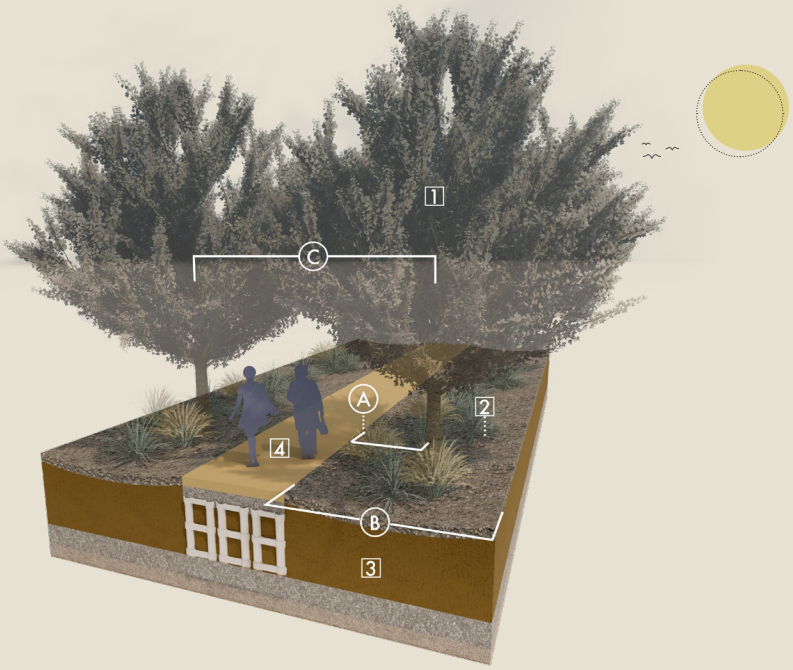

Figure 4-8. Pedestrian path adjacent to roadway and utilities.

TREE GUIDE FOR SPECIFICS ON:

- (A) HARDSCAPE BUFFERS
- (B) PLANTER DIMENSION
- (C) DISTANCE BETWEEN TREES
- (D) BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, STREET, BACK OF CURB - Prioritize clearance above travel lanes and signage
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Prioritize pedestrian shade while keeping clear of utilities
5. BEST PRACTICE - Coordinate tree placement with utility providers; maintain recommended clearances from boxes, vaults, and poles

Figure 4-9. Parking near a pedestrian path.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, PARKING LOTS - Broad canopy with adequate clearance and minimal litter
2. WATER HARVESTING ELEMENT - Bioswale, rain garden, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Trees shade walking routes, access points, and seating areas
5. BEST PRACTICE - Use the outer planting strip to frame the path and complete a continuous shaded edge

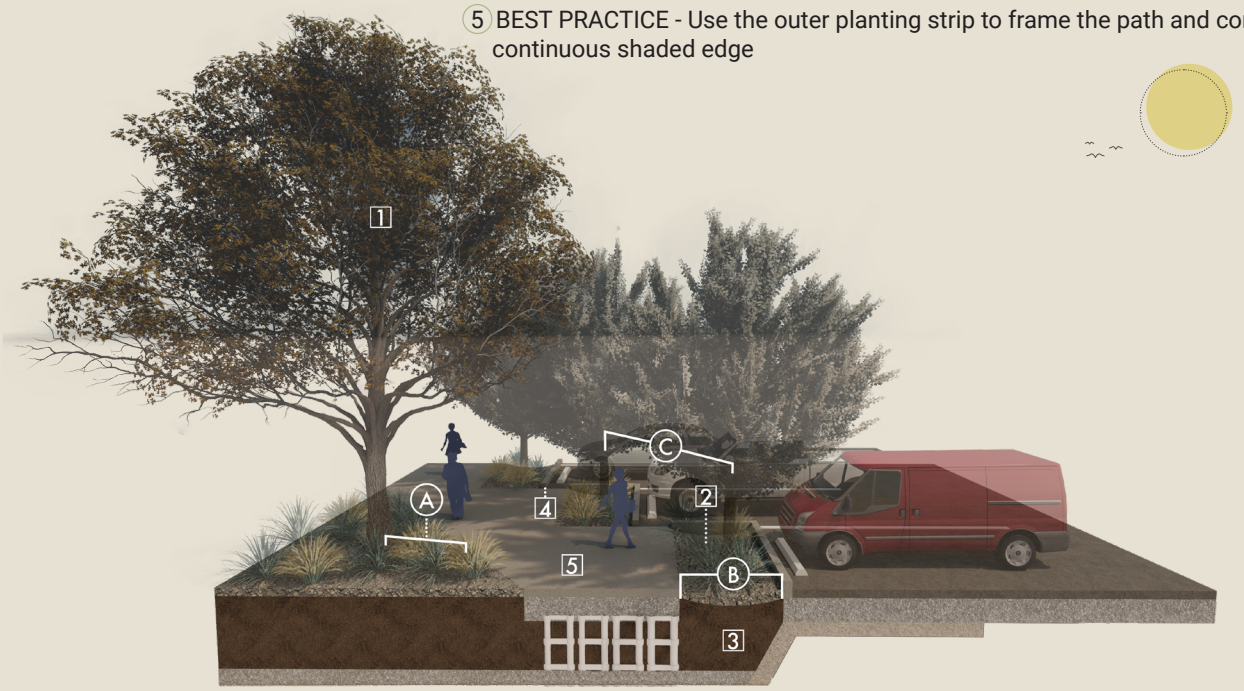

Figure 4-10. Planter in a parking area.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, PARKING LOTS - Broad canopy with adequate clearance and minimal litter
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, structural soil
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with structural soil
4. PEDESTRIAN FOCUS - Prioritize shade where people exit vehicles
5. BEST PRACTICE - Use continuous planting strips and structural soil to link individual islands where possible

Figure 4-11. Parking dogbone.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, PARKING LOTS - Broad canopy with adequate clearance and minimal litter
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, rain garden, structural soil
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with structural soil
4. PEDESTRIAN FOCUS - Prioritize shade where people exit vehicles
5. BEST PRACTICE - Place dogbone islands at regular intervals to break up long rows of parking and form a continuous shaded spine

