

Southern Nevada Regional Planning Coalition

Recommended Best Practices For Urban Trees in Southern Nevada



January 24, 2012



On the cover: The District at Green Valley Ranch, Henderson, Nevada

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Unless otherwise noted, the illustrations included herein were created by Ramil Santiago for *Cleaner Air, Tree by Tree*.

Executive Summary

The purpose of this document is to promote good tree planting practices throughout the municipalities of Southern Nevada and to create consistency across jurisdictional boundaries to ensure that trees in urbanized areas thrive, grow to full maturity and provide the maximum benefit to our communities.

The recommended practices in this document are separated by types of development and organized by safety requirements, species selection, soil consideration, and design considerations. Whereas all of the recommendations promote good urban forestry principles, several of the recommendations should be considered for consistency and to achieve the greatest positive impact. They are as follows:

- Tree spacing based on mature tree size
- Number of understory plants based on landscape coverage, not arbitrary spacing
- Minimum sizes for planters (6' interior dimensions)
- Minimum soil surface areas based on mature tree sizes
- Permeable paving in hardscape areas
- Minimum proper soil volume based on mature tree size
- Structural soil beneath hardscape to promote root development
- Safe distances from overhead and underground utilities
- Maintain sight visibility clearances
- Maintain adequate distances from structures and provide root barriers where needed

Other practices listed herein may be implemented by local jurisdictions as applicable. As more of these practices are implemented, the greater the results—and the benefits—will be.

Introduction

The following recommended best practices for urban trees were based on *Cleaner Air, Tree by Tree*, a publication of the Nevada Division of Forestry funded through the USDA Forest Service. These practices are organized by potential planting locations and address species selection, soil considerations and design considerations for each location.

These recommendations have been compiled from professional arborists and landscape professionals with extensive experience in their fields. Adoption and implementation of these recommendations will have many positive impacts on the growth, development, health and longevity of urban trees.

Tree Benefits

Trees are assets to our communities. Unfortunately, trees—including those on public lands—are often seen not as assets but as burdens to operations and maintenance costs. However, trees provide many quantifiable benefits to the communities in which they are planted. These benefits increase as trees grow and continue to give back to the community throughout the life of the trees, making them more valuable as they mature. Indeed, it is said that trees are the only municipal asset that increase in value over time. Therefore it is in our best interest to help our urban trees to grow to full maturity in order to enjoy the greatest potential benefits they provide.

The benefits of urban trees can be calculated using software such as the USDA Forest Service's *i-Tree* or on-line at web sites such as the National Tree Benefit Calculator at www.treebenefits.com. Notable tree benefits include the following:

- Reducing water consumption through proper species selection and irrigation practices
- Decreasing building energy consumption by planting trees strategically to shade buildings
- Improving air quality by producing oxygen, sequestering carbon emissions, and filtering particulate matter out of the air
- Mitigating stormwater runoff
- Mitigating the urban heat island effect
- Providing wildlife habitat
- Providing visual buffers or buffers for wind and noise
- Increasing property values
- Promoting walkable neighborhoods
- Improving neighborhood aesthetics
- Improving community health and interaction

General Recommendations

In any urban environment, trees will have a better chance of surviving and thriving if the appropriate species are planted in the proper locations and are given appropriate care. This is especially true in the arid climate of the Mojave Desert, where high temperatures, low rainfall, and poor soils exist. The following recommendations should be considered for planting trees in any urban situation in Southern Nevada.

Safety Requirements

- **Call Before You Dig** (Nevada: 1.800.227.2600 or 811) if boring, tunneling, trenching or digging. Call at least two days before work will begin so that underground utilities are located and marked.
- **Call Before You Crane** (NV Energy: 702.227.2929) if overhead power lines are in close proximity to the work site and a crane or other equipment is to be used.
- Locate trees away from aboveground and underground utilities. See Utility Corridors section for specific clearances and additional information.

Species Selection

- Use low-water use species (i.e., native species or desert adapted species) whenever practicable.
- Consider planting low *biogenic volatile organic compound (BVOC)* emitting trees.
- When planting rows of trees include a variety of species to avoid monocultures and noticeable gaps after dead or injured trees are removed and a smaller tree is replanted.
- Match the species mature size to the available growing space.
- Do not plant trees or plants with a mature height over 24 inches in sight visibility zones near driveways or intersections.
- See the SNRPC Regional Plant List for site-appropriate species.
- Plant quality nursery stock that meets Arizona Nursery Association Standards or the American National Standards Institute for Nursery Stock (ANSI Z60.1-2004).

Soil Considerations

- Providing adequate soil volume for healthy root growth is the critical factor for successfully growing healthy trees. Per Casey Trees, “published research suggests that trees need 1 to 2 cubic feet of soil volume for every square foot of crown area spread.” See **Table 1** below for recommended minimum soil volumes.
- Ideally, enough exposed soil surface area should be provided to allow the roots to grow at least to the dripline of a mature tree. See **Table 1** below for recommended open soil surface areas.
- The minimum soil depth recommended for proper root growth is two to three feet.
- Planting pits should be excavated to a depth appropriate to the size of the root ball and 2 to 3 times the diameter of the root ball.
- Remove construction debris from planting pits and backfill with soil composed of 75% native soil and 25% soil amendment (may not apply to native species).

- Consider using *structural soil* beneath areas of pavement to increase the volume of soil available to tree roots.
- For hardscape areas, consider using *pervious concrete* or pavers in combination with *structural soil*. *Pervious concrete* and pavers accommodate pedestrians and vehicles, allow for increased moisture flow to tree roots, and allow for gas exchange between the roots and soil surface.

