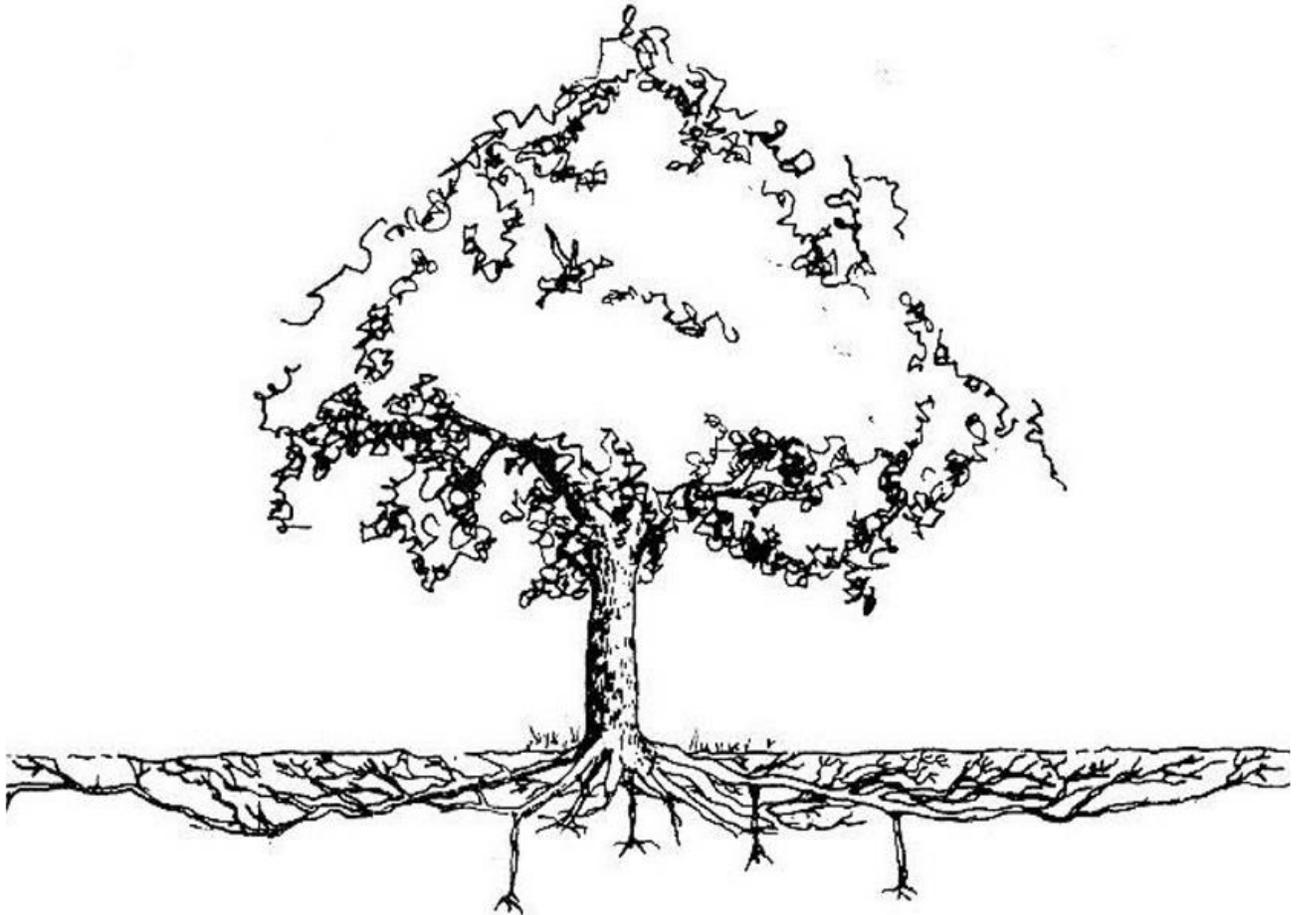




Salem Tree Manual

City of Salem, Massachusetts



Prepared by the Salem Tree Commission, 2023

www.salem.com/tree-commission

The Salem Tree Commission gratefully acknowledges the noteworthy work of the Lexington, MA Tree Committee for providing Salem with a model to follow in urban forestry and for granting permission for extensive duplication from their Tree Management Manual, 2012, third edition.

Inside illustrations by Bruce Walker www.bruce-walker.com

Call Dig Safe before excavating tree pits: Dial 811 or 1-888-344-7233

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WITH THANKS TO:

The Cambridge Department of Public Works,
City of Cambridge Standard Specifications and Details, 2016
for Figures 16 – 20,
illustrations of sidewalk tree pits.

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to the Photos and Figures*

1. PURPOSE

On January 10, 2019, the Salem City Council approved the Salem Tree Ordinance, which gives increased protection to the city's urban forest and created Salem's Tree Commission. The ordinance affects trees along public rights-of-way and, in certain cases, trees on portions of private property. From time to time, the Tree Commission and the City Council may modify the ordinance. Please refer to the city website for the current ordinance: [Salem Tree Ordinance, Ch. 43](#)

The Tree Commission adopted the *Salem Tree Manual* as the standard for tree care in Salem. Its purpose is to set forth details of current standards and practices for arboriculture and it applies to work done by city employees, developers, builders, contractors, and private individuals. The Tree Commission should periodically review it and the information updated as needed.

2. GOALS

The goals of the City of Salem Tree Commission are:

1. To expand and improve the tree canopy in the City of Salem.
2. To educate and encourage the use of best practices when planting and maintaining trees by both professionals and amateurs.
3. To foster cooperation between the Tree Warden, city departments, and entities such as private developers, utility companies, organizations, and agencies, as well as businesses and residents on matters that affect Salem's trees.
4. To encourage the planting of hardy, well-sited, beautiful trees along the public rights-of-way, in parks, and other public spaces, as well as on private property, when the owner has granted permission.
5. To continue a tree-by-tree inventory on public rights-of-way with information about location, species, size, and health of each tree in a database that is consistently updated. This inventory will serve as a basis for tree maintenance, planting, and management planning.
6. To replace trees lost during the preceding year on a better-than-one-for-one basis.
7. To submit an annual budget for planting new and replacement trees.
8. To encourage private funding as a supplement to the city's tree budget.

3. ENABLING LEGISLATION

The following provisions of law regulate and affect public trees in Salem, and set forth the duties of the Tree Warden:

- Salem Tree Ordinance, Chapter 43 – TREES, City of Salem Code of Ordinances: https://library.municode.com/ma/salem/codes/code_of_ordinances?nodeId=PTIICOOR_CH43TR
- Massachusetts General Laws, Chapter 87, Public Shade Tree Law, Section VII. Planting Guidelines 1-14 <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXIV/Chapter87>
- Massachusetts General Laws, Chapter 40, Scenic Roads Section 15 C <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleVII/Chapter40/Section15c>

4. JURISDICTION OF CITY DEPARTMENTS, BOARDS, COMMISSIONS, AND OTHER ENTITIES

4. A. DEPARTMENT OF PUBLIC SERVICES, TREE WARDEN

The Tree Warden, or his or her designee, shall be responsible for all public trees in Salem. This department shall budget, initiate, and supervise the selection, planting, and maintenance of the city's street trees and setback trees. The Tree Warden may designate an alternate as needed in times of emergency or absence.

4. B. DEPARTMENT OF PUBLIC SERVICES, ENGINEERING

Tree planting for future city projects shall be coordinated with the Tree Warden. Projects may include sidewalk improvements, street construction, public works, parks and recreation, school construction and renovations, and other municipal buildings and facilities such as the community center and the public library. The installed costs for a tree planting design shall be determined up front based on current experience in order to ensure that the planting is not an afterthought.

4. C. DEPARTMENT OF PLANNING AND SALEM PLANNING BOARD

The Board and the Department shall recommend tree preservation, replacement, and/or planting as part of special permit projects and other developments including new and renovated buildings and parking facilities. In this process, the City Planner shall consult with the Tree Warden and Tree Commission to follow the standards and procedures set forth in the *Salem Tree Manual* and the Salem Tree Ordinance.

4. D. OTHER ENTITIES

The following shall also consult with the Tree Warden and Tree Commission and follow the standards and procedures set forth in the *Salem Tree Manual* and the Salem Tree Ordinance:

- City Council
- Design Review Board
- Board of Appeals

- Conservation Commission
- Cemetery Commission
- Historical Commission
- Parks and Recreation Commission
- School Committee
- Utility Companies

5. COMMUNITY BENEFITS OF TREE PLANTING

Salem's climate supports the growth of trees throughout our neighborhoods, along our streets and within property lines. The many benefits listed below are achieved by the active participation of Salem residents who request trees to be planted near them and who look after the trees over the years:

- Enhancing the quality of life, our environment, and the overall appearance of the city.
- Enhancing visual and aesthetic qualities that attract visitors and businesses.
- Defining public spaces and creating civic identity.
- Contributing to the distinct visual character of neighborhoods.
- Protecting and increasing real property values.
- Providing natural privacy among neighbors.
- Preserving the character of wooded and natural areas.
- Conserving and reducing energy consumption by providing shade and evaporative cooling through transpiration.
- Reducing direct sun and reflected glare.
- Improving local and global air quality by absorbing carbon dioxide, ozone, and particulate matter, and by producing oxygen.
- Reducing wind speed and directing air flow.
- Reducing and baffling noise pollution.
- Providing habitat for birds, small mammals, other wildlife, and beneficial insects.
- Slowing storm water runoff and soil erosion; and
- Providing natural flood and microclimate control.

5. A. TREE PITS

The city is responsible for planting Public Trees in tree pits. In Salem, street trees are planted close to the curb in openings in the sidewalk called tree pits that vary in dimensions depending on the width of the sidewalk. The current trend is to open more of the sidewalk to allow the tree roots to grow and have better access to oxygen and water. New or replacement sidewalks can additionally be designed with a structural soil footprint larger than the visible tree pit opening. The additional soil volume aids tree health. (See Sidewalks Figure 16– 20.)

5. B. USES OF TREE LAWNS

In some neighborhoods, between the curb and the sidewalk, there is a strip filled with grass, or plants, stones, mulch, or soil, which is called a tree lawn. If the surface is water-permeable, then a tree may be planted there by the city with some careful preparation described below in this *Salem Tree Manual*. **Residents may not plant trees in this public right-of-way.**

The tree lawn is a public space which property owners maintain for both the health and beauty of the neighborhood. Any other plantings in a tree lawn, including flowers, should be kept back from the tree root zone to minimize competition for water and to avoid destroying the tree's small, superficial feeder roots. Woody plants located in tree lawns can present problems for future trees. Such planting would require a [Public Tree Permit](#) under M.G.L. 87 from the Tree Warden. **Parking on the tree lawn is illegal.** Parking compacts the soil.

5. C. SETBACK TREES – PUBLIC TREES ON PRIVATE LAND

In addition to the city planting trees within the public right-of-way near the curb, Massachusetts law has long encouraged communities to plant in the first 20 feet beyond the edge where private property begins. (See

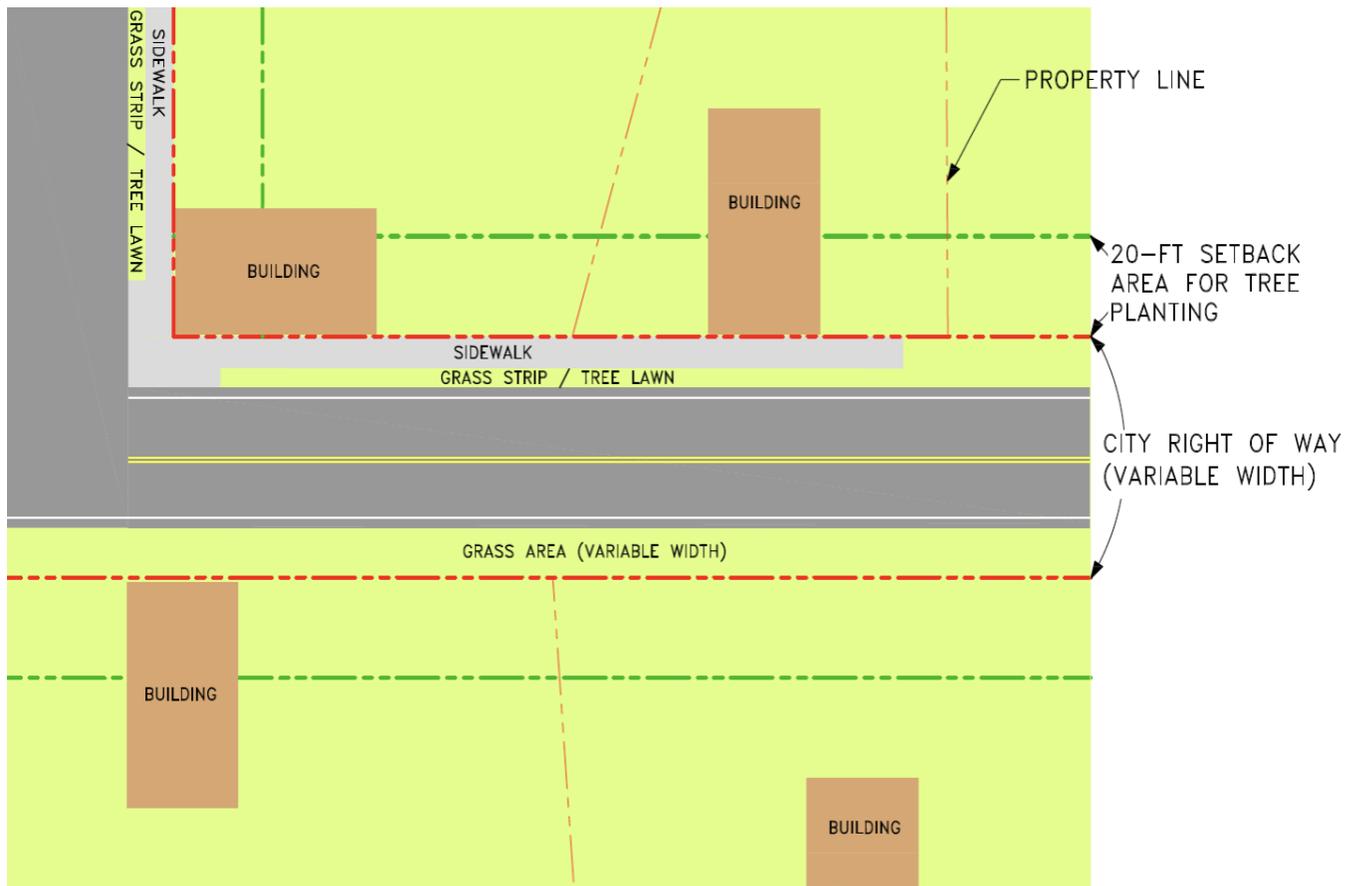
Figure 1. Tree Ordinance Setback Area

.) Tall trees planted within this area can still cast shade onto both the sidewalk and the street and reduce temperatures by as much as 10° F. The city will plant a Setback Tree; the property owner shall water the tree through the three-year establishment period; the city will periodically monitor it during the establishment period. **READ** below Section 7. D. **SETBACK PLANTING ON PRIVATE PROPERTY. See:** Salem Tree Ordinance Article IV. – Protected Tree Preservation.

Figure 1. Tree Ordinance Setback Area

Setback Area for Tree Planting Salem Tree Ordinance

The Salem Tree Ordinance and M.G.L. Chapter 87 permit planting public trees within the 20-foot setback from the public right-of-way (ROW). Often the back of sidewalk is the edge of the ROW and the beginning of the setback. Where there is no sidewalk, there still may be a roadway ROW boundary beyond which the setback begins.



Credit: R.L. McCarter

5. D. HOW TO REQUEST A TREE

1. SeeClickFix. Trees for tree lawns, tree pits and setback locations may be requested through the SeeClickFix application on the City of Salem website: (https://seeclickfix.com/web_portal/9uMKWtTC6yi8SAffD2v7iGGd/report/category) or through the link on the Tree Commission webpage under “Quick Links” on the lower left side of the page: [TO MAKE Tree Requests: City Street Trees-SeeClickFix](#) The Tree Warden will evaluate the suitability of the site for tree planting and may discuss the choice of trees with the resident before planting the tree.

Through the same website, residents may also request tree pruning from the city. Residents must obtain a [Public Tree Permit](#) from the Tree Warden in order to hire an approved arborist to prune trees in the public right-of-way.

2. Century Tree. “Touch the Future - Plant a Tree!” Salem commemorates the 400th anniversary of its founding in 2026. In celebration, the Salem Tree Commission is seeking Setback Tree locations where tall, majestic trees may be planted to be enjoyed by generations to come. Each tree will be marked with a special Century Tree tag. For details, click the [Century Tree](#) link on the Tree Commission webpage. Tax deductible donations to support this program may be made to the [Salem Tree Fund](#).
3. Greening the Gateway Cities Program. Residents, tenants, and business owners in specified urban residential areas, which includes all of the Salem downtown, can request free trees to be planted for them anywhere on their property. The program is designed to reduce energy use for heating and cooling by increasing tree canopy cover in urban areas while improving the aesthetic appearance of neighborhoods. Eligible properties throughout the city are identified by entering an address at the Mass Urban Canopy website: <https://www.maubancanopy.org/town/salem/> or on the Tree Commission webpage under “[TO MAKE Tree Requests: Salem Greening the Gateway Cities Program](#)”

If the property is located within the Planting Zone, contact the Department of Conservation and Recreation forester to start planning for a new tree!

5. E. NO PLANTERS OR PLANTINGS AROUND TREE TRUNKS

Do not build any structure filled with soil **nor plant anything** around a tree trunk or root area. Building a box around a tree trunk and filling it with soil for flowers and other plants raises the soil level, which can create crippling results for a tree. Besides rotting the bark of the tree, the increased soil buries the roots too deeply, blocking the oxygen needed for survival. The tree will grow secondary roots that in the search for air strangle the trunk, cut into the bark, and block nourishment. See examples of such knotty roots in the photos below. The tree cannot maintain itself, branches become brittle and the crown slowly dies and breaks off. (See Photo 1– 4.)