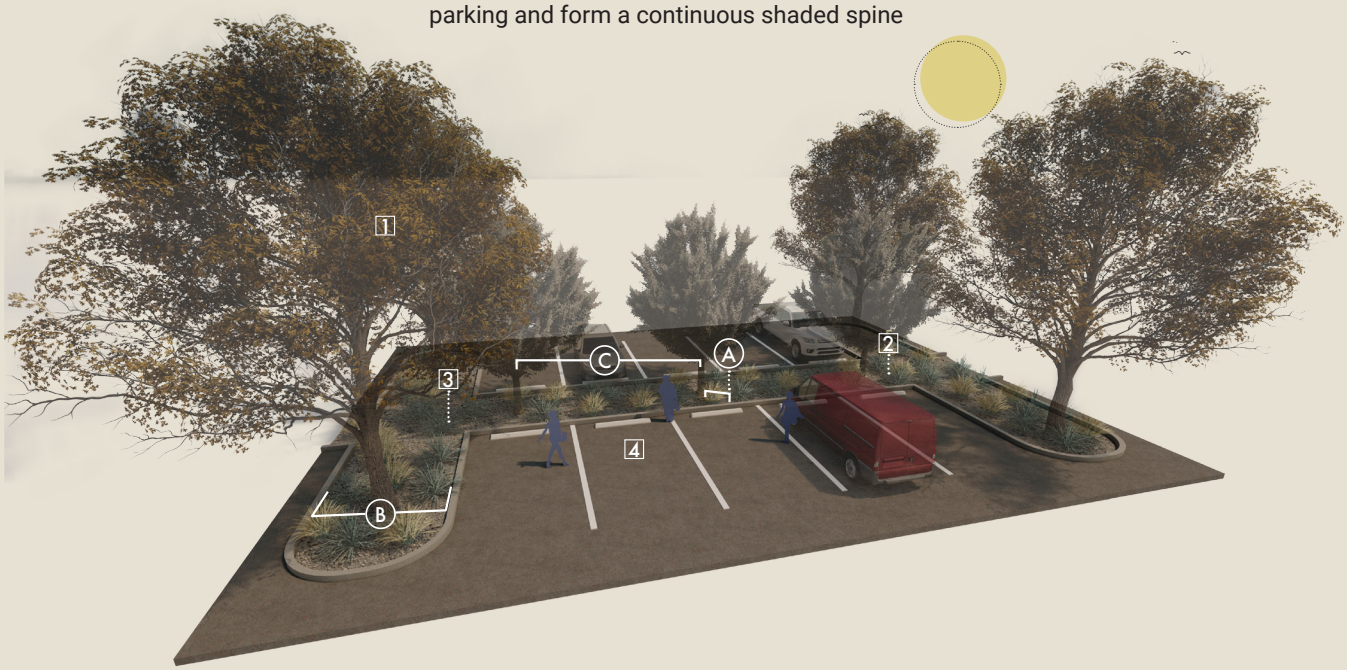

Figure 4-12. Planter islands in a parking area.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, PARKING LOTS - Broad canopy with adequate clearance and minimal litter
2. WATER HARVESTING ELEMENT - Bioswale, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Prioritize shade where people exit vehicles and pedestrian paths
5. BEST PRACTICE - Space planter islands so no stall is far from a tree, creating a more continuous canopy along parking rows

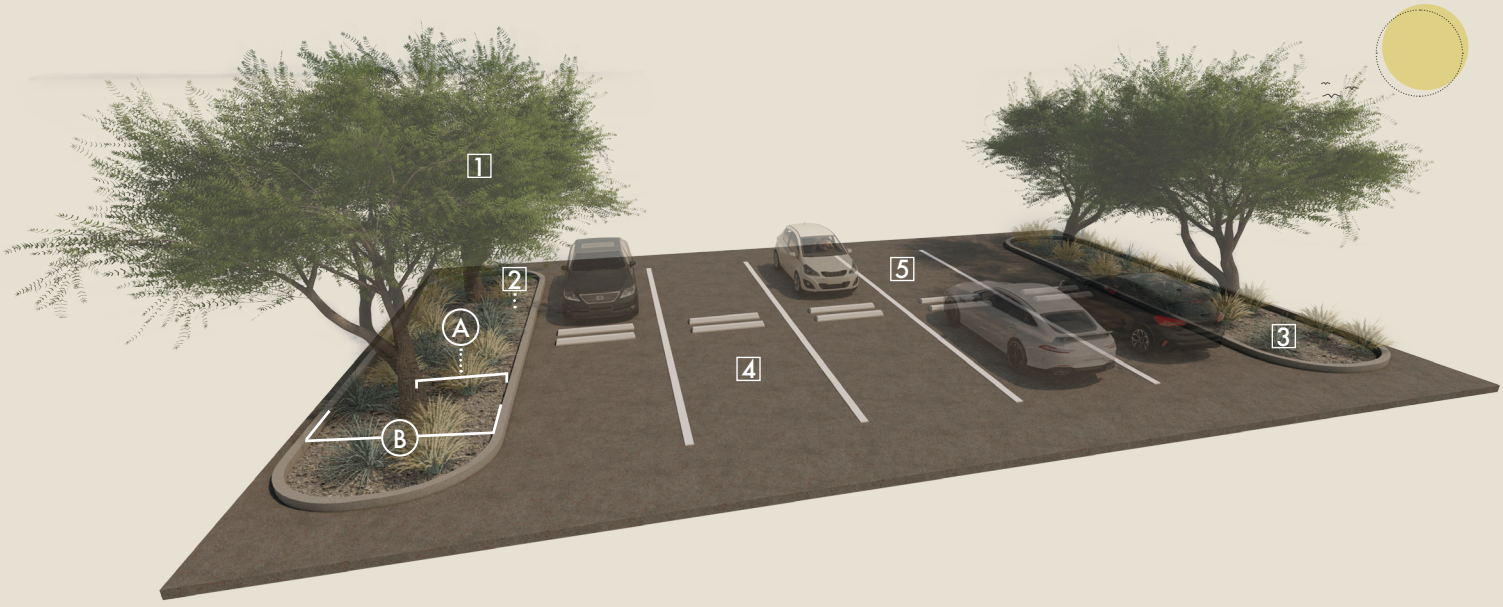

Figure 4-13. Parking with alternating planter islands

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, PARKING LOTS - Broad canopy with adequate clearance and minimal litter
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Locate trees to shade typical walking routes between parked cars
5. BEST PRACTICE - Stagger planter islands so trees alternate from side to side, creating overlapping canopies and reducing unshaded gaps along the parking rows