Table 1

Recommended Tree Species Size Categories	Average Canopy Size	Minimum Open Soil Surface Area (Per Tree)	Minimum Open Soil Surface Area For Planting Strips (Per Tree)	Minimum Soil Volume (Per Tree)
Small	16 ft x 16 ft	81 ft ² (9 ft x 9 ft)	84 ft ² (6 ft x 14 ft)	201 cu. ft.
Medium	22 ft x 22 ft	121 ft ² (11 ft x 11 ft)	120 ft ² (6 ft x 20 ft)	380 cu. ft.
Large	28 ft x 28 ft	196 ft ² (14 ft x 14 ft)	198 ft ² (6 ft x 33 ft)	615 cu. ft.

Design Considerations

- Minimum tree spacing based on mature species size.
- Provide understory plantings to ensure trees receive adequate irrigation because they shade the soil, prevent evaporation and provide extra emitters within the planting area. Understory plantings should cover a minimum of 50% of landscaped areas based on the mature size of the plants.
- For trees planted within 10 feet of sidewalks and curbs, install root barriers along sidewalks and curbs to reduce tree roots from heaving and breaking pavers, sidewalks, curbs, and road pavement.
- Plant trees only where there is adequate room, both overhead and underground, for the mature size of the tree being planted.
- Provide appropriate irrigation in xeriscape areas.

Parking Lots

Although the parking lot is a difficult environment for trees, successful planting in parking lots can be achieved through proper species selection, site design, soil consideration and proper maintenance. In addition to the General Recommendations above, the following recommendations pertain specifically to tree plantings in parking lots:

Species Selection

- Choose trees that do not have sharp spines or thorns and do not drop an excessive amount of fruit, limbs, or leaves.
- Plant moderate to fast growing trees to realize shading benefits as soon as possible. Trees in parking lots may have short life spans.
- Select species appropriate for parking lots per the SNRPC Regional Plant List. These species will tolerate reflected heat and limited soil space.
- Plant trees with a large canopy. The use of trees with small canopy is highly discouraged.
- Do not use palm trees in the interior of the parking lots, as they provide minimal shade. If palm trees are desired, use them as only as accent trees in groups near parking lot entrances.