If flowers are desired, they should be placed in pots beyond the drip line of the tree, as opposed to being planted in the ground. (See Figure 12.)

Photo 1. Do Not Create Planters

Raising the Soil Around Tree Trunks Above the Root Flare Damages the Tree as Much as a Mulch Volcano

Left: Planting structures filled with soil smother the roots of a tree. The tree grows extra roots that search for oxygen. These knotty girdling roots end up compressing the bark and diminishing the flow of nutrients, slowly killing the tree.



Right: When the wooden structure that surrounded this tree was taken away after many years, the strangling above-ground roots showed the amount of soil that had once been in the box. The tree's brittle branches were easily broken by passing trucks. The tree had to be removed.



Below: Look at the difference between the two trees with the stone planters in the center of the photo and the larger trees on either side. The extra soil in the stone planters caused the trees to lose the leaves in their crowns early, and they are shorter and smaller than their neighbors even though it is likely that all four trees were planted at the same time.



Photo 2. Examples Of Girdling Tree Roots

Case #1 Similar to Planters, Mulch Volcanos Can Cause Girdling Roots

Right This photo shows a tree that has been over-mulched. The roots girdled the tree and erupted to get oxygen.

Total mulch depth should never be greater than 2" – 3" and should stay at least 3" away from the tree trunk. Never pile mulch onto the trunk of a tree. So called "mulch volcanos" are extremely harmful.

It is a misconception that the mound shape is desirable, it is not. Any time more mulch is added, remove some of the existing mulch to *maintain the 3" proper depth.*



If girdling roots are found, professional pruning may extend the life of the tree. Contact the Tree Warden for a pruning permit and a referral to an arborist qualified to remove them.

Case #2 Planted Too Deeply

Left: When a tree is planted, the root flare should be visible. If the tree is planted too deeply, the tree will grow girdling roots searching for oxygen. A tree that looks like a telephone pole stuck into the ground with no visible root flare may not thrive. **See Figure 4 for proper planting practice to expose the root flare.**

Right: Better planting practices may avoid a stunted tree with a trunk girth that is small for its age and branches that die back steadily.



Photo 3. Girdling Roots Exposed #1

WHAT HAPPENS UNDER TOO MUCH SOIL OR MULCH?
This tree was probably buried 6" too deep. Girdling roots grew at multiple levels.

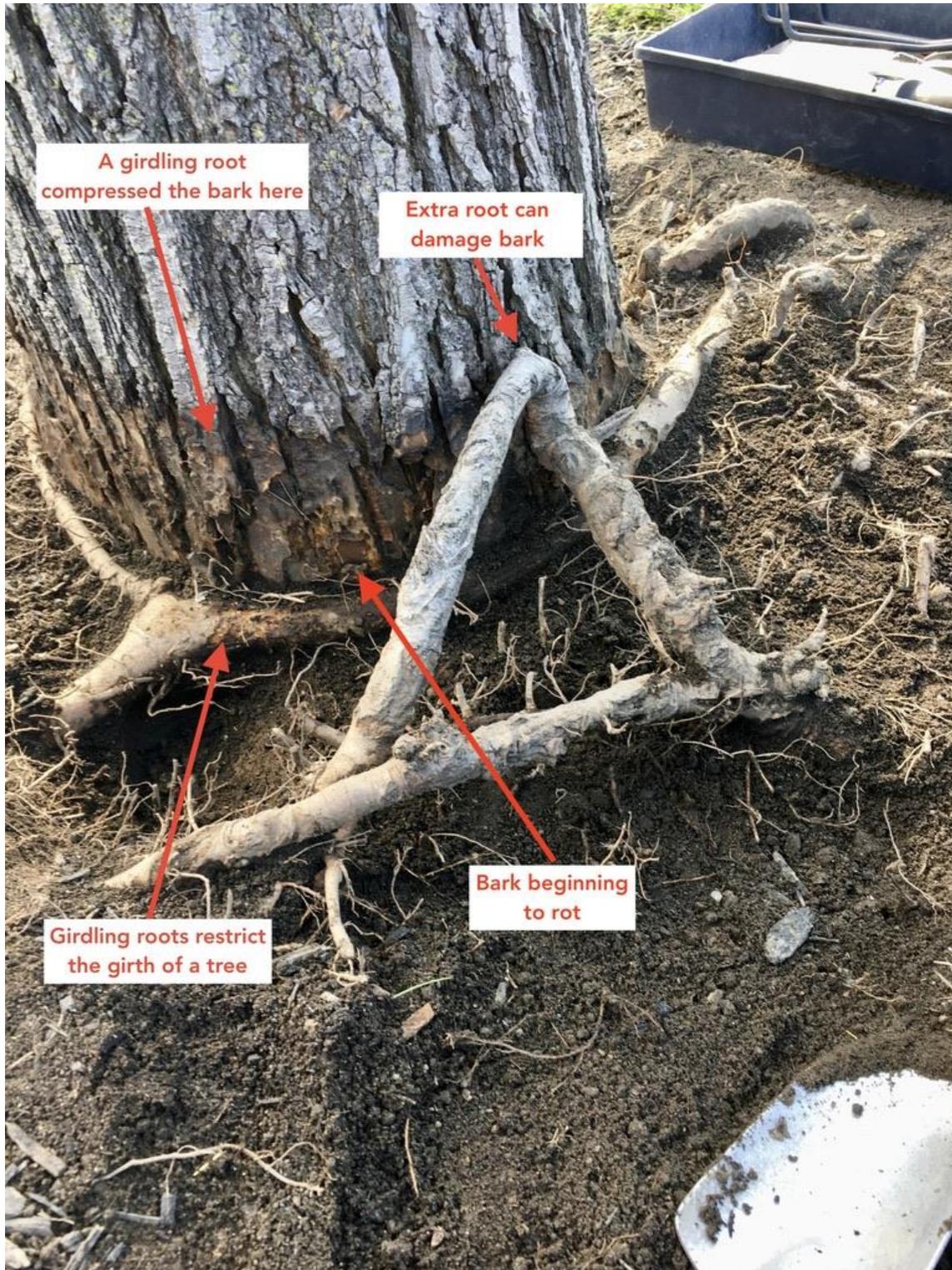
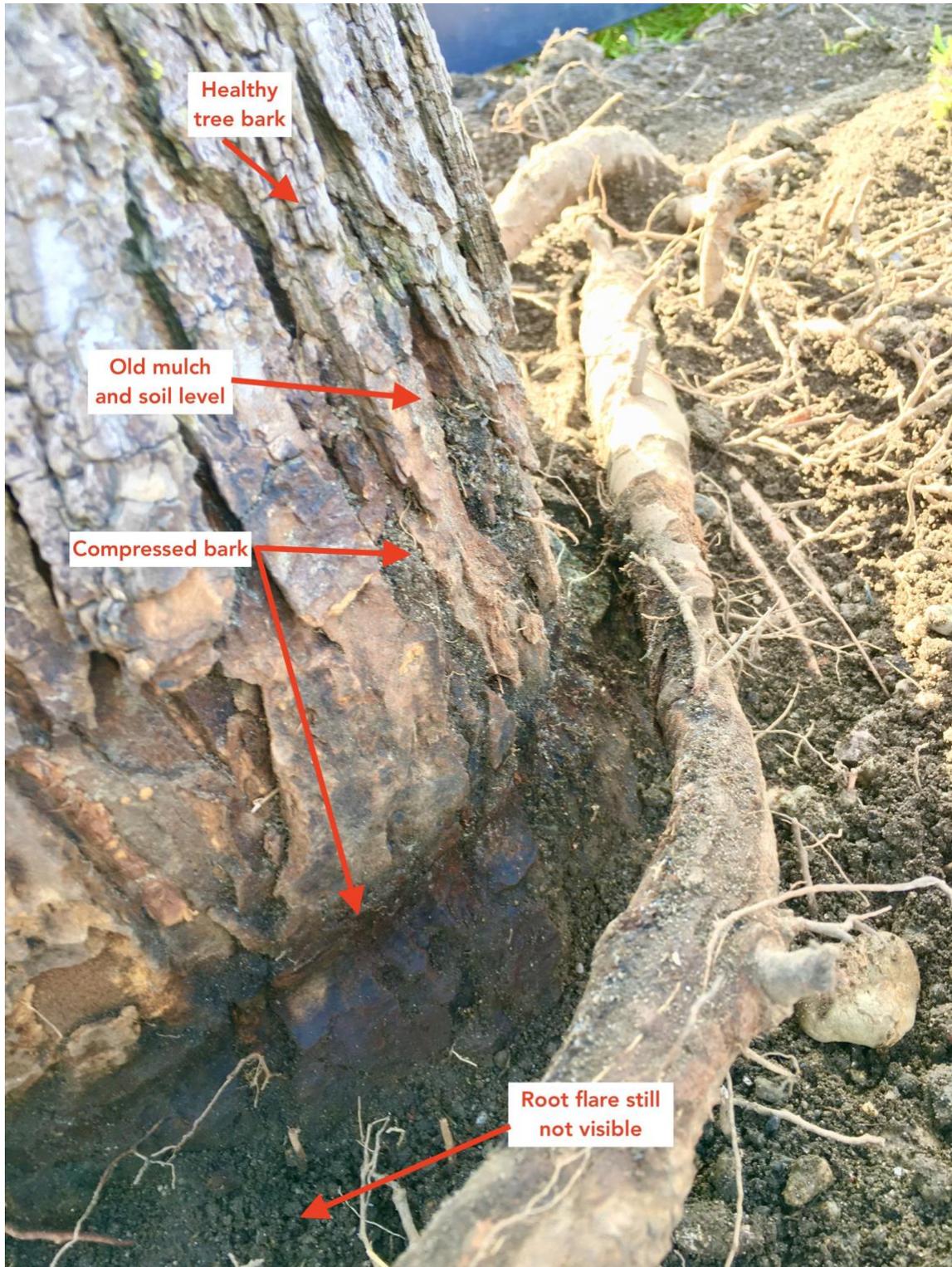


Photo 4. Girdling Roots Exposed #2

On the back side of the tree, the lower girdling root is pushed back. The bark is compressed at two different levels. The root flare must be somewhere below this point.



6. STREET TREE SPECIES RECOMMENDATIONS

6. A. RECOMMENDED STREET TREE SPECIES

Subject to change by Tree Commission. Last updated May 16, 2022.

This list contains species that the city currently installs as street trees. It is also a good reference for private property owners whose plantings increase Salem's tree canopy. Specific cultivated varieties are to be determined by the city Tree Warden as commercial nursery availability changes.

Native trees are preferable to non-native species as they host far more beneficial insects desirable to songbirds and mammals, expanding and enriching the biodiversity of the local ecology. Adaptive tree species, those that perform well in challenging situations but are not indigenous or invasive, have proven valuable as droughts increase and the urban street tree conditions continue to warm. A mix of native and adaptive trees is desirable with a clear majority favoring native species.

In the below tables, a **superscript "N"** denotes a species native to North America

Tree Species and Cultivars That Survived Hurricanes and Saltwater Inundations

As a coastal city, Salem is susceptible to flooding. It is important to recognize that flooding can last for extended periods during hurricanes and the subsequent loss of trees can be severe. To ensure that any future private or public tree plantings will be "long-lived and resilient," the Tree Commission website provides a link to a valuable article* [Trees for Flood Plains](#). At the end of the article is the current list of species and cultivars that are proven survivors of the 2012 Hurricane Sandy in New York City and Long Island.

In the below tables, a **superscript "FP"** (Flood Plain) marks those Salem Street Tree Recommendations that have shown a higher tolerance for saltwater inundation as identified in this hurricane article. Flood tolerant cultivars are noted in their own column.

For more information on trees **Visit:**

[Planting for Resilience: Selecting Urban Trees in Massachusetts, U Mass Amherst.](#)

<http://www.treesforme.com/massachusetts.html> Native trees.

<http://woodyplants.cals.cornell.edu/home> Overview of tree information.

<https://www.missouribotanicalgarden.org> › [PlantFinder](#) Quick references for trees.

* "Flood Damage to Trees After Hurricane Sandy: Lessons and Surprises"

<https://nysufc.org/flood-damage-trees-hurricane-sandy-lessons-surprises/2016/06/03/>

6. A. RECOMMENDED LARGE AND MEDIUM STREET TREE SPECIES

LARGE (>45') & MEDIUM (35' - 45') SHADE TREES

No wires overhead.

BOTANICAL NAME <i>Native Tree^N Flood Plain^{FP}</i>	COMMON NAME	These 'cultivars' have shown tolerance for Flood Plains	HEIGHT
<i>Acer rubrum^N</i>	red maple	'Red Sunset'	40-60'
<i>Acer x freemanii^N</i>	freeman maple		40-75'
<i>Betula nigra^N</i>	river birch	'Duraheat'/'Heritage'	40-70'
<i>Carpinus betulus</i>	European hornbeam	Columnar European Hornbeam	35-60'
<i>Catalpa speciosa^N</i>	catalpa		40-60'
<i>Carpinus caroliniana^N</i>	American hornbeam		20-30'
<i>Carya ovata^N</i>	shagbark hickory		70-90'
<i>Celtis occidentalis^{N FP}</i>	common hackberry	'Magnifica'	40-60'
<i>Cercidiphyllum japonicum</i>	katsura tree		40-60'
<i>Cladrastis kentukea^N</i>	yellowwood		30-50'
<i>Fagus grandifolia^N</i>	American beech		50-80'
<i>Ginkgo biloba</i>	ginkgo, maidenhair tree	'Autumn Gold' 'Magyar' 'Princeton Sentry'	50-80'
<i>Gleditsia triacanthos</i> var. <i>inermis^N</i>	thornless honeylocust	'Halka'/'Imperial' 'Shademaster'/'Skyline'	40-60'
<i>Gymnocladus dioica^{N FP}</i>	Kentucky coffeetree	'Espresso' 'Prairie Titan'	50-75'
<i>Halesia carolina^N</i>	Carolina silverbell		20-40'
<i>Koelreuteria paniculata^{FP}</i>	goldenraintree		30-40'
<i>Liquidambar styraciflua^N</i>	American sweetgum		40-65'
<i>Liriodendron tulipifera^N</i>	tuliptree		70-90'
<i>Metasequoia glyptostroboides</i>	dawn redwood		70-100'
<i>Nyssa sylvatica^{N FP}</i>	black gum, tupelo	'Forum'/'Red Rage'	30-60'
<i>Platanus x acerifolia</i>	London planetree		65-80'
<i>Quercus alba^N</i>	white oak		45-80'
<i>Quercus bicolor^{N FP}</i>	swamp white oak		45-70'
<i>Quercus coccinea</i>	scarlet oak		60-75'
<i>Quercus imbricaria^N</i>	shingle oak		40-60'
<i>Quercus macrocarpa^{N FP}</i>	bur oak		60-80'
<i>Quercus palustris^N</i>	pin oak		50-70'
<i>Quercus petraea</i>	Irish oak		Up to 150'
<i>Quercus phellos^{N FP}</i>	willow oak		40-60'
<i>Quercus robur^{FP}</i>	English oak		40-60'
<i>Quercus rubra^N</i>	northern red oak		60-75'
<i>Quercus velutina^N</i>	black oak		50-60'
<i>Styphnolobium japonica^{FP}</i>	Japanese pagodatree (sophora)	'Princeton Upright' 'Regent'	50-70'
<i>Tilia americana^N</i>	American linden		60-80'

<i>Tilia cordata</i>	littleleaf linden		50-70'
<i>Tilia tomentosa</i>	silver linden		50-70'
<i>Ulmus americana</i> ^{N FP}	American elm	'Valley Forge' 'Princeton'	60-80'
<i>Ulmus parvifolia</i> ^{FP}	lacebark elm	'Allee'/'Bosque' 'Dynasty'	40-75'
<i>Zelkova serrata</i>	Japanese zelkova		50-80'

6. A. RECOMMENDED SMALL STREET TREE SPECIES
SMALL (<35') & ORNAMENTAL TREES

Wires may be overhead.

BOTANICAL NAME <i>Native Tree</i> ^N <i>Flood Plain</i> ^{FP}	COMMON NAME	These 'cultivars' have shown tolerance for Flood Plains	HEIGHT
<i>Acer campestre</i> ^{FP}	hedge maple	'Evelyn'/'Metro Gold'	25-35'
<i>Amelanchier</i> spp. ^N	serviceberry		15-25'
<i>Carpinus caroliniana</i> ^N	American hornbeam, ironwood		20-30'
<i>Cercis canadensis</i> ^N	eastern redbud		20-30'
<i>Cornus kousa</i>	kousa dogwood		15-30'
<i>Cotinus obovatus</i> ^N	American smoketree		20-30'
<i>Crataegus</i> spp. ^N	hawthorn		25-35'
<i>Crataegus</i>	"	'Crimson Cloud'	
<i>Crataegus crusgalli</i> var. <i>inermis</i> ^N	"	'Thornless Cockspur'	20-30'
<i>Crataegus</i>	"	'Lavellus'	
<i>Crataegus phaenopyrum</i>	"	'Washington'	25-30'
<i>Crataegus monogyna</i>	One-seed hawthorn		20-25'
<i>Crataegus viridis</i>	"	'Winter King'	25'
<i>Maackia amurensis</i> ^{FP}	amur maackia		20-30'
<i>Magnolia virginiana</i>	sweet bay magnolia		15-20'
<i>Malus</i> spp. ^{FP}	flowering crabapple		10-25'
<i>Ostrya virginiana</i> ^N	American hophornbeam		25-40'
<i>Prunus</i> spp.	cherry		20-30'
<i>Syringa reticulata</i>	Japanese tree lilac		20-30'

6. B. UNDESIRABLE OR PROHIBITED STREET TREES

This list includes trees with structural characteristics that make them unstable and unsuitable for street tree planting or are prohibited by law. See the [Massachusetts Prohibited Plant List](https://www.mass.gov/massachusetts-prohibited-plant-list) that forbids the importation, sale, and trade of plants determined to be invasive in Massachusetts: <https://www.mass.gov/massachusetts-prohibited-plant-list> and **READ** below 7.B. TREES WITH PROBLEMS.

