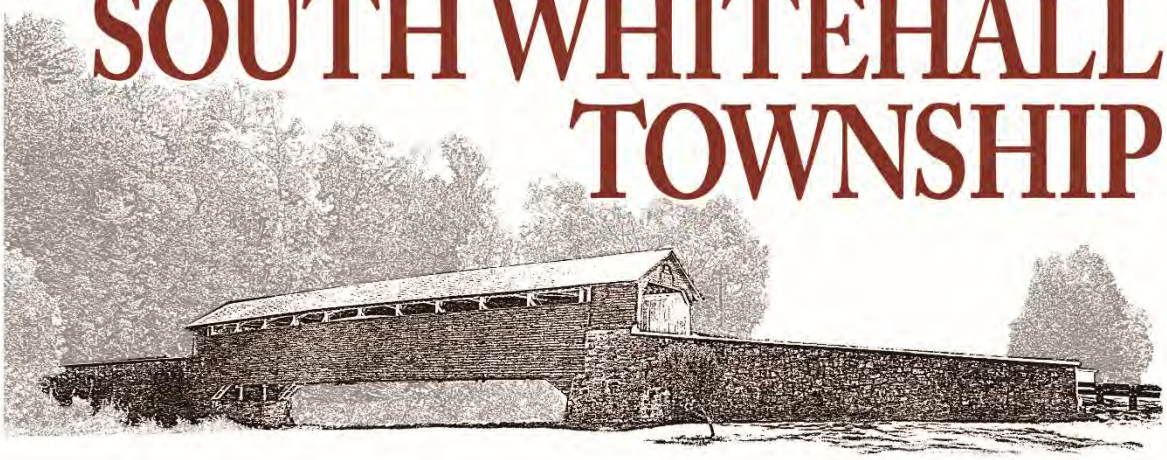
SOUTH WHITEHALL TOWNSHIP



SHADE TREE

ORDINANCES, POLICY AND GUIDE

July 6, 2005
Revised May 7, 2008
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SHADE TREE ORDINANCES

SOUTH WHITEHALL TOWNSHIP CODIFIED ORDINANCE

Chapter 330
Trees

§ 330-1 NAME

This chapter shall be commonly known as “Trees”.

§ 330-2 PURPOSE

South Whitehall Township recognizes that the urban forest within the Township plays an integral part to the infrastructure of the Township. Therefore, the purpose of this Chapter is to support the goals and policies related to the urban forest, including but not limited to the permitting, planting, removal, maintenance, and protection of trees within the Township. These policies will help to maintain the neighborhoods within the Township and make them a safer and attractive place to live.

§ 330-3 DEFINITIONS

Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular. As used in this chapter, certain terms are defined as follows:

COMMISSION

The Landscape and Shade Tree Commission of South Whitehall Township.

COST OF CURE

The total cost for the replacement of a given tree with one of equal size and condition as calculated by the standards of the International Society of Arboriculture (ISA).

LAND DEVELOPMENT

As defined by SALDO Section 312-6 Definitions.

MAINTENANCE or MAINTAIN

Clipping, pruning, fertilizing, spraying, treating for disease, insects or injury and any similar work done to promote health, growth or beauty to trees.

NUISANCE

The following are declared to be a nuisance under this chapter:

(1) Any physical condition regarded as a public nuisance or attractive nuisance at common law.

(2) Any condition which interferes with the normal use or enjoyment of any property or endangers human health, safety or welfare.

(3) Any insect or disease infestation.

(4) Any discharges, flowers, fruits, berries, or other seeds which create noxious odors or other offensive conditions.

PERSON

Any natural person, firm, partnership, association, corporation, company or any other organization of any kind.

PLANTING

Putting or setting into the ground.

PLANTING STRIPS

The unpaved area between the sidewalk and the curb.

SHADE TREE

Any trees in a street right-of-way.

SHADE TREE COORDINATOR

A South Whitehall Township employee or third-party individual or organization, as designated by the Township Manager, who is knowledgeable of shade trees and their maintenance to administer the rules and regulations of this Chapter. The Shade Tree Coordinator shall act as an advisor to the Commission on matters concerning shade trees within the public right-of-way. The Commission shall consider the advice of the Shade Tree Coordinator on matters concerning the application of this Chapter. The Shade Tree Coordinator shall carry out any duties and responsibilities so designated by this Ordinance and so delegated by the Commission.

(1) The Shade Tree Coordinator shall keep full records of its business and shall submit a report of its activities to the Commission at least once a year.

(2) The Township, having exclusive custody and control of all shade trees in the public right of way, may plant, remove, maintain and protect such shade trees. The Shade Tree Coordinator shall give recommendations and advice as to species selection, planting, maintenance or removal of trees on all public rights of way.

(3) The Shade Tree Coordinator shall also work with all other concerned agencies in the planning of trimming, planting, transplanting and removal of shade trees in public right of way.

STREET RIGHT OF WAY

As defined by SALDO Section 312-6 Definitions.

TOWNSHIP

South Whitehall Township, Lehigh County, Pennsylvania

TREE VALUE

Systematic approach to secure a value by using four major factors: size, species, condition, and location. With the four factors established, a Cost of Cure or Trunk Formula can be implemented to the result of a value for a tree. Formulas are based upon “Guide for Plant Appraisal (9th Edition)” by the Council of Tree and Landscape Appraisers and the ISA.

§ 330-4 PERMITS

A. No person, without first obtaining a Shade Tree permit from the Township, shall:

(1) Prune, spray, plant, remove or cut any shade tree in public lands or a street right-of- way.

(2) Attach a guy rope, cable, electric wire, or other fixture to any tree, tree guard or support thereof in public lands or a street right-of-way. Temporary attachments shall be allowed if a permit is issued. The temporary attachments shall cause no harm to the tree, and there shall be a prescribed timetable for removal of the temporary attachments.

(3) Excavate, trench, tunnel, or bore within the dripline of any shade tree in public lands or a street right-of-way. Permit applications for such work will contain at a minimum an excavation plan indicating the tree protection zone and maintenance precautions to be used during construction.

(4) Install lighting within the tree crown of any shade tree in public lands or a street right-of-way. Any permit issued for a tree crown lighting shall include a specified time of installation and time of removal, not to exceed one calendar year.

B. The Township shall adopt regulations establishing the application procedure and technical requirements for all permits issued under this chapter.

C. Permit requirements.

(1) Should a Shade Tree Permit be approved and issued with conditions, the Shade Tree Coordinator shall specifically state within said conditions the timeframe in which all conditions associated with the approval of the permit are to be met. The timeframe(s) shall be reasonable in consideration of the work associated with satisfying the conditions of approval.

(2) The Shade Tree Coordinator may extend the duration of the permit for good cause shown.

(3) If a tree is approved for removal, it shall be replaced in accordance with the Shade Tree Guide.

(4) The Shade Tree Coordinator shall be notified within five days after completion of the work to allow for inspection.

(5) Applicant shall obtain any additional required applications and permits. (Examples: Township Road Closure, PA One Call, etc.)

D. Appeals. A permit applicant may appeal the denial of a Shade Tree permit or conditions of approval of an approved Shade Tree permit.

(1) Submission of the Appeal

(a) The property owner or owner's agent may appeal a Shade Tree Coordinator's decision by filing an appeal application with the Shade Tree Coordinator or other person designated by the Township Manager on a form provided by the municipality. The Township, at its sole discretion, may set fees as appropriate with regard to the appeal in the Township Fee Schedule.

(b) The appeal shall be submitted within thirty (30) days of the denial or issuance of the

Shade Tree permit. An appeal will automatically suspend an action to enforce an order to correct until the matter is resolved.

(c) Unless the owner or owner's agent requests a hearing, the Landscape and Shade Tree Commission shall decide an appeal by reviewing documents and written brief or argument included in the appeal application. The Landscape and Shade Tree Commission shall review the appeal and make a decision within forty-five (45) days of receipt of the appeal application. The applicant and/or Shade Tree Coordinator need not be present before the Landscape and Shade Tree Commission during the review or decision.

(d) Should the owner or owner's agent request a hearing, the Landscape and Shade Tree Commission shall schedule a hearing within 60 days of receipt of the appeal application (unless the applicant agreed in writing to an extension of time) and notify the owner or owner's agent and Shade Tree Coordinator of the date, time and place of the hearing.

