

Water Wise: Tree Selection and Tree Care

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This publication provides information on the value of trees, how to choose the best tree species for various parts of the landscape, and how to properly install and care for them in a water-conserving and drought-conscious manner.

The Importance of Landscape Trees

Trees form the backbone of most designed landscapes, and fill a variety of important roles. They significantly enhance the aesthetics of a landscape through their mass, form, space-defining character, and seasonal changes. Functionally, they enhance landscape livability for humans and a host of other animals, and they provide important habitat value for birds and insects. Properly selected, well-established, and adapted trees can fill a variety of roles in the landscape while successfully tolerating a wide range of growing conditions, including drought. Their expansive root systems make the most of limited soil moisture during prolonged dry periods. Some species will even go into early dormancy to avoid the potential tree health stresses associated with prolonged drought. Trees in the landscape fill the following roles:

- **Enframing** — trees soften building corners and rooflines, focus views, and help visually connect buildings to adjacent landscapes (*Figures 1a-b*)
- **Accent** — trees with unique bark, striking fall color, colored foliage, or an interesting shape can focus attention to specific landscape locations, which in turn can lead landscape visitors to building entrances or other important site locations (*Figures 2a-b*)
- **Unity** — trees that are repeated throughout a landscape help unify the character of the entire landscape (*Figures 3a-b*)
- **Space Definition** — a tree canopy can strongly define a “ceiling height” for outdoor landscape rooms; shorter trees create a smaller, more intimate



Figures 1a-b. Trees soften building corners and rooflines, focus views, and help visually connect buildings to adjacent landscapes

- room setting, while large trees define a taller, more open room scale (*Figures 4a-c*)
- **Screening** — evergreen trees can provide dense year-round screening for privacy, wind protection, or enhanced space definition; deciduous trees that lose their leaves in the winter may also provide screening benefits during the growing season when landscape spaces are most used (*Figure 5*)

- **Shade and Energy Conservation** — trees can shade buildings and paved surfaces, reducing summer cooling costs and the “heat island” effect of increased temperatures in urban areas (*Figure 6*)
- **Stormwater Management** — tree canopies capture, evaporate, and slow storm runoff, which reduces flood potential; trees also remove large amounts of water from the soil through transpiration, which provides additional storage space in soil pores for storm runoff.



Figures 2a-b. Trees with unique bark, striking fall color, colored foliage, or an interesting shape can focus attention to specific landscape locations



Figures 3a-b. Trees that are repeated throughout a landscape help unify the character of the entire landscape



Figures 4a-c. A tree canopy can strongly define a high (a), low (b), or moderate (c) ceiling height for outdoor landscape rooms



Figure 5. Evergreen trees can provide screening for privacy, wind protection, or enhanced definition of space



Figure 6. Trees can shade buildings and paved surfaces, reducing summer cooling costs and the “heat island” effect of increased temperatures in urban areas

Choosing Specific Trees

Deciding which tree to install can be an overwhelming endeavor, given the many species choices available. Local arboretums, parks, and botanic gardens are a great source of information on how a particular species performs in various parts of the state. The Nebraska State-wide Arboretum, <http://arboretum.unl.edu/>, the Nebraska Forest Service, <http://nfs.unl.edu/>, and many others provide detailed information on their websites. Visual search engines such as Google Images, Yahoo Image Search, and Pinterest can provide additional assistance in terms of shape, size, color, and texture of leaves, fruit, and the architecture of each species. Searches should include criteria for functional attributes, drought tolerance, management requirements, etc., as well as aesthetic attributes.

Ultimately, tree selection should be based on a list of tangible benefits desired by the property owner along with the limitations that come with virtually every tree selection. Trade-offs may include:

- fast-growing trees provide quicker curb appeal, but they also tend to be relatively weak-wooded and more susceptible to wind and storm damage than other species; they also tend to be less drought-tolerant than slower-growing species
- slow-growing trees tend to have strong wood and structure. They are often more tolerant of variable growing conditions, but take longer to mature
- trees known for the habitat value of their fruit may also require additional maintenance to clean up dropped fruit, especially if on a patio or other high-use surfaces
- some trees that exhibit attractive fall color have a tendency to develop problems such as sunscald, borers, and fungal diseases. As potential tree choices are made, keep diversity in mind. For example, if the property contains seven existing trees and five of them are an ash, it’s wise to introduce other species to gain the benefits of diversity. Diversity in a landscape

increases the overall resistance to diseases and insect pests, and provides a broader range of aesthetic and functional features for the landscape user.