BOTANICAL NAME <i>Native Tree</i> ^N	COMMON NAME <i>Prohibited</i> ^P <i>Structural</i> ^S
<i>Acer negundo</i>	boxelder ^s
<i>Acer platanoides</i>	Norway maple ^p
<i>Acer pseudoplatanus</i>	sycamore maple ^p
<i>Acer saccharinum</i> ^N	sliver maple ^s
<i>Ailanthus altissima</i>	tree of heaven ^p
<i>Elaeagnus umbellata</i>	autumn olive
<i>Frangula alnus</i> , formerly <i>Rhamnus frangula</i>	glossy buckthorn ^p
<i>Phellodendron amurense</i>	amur cork tree ^p
<i>Pinus thunbergia</i>	Japanese black pine
<i>Populus species</i> ^N	poplar ^s
<i>Pyrus calleryana</i>	callery a.k.a. 'Bradford' pear ^s
<i>Rhamnus cathartica</i>	common buckthorn ^p
<i>Robinia pseudoacacia</i> ^N	black locust ^p
<i>Salix species</i>	willows ^s

6. C. STREET TREES SUSCEPTIBLE TO KNOWN FATAL PESTS

A tree in good health can usually resist a normal infestation of pests. Stressed trees, due to prolonged drought, compacted soils, or mechanical or other injury, are much more susceptible to decline and eventual mortality due to pests.

BOTANICAL NAME	COMMON NAME <i>Native Tree</i> ^N
<i>Acer</i> spp.	maple species: red ⁿ , silver ⁿ , sugar ⁿ , Norway
<i>Aesculus hippocastanum</i>	horse chestnut ⁿ
<i>Albizia julibrissin</i>	mimosa
<i>Betula</i> spp.	birch species: paper ⁿ , gray ⁿ , sweet ⁿ , river ⁿ
<i>Celtis occidentalis</i>	hackberry ⁿ
<i>Fraxinus</i> spp.	ash species: white ⁿ , black ⁿ , green ⁿ , blue
<i>Platanus</i> spp.	sycamore species: American sycamore ⁿ , London planetree
<i>Populus</i> spp.	popular species: aspens ⁿ , balsam ⁿ , poplars ⁿ , cottonwoods ⁿ
<i>Salix</i> spp.	willow species: black ⁿ , crack, weeping, white ⁿ
<i>Ulmus</i> spp.	elm species: American ⁿ , slippery ⁿ , winged ⁿ , water-elm ⁿ , Siberian,

7. PLANNING BEFORE PLANTING

7. A. TREE SELECTION

1. Species Characteristics. When selecting the tree species, research what is appropriate for your site. (See Figure 2.) Consider mature height and canopy width, projected longevity, rate of growth, hardiness, soil, light and moisture requirements, wind and salt tolerance, ornamental attributes, and disease or pest resistance qualities. A useful tool to help property owners explore the choice of species and planting locations on their land or nearby on the street is the [i-Tree Design Program \(https://design.itreetools.org\)](https://design.itreetools.org) available under the Quick Links section on the [Tree Commission](https://www.salem.com/tree-commission) webpage: <https://www.salem.com/tree-commission>
2. Selecting A Healthy Specimen.
 - a. Examine the top of the root ball. Remove any extra soil that covers up the root flare, that zone where the trunk spreads out to meet the roots. Reject trees with girdling roots – roots that grow around or against the tree’s trunk, strangling it. (See Figure 6 and Photo 1– 4 at the end of Section 5.)
 - b. Avoid grafted stock where possible.
 - c. Examine the trunk and reject those with significant wounds.
 - d. Check for desired form and branching; avoid trees with co-dominant leaders.
 - e. Check that foliage has good color and is not wilted.
3. Species Appropriateness to Site. The choice of species to plant depends on surrounding circumstances; for instance, potentially large trees (greater than 60’) need to be planted back of the sidewalk or on broad tree lawns where there is sufficient soil volume and plenty of room for full growth without overhead obstructions such as utility wires. If obstructions limit the available space, select a smaller, upright species or varieties with growth rates that will not create future problems. “Choose the Right Tree for the Right Place.” (See Figure 2.)
4. Species Diversity. All individuals involved in tree planting should avoid planting a monoculture in one area or on one street to avoid total loss due to horticultural epidemics. Care in selection creates a balance between uniformity in defined areas and healthful and visual variety across the city.

7. B. TREES WITH PROBLEMS

1. Species to Avoid. Several tree species are included on the Massachusetts Prohibited Plant List, which is regularly updated at: <https://www.mass.gov/massachusetts-prohibited-plant-list> All of these plants are prohibited from sale, purchase, trade, or propagation. Do not transplant or otherwise nurture these trees that are harmful to the environment. **READ** Section 6. B. UNDESIRABLE OR PROHIBITED STREET TREES and Section 10. INVASIVE SPECIES.
2. Undesirable Tree Species. An undesirable tree species shows the majority of the following characteristics:

- a. Invades its surrounding area.
- b. Alters the soil in which it grows.
- c. Outcompetes other nearby desirable species, often restricts their growth and causes them to die.
- d. Survives where other trees will not as it is hardier than the species that surround it.
- e. Reproduces more quickly than other species either by seed or underground roots or both.

Salem hosts many large, healthy trees such as Norway maples (*Acer platanoides*) that contribute to the total area of the city's tree canopy that are not among those species recommended by the Tree Commission. Removal of such existing trees is not required. However, when these trees are crowded together or unhealthy, the planting area may be evaluated for selective thinning.

In the case of parks, playgrounds, and cemeteries, trees that are listed as undesirable may be planted in those locations if there is a particular horticultural goal. It is not the intent of the Tree Commission to limit those arboreal decisions but consultation with the Tree Warden is urged.

3. Host Trees for Asian Long-horned Beetle (ALB). The Asian long-horned beetle kills young and mature trees by tunneling within the trunk and branches, disrupting sap flow, and weakening the tree. Because this beetle will attack many different tree species, it could significantly disrupt the urban tree canopy if it became established. The current management for this pest is radical but has proven effective in dramatically curtailing the infestation in the Worcester region – immediate removal and total chipping of the infected trees.

ALB host trees are indicated in Section 6. C. STREET TREES SUSCEPTIBLE TO KNOWN FATAL PESTS

When planting yard or ornamental trees, homeowners should consider varieties that ALB does not prefer. For updates **Visit:** <https://www.aphis.usda.gov/aphis/resources/pests-diseases/asian-longhorned-beetle>

4. Trees Killed by Emerald Ash Borer (EAB). Already present in Essex County, the Emerald ash borer has the potential to kill all ash trees (*Fraxinus*, spp.). Borers tunnel under the bark of the tree and disrupt the vascular system, preventing nutrients from reaching the leaves and killing the tree.
5. Chemical inoculants are preventative only at this time. They are expensive and must be repeated over several years. For current data **Visit:** <https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/emerald-ash-borer>

7. C. PUBLIC TREE SITE SELECTION

1. Along the Public Rights-of-Way. M.G.L. c. 87, sec. 7 allows the Tree Warden, and private non-profit groups with permission, to plant new shade trees funded through public monies or donations, along public rights-of-way for the purpose of improving, shading, or ornamenting our community. In Salem, the planting area is constrained by narrow streets and our distinctive sidewalks, which may or may not include tree lawns. As an alternative location for shade trees, the law permits planting within the first 20 feet behind the right-of-way, with permission in writing from the landowner. The right-of-way may not include a sidewalk but often contains utilities such as fire hydrants or electric/telephone poles. The intent of this policy is to provide flexibility in allowing potential planting locations to be selected on a street-by-street basis. The Tree Warden will exercise his or her discretion in siting a tree.
2. Maximum Shade and Canopy. Where overhead space permits, place taller trees where they will make the greatest contribution to shade and improving street appearance.
3. Parking Lots. Provide maximum canopy coverage over parking lots. In a parking lot or park setting, group trees in as large a space as possible for unrestricted root growth. Plant nearby sidewalk street trees in a consolidated tree lawn to achieve maximum root growth. (See Figure 3.)

7. D. SETBACK PLANTING ON PRIVATE PROPERTY

Salem has long relied on shade trees planted in the yards of private property to increase the city canopy, as may be seen in historic Salem postcards. Since 1899, M.G.L. Chapter 87 has permitted planting public trees within the 20-foot setback from the right-of-way, usually the back edge of the sidewalk. (See Figure 1.) To plant a city tree on private property requires a release signed by the property owner and the city.

1. Benefits. Planting trees in the 20-foot setback of front or side yards of private property, along the public rights-of-way, has benefits. It minimizes root constriction and damage from road chemicals and street traffic and lessens potential sidewalk heaving due to root growth, thus reducing loss and replacement costs.
2. Tree Requests. Property owners may contact the Tree Warden to request that a tree be planted in the setback area of their land adjacent to a public right-of-way. A consent form must be signed by the Tree Warden and the owner. The request will be recorded and the site noted for consideration of future fulfillment based on the availability of funds.
3. Consent Form. An agreement, available from the Department of Public Services and signed by both parties, shall consist of the following:
 - a. The city shall provide and plant the agreed-upon tree or trees in the designated setback area.
 - b. Once planted, the city shall monitor the tree's health for the critical first three years and will provide any needed maintenance or structural pruning.

- c. The private property owner shall be responsible for watering the tree(s) from the moment of planting. **READ** Section 8. B. PLANTING DIRECTIONS 9. Water.
- d. The owner shall report to the city any concerns about the tree's health during the three-year period.
- e. After the three-year period, the tree shall become the sole responsibility of the property owner and shall no longer be considered in the care of the city. However, if the tree is placed on any property that is other than a single, double, or triple residential unit (exempt properties) it is classified as a Protected Tree and the Tree Warden must be notified of any upcoming work to be done to the tree. ([City of Salem Tree Ordinance, Ch. 43, Article IV. Protected Tree Preservation.](#))
- f. The city shall keep a list of trees planted on private property.

7. E. PUBLIC TREE PLANTING

- 1. The Department of Public Services and the Tree Warden. The Department of Public Services must advise the Tree Warden about proposed city projects requiring the planting of new trees to fulfill orders from the Planning and other city Boards and Commissions.
- 2. The Tree Warden and the Tree Commission. The Tree Warden then consults with the Tree Commission and recommends the number and species of trees for projects before they go out to bid. He or she considers current environmental and arboricultural changes tending to favor or disqualify certain species such as those affected by Asian long-horned beetle, anthracnose, and blights.
- 3. The Salem Tree Inventory. The Salem Tree Inventory should be regularly reviewed and updated to reflect data available on trees that were recently planted or removed.

7. F. PRIORITIES FOR TREE PLANTING LOCATIONS

The Salem Tree Commission shall be briefed by the Tree Warden on the Tree Planting Annual Plan. No replacement of failed trees shall take place without first determining the reason for the failure and remedying it. Priorities are as follows:

- 1. Prior Tree Removal Locations in Front of Businesses and Residences. These locations are a priority for tree replacement.

Areas where new plantings failed to establish are also added to this list. It is important to identify the causes of failure in these locations in order to ensure replacement tree survival. Causes of failure, including gas leaks, should be remedied before replanting. Most new plantings fail due to insufficient water, nutrients, and no added soil improvements such as compost in the tree pit. When replanting in an existing location, widen the pit where possible.

- 2. Streets or Public Spaces. Streets or public spaces where there has been significant tree loss. The cause of the tree loss shall be determined and remedied before replanting. Consider

engineered planting schemes with structural soil.*

*Sand-Based Structural Soils (SBSS) are designed sand and soil mixes which can meet or exceed pavement design and installation requirements while remaining root penetrable and supportive of tree growth.

3. Requests for New Trees. When fulfilling a request for a new tree, the Tree Warden may advise the homeowner to consider a planting in the setback.
4. New Development Projects. Sites where development or city projects are noticeably under-planted with viable street trees may be eligible for tree plantings. In cases where the Planning Board directs a property owner or developer to pay the city to plant trees in the vicinity of the property, the funds shall be used specifically for that site. The possible exception would be if the Tree Warden finds conflicts or untenable planting conditions. The Tree Warden would inform both the Planning Board and the Tree Commission about the need for reconsideration. It is important that the Tree Warden be brought into the planning process as early as possible so that the proper construction of sidewalks includes structural soil next to tree pits. The cost of properly preparing a tree pit is offset by the long-term success of the tree and the benefits to the immediate vicinity.

7. G. GAS LEAKS

It is critical that any location proposed for tree planting, especially sites where there is unexplained tree loss, be investigated for the presence of gas leaks. No sites proven to have gas leaks should be planted until the situation has been remedied and repeat testing is performed to confirm the problem has been remedied.

7. H. PLACEMENT OF STREET TREES

1. Tree planting sites. Planting sites must be approved by the Tree Warden and shall be compliant with Americans with Disabilities Act (ADA) requirements. Every effort should be made to balance the need for accessible passage with the benefits of a shaded pedestrian pathway including the use of products that ensure water permeability for the tree and a suitable travel surface.
2. Tree grates. The use of tree grates is strongly discouraged.
3. Spacing. In Salem, the streetscapes vary from neighborhood to neighborhood therefore the space available for canopy tree planting may be restricted. In such areas, smaller trees may be useful. The ultimate size of the tree determines the spacing between street trees. The Tree Warden may modify spacing for safety reasons or to achieve a certain design effect. For safety purposes, the following are best practices for siting and spacing of trees.

In Salem, avoid planting trees in the following locations:

- Within 15 Ft. from Street Corners
- Within 5 Ft. from Stop Signs

- Within 5 Ft. from Utilities
- Within 5 Ft. from Hydrants
- Within 3 Ft. from Driveways
- Within 3 Ft. from Crosswalks.

(See Figure 16 – 20 for tree pit drawings for different sidewalk widths, Cambridge, MA)

4. Next to Buildings. Avoid planting within six feet of a building or other permanent structure. However, the Tree Warden shall exercise discretion in locating trees in the tree lawns of Salem’s more densely settled neighborhoods. (See Figure 2)
5. Sidewalk Planting. (See Figure 3 and Sidewalks Figure 16 – 20.) The Tree Warden must approve tree plantings in a pit within a paved sidewalk or city right-of-way. Structural soils are preferred for use underneath sidewalk paving as a way to provide the recommended volume of soil if that is not achieved within the tree pit itself. The surest way to successfully establish a tree for long-term growth is to provide for adequate soil volume and composition. When a new sidewalk is proposed or an existing walkway is to be replaced, providing for a structural soil footprint larger than the visible tree pit opening increases soil volume and the available root zone. Linking individual tree pits together beneath sidewalks with continuous structural soil trenches is one effective option.

Extensive academic and commercial research identifies between 1,000 - 1,200 cubic feet (c.f.) as the ideal soil volume per tree. The greater the available soil volume, the larger the eventual tree. This hypothetical ideal for tree soil volume of 1,200 c.f. measures as a 20' x 20' x 3' depth, though this threshold is rarely achieved. Urban tree pit soil volumes are generally far lower, in the 300 - 800 c.f. range.

Where the tree would benefit from being planted at the backside of the sidewalk the tree should be sited there.

6. Roadside Planting. Street tree plantings along the edge of roadways shall ideally be set back 30 inches from the pavement edge. Refer to American National Standards Institute (ANSI) A300 for planting in less-than-ideal conditions.
7. Utility Wires. Planting large shade trees under utility wires is not advised. Smaller upright trees, however, may be considered in order to secure the benefits of some tree planting.
8. Underground Utilities. Positioning tree balls directly over known underground utilities should be avoided. The root zone will naturally spread into all available planting soils. **Plan ahead – call Dig Safe before doing any excavating, whether for trees near the curb or on private property.** Toll-free telephone number for MA, ME, NH, RI, VT: 811 or 1-888-344-7233.