(2) Notification of Hearing. A notice of the hearing shall be published once in a newspaper of general circulation in the municipality. Such notice shall state the time and place of the hearing and the particular nature of the matter to be considered at the hearing. The publication shall not be more than thirty (30) days and not less than seven (7) days before the date of the hearing. The notice of the hearing shall also be posted at an appropriate location on the Township website and at a visible location at the Municipal Building not less than seven (7) days before the date of the hearing.

(3) Conduct of the Hearing.

(a) The hearing shall be conducted by, at a minimum, a quorum of the Landscape and Shade Tree Commission. Should a quorum not be available at the time and location of the hearing, the appellant may elect to commence the hearing with less than a quorum or agree in writing to an extension of time until a replacement hearing date, which shall be sufficiently distant to be properly noticed in accordance with subsection (2) above. To maintain continuity, once the hearing commences all members of the Landscape and Shade Tree Commission present for the initial hearing shall be present for any and all future hearings of the appeal, should additional hearings be required.

(b) The Landscape and Shade Tree Commission, at its discretion, may continue a hearing to a future date in order to accept new evidence or testimony or deliberate and render a decision. Such a continuation need not be noticed in accordance with subsection (2) above if the location, date and time of the continued hearing is announced prior to the adjournment of the current hearing.

(c) The Landscape and Shade Tree Commission members conducting the hearing shall establish rules for submission of evidence and testimony as appropriate.

(4) Deciding the Appeal. The Landscape and Shade Tree Commission shall only consider the following factors when deciding an appeal:

(a) That the intent Chapter 330 and/or applicable Township policies or procedures was incorrectly interpreted.

(b) That the provisions of Chapter 330 and/or applicable Township policies or procedures do not apply.

(c) That an equivalent or better outcome with regard to the intent of Chapter 330 and/or applicable Township policies or procedures is proposed.

(5) As part of the decision, the Landscape and Shade Tree Commission may add, alter or remove any or all of the conditions of approval of the permit so appealed.

(6) Following the hearing before the Landscape and Shade Tree Commission, the Commission shall issue a written decision to the appellant and to the Shade Tree Coordinator within 15 days. The Landscape and Shade Tree Commission, through the staff so designated by the Manager of South Whitehall Township, shall keep copies of the appeal application, submitted exhibits and the written decision as part of the permanent record. Further appeal of the Commission decision shall be before the Court of Common Pleas of Lehigh County.

§ 330-5 PROHIBITED ACTIVITIES

No person under any circumstances shall:

A. Cut, break bark, or otherwise injure or disturb any tree, tree guard or support thereof in public lands or a street right-of-way, unless the work is being carried out as authorized under an approved Shade Tree permit;

B. Fasten or maintain any sign or advertisement on any tree or tree guard or support thereof in public land or a street right-of-way;

C. Reduce the size of an existing tree pit, planting strip, or root zone of an existing tree in public land or the street right-of-way;

D. Deposit impervious material in such a way as to obstruct the free access of air and water to the roots of any tree in public land or a street right-of-way or cause compaction of any soil in public land or a street right-of-way;

E. Allow any tree on public land or a street right-of-way to be injured or removed during the erection, repair, alteration or removal of any building or structure. No person in charge of such erection, repair, alteration or removal shall leave any tree in public land or in a street right-of-way in the vicinity of such a building or structure without such good and sufficient guards or means of protection as shall prevent injury to the tree, arising out of or caused by the erection, repair, alteration or removal, unless, upon review by the Shade Tree Coordinator, a permit allowing the same is granted. The aforesaid decision may be appealed to the Landscape and Shade Tree Commission, in the case of any determination against the request for such a permit;

F. Cause or allow any boiler, heater, machine, or device generating fumes, fires, gas, smoke, or vapor to remain under or adjacent to any tree in public land or in a street right-of-way, or cause or allow it to be done;

G. Fasten a bicycle, animal, or motor vehicle of any kind to any shade tree, tree guard or support thereof;

H. Authorize the placement of any petroleum products, hot water, steam brine water, oil, dye, or other substance harmful to a tree's life or health on or into the soil about the base of a tree in any public land or street right-of-way;

I. Build or kindle a fire near to any tree on any public land or street right-of-way, so as to

endanger the trunk, limbs, foliage, or roots of such shade tree;

J. Interfere, cause, authorize or procure any interference with the agents or employees of the Township, homeowner or contractors while they are engaged in the following:

(1) The planting, cultivating, mulching, pruning, spraying or removing of trees; or

(2) Removing stone or cement sidewalk or other materials or substances in the open ground maintained for the protection and care of any shade tree in public land or the street right-of-way;

K. Attach any pipe, rain downspout or gutter, lumber, electrical components, including floodlights or any other building material of any kind to any shade or street tree, tree guard or support thereof on public land.

§ 330-6 TREES IN PUBLIC LANDS OR RIGHTS-OF-WAY

A. Tree requirements:

(1) General. All trees planted within the street right-of-way of all subdivisions, land developments, and improved properties, including land abutting existing streets as required herein or by SALDO and all applicable specifications and amendments thereto shall adhere to this chapter and regulations issued under this chapter. Shade trees shall be planted by the developer or owner in accordance with the approved plan or permit and within the time period specified.

(2) Types of trees permitted. Trees shall be of nursery stock quality of a species approved by the Commission, grown under the same climatic conditions as the subject property. Site locations, land use, topography, natural features, and historical features shall be considered by the developer or owner and the Commission in selecting and approving species. Guidelines for selection shall be specified by regulation.

(3) Tree protection. Before any earthwork, construction work or approved tree removal shall commence in connection with any subdivision, land development or land improvement, fencing or guards shall be placed around all existing shade trees to be protected to ensure that there is no unnecessary encroachment with the tree protection zone by changing grade, trenching, stockpiling of building materials or topsoil, parking and/or circulation of vehicles or construction equipment contributing to the compaction of the soil and roots. Such tree protection shall be accomplished with the specifications as outlined in the rules and regulations.

(4) Tree replacement. The developer or owner shall make every effort to preserve and maintain all existing shade trees within the right-of-way and develop site designs and plans in order to accommodate such trees.

(5) Unapproved removal. If an existing shade tree is removed without either prior approval as part of an approved plan, or a property owner does not possess either a valid permit for such tree removal, or a valid notice authorizing such tree removal, then:

(a) The owner shall be required to replace such trees as provided herein.

(b) The Shade Tree Coordinator shall determine the requirements of the tree to be replaced.

(6) The Shade Tree permit fee will be determined by resolution by the South Whitehall Township Board of Commissioners at the adoption of the Township Fee Schedule.

(7) Inspection. Upon completion of any required tree installation, the developer or owner shall submit a request for a final inspection to the Shade Tree Coordinator. The Shade Tree Coordinator shall ensure that all trees are installed per the issued permit or the approved plan.

B. Tree Maintenance Care Provisions.

(1) The owner of any property abutting a street right-of-way that has shade trees growing in the street right-of-way shall trim each tree within the current arboricultural standards as described within the South Whitehall Township Shade Tree Ordinances, Policy and Guide, as amended, or cause such trees to be pruned of all branches interfering with the street right-of-way.

(a) Should the Township determine that the property owner neglected or refused to prune any shade tree as required by this chapter, the Code Enforcement Officer shall notify the property owner of the determination in the manner described in Section C below.

(2) Should the Township determine that a shade tree growing in the street right-of-way is a risk to the life, health, safety, or property of the public, or which is afflicted with any contagious disease or insect infestation, or otherwise is a nuisance, the Code Enforcement Officer shall notify the abutting property owner of the determination in the manner described in Section C below.

C. Notice to remedy.

(1) The notice to remedy shall include:

(a) The property address and owner's name as shown on the Township or Lehigh County property ownership records.

(b) A brief description of the condition that requires a remedy and the remedy required.

(c) A time period for compliance, the length of which is to be reasonable in consideration of the work to be accomplished.

(d) A statement that the notice may be appealed to the Commission along with contact information for initiating an appeal.

(e) A statement that failure to comply may result in criminal or civil action and the completion of the work required by the Township, with the costs to be collected from the property owner.