When choosing, it’s wise to create a short list of suitable species for each location where a tree is to be planted so that when you arrive at the garden center or nursery, an alternative may be purchased if a bargain is available that meets your criteria or if the tree at the top of the list isn’t currently available.

Categories of Trees

Trees can be classified into several categories based upon their relative size and landscape role. These categories can also be helpful in tree selection. They include:

- shade (or overstory) trees — typically medium to large trees with broad or vase-shaped habits that provide a wide area of shade beneath their canopy. Examples: bur oak, hackberry, hybrid elm, sycamore

- understory trees — typically small to medium trees that are adapted to grow near or under shade tree canopies. Examples: redbud, hophornbeam, serviceberry
- ornamental trees — typically small to medium trees that grow in sun or shade and are known for their flowering, bark, or other ornamental features. Examples: birch, callery pear, golden raintree
- fruit trees — typically small trees that provide fruit, including both native and cultivated trees. Examples: apple, pear, paw-paw

Some trees fit in several categories, which helps to maximize landscape benefits. Serviceberry, for example, tolerates canopy shade, has showy spring flowers, and produces edible fruit in June. Paw-paw produces edible fruit, grows as an understory tree, and its large leaves provide a strong ornamental texture contrast with adjacent trees.

Right Plant, Right Place

The old adage of “right plant, right place” takes on additional importance when tree planting in drought conditions is considered. Some trees are naturally adapted to drought, while other trees, even though native, require considerable soil moisture in the natural landscape locations they are best suited for. The native growing conditions and context they are grown in should be kept in mind when trees are selected. Understory trees will likely struggle in a full sun, exposed location while a tree tolerant of high soil moisture in a floodplain location will struggle in upland drought conditions. The closer trees can be matched to the landscape conditions they are naturally found in, the healthier they will be.

Finding the “right place” for a tree includes an understanding of the site conditions, including the number of hours of direct sun received; soil texture (is the soil sandy, which drains quickly, or clayey, which drains slowly?); soil structure (has



Figure 7. Ornamental or enframing trees can often be placed in landscape beds near building corners or landscape perimeters to avoid mowing/chemical conflicts and take advantage of the benefits of mulched rooting areas

the soil been compacted by construction equipment or other activities, reducing soil pore space, available oxygen, and conditions conducive to new root growth?); slope (steep slopes, especially south-facing, dry out faster than flat areas or north-facing slopes); and soil moisture conditions (dependent on texture and structure as well as location in the landscape where runoff may collect or disperse). Drought impacts to trees will be more severe in locations that retain less soil moisture or otherwise impede proper growth and establishment of new tree roots.

Whenever possible, separate trees from turf to avoid lawnmower damage, minimize potential chemical damage from turf herbicides, avoid possible overwatering of tree roots in irrigated zones, and lessen direct competition with turf roots that can predispose trees to stress during drought conditions. Ornamental or enframing trees can often be placed in landscape beds near building corners or landscape perimeters to avoid mowing/chemical conflicts and take advantage of the benefits of mulched rooting areas (*Figure 7*). Large trees that must be located away from buildings in turf areas should have a ring of mulch

applied to their root zone (see details in the next section). In particular, mulch should be about 3 inches deep, should not be placed in contact with the tree trunk, and should be rehydrated regularly so that it doesn’t repel water during rainstorms or irrigation events.