Figure 2. Select Tree According To The Site

Figure 2 SELECT TREES ACCORDING TO THE SITE AVOID FUTURE PROBLEMS

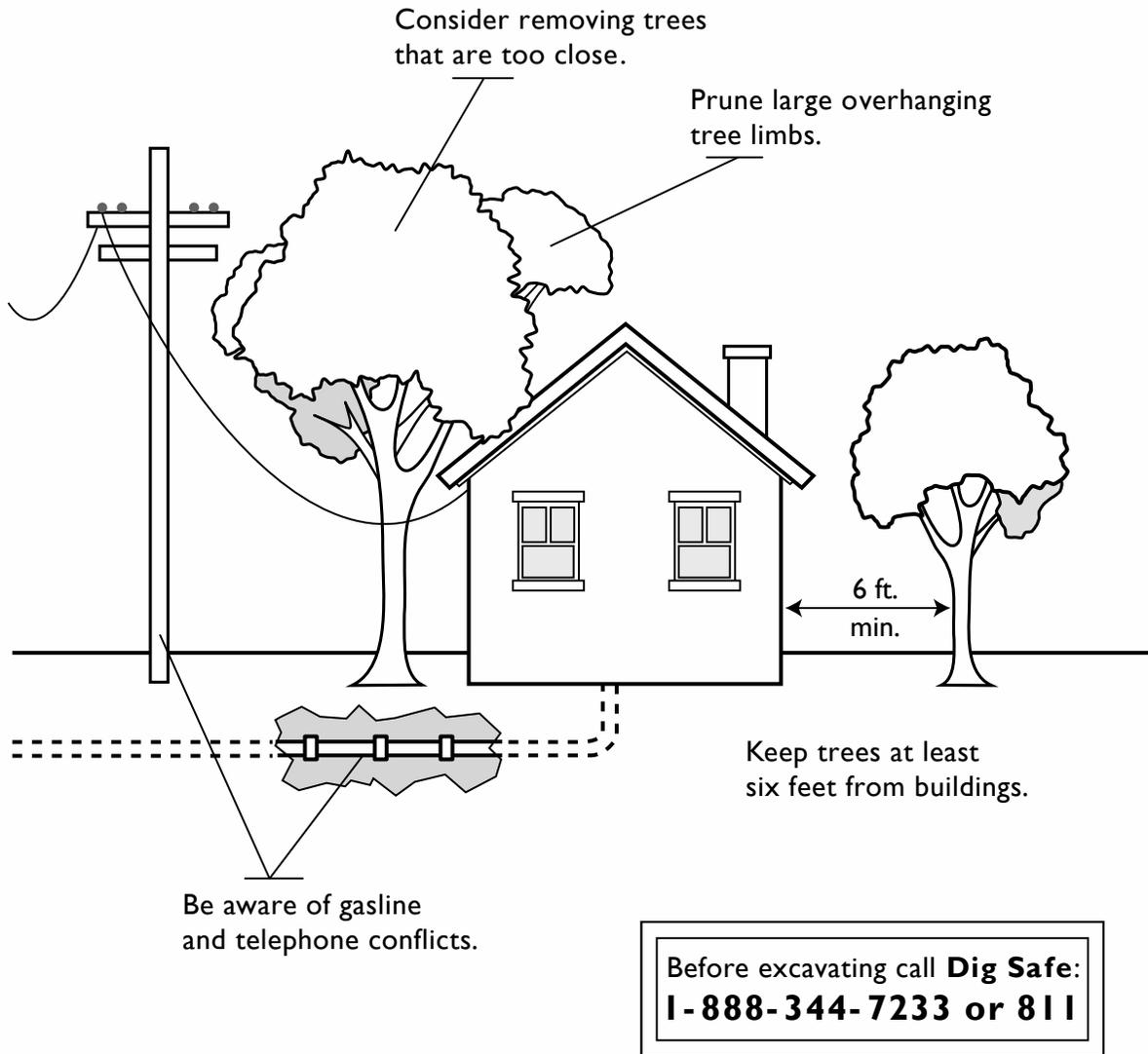


Figure 3. Sidewalk Planting

Figure 3

SIDEWALK PLANTING

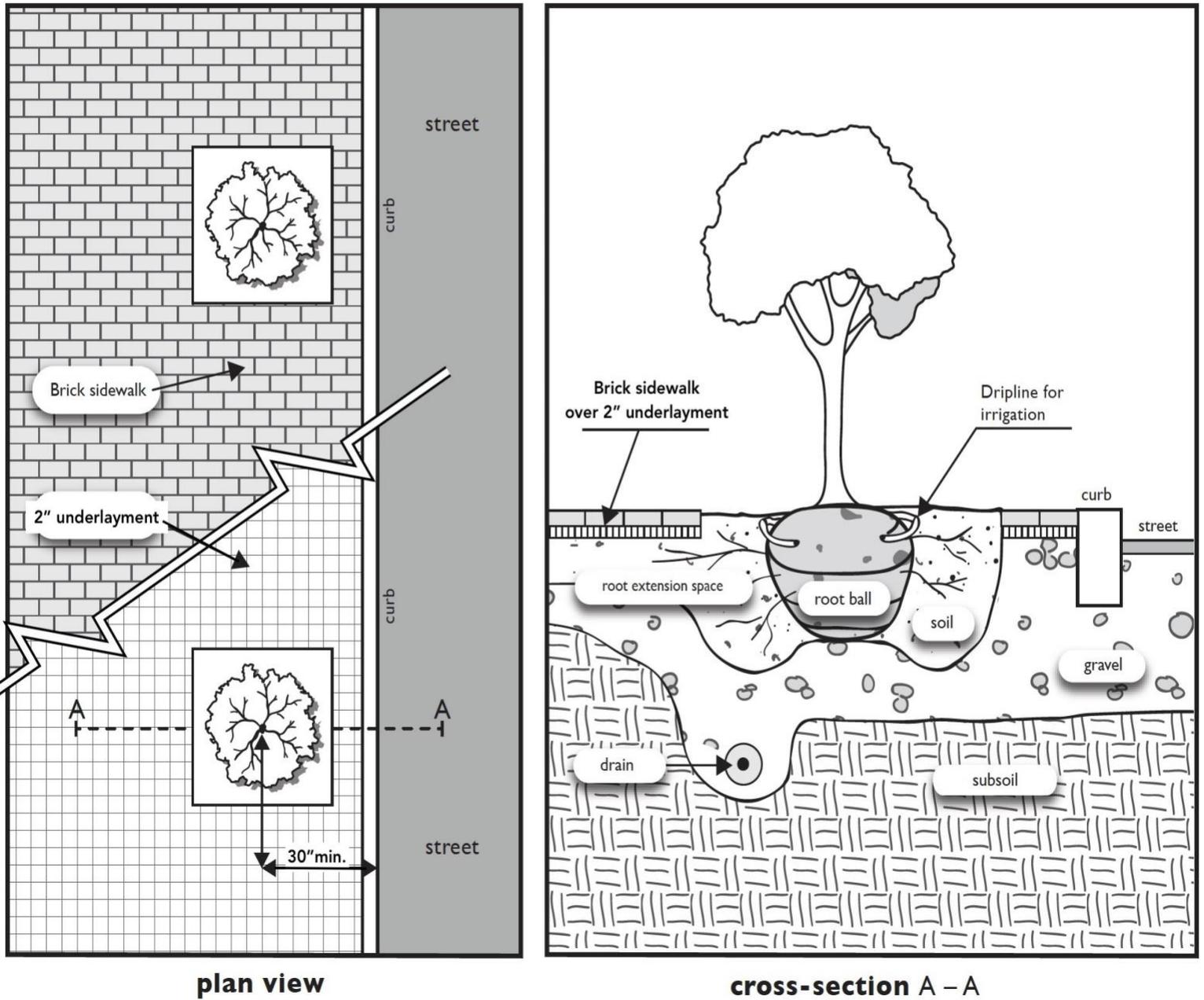
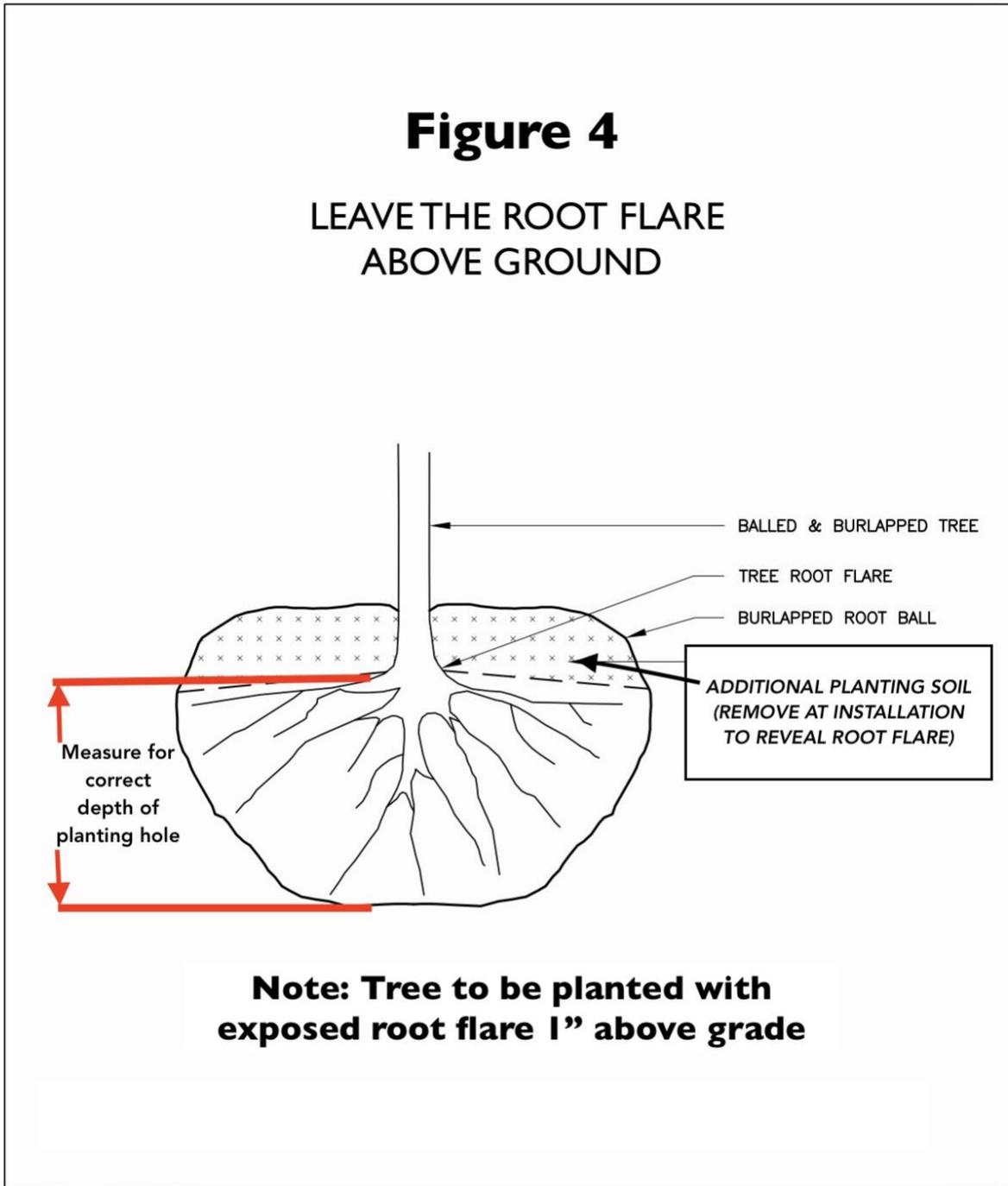


Figure 4. Root Flare Above Ground



Note: Tree to be planted with exposed root flare 1" above grade



LOCATING THE ROOT FLARE

CITY OF CAMBRIDGE STANDARD SPECIFICATIONS AND DETAILS

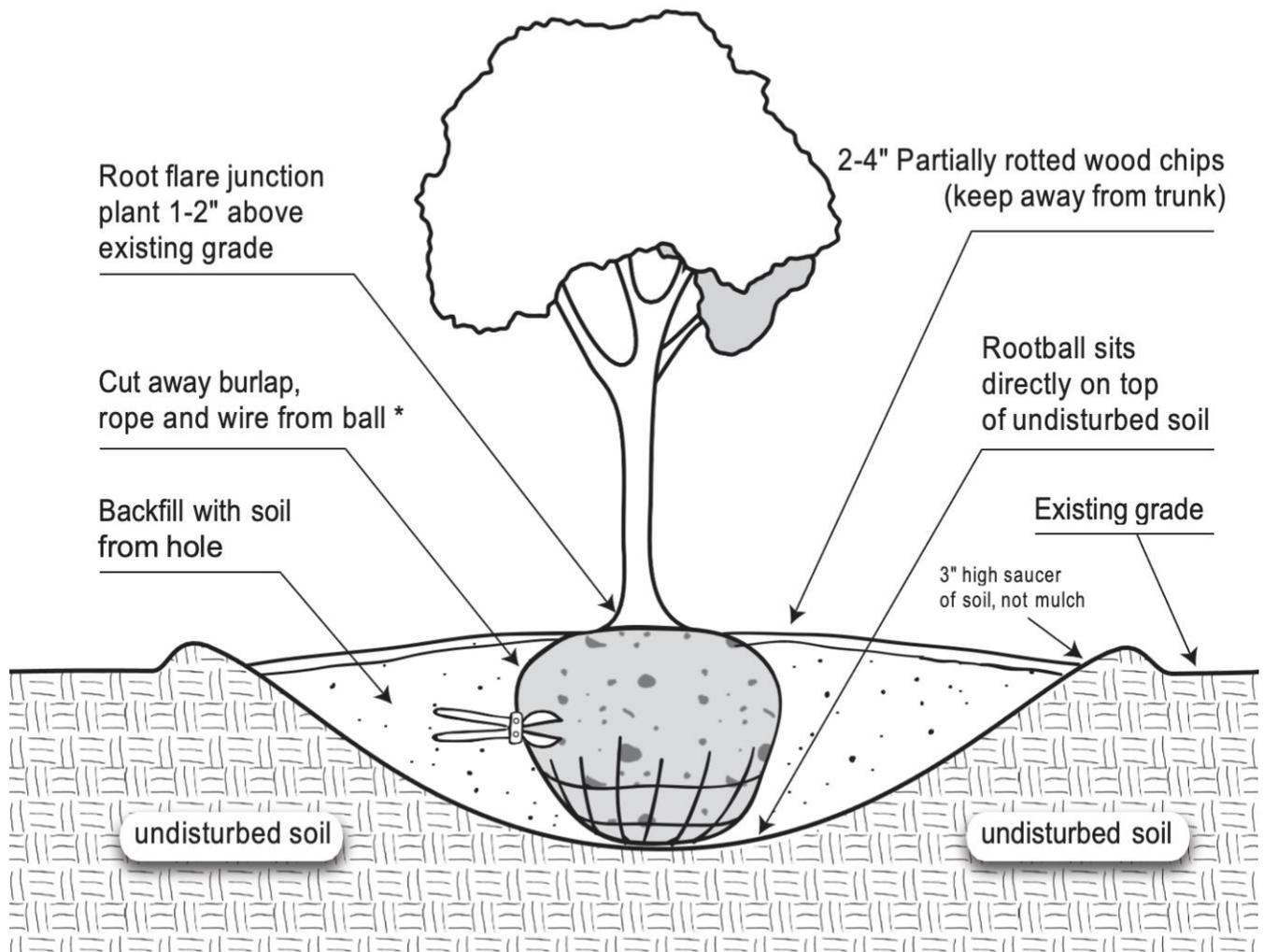
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Figure 5. Tree Planting Guidelines

Figure 5

TREE PLANTING GUIDELINES

(BALLED & BURLAPPED)



Hole should be 3 times as wide as rootball - with sloped sides

* For container plants - remove container and loosen roots with knife or hand rake

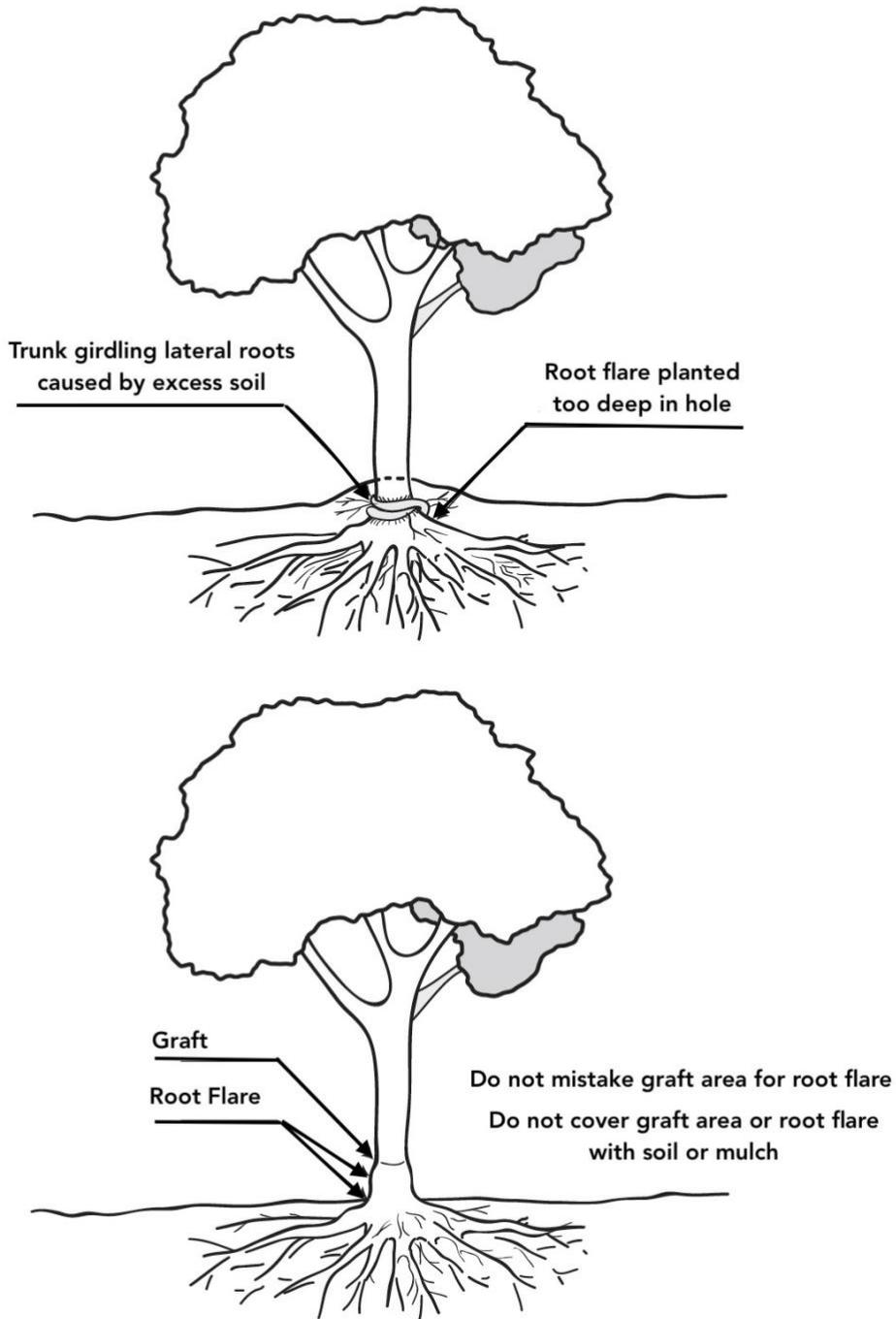
Photo 5. Good Placement Of Root Flare And Mulch



Figure 6. Trunk Girdling Roots

Figure 6

TRUNK GIRDLING ROOTS



8. PLANTING GUIDELINES

Research has shown planting a tree *too deeply* is a major cause of tree death. It has also shown that past accepted practices governing the size and shape of the planting hole and the nature of the backfill mixture need to be revised as follows.