(2) The Code Enforcement Officer shall be authorized to grant reasonable time extensions upon request.

(3) If the property owner neglects or refuses to remedy such determination as required by this section within the time period specified in such notice, the Township or the Township contractor may cause such remedy to be done at the expense of the property owner; and the entire cost plus 10% shall be paid by the property owner within 30 days if no exception thereto is granted by the Code Enforcement Officer. If not paid by the property owner

within 30 days, a lien upon such premises and a claim therefore shall be filed and collected by the Township in the same manner as municipal claims are filed and collected.

(4) Any removed tree may be required to be replaced at the determination of the Shade Tree Coordinator, in accordance with the provisions of this Chapter. Tree replacement shall be at the property owner's expense as part of the cost of compliance.

§ 330-7 ARBORICULTURAL WORK PERFORMANCE REQUIREMENTS

A. All approved pruning, cutting, removal, spraying, fertilizing and arboricultural procedures to trees and shrubs in the street right-of-way shall be done only by a person who has met the requirements set forth by the International Society of Arboriculture (ISA) and provides proof of insurance sufficient to repay any damages caused by said person in performing said work, except as hereinafter provided for property owners. A Township Business Privilege License shall be secured by the company or individual prior to the start of any work.

B. Property owner exemption.

(1) Minor tree work may be done by an individual property owner to trees or shrubs planted in the street right-of-way adjacent to his property, provided that a permit has been obtained from the Township.

(2) The Shade Tree Coordinator shall advise the property owner whether or not the proposed work is minor. The property owner shall comply with accepted pruning standards as described within the South Whitehall Township Shade Tree Ordinances, Policy and Guide, as amended.

§ 330-8 COMPLIANCE WITH TOWNSHIP ORDINANCES

All planting of shade trees in street right-of-way shall be in compliance with any and all applicable Township ordinances.

§ 330-9 SHADE TREE FEES

A. There shall be established a unique budget line number, entitled "Shade Tree Fees," for the purposes set forth in this chapter.

B. The "Shade Tree Fees" line item shall be administered by the Township exclusively in the manner and for the purposes set forth in this chapter and the regulations adopted under said chapter.

C. The "Shade Tree Fees" line item shall be the repository for all funds received from:

(1) Fines, penalties, and restitution collected for violations of this chapter;

(2) Administrative fees collected for administering the provisions of this chapter;

(3) Grants, gifts and bequests given to the Township for any purpose relating to trees.

(4) Any additional funds as approved by the South Whitehall Township Board of Commissioners.

D. The "Shade Tree Fees" line item shall be expended only for:

(1) Reimbursement to the Township for the expense incurred either internally by the Township, for work done by Township employees, or for the actual cost of contracting out work done by non-Township employees for all work done under the provisions of this chapter, to include at least:

(a) Tree planting of any kind;

(b) Tree removal, pruning or other maintenance;

(c) Professional services;

(d) Administrative expenses;

(e) Grant matching expenses;

(f) Professional training, education, and certification;

(g) Public education materials.

§ 330-10 VIOLATIONS AND PENALTIES

A. Violation of any provision of this chapter is a summary offense.

B. Citation Fines. Any person, firm or corporation who shall fail, neglect or refuse to comply with any of the terms or provisions of this Ordinance (including the failure to comply within the stipulated timeframe any conditions attached to an approved Shade Tree permit), or of any regulation or requirement pursuant hereto and authorized hereby shall, upon conviction, be ordered to pay a fine not less than One Hundred ($100) dollars or more than One Thousand ($1,000) Dollars on each offense or be imprisoned no more than thirty (30) days, or both.

C. Restitution. The Magisterial District Judge may order the violator to make restitution where appropriate in an amount at least equal to the appraised tree value of the tree involved plus cost of cure as obtained from certified arborists and to pay the Township's costs of collection/citation proceedings and to pay the Township reasonable attorneys' fees associated with the prosecution of the same.

D. For continuing violations of this chapter, each day that the violation continues shall be considered a separate offense.

Chapter 17
Article VII
Landscape and Shade Tree Commission

§ 17-71 THE LANDSCAPE AND SHADE TREE COMMISSION

A. The Landscape and Shade Tree Commission, created by Ordinance 109, adopted on March 10, 1969, as amended, shall continue under and in accordance with the provisions of this article.

§ 17-72 MEMBERSHIP

A. COMPOSITION. The Landscape and Shade Tree Commission shall be composed of three (3) residents of the Township, appointed by the Township Commissioners by Resolution.

B. TERMS. The members of the Landscape and Shade Tree Commission shall serve for a term of five (5) years or until their successors are appointed. Terms shall be staggered so that no more than one (1) term shall expire in a given calendar year. Each term shall commence on January 1 and terminate on December 31.

C. VACANCIES. The Chairperson of the Landscape and Shade Tree Commission shall promptly notify the Township Board of Commissioners of any vacancies which occur. Vacancies in the landscape and Shade Tree Commission, occurring otherwise than by expiration of term, shall be filled for the unexpired term in the same manner as the original appointments.

D. REMOVAL OF MEMBERS. Any Landscape and Shade Tree Commission member may be removed at the discretion of the Township Board of Commissioners. Any member of the Landscape and Shade Tree Commission, once qualified and appointed, may be removed from office in accordance with the First Class Township Code, as amended.

§ 17-73 JURISDICTION; DUTIES AND RESPONSIBILITIES

A. Except as provided in 53 PS 57070 (Trees and shrubbery within right-of-way) and in accordance with the First Class Township Code and all other applicable law, the Landscape and Shade Tree Commission shall have exclusive custody and control of the shade trees in the Township, and is authorized to plant, remove, maintain and protect shade trees on the public streets and highways in the Township.

B. The Landscape and Shade Tree Commission shall review subdivision and land development plans in accordance with the Subdivision and Land Development Ordinance. The findings of this review shall be prepared and sent to the Planning Commission as recommendations.

C. The Landscape and Shade Tree Commission has exclusive jurisdiction to hear and render final adjudications regarding appeals of staff determinations with regard to Shade Tree permits.

D. The Landscape and Shade Tree Commission shall hold regular meetings a minimum of two times in a calendar year at such times and places as it shall designate.

E. For each and every meeting, the Landscape and Shade Tree Commission shall create an agenda, and take and approve minutes.

§ 17-74 RIGHT AND AUTHORITY; ORGANIZATION; BYLAWS AND PROCEDURES

A. The Landscape and Shade Tree Commission shall have power to adopt rules and regulations for the conduct of all business before the Landscape and Shade Tree Commission, unless otherwise provided in the Ordinance, as it may be amended from time to time.

B. The members of the Landscape and Shade Tree Commission shall elect their own Chairperson and Secretary and select all other necessary officers to serve for a period of one year.

C. The Landscape and Shade Tree Commission shall reorganize on an annual basis at the first regularly-scheduled meeting to be held during each calendar year.

§ 17-75 PUBLIC NOTICE OF MEETINGS

A. Unless otherwise specified, regular meetings for the Landscape and Shade Tree Commission shall be advertised annually in a local newspaper no more than thirty (30) days and no less than seven (7) days before the first day of the new year. Such advertisement shall include the name of the Landscape and Shade Tree Commission, the location of the meetings, the starting time of the meetings, and the dates of the meetings for the upcoming calendar year.

B. Regular meetings for the Landscape and Shade Tree Commission shall be posted annually at the appropriate locations on the South Whitehall Township Website no more than thirty (30) days and no less than seven (7) days before the first day of the new year. Such postings shall include the information described in subsection (A).

C. Regular meetings for the Landscape and Shade Tree Commission shall be posted annually at a conspicuous publicly-accessible location at the South Whitehall Township Municipal Building no more than thirty (30) days and no less than seven (7) days before the first day of the new year. Such postings shall include the information described in subsection (A).

D. Cancellations of regular meetings for the Landscape and Shade Tree Commission shall be posted at the appropriate locations on the South Whitehall Township Website and at a conspicuous publicly-accessible location at the South Whitehall Township Municipal Building at the earliest possible opportunity.