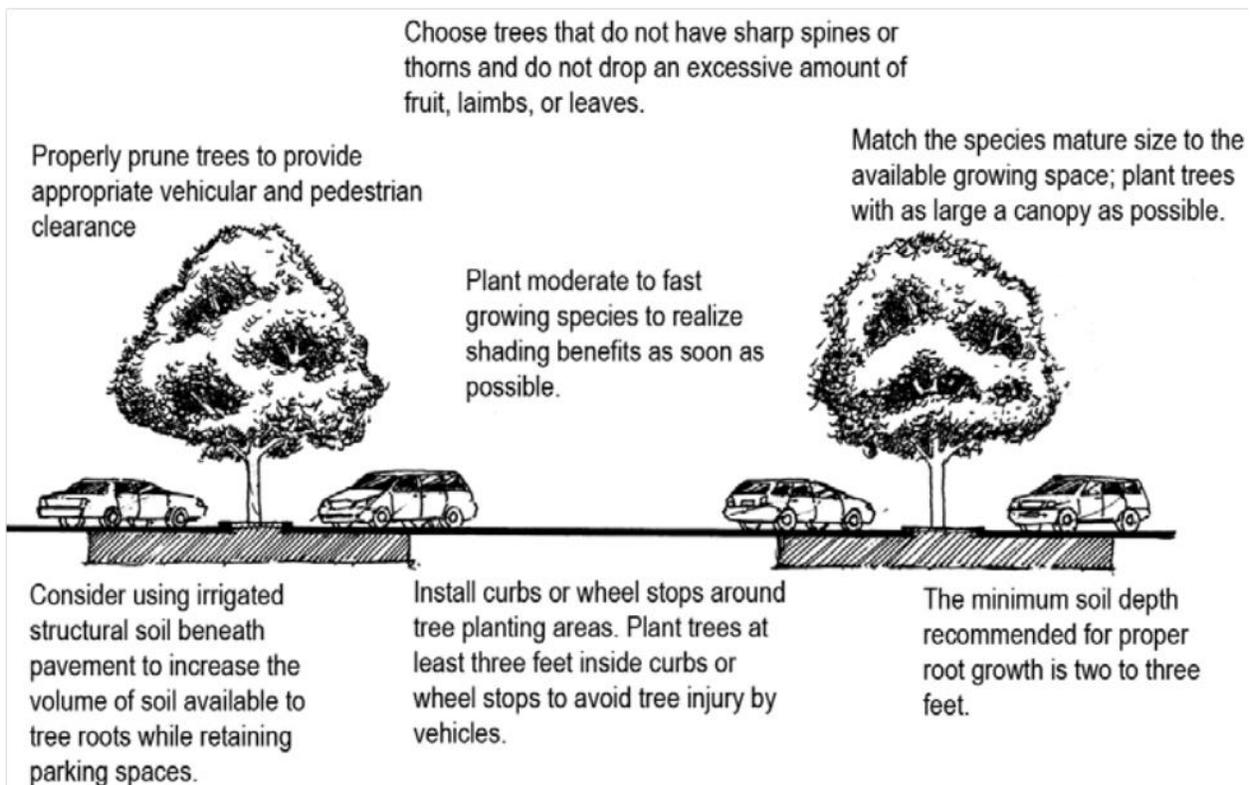
Soil Considerations

- The minimum planting island width to allow space within the critical root zone (CRZ) is six feet.
- Planting diamonds are not preferred, but if they are used, the minimum interior dimension of planting diamonds shall be six feet.
- Avoid planting trees in confined areas, such as small planting diamonds, because they don't provide enough soil volume for healthy and sustainable tree growth.
- Consider planting trees in linear planting strips combined with an enlarged planting area on the end. This allows trees to share rooting space and allows trees to grow healthier, larger, and longer than in individual planting islands.
- Consider using *structural soil* beneath the pavement around trees to increase the volume of soil available to tree roots while retaining parking spaces. See Table 1 for minimum soil volume.
- Consider using *pervious concrete* or pavers in combination with *structural soil* (see **Table 1** above for minimum soil volume). *Pervious concrete* and pavers accommodate pedestrians and vehicles, allow for increased moisture flow to tree roots, and allow for gas exchange between the roots and soil surface.

Design Considerations

- Use a combination of planting islands, *pervious concrete*, and *structural soil* beneath pavement to create more sustainable growing spaces for trees in parking lots.

- Plant trees around the perimeter and throughout parking lots to provide even distribution of shade.
- Plant one large canopy tree for every six parking spaces, one medium canopy tree for every four parking spaces, or one small canopy tree for every two parking spaces. The use of small canopy trees in parking lots is highly discouraged.
- Increase the ratio of compact to full-sized spaces, and use one-way aisles, angled parking spaces, and shared parking to allow for additional tree planting areas.
- Reduce conflicts between trees, light poles, power lines, and signage by coordinating their location.
 - Keep parking lot light poles, area light poles and street light poles separated by a minimum of 10 feet from trees.
 - Consider signage viewshed when specifying tree planting locations.
 - Consider amending sign ordinances to promote monument signs (eye-level signs located near the street)
 - Promote site designs that locate businesses closer to the street and move parking behind the buildings to improve tenant presence, visibility and accessibility to passing motorists and pedestrians.
- Install curbs or wheel stops around tree planting areas. Plant trees at least three feet inside curbs or wheel stops to avoid tree injury by vehicles.
- Provide bicycle parking racks to reduce the practice of locking bikes to tree trunks.
- Consider installing uncurbed tree planting islands in the form of swales or linear shallow depressions which serve to filter and absorb stormwater runoff.