8. A. SITE PREPARATION

1. **Dig Safe. Plan ahead – call Dig Safe before doing any excavating, whether for trees near the curb or on private property.** Toll-free telephone number for MA, ME, NH, RI, VT: 811 or 1-888-344-7233 (1-888-DIG-SAFE).
2. **Site Preparation.** See Figure 5 for information on planting guidelines and site preparation. See Photo 5 for a good example of the root flare planted 1 – 2 inches above the soil level and the mulch applied 3 inches back from the tree trunk.
3. **Depth of Hole.** It is imperative to expose *both the graft and the root flare* on each balled and burlap wrapped (B&B) tree so that the depth of the planting area can be properly measured. Pull back excess soil and any fine roots around the trunk to locate the trunk flare. The trunk flare or root flare is the point where the trunk begins to spread out as it meets the roots growing underground. (See Figure 4.)

GRAFTS – Some trees from nurseries are created by joining the trunk of the desired tree to the roots of a compatible tree species to provide additional valuable properties like winter hardiness, resistance to certain insects and diseases, and performance in various soil drainage types. The trunk will have one bark texture, the slightly larger trunk of the rootstock will have a decidedly different texture, and the point of union is a definite line. It is the root flare of the lower rootstock that must be found and planted above the soil level. For example, in Salem Japanese tree lilacs are chosen for placement under overhead wires because of their expected 25’ height. However, it appears that a number of these trees were planted with the graft totally buried. They do not grow much despite the passage of years. The lesson is not to mistake the graft bulge for the flare. (See Figure 6.)

The Graft Versus the Tree Root Flare Visit: https://csfs.colostate.edu/wp-content/uploads/2022/05/How-to-Properly-Plant-a-Tree-Root-Flare_v2.pdf

Dig the planting hole no deeper than the distance from the bottom of the root flare, not the graft line, to the bottom of the root ball. At the bottom of the hole, leave a firm plateau of undisturbed soil that is one inch higher than the rest of the hole. This keeps the tree from settling over time and is another aid to achieving the correct elevation. Loosen the soil in every direction out from the plateau to make it easy for the roots to grow and thrive. Remember, “Better to plant too high than too low!” (See Figure 5.)

Video: “How to Plant a Tree to Grow Twice as Fast!” <https://www.youtube.com/watch?v=qtXkt61KR3Q>

4. **What Happens if a Tree is Planted Too Deeply.**

As illustrated on the cover of this *Salem Tree Manual*, feeder roots of trees grow in the top two to three feet of soil where vital supplies of oxygen can be found. Take care not to

raise the soil or mulch level over the tree flare and roots after planting or the tree will not flourish into its desired form:

Symptoms of a tree with **excessive covered root flare**. *

- a. Thinning canopy.
- b. Leaf size diminishes over time.
- c. Leaves become discolored.
- d. Tree becomes susceptible to disease and insect invasion.
- e. After years of decline, the tree dies.

***Video:** “Healing a Sick Tree” <https://www.youtube.com/watch?v=s-hYi8a71D4> (On the TC webpage: “Is the Root Flare Buried?”)

5. Diameter of Hole. Dig the hole at least three times the diameter of the root ball to loosen the surrounding soil if at all possible. The diameter of the hole can be several times larger allowing roots to grow into available nutrients. Slope the sides of planting hole and rough them up if they start to look shiny. Periodically check the depth and width by comparing with the root ball.

8. B. PLANTING DIRECTIONS

1. Placement in Hole. Using the root ball, not the trunk, roll or lift the tree into the center of the hole. Check to see that the root flare is one inch above existing grade. While one person holds the tree, another person should stand back to examine the tree from two sides that are 90° apart to check that the tree is straight and attractively and practically oriented to its surroundings. If necessary, wedge the root ball with rocks to keep the trunk pointing straight up.
2. Remove Packaging from the root ball. For container trees, this means removing the tree from the container. For balled and burlapped trees (B&B), this means removing the burlap and wire basket entirely. For in-ground fabric, this means removing the entire bag. If it seems likely that the root ball of a B&B tree will fall apart, place the tree in the hole and then remove packaging. For all trees, remove trunk wrap and check the canopy for flagging tape, rope, or other items, and remove.
3. Container Trees. If a plant is container-grown, remove or cut off the container. Inspect the root ball for girdling roots and cut them off as container plants have a tendency to grow circling roots. (See Figure 6.) Remove roots growing against the container and remove a thin layer of roots from the side and bottom. If roots are matted, use a knife, rake, or garden claw to open up the circling root ends that can be straightened and loosen up the soil. If the root flare is not visible at the top of the root ball, remove excess soil and small roots until the root flare can be seen. From the bottom of the root flare to the bottom of the

roots is the accurate height for determining the depth of the planting hole. Plant the tree one inch above the finished soil level. (See Figure 4.)

4. **Backfill**. Begin refilling with soil removed from hole, tamping gently to settle mix and eliminate voids. If existing soil is inadequate, for example building rubble, or has been severely disturbed, amend by adding aged compost or quality topsoil to supplement the existing soil (no greater than 25%). To avoid air pockets, water the soil halfway through the backfill process. After the water drains away, finish backfilling and water again until no more water is absorbed and a puddle forms. Poke a shovel handle into the mud to release air pockets.
5. **Saucer**. Where the planting location allows, build a 3-inch-high ridge of soil around the outer edge of the hole to retain water to allow it to soak down into the roots. A larger saucer encourages the roots to reach out beyond the immediate root ball.
6. **Mulch**. Leave a circle of bare earth three inches from the trunk. Beyond the circle, spread a 2-inch layer of mulch about three times the size of the root ball to fill in the area to the ridge of soil. Seasoned organic mulch that is free of invasive seeds and insects is recommended. Peat moss should never be used as mulch because it does not absorb water well.

- a. **Mulch Domes or Volcano Mulch**. These are excessive piles of mulch that are loaded over the roots, the root flare and up onto the tree trunk. They deprive a tree of oxygen, can rot the bark and are very harmful. It is imperative for the health of the tree that all mulch be kept three inches away from the base of the tree trunk where the root flare is found. The root flare is the vital transition zone between the dry tissue of tree bark and the moisture-loving root system. If the root flare is exposed to the atmosphere, the tree will remain healthy and live up to its full potential.

Do not create domed mounds of mulch that touch the tree trunk. This is a landscaping error that can split the bark and encourage rot and insect damage. Homeowners and business owners are strongly encouraged to follow the recommended practices and to stop their landscaping companies from using harmful mulching practices. (See Figure 7.)

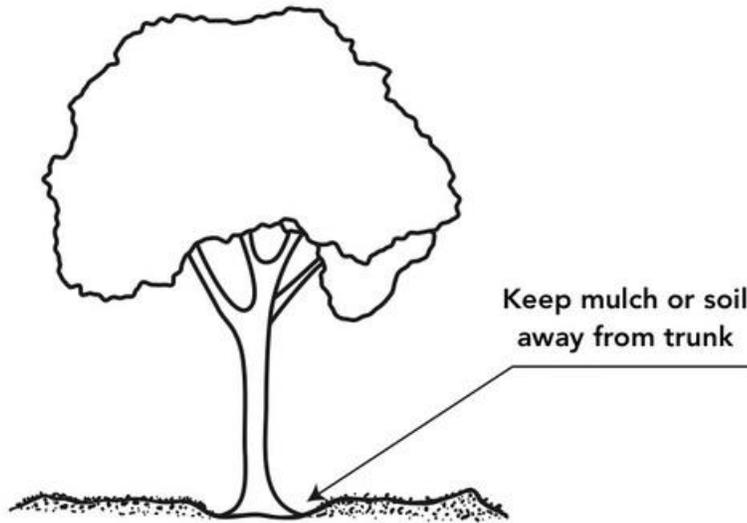
- b. **Dismantle a Mulch Dome**. Gingerly remove the mounded mulch from around the tree until the root flare is exposed and the original ground grade is reached. Be careful not to nick the trunk as the bark will be soft from the trapped moisture. There may be several new fibrous roots that have grown out of the trunk. Expose all these roots and carefully cut them back until the original main trunk roots are reached. Any roots that circle the trunk must be removed since over time they can strangle the tree. Install a new 2-inch layer of mulch as described above.
7. **Planters are as detrimental to trees as mulch volcanos**. Do not build any structure around a tree root area and fill it with soil. Adding soil over the root system deprives the tree of necessary oxygen. Any plants added over the tree roots – flowers, bushes or grass will

compete with the tree for valuable water. If ornamental plants are desired, plant them in containers that are positioned at least three feet from the trunk and roots. (See Photo 1– 4)

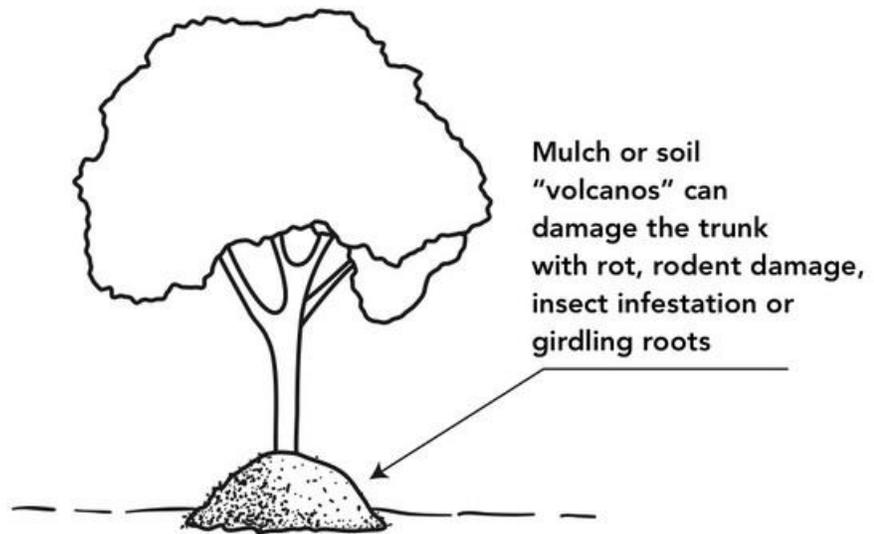
8. Stakes. Staking is not required for trees unless they will be located in high-wind areas or if the species will require additional time to become more deeply rooted. The trunk should be staked with arbor tie or other soft material, not wire. Arbor ties should be placed at two-thirds the height of the tree. This will allow the trunk to sway slightly. Remove the staking after one growing season. If the tree is at risk of being hit by a car door, install one or two protective stakes on the street side.
 9. Water. During the first two years, it is important to give a newly planted tree deep waterings spaced out, rather than shallow waterings frequently. A hand placed directly on the soil can sense whether the soil needs more moisture. Proper watering will establish a new tree successfully in its new spot.
 - a. Water the tree pit during the planting process and then twice weekly for a month. Through two growing seasons, water weekly.
 - b. Fill the saucer described in number 5 during each watering session. After the water disappears, immediately repeat the process.
 - c. Watch the soil around the roots and make sure to keep the soil moist, but not soaked; over-watering suffocates the roots.
 - d. Supply water two times a week during a drought or excessive heat.
 - e. Utilize drip bags if desired. They are fantastic alternatives to hand watering as they slowly drip water into the soil over time. Hang the bags on any available stakes so that the roots spread out looking for the water instead of hanging the bag on the tree trunk. If the tree has two stakes, switch the bag to the other stake every two weeks to even out the watering. Remove the bags during the winter.
 - f. Augment moisture during the active growing season May 1 – November 15. The goal is one inch of moisture per week spring and fall, and two inches of water per week during the summer.
- With thanks also to DCR MA Urban & Community Forestry Program, *Tree Planting 101*.

Figure 7. Correct Use Of Mulch

Figure 7 CORRECT USE OF MULCH



RIGHT



WRONG

9. PRUNING BEST PRACTICES

9. A. GENERAL REQUIREMENTS

1. Emergencies. In emergencies, when there is immediate danger to persons or property, efforts should be made not to cut back trees more than necessary. Report such emergency procedures promptly to the Tree Warden.
2. Standards. All pruning shall comply with the guidelines set forth in the American National Standards Institute A-300 standards for Tree Care Operations and ANSI Z133.1.
3. Tree Pruning for Solar Panels or Artificial Turf. No Public or Protected Trees shall be trimmed or removed by request due to proximity to or impact on solar collectors of any configuration. No Public or Protected Trees shall be trimmed or removed by request due to proximity to artificial lawns.
4. Tree Pruning Damage. Practices that impair the health and beauty of the tree are to be avoided. Overall, tree pruning should never remove more than 25% of the total tree canopy in any one year. Tree topping, or stubbing, is the practice of removing whole tops of trees or large branches and/or trunks from the tops of trees, leaving stubs or lateral branches that are too small to assume the role of a terminal leader. Stubbing cuts leave too much branch beyond the growth collar, a section that will not heal but instead rot and leave the tree vulnerable to pest damage. (See Figure 8.)
5. Where to Cut Branches. Prune to improve tree form and structure by removing co-dominant stems, dead and crossing branches. Do not make excessively deep cuts flush with the trunk or inside the branch collar that produce large wounds or weaken the tree. Make all final tree-pruning cuts to favor the earliest possible covering of the wound by natural callus growth. Make cuts just outside the branch collar. (See Figure 9.) Cuts made to reduce the branch length or influence the direction of growth shall be made to a lateral branch no smaller than 1/3 the diameter of the parent limb.
6. Sharp Tools. Keep all cutting tools and saws well-sharpened so that final cuts will be smooth, with the adjacent bark intact.
7. Disinfection. Properly disinfect all tools used on a diseased or infectious tree immediately after completing the work. Rubbing alcohol is a readily available disinfectant.
8. Avoid Bark Wounds. When pruning branches, hold the branch securely in one hand while cutting. First undercut a wedge, then cut off the branch one to two feet beyond the intended final cut so that tearing back of the bark and wood will be prevented when making the final cut. (See Figure 9 and Figure 10.) When repairing bark wounds, remove only damaged or loose bark and disturb a minimal amount of live tissue.
9. Avoid Root Wounds. When cutting roots of trees to be protected, use well-sharpened, clean tools to create precise cuts, minimizing the entry of decay organisms.
10. Trunk Wound Dressing. Wound dressings and tree paint are prohibited.

11. Root Zone Disruption. Trees identified for root pruning must be approved by the Tree Warden to prevent a hazardous tree condition.
 - a. Contractors shall not use mechanical digging equipment within the dripline of a tree but instead use hand tools.
 - b. Mechanical trenching is not acceptable within the dripline and contractors must not rip or tear the roots during any underground work.
 - c. Contractors are encouraged to tunnel conduit through the critical root zone, particularly in narrow tree lawn conditions. If construction needs to occur within the drip line, a recommended technique is to use an air spade to reveal root structure prior to any subsurface work.
 - d. If excavation causes pruned roots over 1.5 inches in diameter to remain exposed for more than 24 hours, roots on the tree side shall be kept moist. Backfill with topsoil, moist mulch, or drape with wet burlap.
 - e. Where concrete is poured adjacent to pruned roots heavy duty plastic shall be installed against the tree side of the pruned roots to prevent toxic uptake by the tree.
12. Spikes. Never use climbing spurs or spiked shoes while pruning or doing any kind of tree work.
13. Anchors. Do not use public trees or utility poles as anchors for winching in the process of removing other trees. Do not use trees to support utility poles.
14. Safe Work Area. Promptly clean up branches, logs, and other debris resulting from tree pruning or tree removal. Keep the work area safe at all times.
15. Partially Uncompleted Work. Never leave severed or partially cut branches in trees. When removing a tree, never cut tree roots and leave a tree standing with little or no support.
16. Lower with Ropes. Whenever large tree sections are being cut in the treetop, secure such sections by ropes, and lower them safely in a controlled manner.
17. Ground-person. Assign at least one responsible tree worker to coordinate safe operations on the ground at all times while the pruning or removal of trees is in progress.

9. B. ADDITIONAL REQUIREMENTS FOR PROFESSIONALS

The following requirements for utility linesmen, highway departments, and the City of Salem or its contractors are in addition to all general requirements above.

1. Standards. Perform all work in accordance with the latest publication of the ANSI A300: *Tree, Shrub & Other Woody Plant Maintenance Standard Practices*.

2. Large Branches. Authority to prune street and other public trees does not include the cutting back of sound, healthy tree branches in excess of 4 inches in diameter unless specifically described and written into the [Public Tree Permit](#) by the Tree Warden or if required by accepted arboricultural standards in the course of utility line clearance work and approved by the Tree Warden.
3. Stump Removal. When removing public trees, cut the remaining stumps to 8 to 12 inches below ground level.
4. Excavation Finishes. Promptly fill excavations resulting from tree removal to normal ground level with clean earth, properly compacted and cleared of debris. Fine grade and plant grass seed unless otherwise directed by the Tree Warden.

9. C. AUTHORIZED TYPES OF TREE PRUNING

1. Pruning. The two cardinal rules of good pruning are (1) to use clean, sharp tools and (2) to stand back to inspect the overall form between pruning cuts. (See Figure 8.)
2. Pruning Near Public Rights-of-Way. Safety pruning consists of the minimum actions necessary to correct one or more tree conditions that may be hazardous to persons or property. In all cases, avoid stubbing where possible.
 - a. Clear public ways by pruning trees in such a manner as to prevent branch and foliage interference with safe public passage. Clearance shall be a minimum of 16 feet above the paved surface of the street and eight feet above the sidewalk.
 - b. Prune to remove dead, dying, or broken branches of two inches or greater in diameter.
 - c. Reduce weight by cutting back ends of branches only where an excessive burden may result in breakage of supporting limbs. Do not cut back any live, healthy branches in excess of four inches in diameter.
 - d. Cut back the ends of branches and foliage that are blocking the view of traffic control devices or signage or are obstructing safe passage on a public sidewalk or street.