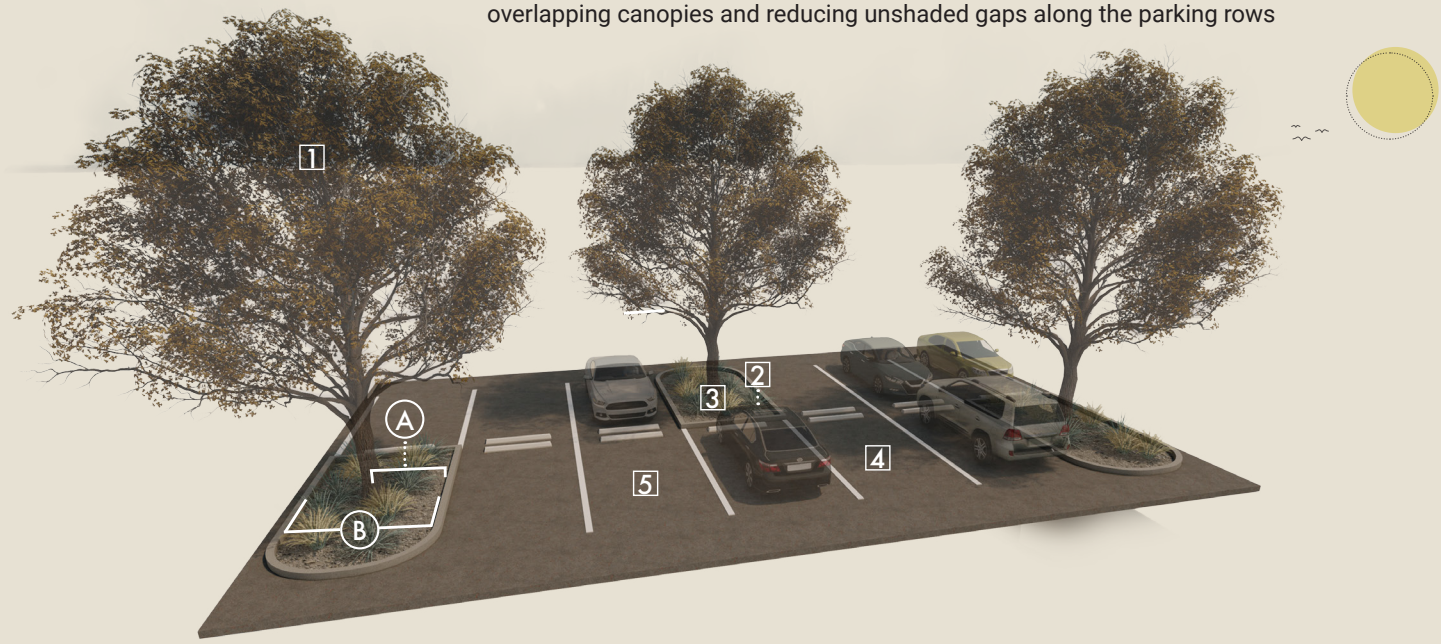

Figure 4-14. Gathering spaces and playgrounds.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE GUIDE, LARGE TREES - Broad canopy, non-thorny trees shade seating and playground
2. WATER HARVESTING ELEMENT - Bioswale, rain garden suspended pavement
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with suspended pavement
4. PEDESTRIAN FOCUS - Prioritize shade along paths, seating areas, and near play equipment
5. BEST PRACTICE - Combine shade structures with trees to provide reliable overhead coverage while extending shade beyond the play area, cooling surrounding hardscape, and offering long-term canopy

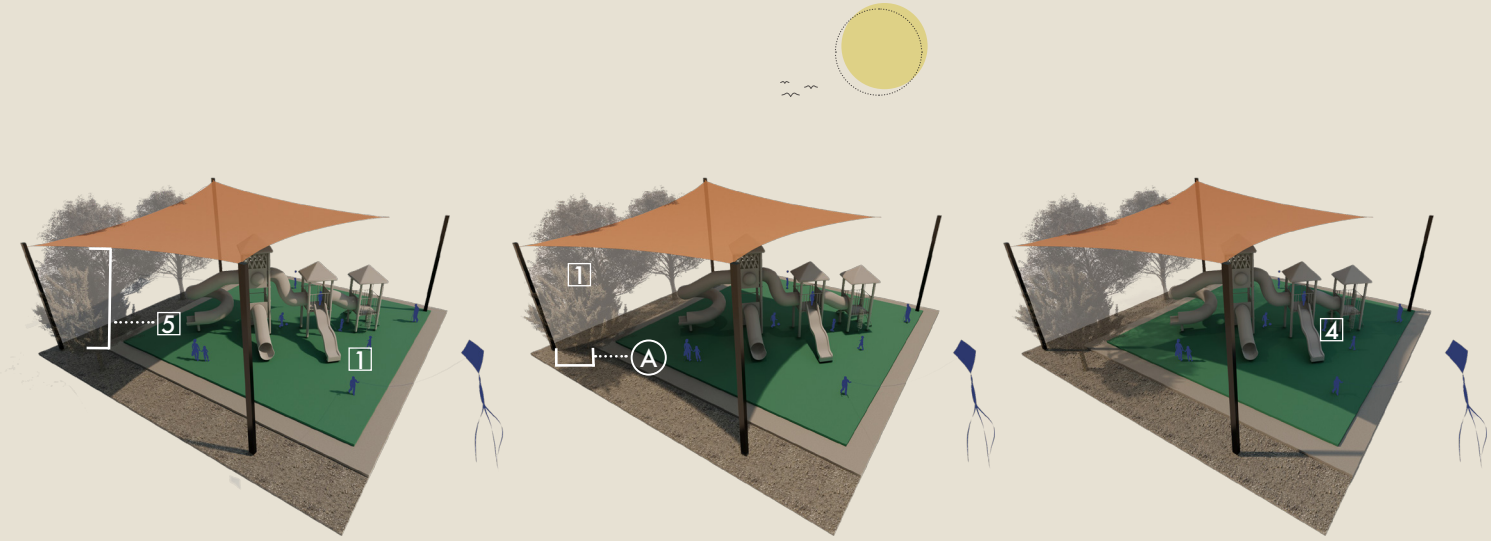

Figure 4-15. Shade structures and trees.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE GUIDE, LARGE TREES - Broad canopy, non-thorny trees shade seating areas
2. WATER HARVESTING ELEMENT - Rain garden, basin, structural soil
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with structural soil
4. PEDESTRIAN FOCUS - Align trees to shade approach paths, gathering zones
5. BEST PRACTICE - Coordinate tree spacing, column layout, and roof overhangs so tree canopy and structure work together: structures supply reliable core shade, and trees extend shade into surrounding pavement