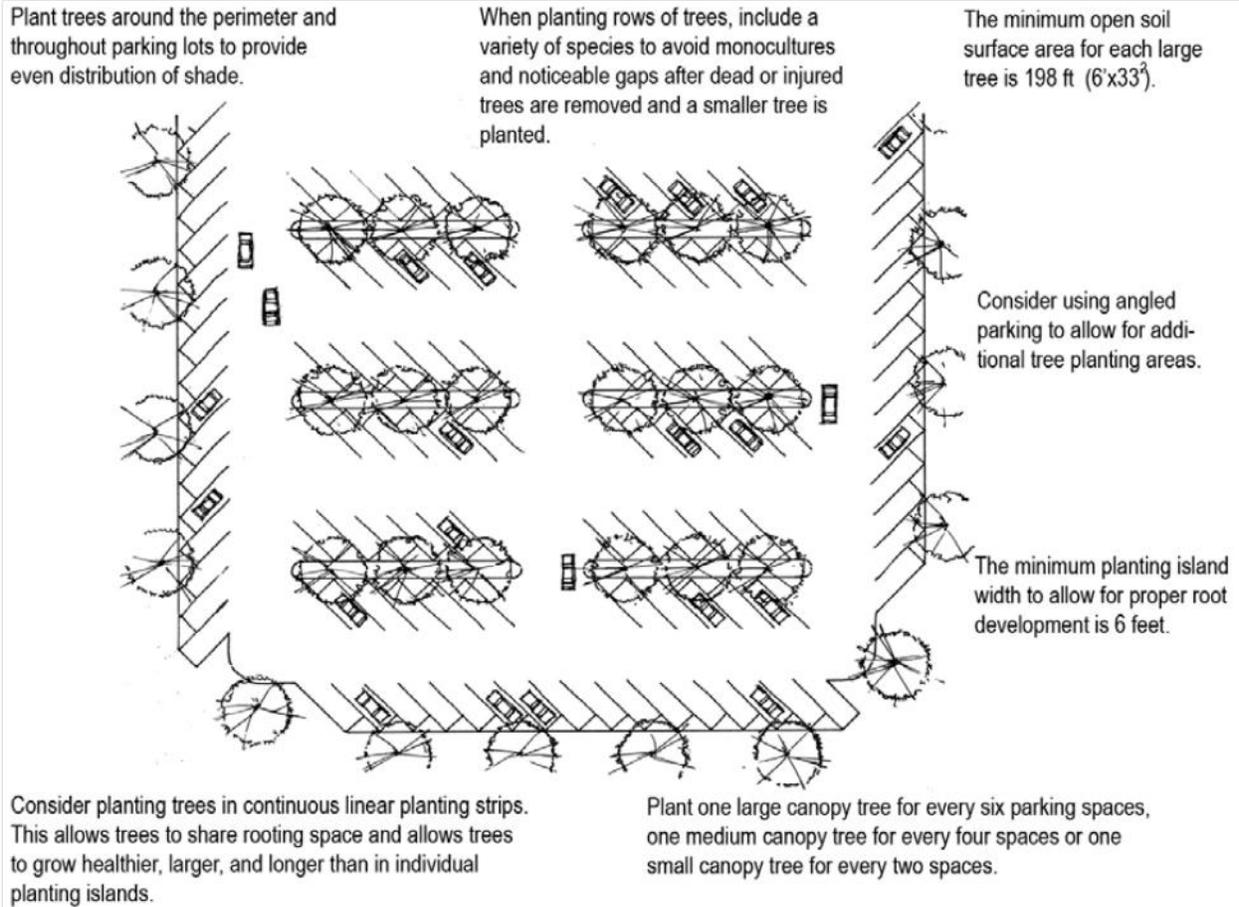


Illustration: Parking Lot Planting Recommendations

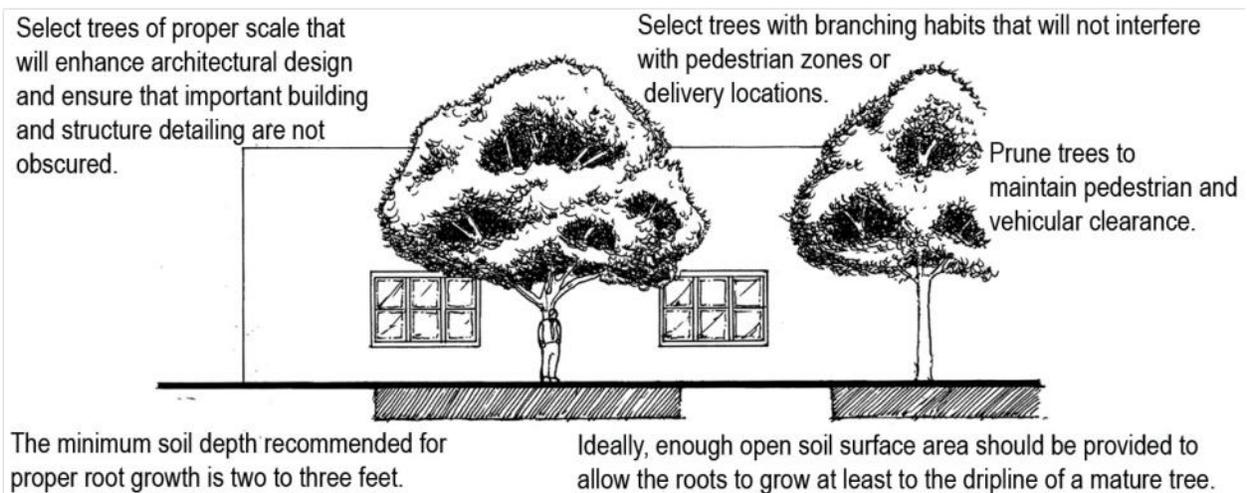
Public Facilities and Commercial Areas

Public facilities and commercial areas include schools, police stations, fire stations, libraries, plazas, downtown settings, and retail and commercial areas.

An abundance of pavement, poor quality and inadequate soil volume, close proximity to buildings and streets, air pollution, and high levels of human activity are characteristic of these areas. These characteristics create challenging conditions for tree survival and management.

Species Selection

- Choose trees that do not drop an excessive amount of fruit, limbs, or leaves.
- Select trees with branching habits that will not interfere with pedestrian zones or tall vehicle access areas.
- Match the species mature size to the available growing space, and recognize that trees do not necessarily grow uniformly in size and shape.
- Select trees of proper scale that will enhance architectural design and ensure that important building and structure detailing are not obstructed.
- Select the appropriate species for the site conditions. Soil and temperature conditions dramatically change from one area to another due to microclimatic conditions created by surrounding buildings and exposure.
- Do not plant low-water use species in turf areas.
- Do not plant low water use species with high water use species. Create hydrozones based on plant water needs.