E. Meetings for the Landscape and Shade Tree Commission that are not regularly-scheduled meetings ("special meetings") are to be advertised at least once (as legally appropriate) in a local newspaper no more than thirty (30) days and no less than seven (7) days before the date of the special meeting. Such advertisement shall include the name of the Landscape and Shade Tree Commission, the location of the meetings, the starting time of the meetings, and the dates of the meetings for the upcoming calendar year. Special Meetings shall also be posted to the South Whitehall Township Website and at a conspicuous publicly-

accessible location at the South Whitehall Township Municipal Building with the above-mentioned requirements.

F. None of the above requirements shall supersede any other advertising requirements required by law.

§ 17-76 FUNDING AND EXPENDITURES

A. The Board of Commissioners may appropriate such money as, in its opinion, is necessary and is available, for the work of the Landscape and Shade Tree Commission.

§ 17-77 RECORDS

A. The Landscape and Shade Tree Commission, through the staff so designated by the Manager of South Whitehall Township, shall keep full public records of the activities of the Landscape and Shade Tree Commission, including agendas and approved minutes. Such records shall be the property of the Township of South Whitehall.

B. On an annual basis, the Landscape and Shade Tree Commission, through the staff so designated by the Manager of South Whitehall Township, shall make a written report of its meetings, activities, and financial, transactions and expenses, if any. Said report shall be submitted to the Township Board of Commissioners by March 1 of the following year and shall be made known and available to the general public.

§ 17-78 COMPENSATION

A. The said members of the Landscape and Shade Tree Commission shall serve in their respective capacities and perform the duties of said office without compensation.

§ 17-79 RESERVED

§ 17-80 RESERVED

§ 312-40 SHADE TREES.

Except as otherwise provided in Subsection C(4) hereof, within the right-of-way of streets or street tree easements, as applicable, adjacent to or in new subdivisions, the developer shall plant shade trees meeting the specifications found in these regulations. Site locations, land use, topography, natural and historic features shall be considered by the developer and the Township Shade Tree Commission in selecting and approving species.

A. Species of trees permitted shall be in accordance with the Township standard construction documents (latest revision).

B. Tree specifications shall be in accordance with the Township standard construction documents (latest revision).

C. Tree location.

(1) In all subdivisions, trees shall be planted within the street rights-of-way or street tree easements at uniform intervals between 30 and 40 feet. The location of shade trees will be subject to the approval of the Landscape and Shade Tree Commission and the Board of Commissioners. If acceptable to the above two boards, trees may be planted midway between the curb and sidewalk providing the planting strip is a minimum of five feet in width; or between the sidewalk and building line, three feet from the sidewalk. Should the latter location be chosen, additional street right-of-way shall be dedicated to the Township or a street tree easement established in lieu of. The size of the additional right-of-way or street tree easement shall be determined by the Shade Tree Commission.

(2) In order to facilitate planting within street rights-of-way, the developer shall indicate grades on his final subdivision plans and shall grade each street right-of-way according to the standard construction documents (latest edition).

(3) Prior to planting, the developer is to contact the Public Works Department to arrange a physical inspection of the trees to be planted and the marking of the planting locations of the shade trees by a representative of the Public Works Department. The developer shall not plant any shade trees until the approval of the inspecting Public Works Department representative has been obtained.

(4) Should the Board of Commissioners grant a waiver or deferral to the requirement to plant shade trees or should the developer, due to the physical characteristics of the land or the location of public utilities located thereon, be unable to plant every required shade tree as shown on the approved landscaping plan, the developer, in lieu of planting such trees, shall contribute a fee to the Township in an amount as established by the Board of Commissioners, from time to time, per tree not so planted.

D. Maintenance. An agreement between the developer and the Board of Commissioners shall be required to provide for the maintenance of all such trees planted.

(1) The term of the maintenance agreement shall be 24 months from the day the Township Engineer and the Township Manager give the developer the final approval on all required improvements identified in the subdivision improvements agreement. During this term the developer shall:

(a) Replace dead trees, or trees of sufficiently poor health so as to be deemed unacceptable by the Landscape and Shade Tree Commission.

(b) Control insects and diseases.

(c) Repair mechanical injury.

(d) Remove all dead branches.

(e) Within one month prior to the end of the maintenance agreement, the shade trees shall be pruned by the developer, in accordance with the South Whitehall Township Shade Tree Policy, unless otherwise directed by the Landscape and Shade Tree Commission.

§ 350-48(o)(2)(E)(v) BUFFER STRIPS, SCREENING AND LANDSCAPING

All improved off-street parking areas required or specified in this chapter and not entirely contained in a garage or building shall:

(1) Have a buffer strip and screening between it and any adjacent residential lot in accordance with § 350-42(b). Such screening shall be augmented as necessary to prevent the glare of headlights from shining on adjacent residential properties.

(2) Provide one shade tree for every 10 parking spaces located in a planned manner within or adjacent to the parking lot areas. Where more than 50% of a parking area is effectively precluded from planting shade trees because of an overhead power line electric utility restriction, the foregoing shade tree requirement shall not apply to those spaces located within the area that is restricted by such electric utility requirement; provided, however, that substitute plantings as may be deemed to be appropriate by the Township may be required to the extent they are not in conflict with the utility restriction. The Township shall have the right to confirm specific landscaping restrictions with the utility company.

(3) The area between the parking area and a public street shall be landscaped to include plantings at least 30 inches in height. Said plantings shall be at least 50% evergreen shrubbery and shall average at least one for every 10 feet of frontage.

(4) The planting and screening required by this section shall not be located so as to obstruct vision at intersections of driveways and streets.

SHADE TREE POLICY

1 Purpose

The purpose of this policy is to provide background and plain-English interpretation of the South Whitehall Township Ordinances regarding shade trees in the Township.

2 Background

On August 12, 1968, South Whitehall Township revised their Subdivision and Land Development Ordinance to include the requirement for shade trees along streets in new developments. On March 10, 1969, South Whitehall Township established a Landscape and Shade Tree Commission, a 3-person citizen Board, to oversee the community forest that lines our streets and roads. The Pennsylvania Municipalities Planning Code states that "The commission shall have exclusive custody and control of the shade trees in the Township, and is authorized to plant, remove, maintain, and protect shade trees on the public streets, and highways in the Township." The Landscape and Shade Tree Commission has been active ever since, ensuring that our existing communities maintain the trees that are an integral part of each neighborhood's unique character and lending guidance to the greening of our new neighborhoods and commercial centers.

3 "Shade Trees"

When dealing with the Township, trees are divided into several categories, each of which has its own regulations associated. "Shade Trees" or "Street Trees" refers to trees within the rights-of-way of public streets. These trees are most commonly known as the trees between the curb and the sidewalk along many public streets. Since the right-of-way of any given public street will generally extend beyond the edge of the roadway, it may not be easy to determine if a given tree is a "Shade Tree" in areas without sidewalks. Please call the Township if you have a question regarding the location of the right-of-way of a public street. "Parking Lot Trees" refers to those trees in and surrounding commercial parking lots as required by the Zoning Ordinance. "Buffer Strips" refers to trees and vegetation that serve as an attractive sound and light barrier around commercial uses as required by the Zoning Ordinance. Generally speaking, all other trees on private property are considered private property and may only be subject to Township concern should a situation regarding visibility along or access to a public right-of-way, danger to property, or public safety arise.

4 Legal Basis

As mentioned previously, the Landscape and Shade Tree Commission is regulated by the Pennsylvania Municipalities Planning Code. On January 17, 2024, South Whitehall Township adopted an updated ordinance *Chapter 17 Article VII Landscape and Shade Tree Commission* to outline the powers and duties of the Landscape and Shade Tree Commission and ensure consistency with other Boards/Commissions/Councils of the Township. Subsequently, the Township also adopted on January 17, 2024, an ordinance *Chapter 330 Trees* to specify the maintenance requirements and enforceable actions associated with Shade Trees.

Subdivision and Land Development Ordinance Section 312-40 deals with the planting of Shade Trees by developers and Section 350-48(o)(2)(E)(v) of the Township Zoning Ordinance deals with the requirements for parking lot trees and buffer plantings.