Tree Selection, Installation, and Establishment

Trees are usually sold “balled and burlapped” (B&B), potted (in rigid plastic or “bag” containers), or bare root. B&B trees are dug from growing fields and typically lose a substantial amount of their root system in the process. This root loss can create significant stress on the tree during drought conditions and may limit plant vigor and establishment. Potted tree root systems are intact when planted, but circling roots within the container can lead to future defects if not corrected or removed. Bag or fabric containers are designed to limit circling roots, and normally provide a vigorous and fibrous root system, which maximizes initial tree establishment in dry conditions. Bare root trees have limited availability and require additional care,

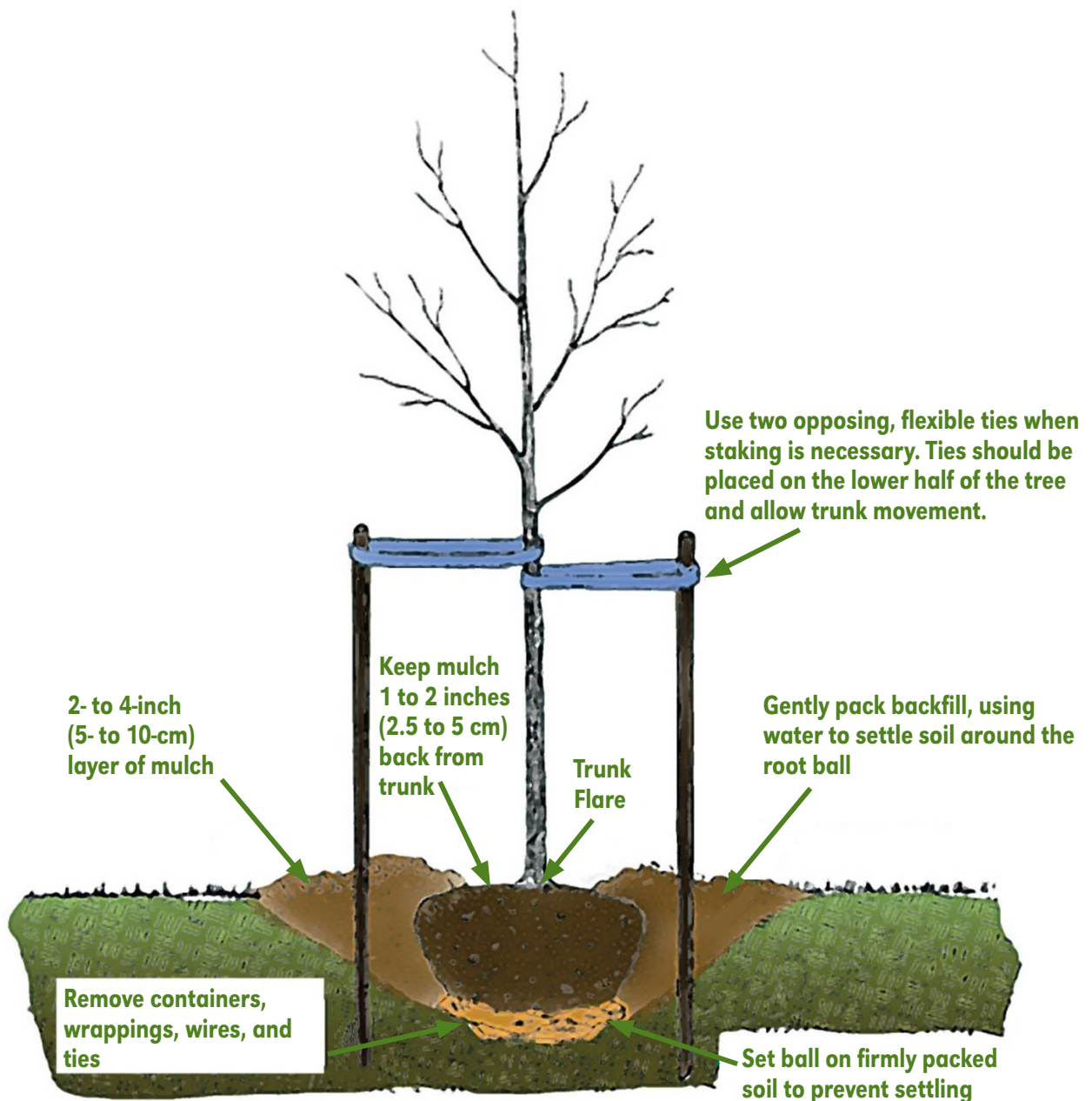


Figure 8. Planting trees properly will give them the best chance they have to thrive in their new location. Copyright International Society of Arboriculture. Used with permission.

given that they should typically be handled and planted when dormant. Their roots can dry quickly when exposed. Beneficially, their exposed root system allows for pruning of dead/damaged roots and proper root spread at planting.