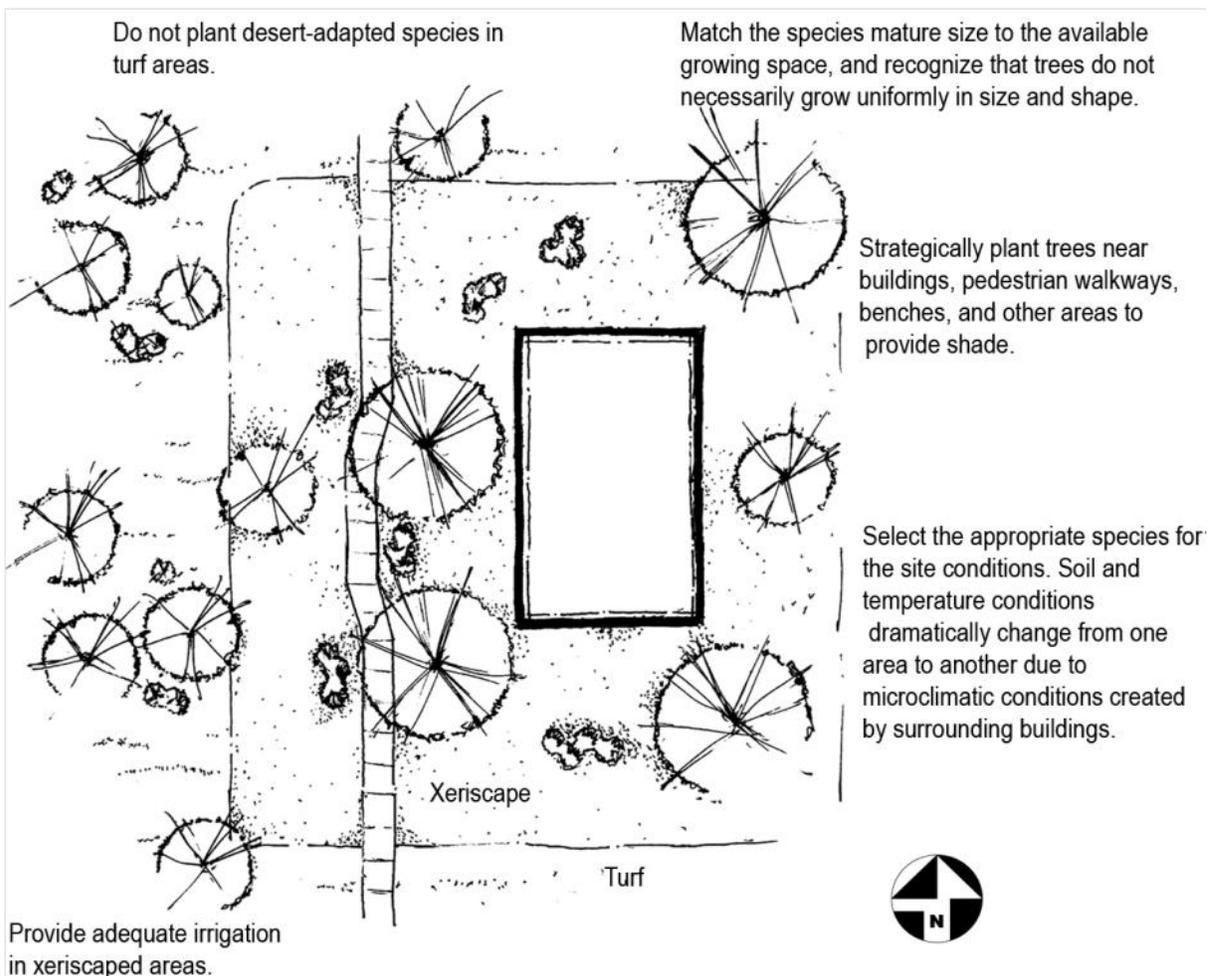


Soil Considerations

See Soil Considerations under General Recommendations on Page 4 above.

Design Considerations

- Strategically plant trees near buildings, pedestrian walkways, benches, and other areas to provide shade. Evergreen trees planted on the north side of buildings block prevailing winter winds and deciduous trees planted on the south and west sides of buildings provide shade during summer months and allow warming in winter months.
- Reduce conflicts between trees, lighting, power lines, and signage by coordinating location of trees, light poles, and signs.
 - Keep parking lot light poles, area light poles and street light poles separated by a minimum of 10 feet from trees.
 - Consider signage viewshed when specifying tree planting locations.
 - Consider amending sign ordinances to promote monument signs (eye-level signs located near the street)
 - Promote site designs that locate businesses closer to the street and move parking behind the buildings to improve tenant presence, visibility and accessibility to passing motorists and pedestrians.
- Provide bicycle parking racks to reduce the practice of locking bikes to tree trunks.



Large Landscaped Areas and Open Space

Open space areas include parks, golf courses, large landscaped areas around institutions, office and industrial parks, and rural areas. Trees occur individually and in small groups within large landscaped areas, and usually have abundant growing space for their trunk, crown, and roots.

While some large landscaped areas and the trees within them are intensively managed, such as on a golf course, others in open space and natural areas are relatively unmaintained.

Species Selection

- Plant a variety of species in mixed groups as well as individually where appropriate.
- Select trees for their suitability to the differing topography, soils, winds and vegetation that exist on the same site.
- Use desert-adapted species to create natural areas.
- Do not plant desert-adapted species in turf areas.

Soil Considerations

- Prevent soil compaction by keeping vehicles out of the dripline and beyond. Restore aeration to compacted areas by vertical mulching.

Design Considerations

- Create tree islands with understory plants to enhance wildlife habitats or to prevent pedestrian foot traffic in unwanted areas.
- Plant trees strategically around trails, playgrounds, and sporting fields to provide shade. Also shade passive recreation sites such as picnic areas and benches.