5 Property Owner Responsibilities

Permits

Subsection 330-4 of *Chapter 330 Trees*, in summary states that no person shall conduct work to a Shade Tree or remove a Shade Tree without first obtaining a permit from the Township. The purpose of this permit is to ensure there are no conflicts or safety concerns with the proposed work. Following the removal of a Shade Tree, a property owner will often be required to replant a new Shade Tree in accordance with the Township Shade Tree Guide. This requirement is provided in the form of a recommendation by the Township Shade Tree Coordinator. If a property owner chooses to challenge the recommendation of the Township Shade Tree Coordinator, they may file an appeal with the Landscape and Shade Tree Commission.

Tree Maintenance

Subsection 330-6 of *Chapter 330 Trees*, outlines general details on the types of trees that may be planted should they be considered "Shade Trees". More specific details on the species and types of trees appropriate can be found in the Township's Shade Tree Guide. Property owners are responsible for the maintenance and reasonable trimming of their respective Shade Trees, following the American National Standards Institute (ANSI) A300 Tree Care Standards. All major tree maintenance must be conducted by an ISA Certified Arborist or under the supervision of an ISA Certified Arborist. Property owners may complete minor tree work following the ANSI A300 Tree Care Standards, only if a permit has been obtained and the work is approved as minor by the Township Shade Tree Coordinator.

Should a landowner fail to properly maintain a Shade Tree or if the Shade Tree is considered a risk to the life, health, safety, or property of the public, the Township Code Enforcement Officer shall notify the property owner to mitigate the issue. Similarly, the Township Code Enforcement Officer shall notify the property owner to mitigate issues pertaining to contagious disease, insect infestation, or similar nuisances related to the Shade Tree.

Township Responsibilities

The Township shall have the right in the event of an emergency, natural disaster, roadway obstruction or roadway maintenance to prune, trim or remove any Shade Tree or part of a Shade Tree in the street right-of-way. Should a Shade Tree or part of a Shade Tree fall and bring down overhead utility wires, the Township will take appropriate measures to control the hazardous situation while the appropriate utility is dispatched to repair the damage. If the fallen tree(s) are touching wires, the Township will not engage until the appropriate utility has determined the area to be safe. The Township is not responsible for the overhead utility lines and cannot repair them.

SHADE TREE GUIDE

1 Introduction

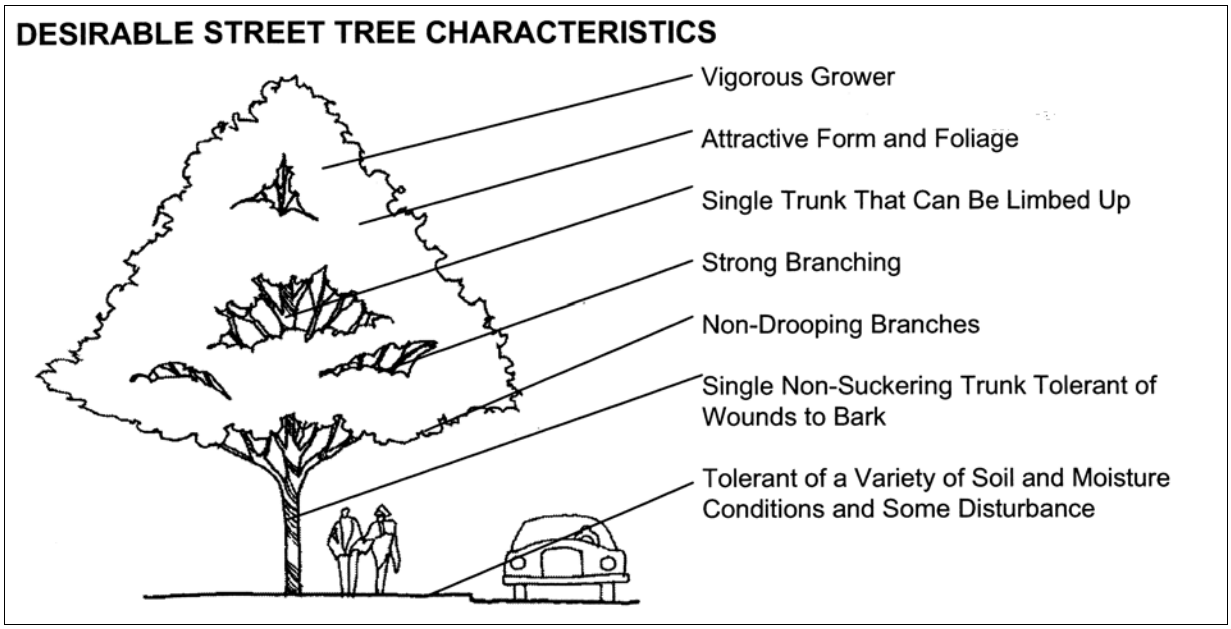
Shade Tree Tips *(Courtesy of Best Management Practices for Community Trees)*

Best Management Practices for Shade Trees

- Plant trees only where there is adequate room both overhead and underground for the mature size of the tree you are planting.
- Vary the spacing of trees along road rights-of-way to add interest and diversity to roadway plantings.
- Maintain sight lines so drivers can see pedestrians and vehicles when pulling out of driveways.
- Provide at least 14 feet of clearance for large vehicles such as buses and delivery along tree lined streets and drives.
- Provide at least 8 feet of clearance for pedestrians and bicyclists to avoid hazards created by low branches or trees too close to sidewalks and drives.
- Consider the impact of utility line maintenance along roadways.
- Avoid over-thinning a natural stand to reduce susceptibility to wind damage and uprooting.
- Remember that the closer you plant a tree to the street in a frontage area, the more difficult the situation for healthy tree growth.
- Tunnel or bore instead of trenching during utility line installation to avoid damaging tree roots.
- Avoid planting trees directly over property lines or corners.
- Consider the installation of root barriers along sidewalks and curbs to prevent tree roots from heaving and breaking payers, sidewalks, curbs, and road pavement.
- Plant trees behind the sidewalk utilizing tree planting easements, to increase above and below ground growing space and vehicular and pedestrian clearance.

Some of the common mistakes made when planting or conserving shade trees include:

- Planting in tree lawns (the buffer strip between curb and sidewalk) too narrow to support tree growth
- Planting too close to buildings and structures
- Planting medium or large trees under utility lines
- Planting too many of one species of tree along a street or within a neighborhood
- Removing trees from a stand and leaving a single specimen with disturbed roots, a small crown, and a tendency to blow over
- Over-thinning the canopy or removing the understory in tree save areas
- Grading and filling soil within tree-save areas
- Severing tree roots and increasing their risk for failure
- Leaving trees with root and trunk damage from construction activities that will decline and die



Our Community Trees

Our community trees are part of our infrastructure and are a valuable asset. Trees perform many essential biological functions that benefit all of us and our environment in substantial, measurable ways. But unlike other assets, trees are living entities and have basic biological requirements for survival and growth. As such, this unique asset must be actively managed and protected to maintain its health, function, safety, beauty, and value.

There is a shared community responsibility for tree management that results in considerable costs and risks associated with owning trees. To maximize the benefits we gain from our trees and minimize the costs and risks associated with them, we must have a good understanding of their benefits, costs, structure, and growth requirements, and we must be pro-active in their management.

The Benefits of Trees

Shade trees contribute the following benefits:

- Shade street pavement increasing its useful life
- Shade and cool homes and neighborhoods
- Create a pleasant and comfortable sidewalk environment
- Create an attractive presentation of property and buildings
- Screen the view of parking lots and utility areas from public streets
- Buffer noise, dust, fumes, and light
- Enhance the beauty of public thoroughfares

Trees provide you, and our community, with many environmental, social, and economic benefits. Many of these benefits are tangible and measurable. Some of the more important benefits are highlighted below:

Trees improve air quality. Their leaves absorb carbon dioxide during the process of photosynthesis, and produce as a by-product the oxygen we need to breathe. Tree leaves also absorb other pollutants and particulate matter from the air.

A large, healthy tree can produce enough oxygen each day for 18 people. Trees reduce pollution and absorb carbon monoxide, sulfur dioxide, nitrogen dioxide, and particulates. Deciduous trees remove up to 9% of particulates and evergreen trees can remove up to 13% of particulates in the air.

Trees can absorb and store a yearly average of 13 pounds of carbon each. A community forest can store as much as 2.6 tons of carbon per acre per year. Community trees across the United States store 6.5 million tons per year, resulting in a savings of $22 billion in control costs. The value associated with the removal of each pound of carbon is $1.70. Therefore, each tree creates a savings through carbon storage of $22 per year.