Before purchasing trees to plant, inspect the root system for warning signs of potential future root defects. A thick mat of roots at the edge of the root mass is a sign that the tree is root-bound with the

potential to develop circling roots that may girdle (or choke) the main stem of the tree as the stem and the roots thicken over time. In addition, verify that tree height and structure are in proportion to the root system. If your potential purchase is a tall tree in a very small container, the tree will have more demanding water needs during establishment than a tree with proper structure/root mass ratio. Smaller trees (1½ inches in diameter or less) have usually spent less time in their growing container. They tend

to establish more quickly and are less likely to have defective roots than trees that have been in production containers for longer periods of time.

Planting trees properly will give them the best chance they have to thrive in their new location (*Figure 8*). Most trees will begin to widen where the trunk meets the root system and this “root flare” should be located at ground level when planting is finished. Sometimes this will require care-

fully removing soil from the top of the root mass to find and expose the flare to ensure a proper planting depth before digging your planting hole.

Digging an adequately sized planting area instead of a hole that just fits the root mass will loosen surrounding soil and support stronger root establishment during drought periods. Try to avoid disturbing the soil in the bottom of the hole or settling may cause your tree to end up deeper than intended. Compost should not be added to the backfill when planting the tree, but can be used to top-dress a large area around the tree where roots will grow in the future. Wood chip mulch can also be used for this purpose. To properly plant, place the root mass in the planting hole at the appropriate depth. Begin filling the planting hole with soil, and when the hole is approximately one-third full, gently replace and settle the soil around the root mass. After this, continue to fill the planting hole, stopping every few inches to settle the soil with water. Ensuring good soil/root contact will help the tree maximize water uptake during dry conditions.

Chronic mechanical damage from lawn mowers, string trimmers, and other motorized equipment causes long-term damage to trees that can compromise their health, predispose them to insect and disease problems, and ultimately reduce their life span. This damage can be minimized by separating the lawn from the trees with a mulch ring. Mulch should be an organic material that breaks down to enhance nutrient cycling and soil porosity. It should be spread in a flat layer 3-4 inches deep outward from the trunk, ideally extending outward to the tree drip line (as far as branches extend). Mulch should never be piled against the bark to any depth. Buried bark remains wet and has increased potential for disease and damage. Excessive quantities of mulch can stifle gas exchange and water infiltration into the soil and also stimulates root growth in conditions that are only temporarily favorable once the mulch dries out again.

Additional fertilization is typically not required for newly planted trees unless a soil test indicates a need for nutrients.

If necessary, stake the tree. Newly planted trees may need to be staked to prevent damage or uprooting. If the tree is small, or has a small or open canopy that doesn't catch significant wind, staking is discouraged since a small amount of tree movement helps develop trunk strength and root establishment. When staking, use two stakes anchored outside the planting hole to prevent root injury. Ideally, align them with the prevailing wind direction to maximize protection under windy conditions. The material used to tie the tree to the stakes should be flexible to prevent damaging the trunk. Stakes and tying material must be removed after approximately one year.

Under average weather conditions, all newly planted trees require supplemental irrigation. Keep the soil within the newly planted root mass moist, but not saturated. The surrounding soil in the planting area also should be monitored and kept moist. If you overwater, the tree's roots will rot and die back from lack of oxygen, and the leaves also may turn yellow or fall off. Undisturbed soil adjacent to the planting area may drain poorly. If so, monitor the planting area carefully and only water when necessary to keep the root mass moist. Typically, it is sufficient to water once a week, possibly more often under hot, dry conditions. Irrigation frequency should taper off once summer heat or drought conditions subside.