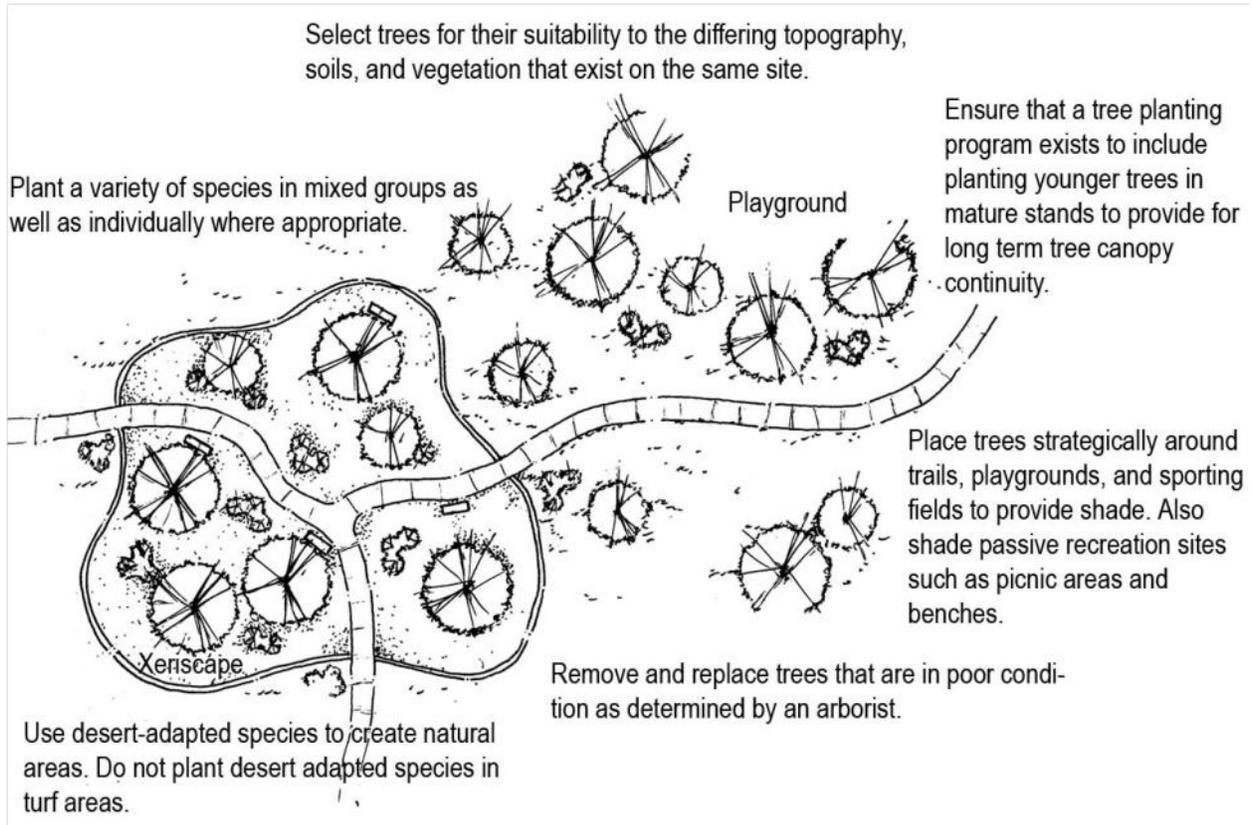


Illustration: Open Space Planting Recommendations

Transportation Corridors

The planting areas for trees in transportation corridors include road frontage areas along streets, roads, and highways. They are made up of the public road right-of-ways (including medians) and the adjacent property behind them. They can include residential front yards and commercial, institutional, and industrial frontages.

Frontage areas include both street trees and yard trees that are part of a property's landscape design and function. Street trees are found growing both individually and in groups.

Species Selection

- Consider mature canopy width and planting distance from the right-of-way to ensure adequate clearance for vehicles.
- Plant a variety of species throughout a neighborhood to discourage a monoculture, but promote visual continuity by restricting the number of species along any individual street.

Soil Considerations

- Provide detached sidewalks with a minimum planting area of 6 feet between back of curb and sidewalk.
- Plant trees behind the sidewalk on adjacent private property and tree planting easements to increase growing space.
- Streetscapes and planting medians should be a minimum of 6 feet wide to allow for proper root development.