To grow a pound of wood, a tree uses 1.47 pounds of carbon dioxide and gives off 1.07 pounds of oxygen. An acre of trees might grow 4,000 pounds of wood in a year, using 5,880 pounds of carbon dioxide and giving off 4,280 pounds of oxygen in the process. For every pound of wood that decays (or is burned), the process is reversed: 1.07 pounds of oxygen are used, and 1.47 pounds of carbon dioxide are released.

By providing a cool, shady spot for us to park our cars, trees also reduce the amount of volatile organic compounds (VOC's) that are released from them. In the sun and heat, parked cars continue to release VOC's from the gas tank, so tree canopy can significantly reduces the level of emissions.

Trees save energy. They shade our homes and offices, and the streets, parking lots, and other pavement that surrounds them. They cool the air as their leaves evaporate water.

Leafy green tree crowns create a canopy of shade, reducing the amount of sunlight reaching our streets, lawns, and parking areas, resulting in lower summer temperatures. If properly placed for optimal shading of buildings (south and west sides) and air conditioners, trees can provide a 17% to 75% decrease in summer cooling costs. The presence of a thick evergreen canopy can increase winter heating costs in some areas, but trees generally decrease winter heating costs if properly placed to buffer a home against cold winter winds (north and west sides).

The 200,000 leaves on a healthy 100-foot tree can take 11,000 gallons of water from the soil and breathe it into the air in a single growing season. The cooling effect of all that water going into the air is the equivalent of air conditioning for 12 rooms.

Trees reduce stormwater runoff. Their leaves and branches intercept rainfall and release it slowly, thereby reducing runoff and helping to maintain water quality.

The many leaves, branches, and stems of trees intercept rainwater, hold it, and then release it slowly so that it can be absorbed by the soil. Tree roots also actively remove water from the soil.

The amount of overland flow of water and non-point source pollution that occurs during and after heavy rains is decreased by trees.

The value of trees can be measured as the reduction in construction and material costs for storm water control structures and systems because trees intercept 7% to 22% of precipitation. One study has shown that for every tree 2 cents in water control costs are saved for every gallon of water intercepted during a twelve-hour storm. In a medium sized city, this equates to a 17% reduction of 11.3 million gallons, and a savings of $226,000!

Trees improve water quality and reduce soil erosion. Their roots hold the soil, reduce erosion, and decrease the amount of sediment that enters our creeks, streams, rivers, and lakes.

Riparian, or 'streamside', forests are important to the stream environment. They control fluctuations in water temperature and maintain varied, but stable light levels. Light levels control the type and amount of algae present in a stream, a major food source for many macro-invertebrate animals. Litterfall contributes food energy to stream inhabitants. Aquatic habitat depends in large part on the woody debris available to streams, and the decay of woody debris as it releases nutrients into the aquatic system.

Without a streamside forest stream channels become unnaturally wide as stream banks erode. When the dimension, pattern, and profile of a channel are fundamentally changed habitat loss results. Riparian forests remove, hold, or transform nutrients from fertilizers, sediments, and other pollutants. Even before water reaches the riparian forest, trees can reduce sediment movement off a site by 95%. This keeps our lakes, rivers, and streams cleaner and healthier. In a medium sized city, the amount of soil saved annually can be as much as 10,886 tons!

Trees provide wildlife food and habitat. Their flowers, fruits, leaves, buds, and woody parts are important to the survival of birds, mammals, insects, and other wildlife. The decay of these tree parts caused by bacteria and fungi also increases the fertility and structure of the soil.

Many birds, mammals, reptiles, amphibians, insects, and microorganisms depend upon trees and the forest for food and shelter. Songbirds eat the fruit of black cherry and sumac; deer, turkey, and squirrels eat acorns of white oak, northern red oak, water oak, and willow oak. Cavities and branches in many trees, such as oak, sycamore, river birch, American holly, and black willow, are used for cover and nesting sites.

Trees growing along streams contribute to the health of aquatic ecosystems, providing shade and reducing water temperatures. Woody debris that falls into the stream provides habitat for turtles, otters, beavers, and fish.

Trees enhance recreational opportunities and attract visitors and residents to our community. They create an aesthetically pleasing and comfortable place in which to live, work and shop. Trees also create a natural setting for recreational activities such as walking, jogging, bicycling, golfing, and bird watching. The value of community trees is also reflected in increased property values.

For a single home, trees can provide an owner with a 4% to 27% increase in property value. A single tree can add up to 9% to the value of a residential property. One study has shown that each hardwood tree on a site adds $333 to the property value and each pine adds $257. Trees also attract more residents and visitors to a community, adding value by increasing the community's tax and economic base.

The Cost of Trees

While trees provide us with many benefits and are a valuable community asset, there are costs associated with their conservation, establishment, and maintenance. And if neglected, unprotected, abused, or poorly maintained tree health suffers and trees can have an increased risk for failure and additional liability for the tree owner. Some of the ways in which trees directly or indirectly cost money are described below.

Trees cost money to establish, maintain, and protect.

Planning for trees and conducting tree evaluations and surveys requires extra time and costs during project planning and design. However, good design can result in a more successful and valuable project with high income.

Good quality planting stock is expensive, but by purchasing good quality trees, future replacement and maintenance costs can be reduced.

Tree maintenance, especially pruning, must be done regularly to insure tree health, safety, and longevity.

Trees must be constantly monitored and protected from damage that may result from construction activities, utility line installation or repair, and pest problems.

When trees decline beyond the point of improvement or when they die they require removal which can be expensive for large trees.

Trees can grow larger than expected and may outgrow the space available.

When tree branches grow into clear zones for utility lines, pedestrian walkways, buildings, streets, and vehicle and equipment travel lanes they reduce clearance and sight distance and cause increased costs to maintain public safety.

Without adequate growing space, trees will not achieve their potential for size, health, and longevity and will require more maintenance and will need to be replaced more often.

Trees can be hazardous.

Many trees, either today or in the future, tower over our property and us. When whole trees or their parts fail and fall, they can cause utility service outages, damage to vehicles, homes, fences, and pavement, and personal injury.

Tree roots that surface above ground can be a tripping hazard, and can cause damage to lawn mower blades. Trees left unpruned over walkways can cause personal injury.

Tree roots can cause damage to infrastructure.

Tree roots, attracted to favorable soil moisture conditions, will penetrate underground water and sewer lines through small cracks or pipe joints where they proliferate and cause problems.

Tree roots can cause cracking and heaving of sidewalks, curbs, and street pavement.

While there are many costs associated with trees, in most cases the benefits far outweigh the costs. The ratio of benefits to costs can be much improved with the implementation of the BMPs.

Tree Structure

A tree is defined as a woody plant that grows to 15 or more feet in height, usually with a single trunk, growing to more than 3 inches in diameter at maturity, and possessing an upright arrangement of branches and leaves. Trees are commonly referred to by their size, specifically their mature height. In this Guide, tree heights are divided into small, medium, or large height classes and are defined as follows:

Small Trees:	Less than 25 feet tall at maturity
Medium Trees:	25 to 40 feet tall at maturity
Large Trees:	40 to 100 feet tall or more at maturity

Trees, like people, are complex living organisms made up of many types of cells arranged into tissues and organs. Unlike people, they are only generating systems, and cannot regenerate new cells in the place of damaged or destroyed cells. Because trees generate new wood each year during the growing season, they can get to be very large and achieve a huge volume (size) and mass (weight).

The three main parts of a tree are its crown, trunk, and roots.

The crown is the woody and leafy component of the tree. It is composed of large, scaffold limbs that support smaller branches, twigs, leaves, and buds. The leaves absorb carbon dioxide and in the presence of sunlight produce food—carbohydrates—in a process called photosynthesis. As a by-product, the trees' leaves produce and release oxygen. Tree growth occurs at the tips of the branches, which can extend a few inches to several feet a year, depending upon the species and growing conditions. Tree crown size is measured as diameter in feet of the width of the branches at their greatest extent.