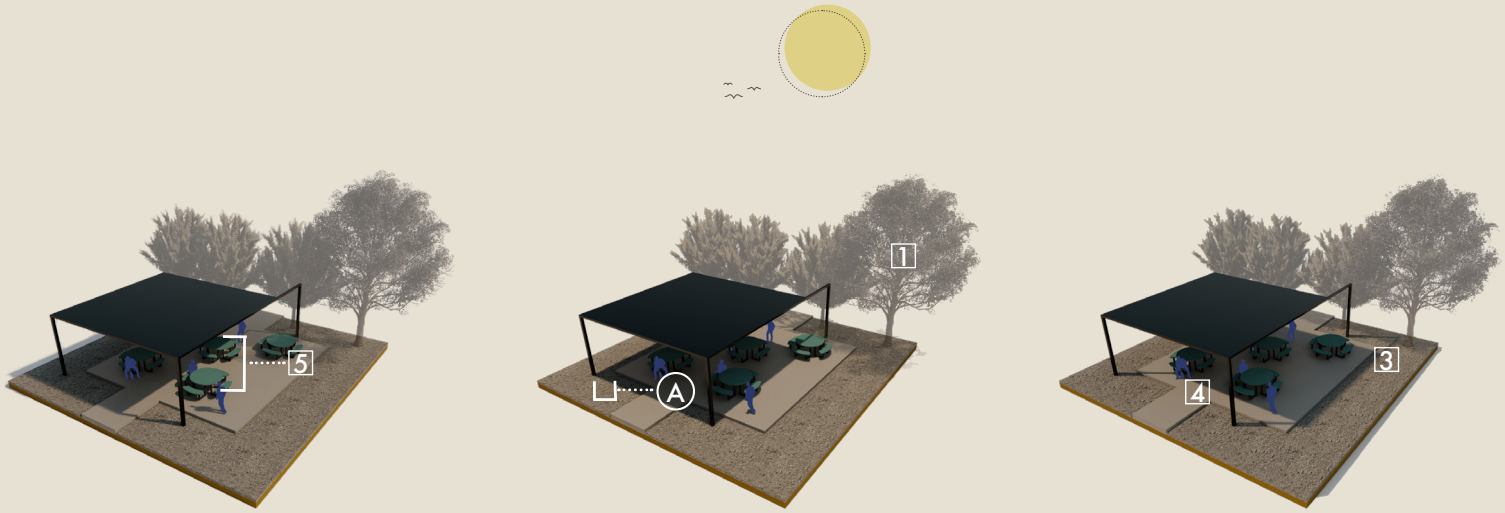

Figure 4-16. Shade structures or trees.

TREE GUIDE FOR SPECIFICS ON:

- A HARDSCAPE BUFFERS
- B PLANTER DIMENSION
- C DISTANCE BETWEEN TREES
- D BUILDING DISTANCE

SITE NOTES:

1. TREE LIST, STREET, BACK OF CURB - Prioritize clearance above travel lanes and signage
2. WATER HARVESTING ELEMENT - Curb cut, bioswale, structural soil
3. SOIL VOLUMES - 500 cu ft Min., 1,000 cu ft with structural soil
4. PEDESTRIAN FOCUS - Align trees or structures so shade falls along pedestrian route
5. BEST PRACTICE - Use trees as the preferred long-term shade solution wherever adequate width, soil volume, and utility clearances exist, and rely on shade structures in street locations where utilities, hardscape constraints, or limited planting space make tree installation impractical

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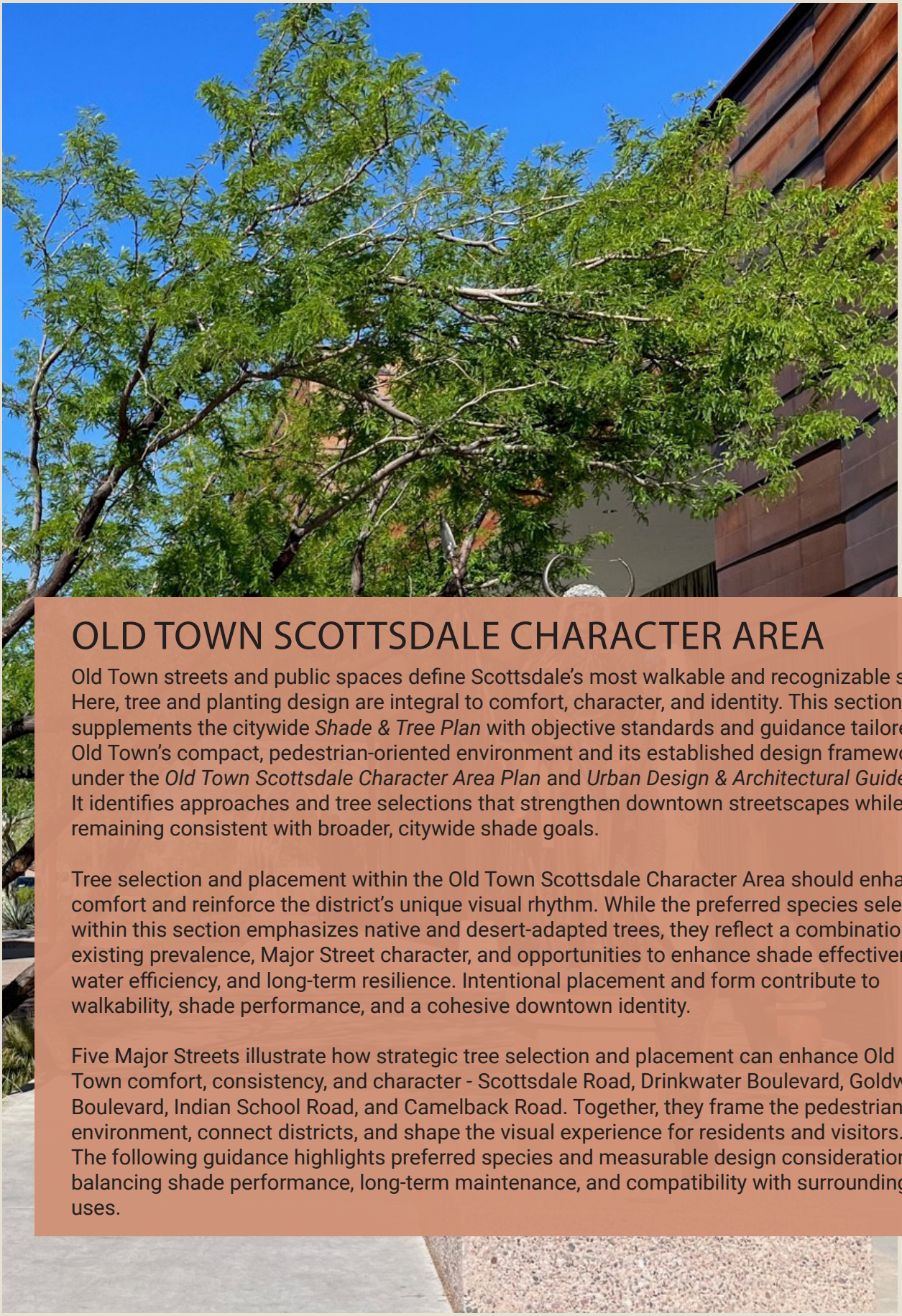


OLD TOWN SCOTTSDALE CHARACTER AREA

Old Town streets and public spaces define Scottsdale's most walkable and recognizable setting. Here, tree and planting design are integral to comfort, character, and identity. This section supplements the citywide *Shade & Tree Plan* with objective standards and guidance tailored to Old Town's compact, pedestrian-oriented environment and its established design framework under the *Old Town Scottsdale Character Area Plan* and *Urban Design & Architectural Guidelines*. It identifies approaches and tree selections that strengthen downtown streetscapes while remaining consistent with broader, citywide shade goals.

Tree selection and placement within the Old Town Scottsdale Character Area should enhance comfort and reinforce the district's unique visual rhythm. While the preferred species selection within this section emphasizes native and desert-adapted trees, they reflect a combination of existing prevalence, Major Street character, and opportunities to enhance shade effectiveness, water efficiency, and long-term resilience. Intentional placement and form contribute to walkability, shade performance, and a cohesive downtown identity.