Figure 8. Tree Pruning Crimes

Figure 8 TREE PRUNING CRIMES

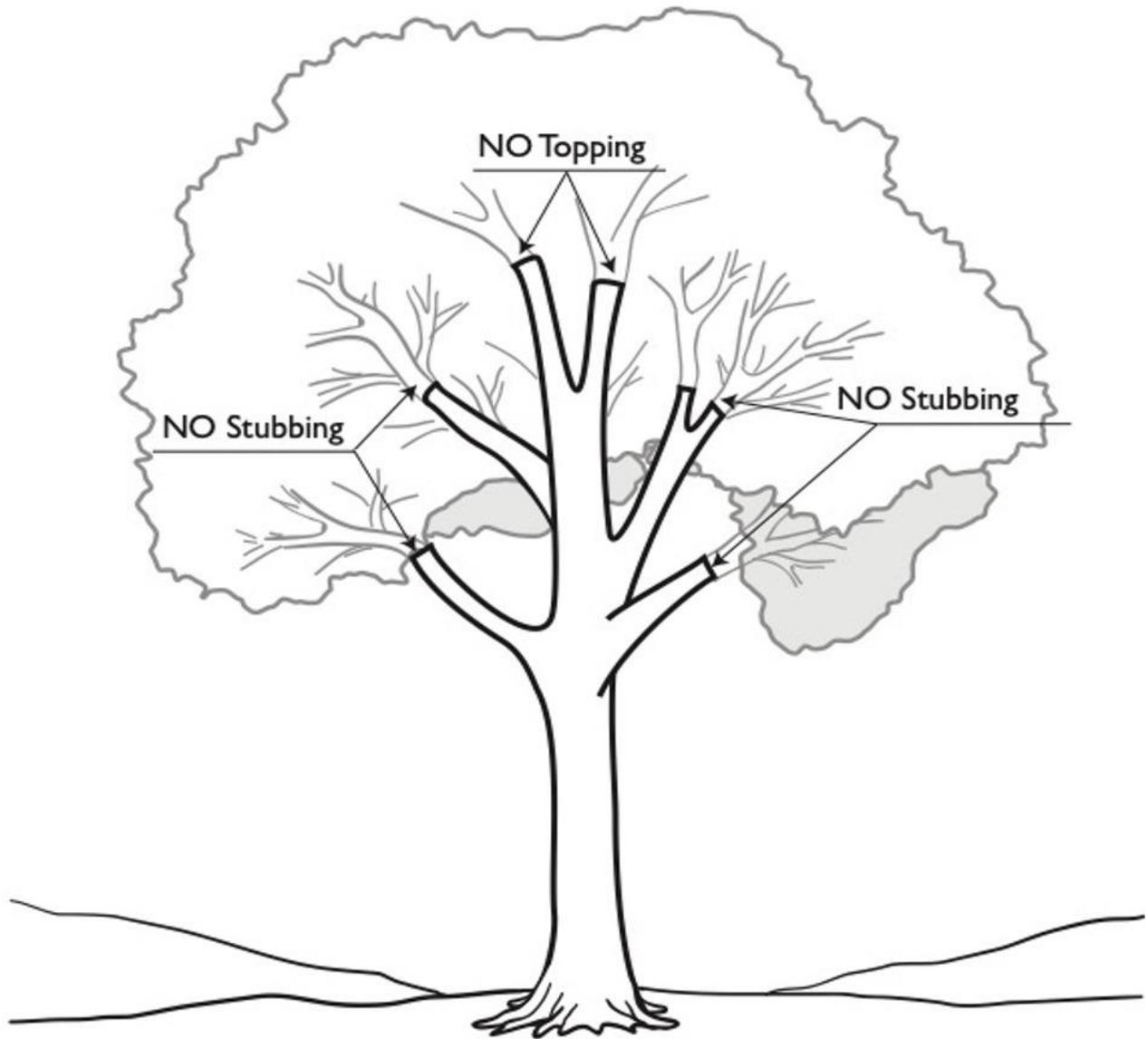


Figure 9. Where To Cut Branches

Figure 9 WHERE TO CUT BRANCHES

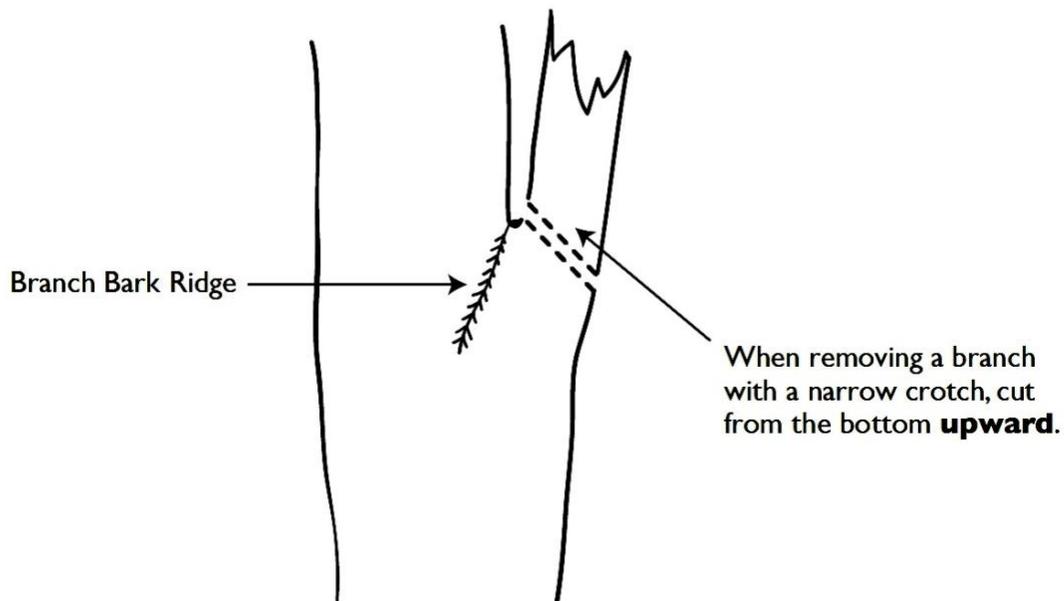
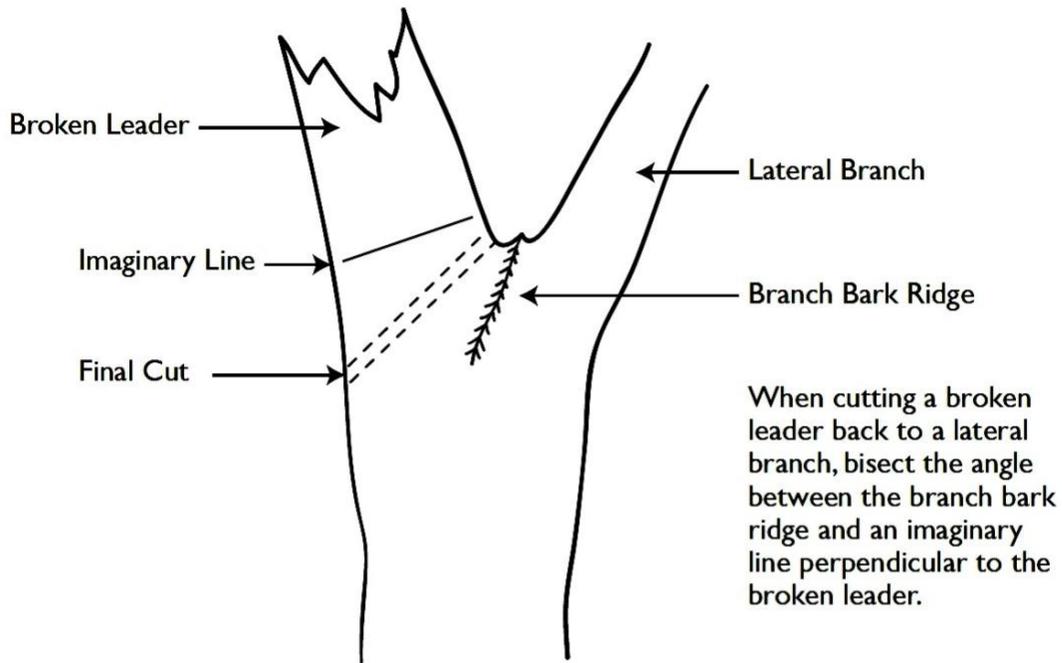
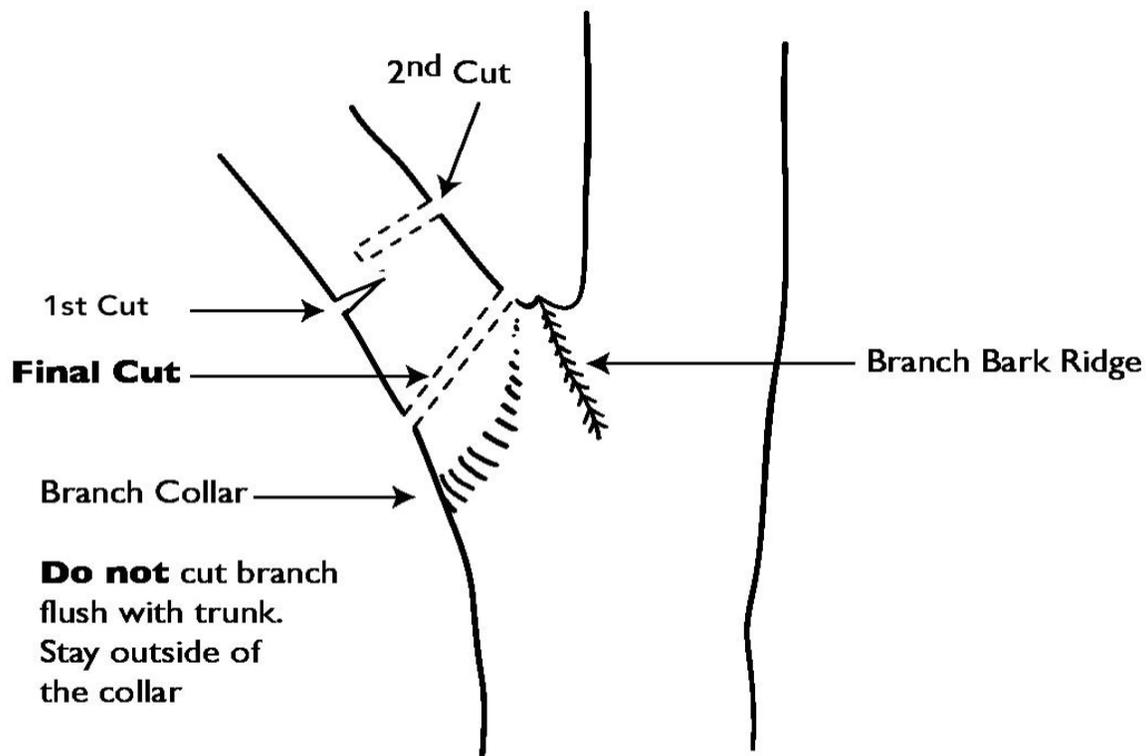


Figure 10. Avoid Bark Wounds

Figure 10

AVOID BARK WOUNDS



Removing a large lateral branch requires two preliminary cuts before the final cut.

The first two cuts prevent bark peeling off the trunk.

10. TREE PROTECTION DURING CONSTRUCTION

10. A. GENERAL GOAL OF SAVING LIVING TREES

Both public staff and private contractors should keep in mind that not only the construction project's neighbors, but also the larger community, are keenly aware of the value of mature trees in their environment. Trees, and especially mature trees, have aesthetic appeal, contribute to the distinct character of a neighborhood, improve air quality, provide glare and heat protection, reduce noise, aid in soil stabilization, provide natural flood control, create habitats for wildlife, provide natural privacy to neighbors, and enhance property values. For specific legal permit requirements, refer to the Salem Tree Ordinance and the site plan review process overseen by the Planning Department.

To achieve the goal of saving healthy trees, the following is required as part of design development:

1. Create a Plot Plan. Record on the base plan the species and size of all existing trees of 8-inch DBH or greater located in the setback area. (See Figure 1 for location of setback area.)
2. Design to Save Specimen Trees. Identify specimen trees, especially those 8 inches or larger in diameter and make an effort to preserve them. Provide a tree protection plan. (See Figure 11.) The i-Tree Design Program uses Google Maps to identify existing trees and can model the canopy growth of current and planned new plantings.
3. Transplant When Possible. Identify desirable trees in the way of construction. If they can be transplanted on site, incorporate them into the site design.
4. Remove Unsafe Trees. Identify trees that are terminally diseased, damaged beyond repair, or in danger of falling. Remove them early in the development process in order to create a safer building site for construction workers.
5. Submit Plan to the Tree Warden. Before any tree work commences, develop a plan for trees within the protected zone and submit it to the Tree Warden for review. Discuss and come to an agreement as to which trees are to be preserved, transplanted, protected, or removed.
6. Prune Only as Necessary. Carefully prune the trees to be saved only as needed to remove broken branches, to enhance their natural form, and to fit with the proposed buildings. Remember that trees need as much foliage as possible to help them survive the stress of construction. Follow pruning procedures outlined by the National Arborist Association, ANSI A300, and this *Salem Tree Manual*.
7. Design for Foundations. Consider alternative foundation methods such as posts and pillars that could be substituted for footings and walls where proposed foundations conflict with tree roots. Site conditions and design plans should be reviewed and approved by a registered Structural Professional Engineer.

10. B. PROTECTION REQUIREMENTS

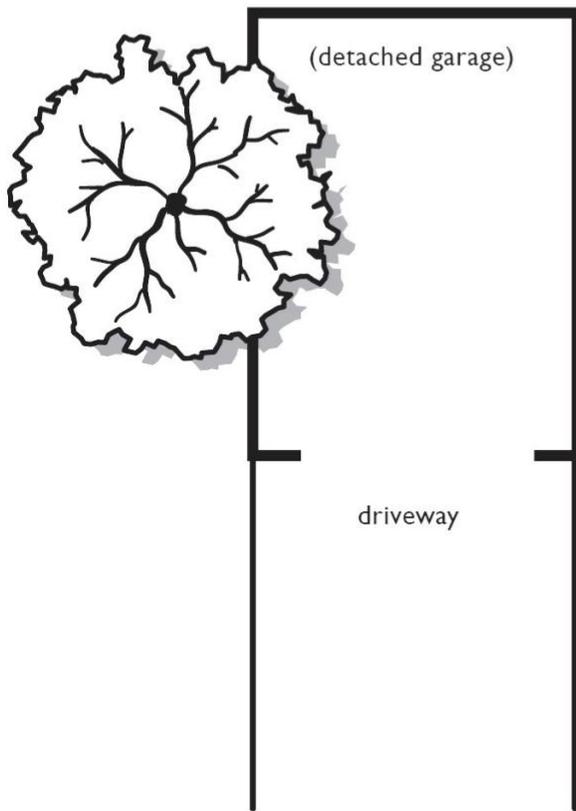
1. Barrier Protection. Before demolition and land clearing begin, protect all trees to be saved with barriers at the dripline. The protection zone may be modified to a shape agreed upon during an on-site visit of the Tree Warden. Construct barriers of sturdy posts and highly visible plastic mesh or other approved durable fencing. This protection is to prohibit heavy equipment from compacting soil, damaging roots, breaking branches, and scarring the trunk. (See Figure 12.)
2. No Parking. Do not park vehicles or equipment or stockpile earth, fill, or other materials within the tree root zone.
3. Chemical Damage. Do not pour or dump debris, cement, asphalt, petroleum products, herbicides, or other chemicals within the critical tree root zone.
4. Leaf Mulch. Allow all fallen leaves from the trees within the root zone to remain on the ground as mulch. Do not rake up.
5. Flooding. Do not create conditions that would cause the retention of water over the roots of protected trees for longer than a day or two.
6. Fasteners. Allow absolutely no nails, screw eyes, and other fastening devices on the trees. Use separate posts for signs, fences, electrical wires, pulley stays, etc.
7. Debris Burial. Bury no debris within 50 feet of the dripline of trees on city construction sites. No burial of debris is permitted within any public right-of-way.
8. Utility Lines. Where possible, locate all new underground utility lines outside the dripline of trees. If not possible, tunnel below roots as an alternative. (See Figure 13.) Utilities using trenching methods are responsible for damage to trees from the trenching and must pay for the replacement of damaged trees for up to three years after the trenching event.
9. Watering. During dry spells in the growing season, water thoroughly all protected trees at least once a week so that the water penetrates 12 to 18 inches into the soil.
10. Building within Dripline. If a building, road, walk, utility, or other feature must be built within part of this area, it may still be possible to save the tree. However, extra care must be taken. Therefore, the following is recommended:
 - When trees are so close to construction activities that the trunk or buttress roots may be mechanically damaged, those parts should be protected by installing thick wood planks (dimensional lumber) around the trunk, preferably on a closed-cell foam pad. Straps or wires are used to bind the planks in place. Wooden barriers can be installed at an angle so that the trunk flare and buttress roots are protected. (See Figure 14.)
 - Use hand tools instead of machines.
 - Fertilize and water the tree in monitored amounts.
 - Tunnel instead of trench for utilities through tree root zones if at all possible.
11. Grade Change Guidelines. Maintain existing grade around trees. Do not lower the grade or add fill within the drip line. (See Figure 15.)