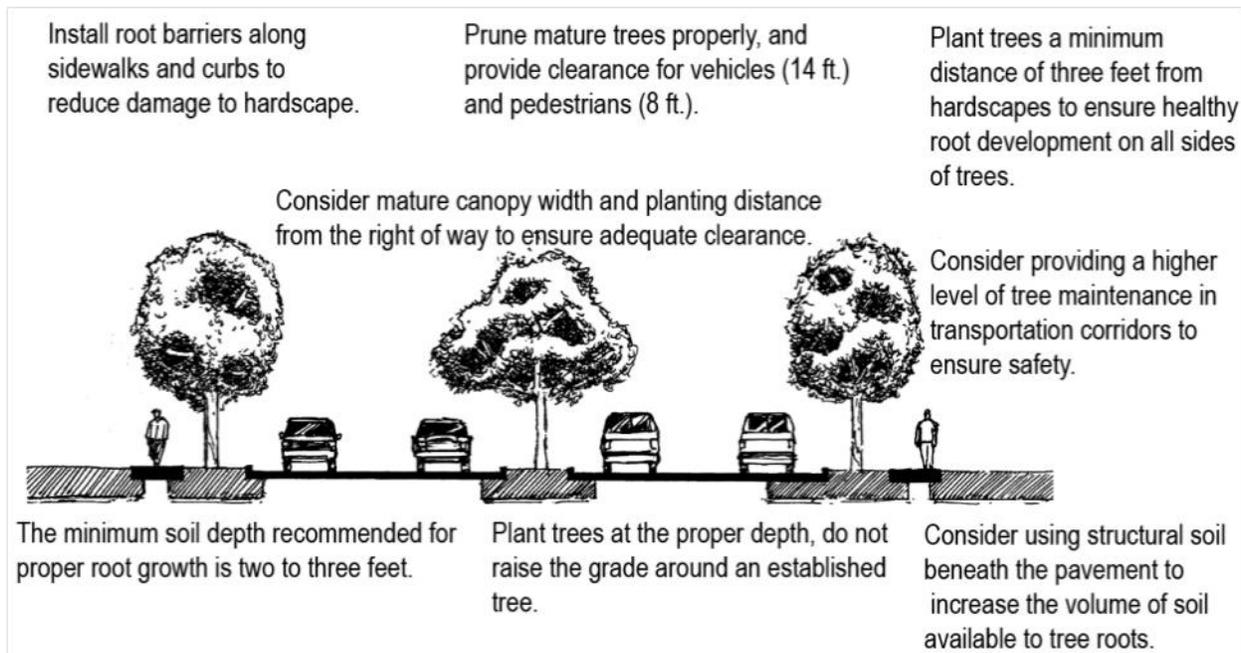


Illustration: Street Tree Planting Cross-section

Design Considerations

- Plant low-maintenance trees in center medians and irrigate appropriately.
- Vary the spacing between trees to add interest and diversity to roadway plantings while ensuring that spacing between trees is adequate to support healthy mature canopies.
- Plant large groups of trees to provide visual relief. Scale and massing should be appropriate for speed limit of roadway.
- Minimize ownership concerns by planting trees at least three feet away from property lines and providing root barriers where there are curbs and sidewalks.
- Plant trees a minimum distance of three feet from hardscapes to ensure healthy root development on all sides of trees.
- To ensure adequate visual sight lines for motorists, follow the local jurisdiction's requirements for sight visibility easements and do not plant trees within those easements.
- The lowest branches of the street tree canopies should be at a minimum height of 9 feet when practicable depending on the species and kept trimmed so as to not conflict with the drivers' line of sight.
- Trunk and canopy sizes at maturity should be part of the design considerations for street tree planting.
- Install root barriers along sidewalks and curbs to reduce damage to hardscape.
- Consider recycled rubber sidewalks when trees and sidewalks are in close proximity to prevent infrastructure damage by tree roots.
- Consider using pervious concrete or pavers, in combination with structural soils, for sidewalks when in close proximity to trees.

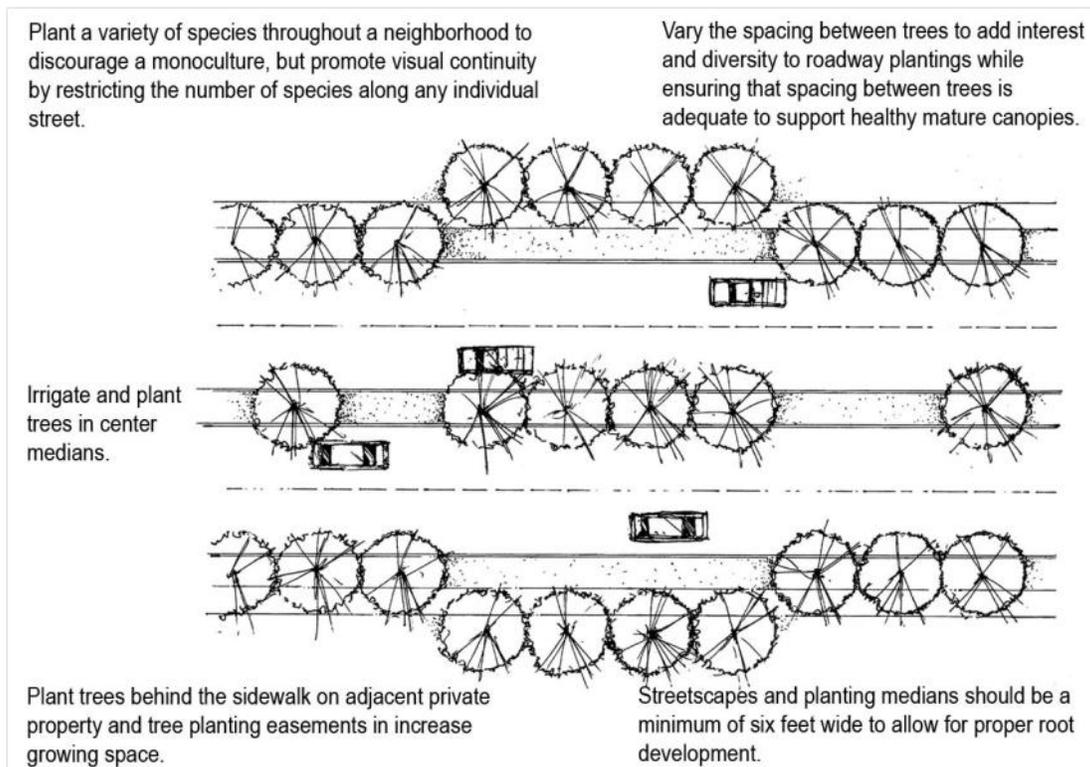


Illustration: Street Tree Planting

Utility Corridors

Utility corridors are linear landscapes that can contain power, gas, water, sewer, or phone services. These corridors range from 20 feet to 150 feet wide, often parallel roadways, and contain aboveground and/or underground lines. Vegetation must be controlled within the corridors to allow safe maintenance and repair of the utility lines.

Safety Requirements

- Contact the local electric power utility before work begins, if working within 10 feet of overhead or underground high voltage powerlines. Required by law (Nevada Revised Statutes (NRS) 455.200-250).
- Use only qualified line-clearance arborists (OSHA 29 CFR Part 1910 and ANSI Z133.1-2006 or current) to work within 10 feet of distribution voltages (750 volts-50 kV) and 15-27 feet from transmission voltages (69-500 kV).

Species Selection

- Plant only small trees within 15 feet of overhead electrical power lines to ensure line clearance can be maintained.
- Plant medium-sized trees at least 20 feet from overhead electrical distribution lines.
- Plant large-sized trees at least 30 feet from overhead electrical distribution lines.