Five Major Streets illustrate how strategic tree selection and placement can enhance Old Town comfort, consistency, and character - Scottsdale Road, Drinkwater Boulevard, Goldwater Boulevard, Indian School Road, and Camelback Road. Together, they frame the pedestrian environment, connect districts, and shape the visual experience for residents and visitors. The following guidance highlights preferred species and measurable design considerations, balancing shade performance, long-term maintenance, and compatibility with surrounding land uses.

Design and Implementation Framework

Although all Citywide Guidelines apply in Old Town, the accompanying Old Town Scottsdale Character Area Tree Guidelines, Major Streets Map (see page 102), and Street Tree Palette (see page 103) provide additional clear, measurable direction for Scottsdale's downtown area. The map identifies Scottsdale Road, Drinkwater Boulevard, Goldwater Boulevard, Indian School Road, and Camelback Road as Major Streets, each with corresponding Tree Palette and standards specifying Theme and Accent species, recommended spacing intervals, and preferred canopy forms designed to maintain rhythm, shade effectiveness, and visual consistency along each corridor. These standards ensure that new improvements, replacements, or infill plantings remain compatible with established canopy patterns and continue to advance citywide shade coverage objectives.

While the Street Tree Palette provides street-specific direction for Major Streets, the Old Town Scottsdale Character Area Tree Guidelines apply more broadly, offering principles for tree placement, health, and maintenance throughout the Old Town network of streets, plazas, and pedestrian connections. These guidelines establish the technical foundation for achieving consistent, high-performance shade and landscape outcomes across varying contexts.

Tree Selection & Location defines how trees should be placed to reinforce streetscape rhythm, complement adjacent architecture, and meet minimum spacing and setback standards. It introduces objective standards for consistency, visibility, and coordination with utilities.

Trees in Parking Areas extends these principles into surface parking areas, specifying shade coverage requirements to achieve 50% surface shade at maturity.

Together, these components create a complete decision-making framework, from planning and design to construction and long-term management. The map and street prescriptions illustrate where each tree type should occur, while the guidelines describe how those trees should be planted, sustained, and integrated with the surrounding built form. When used collectively, they ensure that tree selection, placement, and performance advance consistent, measurable outcomes for shade and identity across Scottsdale's downtown.

Shaded pedestrian path along Arizona Canal.

Legacy + Character

The Street Tree Palette balances shade performance with established landscape character. Sissoo remains the theme tree on Indian School Road because an existing mature canopy defines the corridor and continues to provide meaningful shade. Date Palms and Mexican Fan Palms are included as accent trees in select segments where they are strongly associated with Old Town's resort-style and historic identity. Where these species provide limited shade or present maintenance considerations, they should be used strategically and paired with higher-performing shade trees to maintain corridor shade objectives.

TREE SELECTION & LOCATION

Ensure tree placement provides measurable pedestrian shade, visual continuity, and compatibility with adjacent development.

OT 1 Trees should be located within rights-of-way, open space, and landscape areas to provide pedestrian shade, reinforce designated street theme palettes, and establish a continuous streetscape rhythm through species selection, canopy form, and spacing.

OT 1.1 Old Town Scottsdale Character Area Major Streets should incorporate designated Theme and Accent trees per adopted palette and spacing (see pages 102 - 103).

- OT 1.1.1 Theme tree spacing may only be adjusted for driveways, utilities, or visibility triangles.
- OT 1.1.2 Accent trees may be located near entries, intersections, or courtyards to create visual focus within the rhythm of theme trees.

OT 1.2 Old Town Scottsdale Character Area streets where no adopted palette exists, should incorporate tree species that match the prevailing species present along the same street frontage.

- OT 1.2.1 Tree spacing should match mature canopy width, unless constrained by driveways, utilities, or visibility triangles.

OT 1.3 Streetscape design should respond to roadway function and adjacent land-use context while maintaining consistent shade rhythm.

OT 1.4 Taller accent trees may be used to reduce perceived street width and soften adjacent building massing.

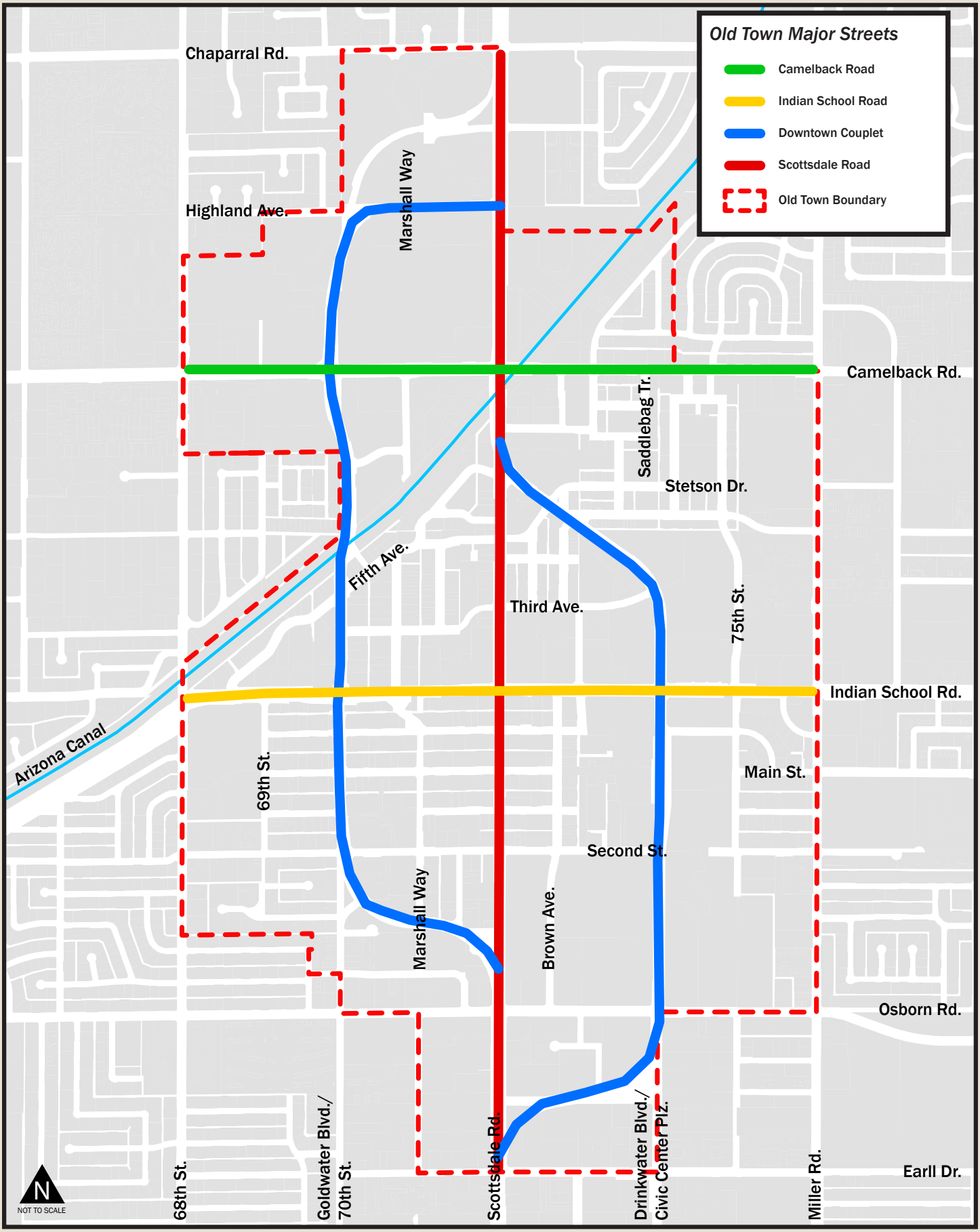
OT 1.5 Open space areas greater than 2,500 square feet should include trees at a rate of one tree per 500 square feet.