Figure 11. Design To Save Specimen Trees

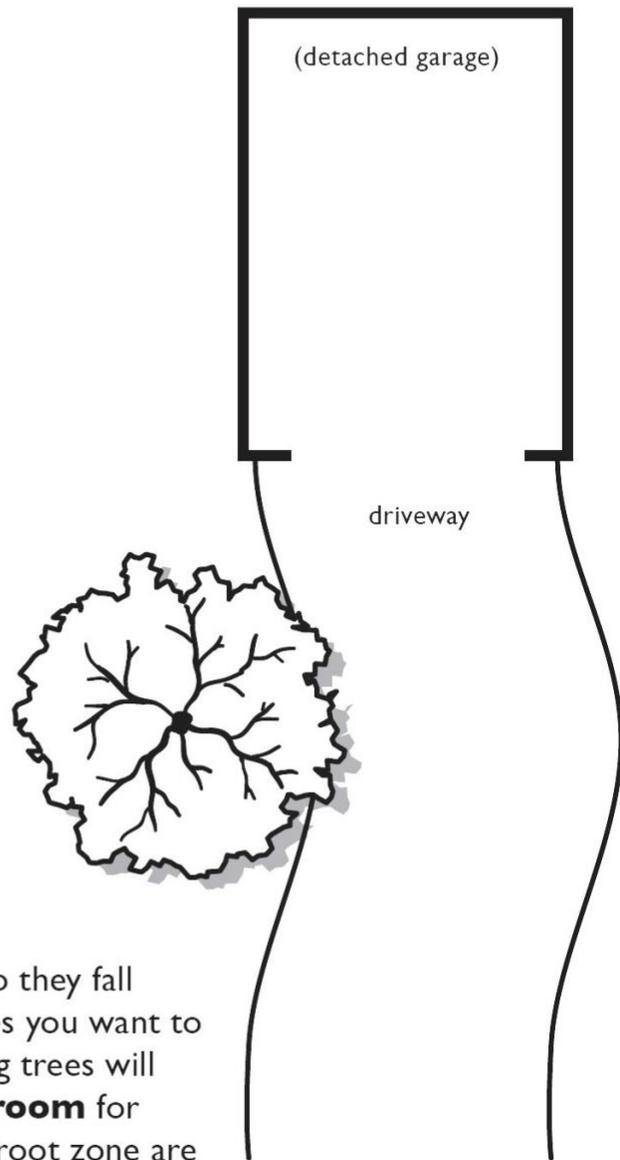
Figure 11

DESIGN TO SAVE SPECIMEN TREES

WRONG

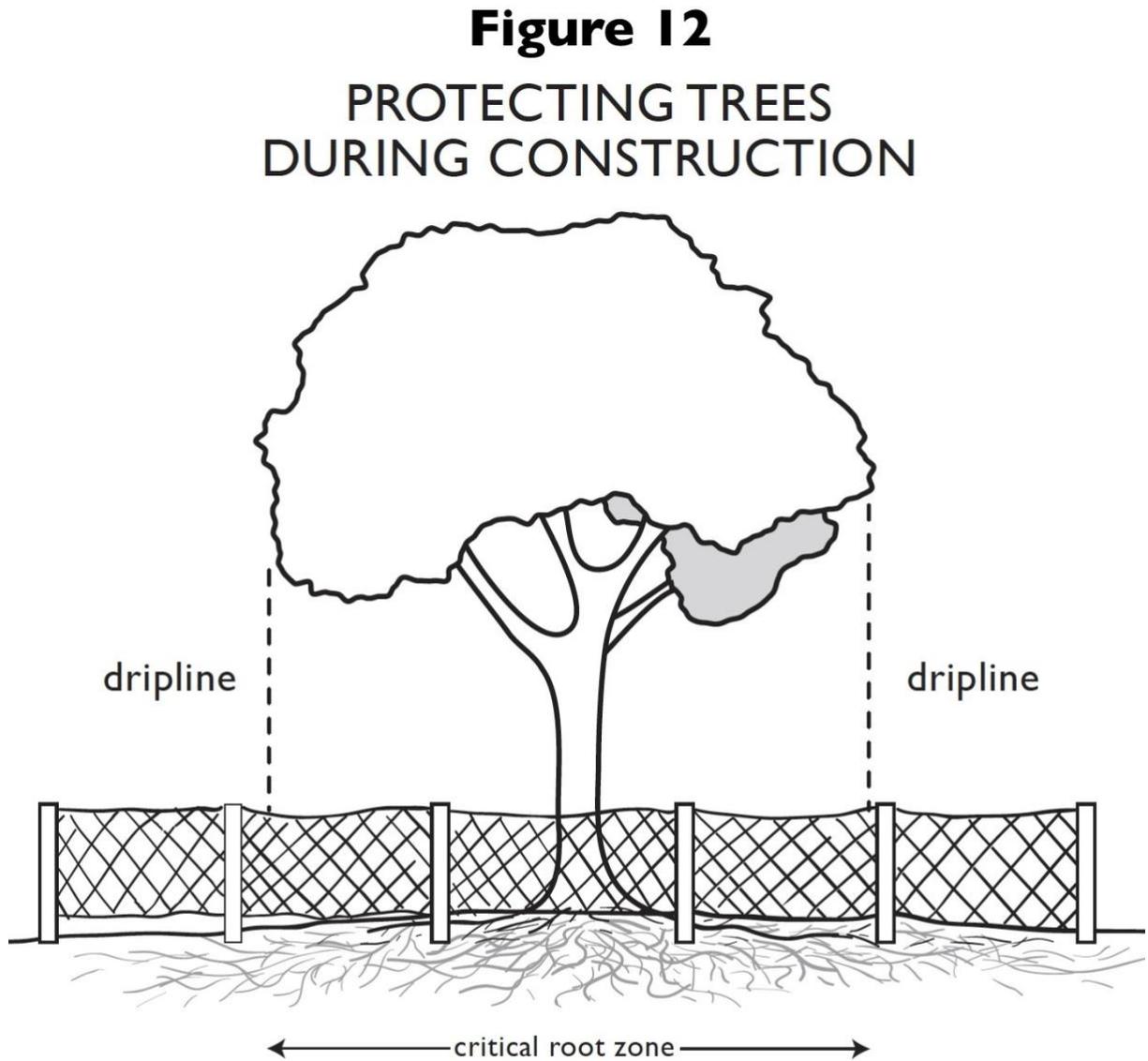


RIGHT



Locate buildings and other elements so they fall **outside** the root zone of special trees you want to save. Take into account the **size** young trees will reach at maturity and allow adequate **room** for development. If structures within the root zone are unavoidable, use pillars and posts instead of footers and walls to minimize damage to tree roots. Use <https://design.itreetools.org/>.

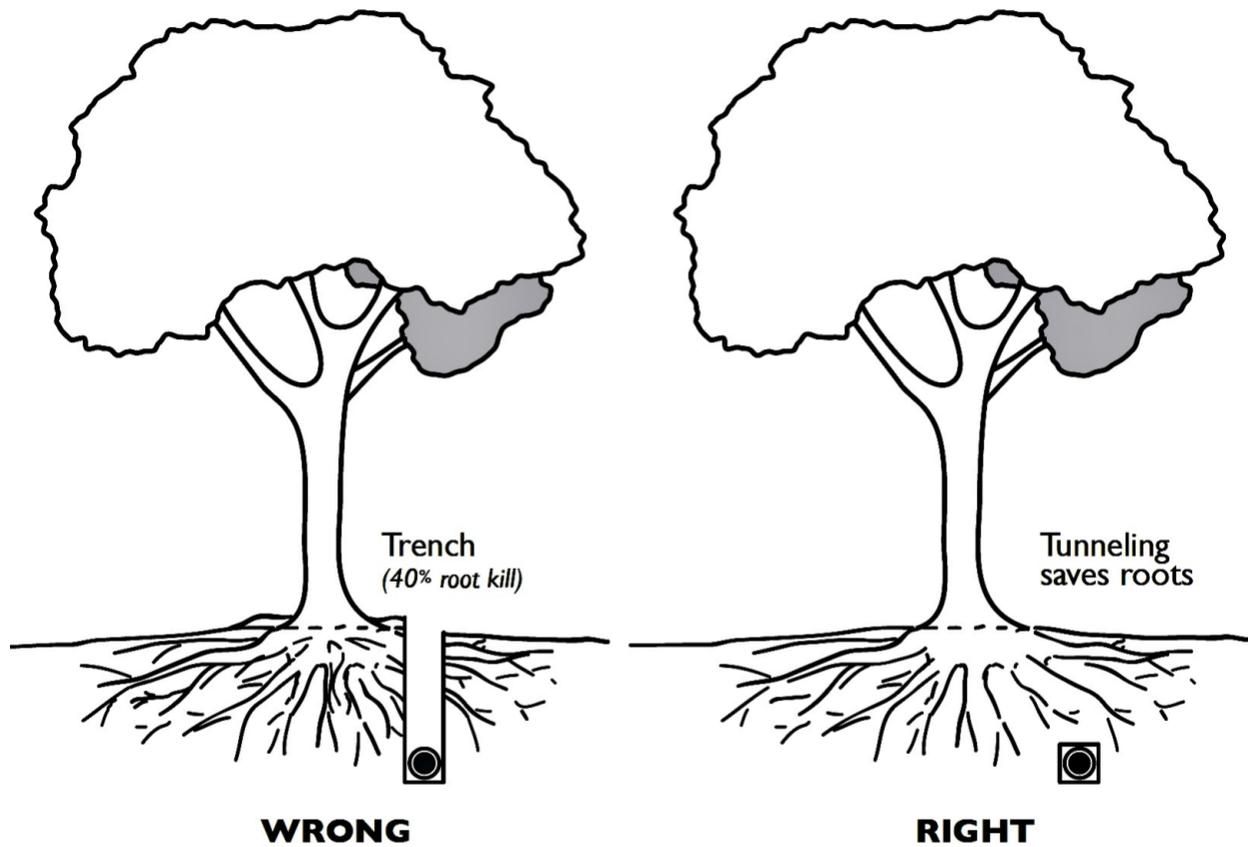
Figure 12. Protecting Trees During Construction



- Install a **protective fence** around the tree dripline.
- **Avoid compaction** of the soil by keeping foot and vehicle traffic away from the root zone.
- Tie protective 2x4s around trunk of tree with **rope** not **wire**.
- Take special care with backhoes and other machinery to **minimize damage** to trunk, limbs and overhead branches.

Figure 13. Tunneling Under Root Zone

Figure 13 TUNNELING UNDER ROOT ZONE



AVOID SEVERING ROOTS

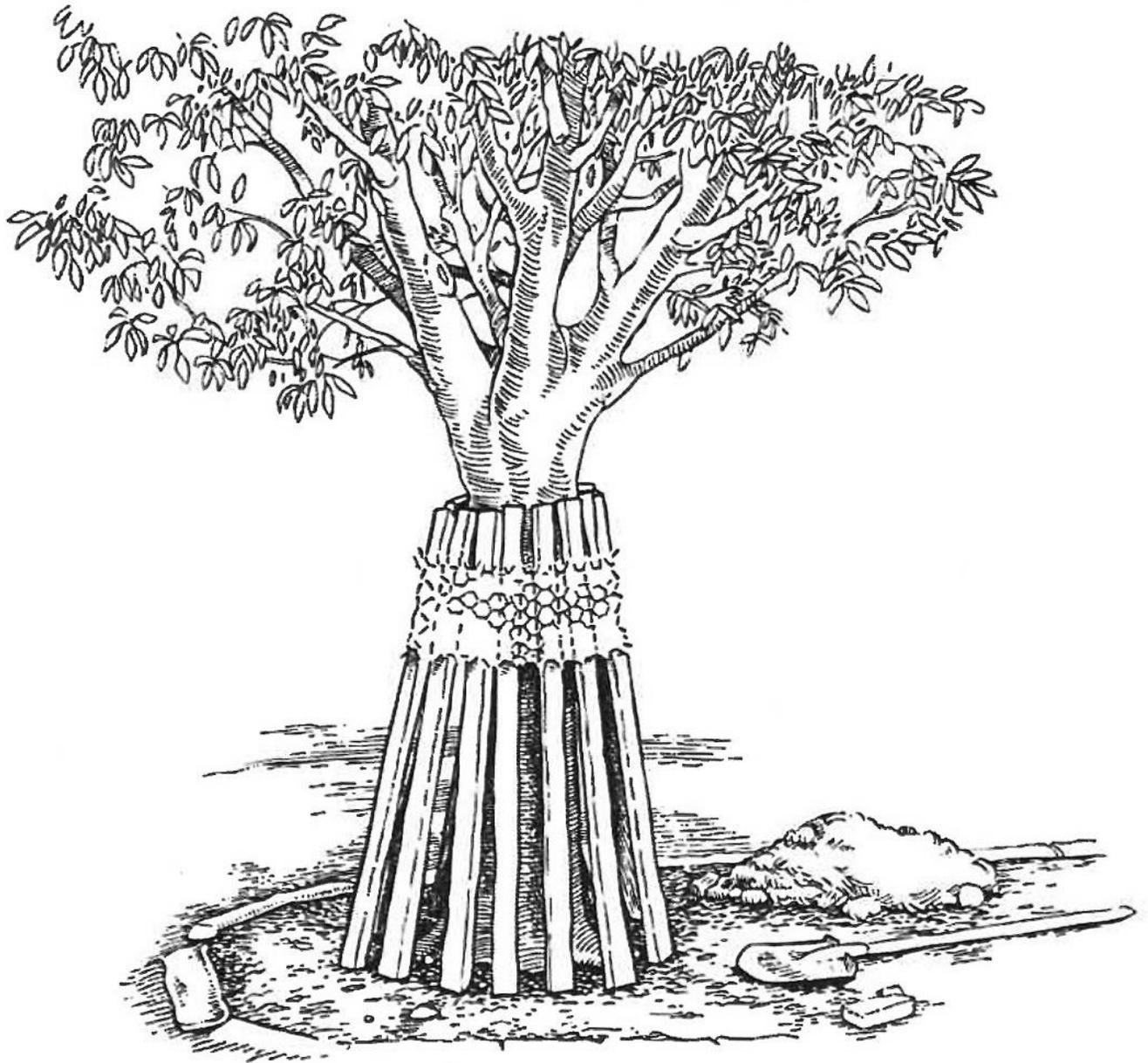
Install utility lines *around* tree roots or tunnel *under* the root zone. Trenching *kills* all the roots outside the trench line. Posts and supporting beams can be substituted for footing and walls where proposed foundations conflict with tree roots.

Figure 14. Building Within Drip Line

Figure 14

BUILDING WITHIN DRIP LINE

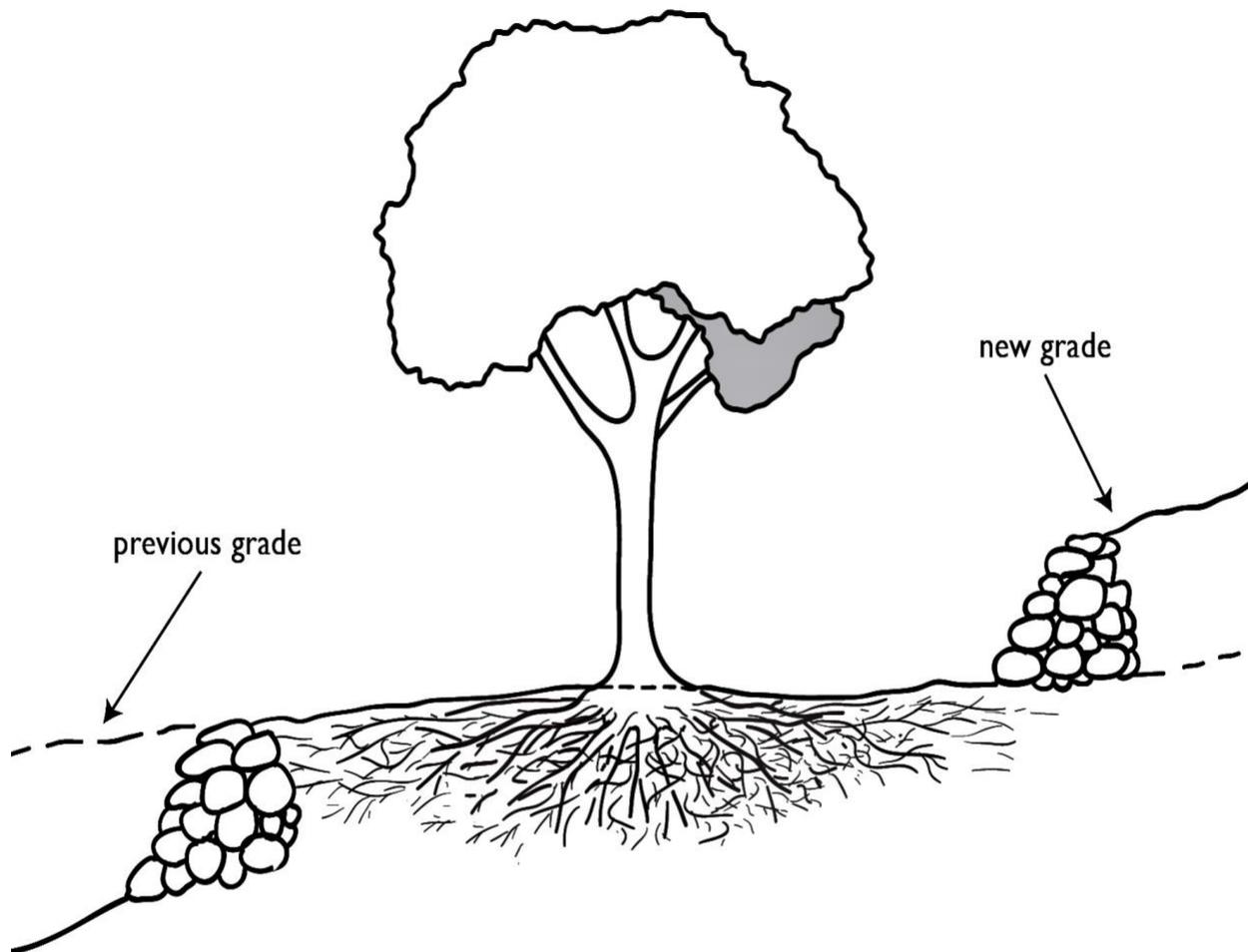
*Best management Practices; Managing Trees During Construction; second addition
International Society of Arboriculture*



Thick wooden planks tapered to protect trunk and buttress roots at construction sites.

Figure 15. Grade Change Guidelines

Figure 15 GRADE CHANGE GUIDELINES



MAINTAIN EXISTING GRADE AROUND TREE

Protect tree roots by creating terraces with retaining walls. This will allow the original grade around the root zone to be maintained. Cutting or shaving roots or piling soil on top of roots to create a continuous new grade will slowly kill the tree. Look out for drainage changes that could mean a tree gets too much water or not enough.

11. INVASIVE SPECIES — IMPACT ON THE LANDSCAPE

A. The Commonwealth of Massachusetts has passed legislation that bans the import, sale, or propagation of over 140 species of exotic plants. The complete list can be found at: <https://www.mass.gov/service-details/massachusetts-prohibited-plant-list-updates>. Many of the plants are weeds that one would not deliberately plant, but there are also many commonly used landscape plants that may not be sold, traded, or purchased.