Detailed tree planting information is available at: <http://nfs.unl.edu/treecare/treeplanting.asp>

Ongoing Irrigation/ Year Two Irrigation Practices

Trees and turfgrasses have growing and management needs that are very different from each other, and it can be difficult for both to thrive where they are growing in close proximity. When trees are healthy, their full canopies shade the turf, affecting its health and growth rate. In a well-established lawn, a newly planted tree will have strong competition for rain from the dense, fibrous root system of the turf around it. Unlike turfgrass, which

needs regular water in smaller quantities, trees prefer infrequent watering that is able to percolate 18 to 24 inches down to reach as much of the roots as possible. Trees that receive supplemental water from turf irrigation should be a species that is adapted to frequently wet sites to minimize potential for shallow root systems, chronic stress, or death from overwatering.

To determine the water needs of trees throughout the growing season, it is best to check the moisture of the soil itself rather than to rely on a set watering schedule. Ideally, under drought conditions irrigation should supplement natural rainfall to seasonal averages rather than overuse water at higher-than-average rates. To evaluate soil moisture, probe the soil throughout the tree's drip line 1-2 feet down with a long metal tool such as a screwdriver. Water-logged soil will leave mud on your soil probe and may have a foul odor as well. Dry soil will leave little or no soil on the probe while moderate moisture will deposit small, visible crumbs.

A slow watering directly into or on the ground over a long period of time is best for deep percolation, especially for trees planted on a slope. Adjust the flow from the hose to a trickle that allows little or no runoff away from the tree and move the hose around to adequately water as much of the root system as possible, concentrating on the drip line of the tree more than near the trunk. Soaker hoses, drip irrigation systems, and various "bag" products are available to water trees slowly over time while minimizing water loss and/or saving time (Figures 9a-c).

In growing seasons when rainfall has been below normal for the region, tree roots must be moist entering the winter to avoid damage from desiccation. This is especially the case for trees that are newly planted or under stress from other factors. There are several key components to providing appropriate moisture to these trees:

- Water should be applied slowly and gradually to the surface, especially on slopes to avoid runoff.



Figures 9a-c. Soaker hoses, drip irrigation systems, and various “bag” products are available to water trees slowly over time while minimizing water loss and saving time

- The soil should be moist, not soggy or dry, to a depth of 24 inches after watering.
- Water should be placed several feet inside the drip line, at the drip line and extended outwards 10 feet for established trees, and applied as a thorough soaking of the root ball for new trees. If water puddles, stop watering.
- As the soil dries after watering, it should be monitored with a probe to determine the water content every 3-4 inches to a depth of 24 inches to determine when the next water application should occur.

For additional information on tree irrigation, refer to: <http://extension.umass.edu/landscape/fact-sheets/irrigation-systems-and-trees>.

Ongoing Mulching

Proper mulching is a key for tree health and vigor, but also critical to keep mowers and string trimmers away from tree trunks where damage can occur. Start mulching 2-3 inches away from the tree trunk and extend it as far away as is practical in the landscape. Coarse, organic mulch such as wood chips, corn cobs, pine needles, pine bark, or stump grindings are preferable to inorganic sources such as rock and rubber. The organic materials generally keep the roots cooler, are better at weed suppression, and maintain moisture around the roots better than the inorganic choices. Also, organic materials decompose over time, recycling nutrients back to the tree and incorporating humus into the soil profile to support healthy rooting systems (Figures 10a-b).

Ongoing Fertilization

Most Nebraska soils are sufficient in nutrients to support healthy tree growth. However, deficiencies are present in some landscapes.



Figure 10a. Organic materials decompose over time, recycling nutrients back to the tree and incorporating humus into the soil profile to support healthy rooting systems. Figure 10b. Improper mulching – mulch should never be piled up against a tree trunk in a mound; moisture and insect damage to the bark can result. In addition, few, if any, roots benefit from the mulch layer when it does not extend out to or beyond the drip line of the tree.

Observe and document visual symptoms in trees such as a reduced growth rate in current and previous years and color changes in leaves (*Figure 11*). If necessary, perform a soil test to determine the level of essential nutrients and soil pH. Additionally, core aerate and surface apply nutrients as indicated by a soil test.