OT 1.6 Trees in open spaces should be placed in linear, geometric, or clustered groupings to define pedestrian linkages and gathering areas.

OT 1.7 Plantings of three or more trees of a like species should be grouped in odd numbers and used to define activity areas and provide visual cohesion.

OT 1.8 Avoid placing fruiting species or trees prone to heavy bird nesting adjacent to pedestrian areas.

Old Town Scottsdale Character Area Major Streets



Notice: This document is provided for general information purposes only. The City of Scottsdale does not warrant its accuracy, completeness, or suitability for any particular purpose. It should not be relied upon without field verification. Map not to scale.

CAMELBACK ROAD

Camelback Road is divided into two design segments based on adjacent land uses and existing planting patterns. Segment 1 reflects larger-scale mixed-use and resort development. Segment 2 transitions to smaller-scale commercial, hotel, and service-residential uses, with a corresponding shift in the tree palette:

Camelback Road Segment 1 – 68th Street to Saddlebag Trail
Theme Tree: Live Oak (25-30 ft spacing)
Accent Tree, Street Frontage: Date Palm (15-20 ft spacing)
Accent Tree, Medians: Sonoran Emerald Palo Verde (25-30 ft spacing)

Camelback Road Segment 2– Saddlebag Trail to Miller Road
Theme Tree: Evergreen Elm (25-30 ft spacing)
Accent Tree, North-side Street Frontage: Texas Ebony (25-30 ft spacing)
Accent Tree, South-side Street Frontage: Date Palms (15-20 ft spacing)

INDIAN SCHOOL ROAD

Indian School Road is the primary east–west access into Old Town and connects to multiple Old Town Districts. This roadway is defined by wider setbacks with separated sidewalks, plazas, and coordinated landscaping, further supported by a consistent double-row street tree pattern:

Indian School Road
Theme Tree: Sissoo (30–35’ spacing)
Accent Tree, street frontage: Pistache Red Push (located at intersections, 25–30’ spacing)
Accent Tree, medians: Texas Ebony (25–30’ spacing)

DOWNTOWN COUPLET

Drinkwater and Goldwater Boulevards form a north–south couplet east and west of Scottsdale Road, serving the majority of Old Town Districts. Each roadway has five travel lanes and a landscaped median, providing circulation around the Downtown Core and access to civic, parking, and mixed-use destinations. The Downtown Couplet is intended to function as a pair of civic boulevards:

Drinkwater Boulevard
Theme Tree: Pistache Red Push (25–30’ spacing)
Accent Tree, street frontage: Fruitless Olive (15–20’ spacing)
Accent Tree, intersections, driveway entrances, and plaza spaces: Date Palm (15–20’ spacing)
Accent Trees, medians: Alternating Fruitless Olive (15–20’ spacing) and Date Palm (15–20’ spacing)

Goldwater Boulevard
Theme Tree: Ironwood (25–30’ spacing)
Accent Tree, intersections and curb cuts north of Indian School Road: Date Palm (15–20’ spacing)
Accent Tree, street frontage south of Indian School Road: Date Palm (15–20’ spacing)
Accent Tree, medians: Ghost Gum (30–50’ spacing)

SCOTTSDALE ROAD

Scottsdale Road is the central north–south spine through Old Town, serving the majority of Old Town Districts and providing access to a wide range of land uses and building scales. Through-traffic is redirected to the Downtown Couplet, allowing Scottsdale Road to function as a primary urban corridor. For design purposes, Scottsdale Road includes endcap gateways:

Scottsdale Road Gateways – Chaparral Road to Camelback Road & 2nd Street to Earll Drive
Theme Tree: Live Oak (25–30’ spacing)
Accent Trees, street frontage: Date Palm (15–20’ spacing) and Sweet Acacia (20’ spacing)
Accent Tree, medians: Sweet Acacia (20’ spacing)

Scottsdale Road – Camelback Road to 2nd Street
Theme Tree: Live Oak (25–30’ spacing)
Accent Tree, in clusters at street frontage: Mexican Fan Palm (5–10’ spacing)
Accent Tree, medians: Sweet Acacia (20’ spacing)
Accent Tree, in clusters within medians: Mexican Fan Palm (5–10’ spacing)

TREES IN PARKING AREAS

Reduce heat gain and improve comfort in surface parking areas through consistent canopy coverage.

OT 2 Shade trees should be provided within surface parking lots to achieve consistent canopy coverage and complement other shade systems.

OT 2.1 Trees should be set back a minimum of 2 feet from curbs or parking stall edges to allow vehicle door swing and bumper overhang.

OT 2.2 Tree species used in parking areas should be single trunk, maintain minimum clearance of 7 feet above parked vehicles, and have limited fruit or sap.

OT 2.3 Canopy trees should be provided in required landscape islands at intervals sufficient to achieve 50% surface shade coverage based on projected canopy spread at species maturity.

Consistent canopy coverage in parking areas can reduce heat gain.

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APPENDIX

GLOSSARY

#

30/20/10 Rule – A planting guideline used to promote biodiversity and reduce risks associated with monocultures by limiting plant composition to no more than 30% from a single family, 20% from a single genus, and 10% from a single species within a landscape.

A

Active Water Harvesting – Systems that collect rainwater and store it for later use, such as cisterns or gray water systems.

Air Spade – A specialized tool that uses high-pressure compressed air to loosen and excavate compacted soil to improve soil aeration, water infiltration, and root health in established landscapes.

ANSI A300 Standards – A nationally recognized set of professional standards developed by the American National Standards Institute that establish best practices for tree care.

B

Basin, Bioretention Basin – A depression filled with vegetation that collects and filters stormwater, allowing it to infiltrate into the soil, which reduces runoff and improves water quality.

Biodiversity – (1) The wildlife habitat and ecosystem value created by trees; and (2) a desired outcome advanced through intentional species diversity in planting.

Bioswale – A vegetated, sloped drainage feature that slows, filters, and absorbs stormwater, preventing runoff and allowing water to infiltrate the ground.