B. Please *avoid* planting or transplanting any of the trees mentioned in the table found in Section 5. B. UNDESIRABLE OR PROHIBITED STREET TREES.

C. A native plant species in North America is usually defined as ones that were present before the arrival of European colonists. These plants shared the environment harmoniously, each with checks and balances to their growth that prevented one species from overwhelming others, and provided a bio-diverse environment supportive of other plants and animals.

D. A non-native species may become invasive depending on where it is and the number of specimens present in an area. A particular plant species might be invasive in one state and not in another, and a single specimen of a non-native plant escaping to a roadside might not be troublesome at all. But if multiple specimens appear at one site, crowding out other growth, it would be considered invasive.

E. The pervasive development of land over the last 400 years in New England by agriculture, industry, and the building of roads, parking lots, and buildings has greatly changed the physical structure of much of the landscape. In its disturbed state, the environment is less able to resist certain aggressively growing non-native plants, which may for botanical reasons be able to overwhelm local species.

F. When a non-native tree such as the Norway maple (*Acer platanoides*) is planted on a private property, typically the homeowners mow around it, pull up its seedlings, and take care of the property. In that spot, it is not a problem. However, the great quantities of seed it produces blow around the neighborhood and take root in minimally managed areas – fencerows, hedges, roadsides, property lines, railroad beds, and woodlands. This maple’s rapid growth rate, shallow water-gulping root system, very dense canopy, and longer growing season soon shade out anything else growing nearby, reducing the numbers of indigenous plants available to supply food to native animal life.

However, even large, healthy invasive species contribute to the total area of the city’s tree canopy. Removal of such existing trees is not required. When these trees are crowded together or unhealthy, the planting area may be evaluated for selective thinning.

G. The dangers of unchecked, non-native plant invaders, in addition to the possibility of extinction of native plant or animal species, include the diminishment of ecosystem functions of importance to humans such as water filtration, wood production, and recreation, as well as the mounting economic cost of control efforts.

H. However, there is a developing category of plants that are adaptive. They were not originally part of the natural ecosystem but have evolved to a point where the physical conditions such as soil, climate, and geology are conducive for healthy growth. As these trees are identified, they should be welcomed to the urban forest.

I. Salem citizens can be responsible stewards by learning more about invasive species, by eliminating seedlings from their own land so they don’t spread to public property, and by replanting native or non-invasive species or newly identified adaptive species.

Figure 16. Sidewalk 1: Replacement At Existing Tree Pit

Figure 16: Sidewalk 1 REPLACEMENT AT EXISTING TREE PIT

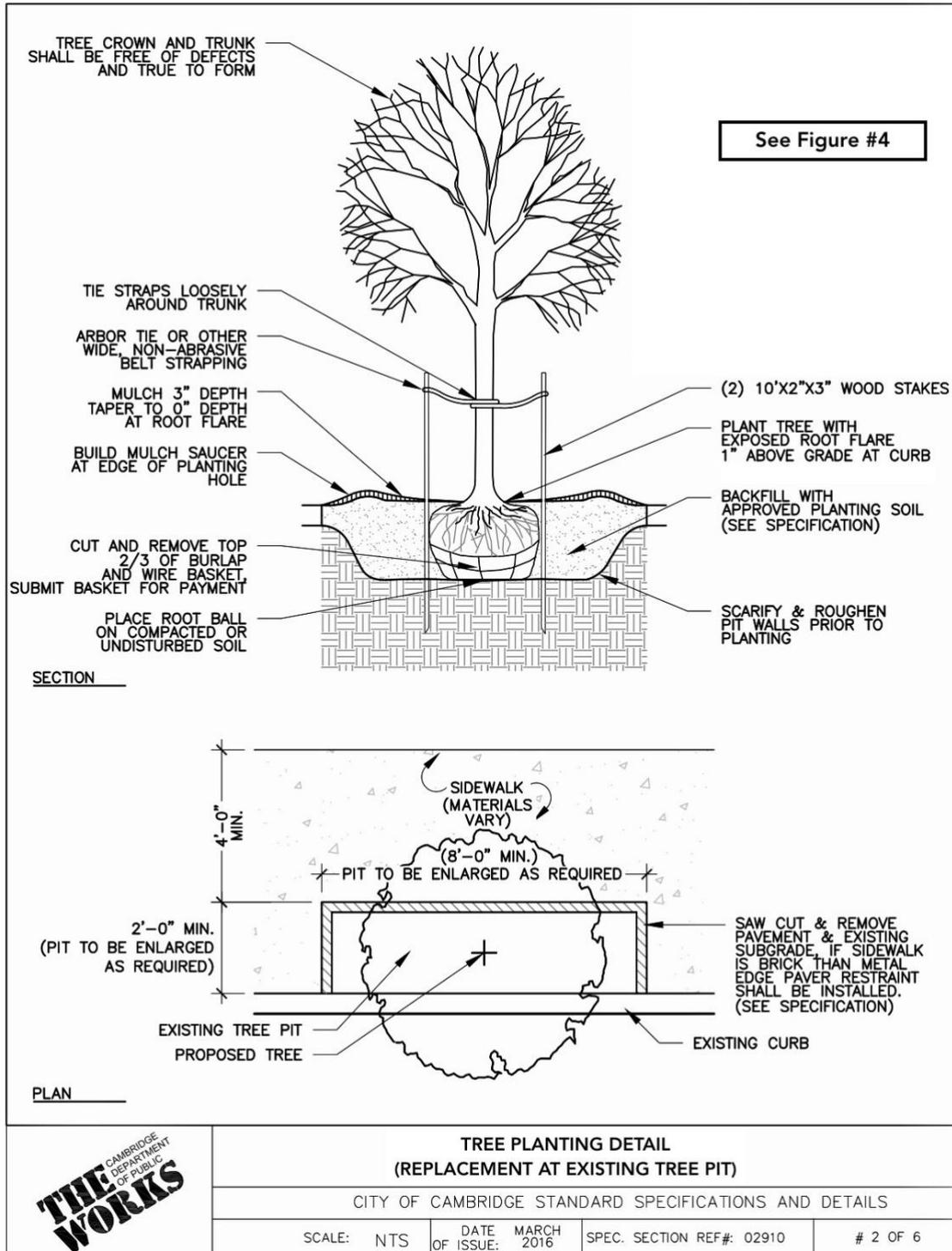


Figure 17. Sidewalk 2: 6' Configuration

Figure 17: Sidewalk 2 6' SIDEWALK CONFIGURATION

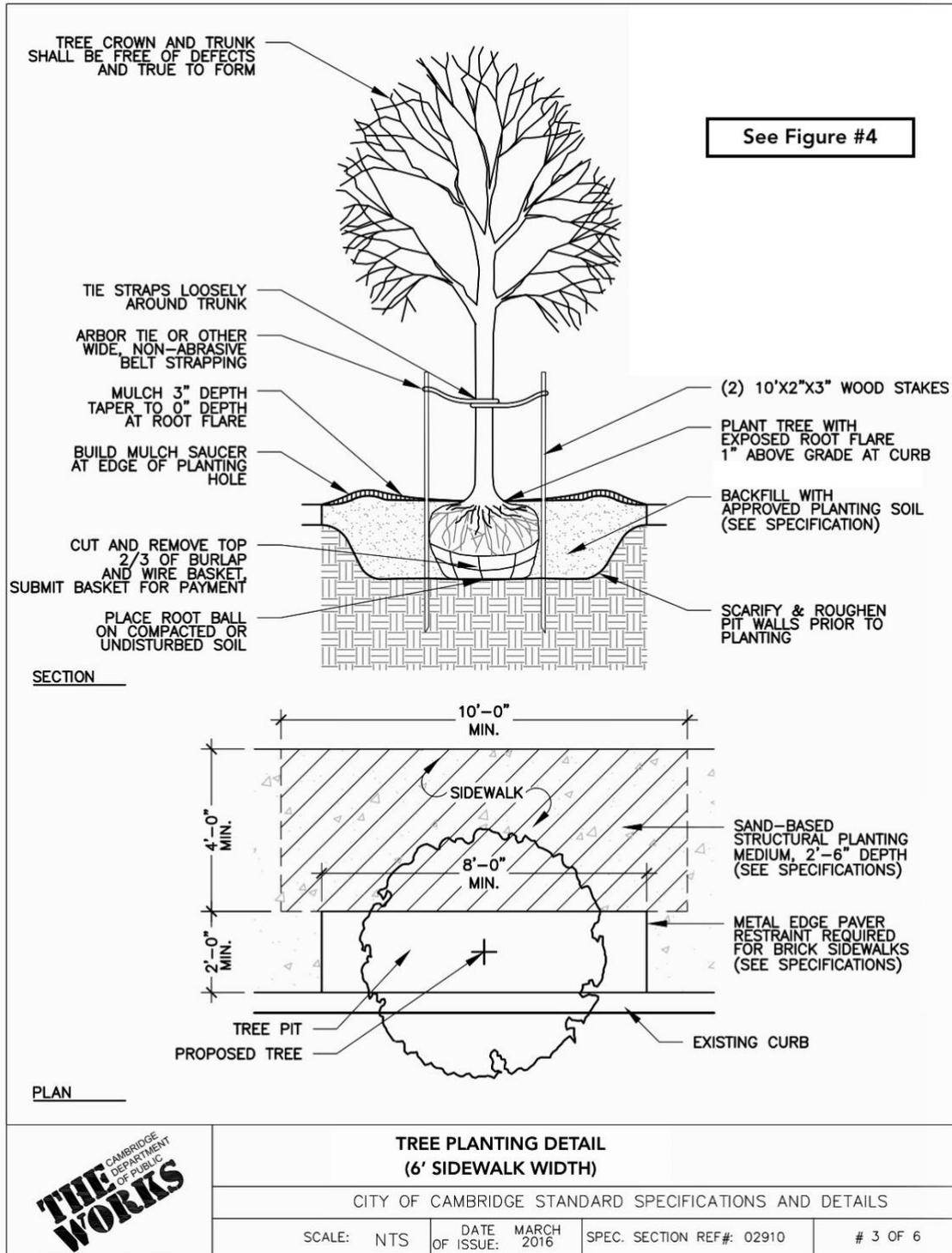


Figure 18. Sidewalk 3: 7' Configuration

Figure 18: Sidewalk 3 7' SIDEWALK CONFIGURATION

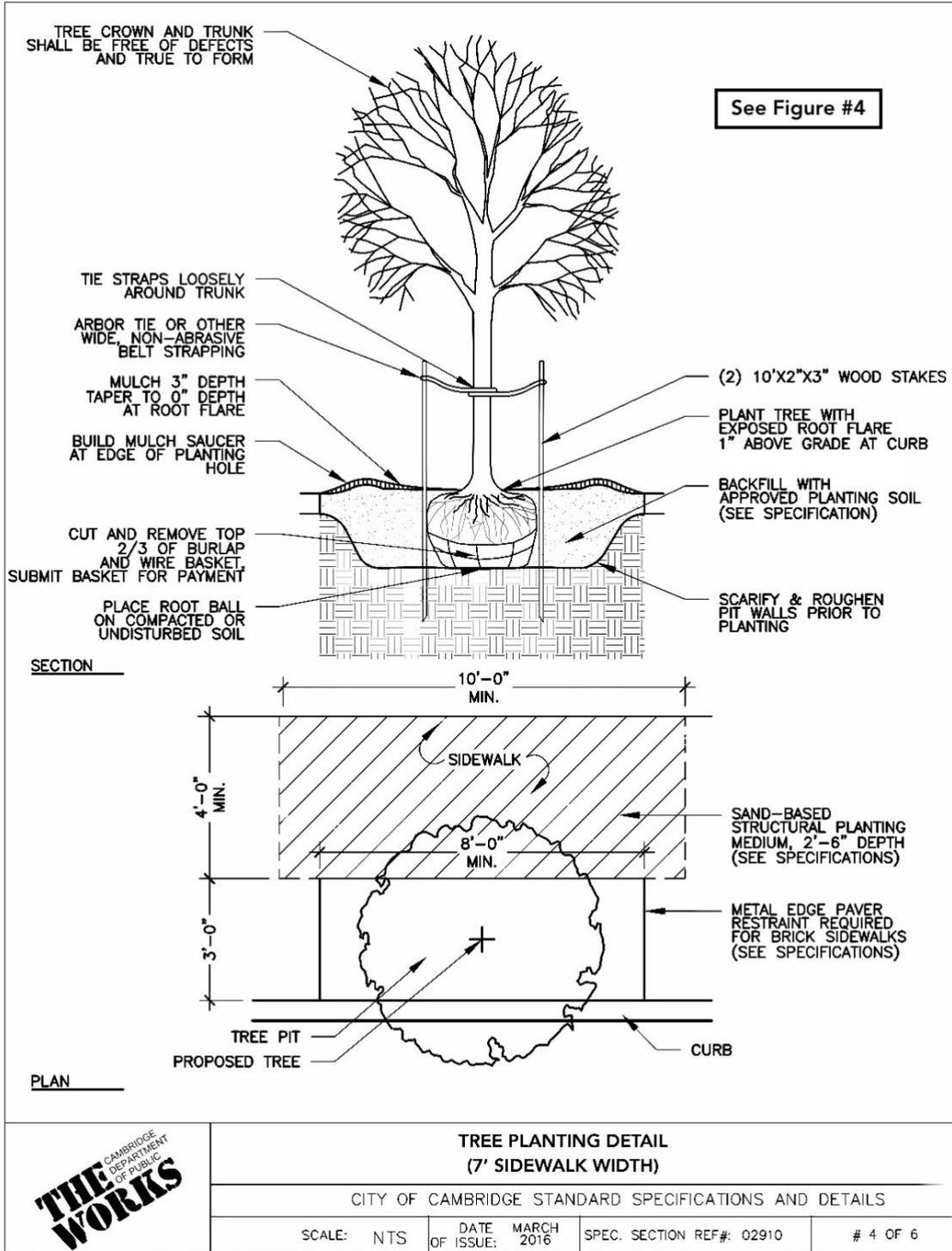


Figure 19. Sidewalk 4: 8' Configuration

Figure 19: Sidewalk 4 8' SIDEWALK CONFIGURATION

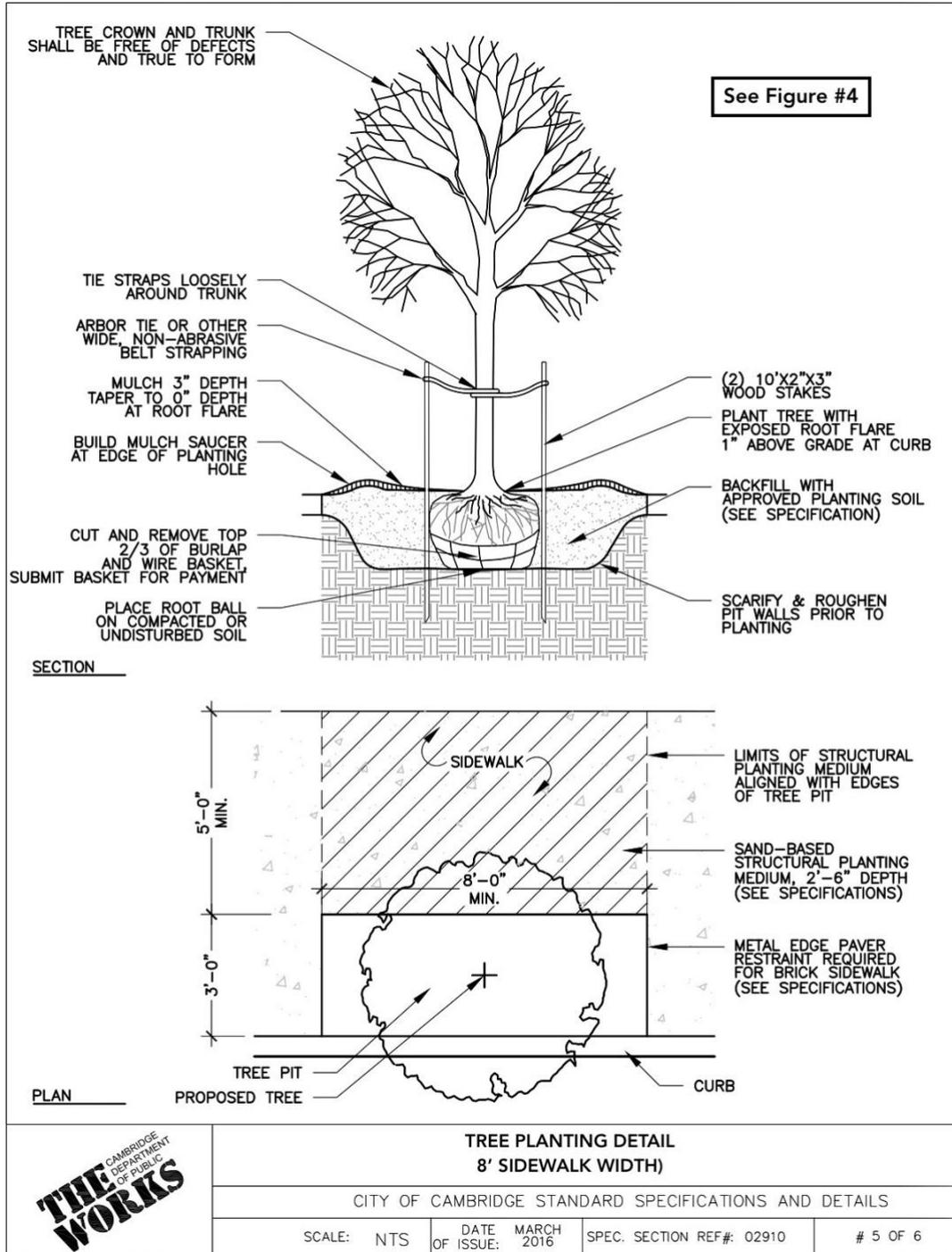


Figure 20. Sidewalk 5: Greater Than 8' Configuration

**Figure 20: Sidewalk 5
>8' SIDEWALK CONFIGURATION**