Soil Considerations

- Prevent soil compaction by keeping vehicles out of the dripline. Restore aeration to compacted areas by vertical mulching.

Design Considerations

- Plant all trees at least 10 feet from sewer lines, 15 feet from underground electrical power distribution lines, and 20 feet from underground electrical or gas transmission lines.
- The placement of trees should not impede access for maintenance vehicles and equipment.
- Consider establishing trails within utility corridors. Trees planted along these trails provide shade for users and increase their level of usage.
- Trees with aggressive root systems require installation of a root barrier system.

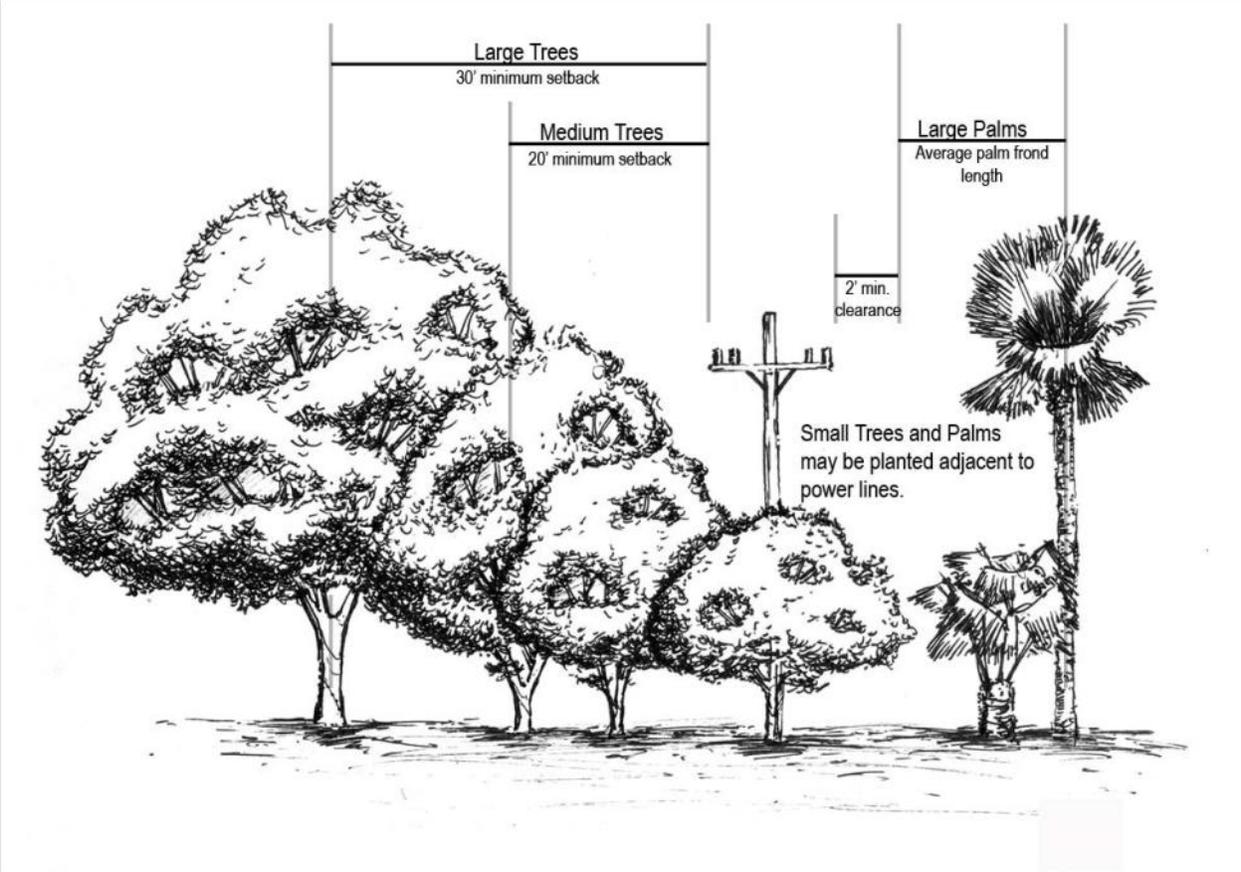


Illustration: Separation from overhead utilities.

Definitions

Biogenic volatile organic compound (BVOC)

Hydrocarbon compounds released into the air by vegetation that contribute to the formation of smog and may be toxic by themselves.

Pervious concrete or paving

Hardscape materials that allow for water and gases to pass through into the soil. Examples include bricks and pavers that do not have mortar between them.

Root barriers

Devices made of fabric, plastic or metal that are installed in the ground to direct roots away from areas to be protected.

Soil Volume

The amount of soil needed for the roots of a tree to grow and expand in a way that promotes optimum health for the tree. The general recommendation based on the tree species size is for one to two cubic feet of soil per square foot of tree canopy area. The formula used in Table 1 is based on 1 cubic foot of soil per square foot of tree canopy area at a depth of 3 feet. The soil volume provided may be covered with hardscape. In those cases, permeable paving materials are highly recommended as is structural soil.

Structural Soil

A two-part mix of rocks and soil which acts as both a load-bearing medium (the rocks) and a growing medium (the soil). Angular chunks of crushed rock provide structure while leaving gaps that are filled by soil, allowing for root penetration. Typically used under hardscape areas near trees. For additional information, go to <http://www.hort.cornell.edu/uhi/outreach/pdfs/custructuralsoilwebpdf.pdf>.