Built Environment – Human-made elements including, buildings, structures, roads, canals, paths, and trails, that together create the physical character of an area or community.

C

Canopy – See Tree Canopy.

Character – Unique features, qualities, and attributes that contribute to the identity of a place.

Cistern – Containers or tanks used to store rainwater collected from roofs for later use, typically for irrigation, as part of active water harvesting systems.

Context – The relationship between a location and its surrounding natural, planned, permitted, and/or built environment; the whole environment relevant to a particular building or place; the interrelated conditions in which something exists or occurs.

Covered Walkway – Shaded path or passage.

Curb Cut – Opening in street curbs that diverts stormwater from streets into green spaces, allowing water to infiltrate into the soil.

D

Deep Tilling – Loosening soil well below the surface (beyond typical grading depth) to reduce compaction, improve infiltration, and expand rootable soil for long-term tree health.

Dieback – Death of twigs, branches, or portions of the canopy, typically caused by stress (heat, drought, poor soils, pests, or improper watering), resulting in reduced shade performance.

Drip Irrigation – A low-water-use irrigation method that delivers water directly to plant roots through a network of tubes, minimizing water waste.

Durability – The ability to withstand wear, pressure, or damage.

E

Evapotranspiration – The combined process of evaporation from soil and other surfaces and transpiration from plant leaves, during which water absorbs heat as it changes from liquid to vapor.

F

Filtered Shade – Shade created by structures or trees that allow some sunlight to filter through, providing dappled light and reduced heat.

First Flush – The initial 0.5 inch of runoff from a storm event that often carries the highest concentration of sediment, trash, oils, and other pollutants.

Full Shade – An area that receives little to no direct sunlight, typically provided by dense tree canopies or overhead shade structures like canopies and pergolas.

G

Green Stormwater Infrastructure (GSI) – Nature-based stormwater practices (e.g., basins, bioswales, rain gardens, tree trenches) that capture, slow, filter, and infiltrate runoff to support vegetation, reduce runoff, and improve water quality. See also, Water Harvesting.

H

Hardscape – A built element added to a landscape area, including but not limited to concrete walkways, benches, recreation equipment, statuary and fountains.

Heat Island – The phenomenon involving elevated temperatures in urban/suburban areas as compared with outlying rural/ undeveloped surroundings. Heat islands are generally caused by reduced vegetation, solar heat absorption, material heat capacity, use of energy, and building spacing.

Horizontal Shade Structures – Overhead elements like pergolas, canopies, or tensile fabric structures that provide shade over larger open areas, reducing surface temperatures and direct sun exposure.

I

J

K

L

Linear Bioswales – Long, narrow vegetated conveyance features (commonly along streets, medians, or parking edges) designed to intercept runoff, slow flow, filter pollutants, and promote infiltration.

Low Impact Development (LID) – Refers to design and implementation practices that can be employed at the site-level to both control stormwater and replicate the pre-development hydrology of the site. This approach to water management protects, restores, or mimics the nature water cycle on a development site.

M

N

O

P

Passive Water Harvesting – Systems that capture rainwater where it falls, allowing it to infiltrate into the soil naturally. Examples include bioswales, rain gardens, and permeable pavement.

Pavement Heaving – Upward lifting or cracking of pavement caused by roots, expansive soils, or inadequate subgrade/ soil design, often indicating insufficient root space.

Permeable Pavement – Paving materials that allow water to pass through the surface, reducing runoff and supporting groundwater recharge.

Public Realm – The environment created by the network of streets and open spaces, parks and plazas, and the pattern of uses and activity, which contribute to the character and quality of the place.

Q

R

Rain Garden – A planted depression that collects rainwater from roofs, streets, and other surfaces, allowing water to infiltrate into the soil and reduce stormwater runoff.

Right(s)-of-way – The strip of land over which certain transportation and/or other public facilities are built, including roads, sidewalks, and utility lines. A public right-of-way is typically dedicated or deeded to the public for public use and controlled by a public agency, such as the city.

Right Tree/Structure, Right Place – A performance-based planning and design principle that matches tree species and/or shade structure type, size, and placement to site conditions and intended shade outcomes—prioritizing south and west exposures for afternoon relief, using site-specific shade diagrams, and accounting for constraints such as utilities, soil volume, hardscape conflicts, and water availability so shade elements can thrive and function long-term.

Root Flare – The natural widening at the base of the trunk where major roots begin; it should be visible at or slightly above finished grade to avoid trunk rot and instability.

Root Zone – The soil volume where a tree's roots grow and function (water, oxygen, nutrients); protecting and expanding this zone supports canopy growth and shade longevity.

S

Safe-to-touch – A performance benchmark indicating that a surface is suitable for short-duration contact under expected hot-weather conditions. For this Plan, the benchmark assumes brief contact (about 5 seconds) and is generally met when surface temperatures are at or below approximately 140°F during peak summer conditions.

Sediment Forebay – A small, dedicated pretreatment pool located at the inlet of a basin area that slows incoming runoff so coarse sediment and debris settle out in an accessible location, protecting downstream infiltration media and reducing long-term maintenance demands.

Sediment Trap – A pretreatment feature installed at stormwater entry points (such as curb cuts, inlets, or grate openings) that captures sediment, trash, and debris before runoff enters basins, bioswales, rain gardens, or other water-harvesting features to help prevent clogging, protect infiltration performance, and simplify maintenance.

Shade Goals – Targets established within the Scottsdale Shade & Tree Plan to increase the percentage of shade coverage throughout the city, with specific goals for different land uses, such as parks, streetscapes, and commercial areas.

Shade Infrastructure – An interconnected system of trees, shade structures, and water-harvesting practices.

Soil Fracturing – Targeted loosening of compacted soils to restore pore space, improve infiltration, and reduce root stress without major excavation.

Structural Soil – Engineered soil designed to support both plant growth and pavement weight, allowing tree roots to grow and breathe in compacted urban areas.

Suspended Pavement – A pavement-support system that carries sidewalks, plazas, or parking areas on a structural deck, frame, or cell system so that soil beneath remains largely uncompacted and usable for tree roots and stormwater infiltration.

T

Tensile Fabric – A durable, UV-stable shade fabric installed under tension (e.g., shade sails) that provides immediate shade, typically used where trees are not feasible or need supplemental coverage.

Treatment Train – A sequence of stormwater features used together to improve performance, typically combining pretreatment with infiltration/filtration practices to capture, slow, filter, and infiltrate runoff.

Tree Canopy, Tree Crown – The top part of a tree, containing its branches, leaves, flowers, and fruits, extending from where the main branches emerge from the trunk, responsible for photosynthesis, transpiration, and overall energy production for the tree.

Tree Guying – Stabilizing a tree using guy wires/straps anchored to the ground, typically for larger-caliper trees or windy sites; adjusted to avoid bark damage and removed after establishment.

Tree Staking – Temporary supports used to stabilize a newly planted tree during establishment while allowing enough movement to develop trunk strength; removed once the tree is self-supporting.