Tree Defect Awareness

Older mature trees should be routinely inspected to determine if various defects such as decay, codominant leaders, girdling roots, leaning, and cracks are present. If any concerns are noted, it's best to contact an ISA (International Society of Arboriculture) or NAA (Nebraska Arborists Association) certified arborist. These professionals can help to determine if the observed condition is a real concern and action is justified, if monitoring is necessary, or if it is simply an interesting feature of the tree.

For additional information on tree defects, refer to: <http://www.ianrpubs.unl.edu/live/g2111/build/g2111.pdf>

Summary

Drought conditions can pose a challenge to tree selection, planting, and management in Nebraska landscapes. If trees are properly selected for suitable locations, planted and managed with recommended water-wise methods that maximize soil moisture availability, tree rooting, and vigor, healthy trees can retain their important roles in urban and rural landscapes across the state (*Figure 12*).

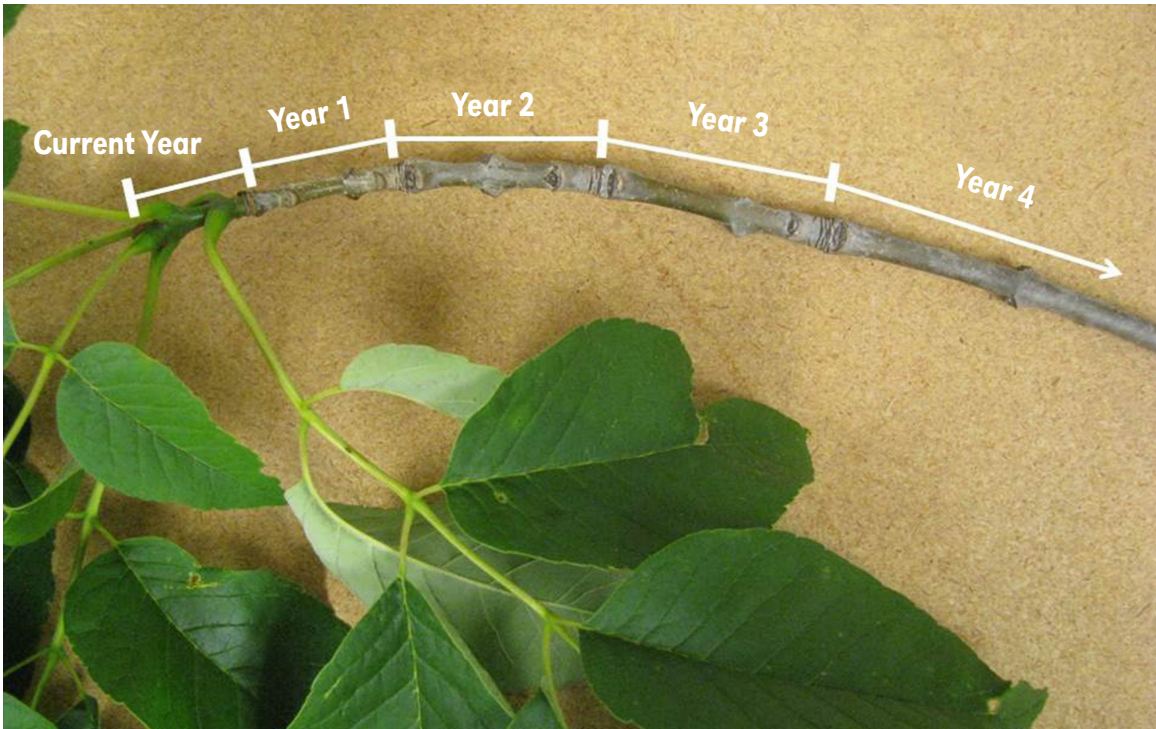


Figure 11. Observe and document visual symptoms in trees such as a reduced growth rate in current and previous years and color changes in leaves



Figure 12. If trees are properly selected for suitable locations, planted and managed with recommended water-wise methods that maximize soil moisture availability, tree rooting, and vigor, healthy trees can retain their important roles in urban and rural landscapes across the state

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