U

Ultraviolet (UV) – Invisible radiation from sunlight that can be harmful; effective shade reduces UV exposure in outdoor spaces and improves comfort, especially during peak sun hours.

V

Vertical Shade Structures – Shade structures like screens or louvers installed vertically to block sunlight from west- or south-facing areas. Often used in narrow spaces, these structures typically maintain 60% transparency for safety and visibility.

Volunteer Tree – A self-established tree that was not intentionally planted. Volunteer trees may be desirable or undesirable and are evaluated for retention or removal based on site conditions.

W

Water Harvesting – The practice of collecting and using rainwater for landscape irrigation or other non-potable uses, either passively (e.g., through bioswales and rain gardens) or actively (e.g., through cisterns and gray water systems).

X

Y

Z

RELATED PLANS & POLICIES

A

- Arizona Department of Water Resources Low Water Use and Drought Tolerant Plant List

B

C

- Commercial Solar Guidelines (2020)

D

- Design Standards and Policies Manual (2018)
- Drought Management Plan (2021)

E

- Environmentally Sensitive Lands Ordinance (1991 + amendments)

F

- Frank Lloyd Wright Streetscape Design Guidelines (1991)

G

- Greater Phoenix Green Infrastructure Handbook: Low Impact Development (LID) Details for Alternative Stormwater Management (2019)
- Green Building (LEED™) Policy for New City Construction and Remodels (2005)
- Green Building Design Principles
- Green Building Program and Guidelines

H

I

- Identifying Strategies for a Cooler Scottsdale (2020)
- Integrated Water Resources Master Plan (2022)
- International Energy Conservation Code (IECC) for Commercial and Residential Projects
- International Green Construction Code (IGCC) For Commercial Projects

J

K

L

M

- MAG Complete Streets Guide (2011)
- MAG Desert Spaces Environmentally Sensitive Development Areas Policies and Design Guidelines (2000)
- MAG Desert Spaces Plan (1995)
- MAG Pedestrian Policies and Design Guidelines (2005)
- McDowell Road Design Guidelines (2003)
- McDowell Sonoran Preserve Access Area Design and Site Standards (1999)

N

O

- Old Town Scottsdale Urban Design and Architectural Guidelines (2024)

P

- Parks and Recreation Master Plan (2024)
- Phoenix Cool Pavement Program
- Phoenix Cool Corridor Program

Q

R

- Residential Solar Guidelines (2016)

S

- Scenic Corridor Design Guidelines (2004)
- Scottsdale General Plan 2035 (2021)
- Scottsdale i-Tree Analysis (2024)
- Scottsdale Road Streetscape Design Guidelines (2008)
- Scottsdale Water Strategic Plan (2025 - 2030)
- Sensitive Design Principles (2001)
- Shea Boulevard Streetscape Design Guidelines (1994)
- Stormwater Management Plan (2022)

T

- Transportation Action Plan (2022)

U

V

- Via Linda Streetscape Design Guidelines (1994)

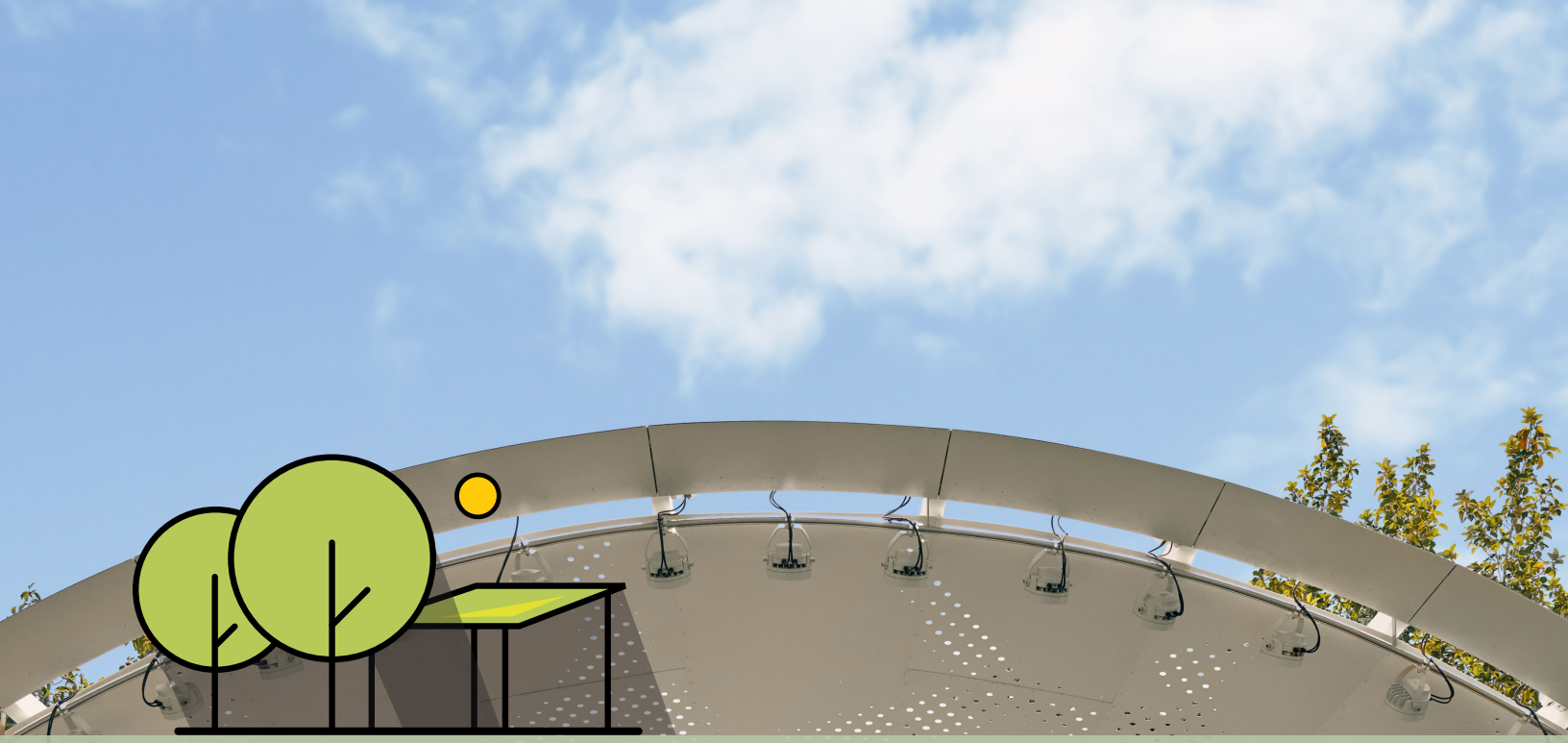
W

X

Y

Z

- Zoning Ordinance



SHADE & TREE PLAN FOR THE BUILT ENVIRONMENT

Development Review Board Resolution No. 10, Adopted May 7, 2026

CITY OF SCOTTSDALE