The horizontal projection of the tree crown onto the ground or the square foot area the crown covers, is defined as the tree canopy. Tree canopy cover is calculated by multiplying the width of the crown in the north-south direction by the width of the crown in the east-west direction. For example, a tree with a crown width of 40 feet in the N-S direction and a width of 30 feet in the

E-W direction has a canopy cover area of 1200 square feet. Estimates of mature crown canopy size categories for trees growing in urban areas are listed as follows:

Very Small Canopy:	150 square feet (approximately 12 x 12 feet)
Small Canopy:	400 square feet (20 x 20 feet)
Medium Canopy:	900 square feet (30 x 30 feet)
Large Canopy:	1600 square feet (40 x 40 feet)

The trunk is the main woody stem of the tree and supports the crown. While most trees normally have one stem or trunk, other trees are characteristically multi-stemmed. Carbohydrates and other substances necessary for tree growth are stored in the trunk, roots, and other woody portions of the tree. Water is transported up through the trunk to other parts of the tree. Tree size is often measured as dbh or “diameter at breast height” which is the diameter of the trunk at 4.5 feet above ground. For a tree forked at or below 4.5 feet, diameter is measured at the narrowest point below the fork.

You can calculate trunk diameter by measuring trunk circumference at 4.5 feet above the ground with a standard tape measure and dividing by pi or 3.14, a constant.

Diameter = Circumference x 3.14

Knowing the cross sectional area of the trunk may also be useful; the cross sectional area of the trunk at 4.5 feet above the ground is also referred to as a tree’s basal area. Basal area is often used to describe the stocking of trees (number and size) per acre of land. Cross sectional area is calculated by first dividing the tree diameter in half to get the radius, and then multiplying the radius times itself and then by 3.14.

Area= Radius x 3.14

Beneath the bark—the outer protective layer that covers the trunk, limbs, branches, and roots—there is a very thin layer of specialized cells known as the cambium layer. The cambium layer is where growth in trunk and root diameter takes place each year when both a layer of wood (xylem) is produced to the inside, and a layer of inner bark (phloem) and bark are produced to the outside. The cambium layer functions as the food transport system for the tree.

The roots are the underground structures that anchor the tree and absorb water and nutrients essential for tree survival and growth. The anchoring roots are large, rope-like, and woody and usually number from 4 to 11. Tree roots grow out from the trunk for a distance of at least 2 to 3 times the radius of the tree’s crown, or at least 2 times the height of the tree. However, they taper rapidly as they move away from the tree trunk.

While the large roots grow out from the tree trunk, many small, fibrous absorbing roots arise from the woody roots and generally grow up and into the top layers of soil and leaf litter—layers rich in organic material. Attached to the fine root hairs on fibrous roots are beneficial fungi that combine with the root hairs to form mycorrhizae, structures of benefit to both the fungus and the

tree. These structures increase the surface area that absorbs water and nutrients. Whether woody or fibrous, 85% of tree roots are located in the top 18 inches of soil.

Tree Growth

Trees require a certain amount of basic substances and a specific combination of environmental conditions to function, survive and grow. Each individual tree species, like all plant species, has a range of soil moisture, soil volume, soil nutrient and acidity levels, air temperature, humidity, and sunlight in which it will grow.

Under optimal conditions, trees will achieve their genetic potential for size, age, and form characteristic of their species. Under less than optimal conditions, trees will grow slower, be smaller at maturity, become easily stressed, have more dead wood, and will be more vulnerable to attacks by insects and disease organisms.

As stated earlier, trees cannot regenerate or replace cells damaged or destroyed with new cells in the same location. Because trees can only "seal" their wounds and cannot "heal" their wounds, any physical damage done to a tree's roots, trunk, or crown affects it for the rest of its life. This is important to understand before we cut or damage a tree's roots, wound its trunk, break its limbs, or prune it incorrectly.

The amount of energy that a tree is able to store has an effect on its ability to withstand unfavorable conditions and resist attacks by insects, fungi, bacteria, and other harmful organisms. This energy storage capacity is an important factor to consider when working around trees. Trees most affected by injury or stresses are those that store little energy, are fast growing, have inadequate soil volume and growing space, have been adversely affected by weather conditions, have been repeatedly wounded, or are at a critical point in their seasonal or life stage development.

The Critical Root Zone and Tree Protection Zone

Because trees contribute so much to our quality of life and because they can be a potential liability, they must be actively conserved, wisely selected, well placed, well planted, routinely maintained, and constantly protected. One of the most critical steps in planning for trees and cost effective ways of managing trees is to maintain adequate growing space for each tree's roots, trunk, and crown throughout the tree's life. Remember that as a tree gets older it gets larger and the growing space it requires increases accordingly.

For existing trees, there is a minimum amount of area, above (for the trunk and crown) and below ground (for soil health and the root system) that is required to protect trees and preserve tree health. This area has been identified as the critical root zone (CRZ) or tree protection zone (TPZ) by various experts and is generally agreed to be equivalent to the soil area below ground and the space above ground defined by the tree's dripline, or the greatest extent of the branches. This is depicted in Figure 1.

However, for small trees, newly planted trees, and trees with narrow crowns, the dripline defines an area that is too small for proper protection. So it is best to define both the critical root and tree protection zones as the circular area above and below ground with a radius equivalent to the greater of 6 feet or 1.5 feet for every inch in trunk diameter at 4.5 feet above the ground. For example, a tree with a trunk diameter (dbh) of 20 inches has a CRZ and TPZ of 30 feet (20 inches x 1.5) around the tree. While the radius of the CRZ (and TPZ) is 30 feet, the diameter of the entire CRZ (and TPZ) is 60 feet.

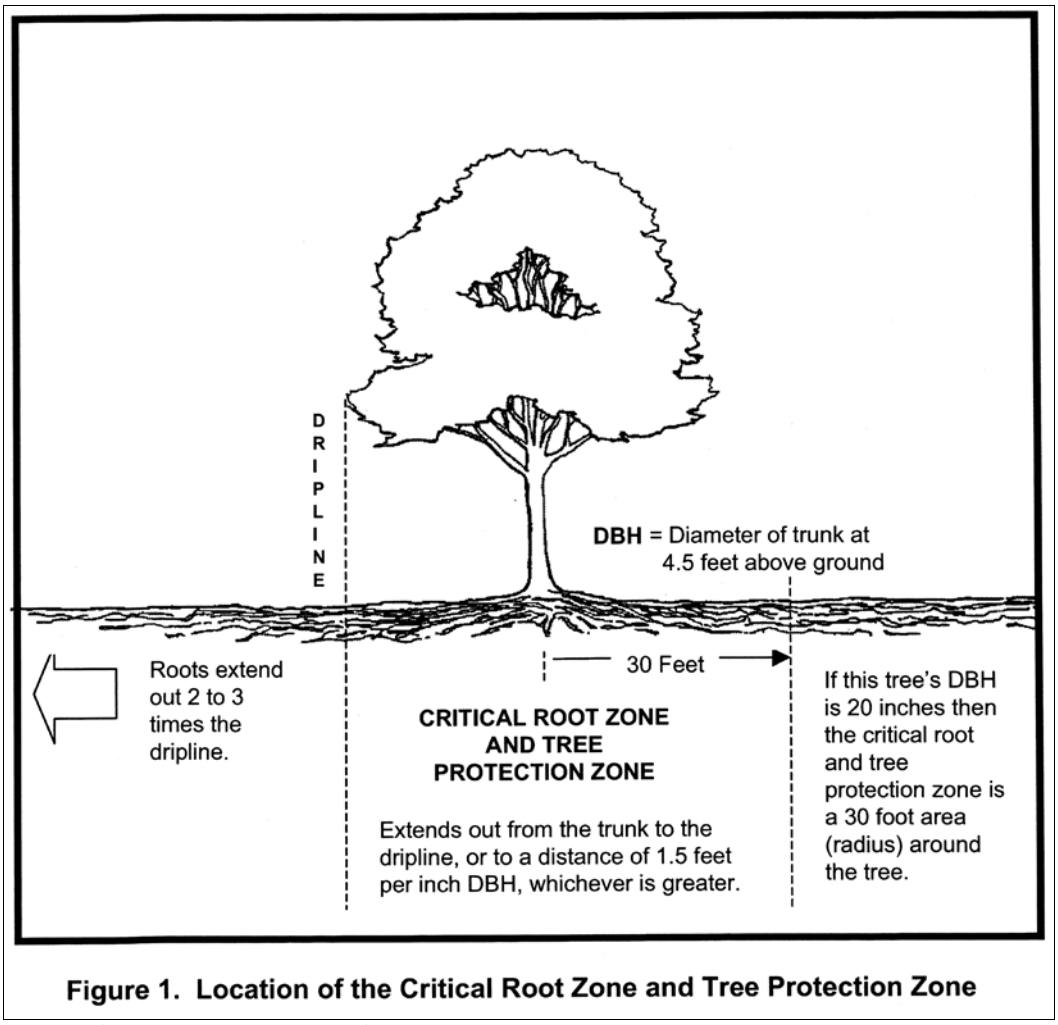


Figure 1. Location of the Critical Root Zone and Tree Protection Zone

Courtesy of Best Management Practices for Community Trees

A generalized requirement for the minimum amount of open soil surface area by tree canopy size category is listed below:

Very Small Canopy:	25 square feet (5 x 5 feet)
Small Canopy:	100 square feet (10 x 10 feet)
Medium Canopy:	225 square feet (15 x 15 feet)
Large Canopy:	400 square feet (20 x 20 feet)

The minimum depth of soil required for adequate root growth is 2 feet, or 24 inches and the maximum required is 3 feet or 36 inches. The minimum soil volume (in cubic feet) required for each tree canopy size listed above can be calculated by multiplying the minimum open soil surface area by 2.0 feet. For example, the minimum soil volume required for a tree with a large canopy is 400 square feet x 2 feet, or 800 cubic feet.

2 Shade Tree Selection

2.1 Preferred Species

In open areas (areas where structures, driveways and light standards are generally greater than 30 feet from planting locations) Plant at 35-40 foot intervals

Aceraceae Family

Red Maple *Acer rubrum*

Caesalpineae Family

Thornless Honey Locust *Gleditsia triacanthos Inermis* ***(susceptible to mimosa webworm infestion)*** ①

Euphorbiaceae Family

Hardy Rubber Tree *Eucommia ulmoides*

Fabaceae Family

Kentucky Coffeetree (males only) *Gymnocladus diocus*

Fagaceae Family

American Beech *Fagus grandiflora* ***(seeds are poisonous if ingested)***
White Oak *Quercus alba* ①
Scarlet Oak *Quercus coccinea*
Shingle Oak *Quercus imbricaria*
English Oak *Quercus robur*
Northern Red Oak *Quercus rubra*

Ginkgoaceae Family

Gingko or Maidenhair Tree (males only) *Gingko biloba* ①

Hamamelidaceae Family

Sweet Gum (seedless only) *Liquidambar styraciflua*

Nyssaceae Family

Black Gum or Black Tupelo *Nyssa sylvatica*

Platanaceae Family

London Plane *Plantanus acerifolia*

Tiliaceae Family

Little Leaf European Linden *Tilia cordata* ***(susceptible to Japanese Beetle infestation)*** ①
Crimean Linden *Tilia euchlora* ①
Silver Linden *Tilia tomentosa* ①

Ulmaceae Family

Hackberry *Celtis occidentalis* ①
Japanese Zelkova *Zelkova Serrata*

In tight areas (areas where structures, driveways and light standards are generally less than 30 feet from planting locations) Plant at 30-35 foot intervals

Betulaceae Family

American Hornbeam *Carpinus caroliniana*
Upright European Hornbeam *Carpinus betulus*

Corylaceae Family

Turkish Filbert Corylus colurna

Sapindaceae Family

Goldenraintree Koelreuteria paniculata

Columnar varieties of other preferred species

Under overhead wires Plant at 30-35 foot intervals

Aceraceae Family

Hedge Maple *Acer campestr*
Paperbark Maple *Acer griseum*
Tatarian Maple *Acer tataricum*

Betulaceae Family

American Hornbeam *Carpinus caroliniana*

Cornaceae Family

Kousa Dogwood (tree form only) *Cornus kousa* ①

Fabaceae Family

Eastern Redbud (tree form only) *Cercis canadensis*

Oleaceae Family

Japanese Tree Lilac (tree form only) *Syringa reticulate*

Rosaceae Family

Serviceberry (tree form only) *Amelanchier x grandiflora* or *Amelanchier laevis* ①
Hawthorne *Crataegus* – (including Ohio Pioneer, Winter Green, Thornless Cockspur, Lavalle, Washington, Winter King, Crimson Cloud English) ①
Crabapple (disease resistant only) *Malus*
Ornamental Pear (except Bradford) *Pyrus calleryana* cultivar ①

Parking Lot Trees

Any preferred variety of Maple *Acer*
Any preferred variety of Oak *Quercus*
Japanese Zelkova *Zelkova Serrata*
Thornless Honey Locust *Gleditsia Triacanthos Inermis*

Note ①: This species is resistant to Verticillium Wilt

2.2 Prohibited Species

Species	Comments
Ash *Fraxinus*	Subject to borers
Birch, Paper *Betula papyrifera*	Intolerant of stress
Box Elder *Acer negundo*	Weak wood, weak limb attachment
Catalpa *Catalpa speciosa*	Messy fruit
Cottonwood *Populus deltoides*	Weak, messy cotton, too large
Coniferous Evergreens, such as Fir, Hemlock, Pine, Spruce	Clearance problems
Elm, American *Ulmus americana*	Disease
Elm, Chinese	Weak, surface rooting
Elm, Siberian *Ulmus pumila*	Weak wood
Horsechestnut *Aesculus sp.*	Messy fruit
Larch	Clearance problems
Locust, Black *Robinia pseudoacacia*	Insects, borers on poor sites
Maple, Norway	Surface rooting, dense shade
Maple, Silver *Acer saccharinum*	Weak wood, weak limb attachment
Mulberry *Morus alba*	Messy fruit
Pear, Bradford	Weak wood, weak limb attachment
Poplar, Lombardy & any variety or hybrid	Weak wood, short lived
Russian Olive *Elaeagnus angustifolia*	Disease problems, weak wood
Sycamore *Platanus sp*.	Too large, messy, disease problems
Tree-of-Heaven *Ailanthus altissima*	Weak wood, invasive
Willow *Salix sp*.	Too large, messy
Any species listed on the current Pennsylvania Department of Conservation and Natural Resources Invasive Species List	

2.3 Tree Diversity

To promote species diversity and minimize impact of disease on the shade tree population, use the following table to determine the number of different species to be planted:

Number of Trees Proposed	Minimum Number of Families
1-10	1
11-20	2
21+	3

So as to minimize the potential impact of species-specific disease or pests, developers should avoid grouping trees of the same family together.

2.4 Selecting Quality Trees

The selection of the trees is one of the most important decisions when planting shade trees. The selection of the proper species for the location and context will increase the probability that the tree will grow to maturity without conflicting with the surrounding infrastructure and without suffering from stunted growth or early death from environmental hazards. Selection of strong, healthy trees of the proper species may initially incur greater expense, but is more likely to require fewer, if any, tree replacements in the future.

3 Planting Shade Trees

3.1 Best Planting Practices

Site Preparation

- ALWAYS call the PA ONE Call for utility locates before you dig to install trees.
- Till, harrow, or break up compacted soils in an area 5 to 10 times the width of the new tree's root ball or container.
- Dig a planting hole that is at least 2 times and as much as 5 times the width of the new trees s root ball or container.
- Dig the planting hole no deeper than the height of the new tree's root ball.
- Do not add soil amendments such as peat moss or fertilizer to the planting hole.

Tree Planting

- Move the tree using only the root ball or container; avoid using the tree trunk as a "handle" to move trees, which can break tree roots and damage the trunk.
- Plant the root ball at or slightly above ground level, never below.
- At planting the root ball wraps should be cut away from the top 1/3 of the root ball. All rope or twine securing the wraps should be cut away from the trunk to prevent girding. All non-biodegradable root wrapping (plastic, nylon or metal) and the twine are to be removed before planting.
- Backfill the planting hole with the original soil.
- Do not add fertilizer or other soil amendments to the planting hole.
- Water once when the planting hole is halfway full of soil, and again thoroughly when full to eliminate air pockets.
- Do not create a watering ring around the tree unless soil conditions are very dry; remove rings after one year.
- Do not stake the tree unless it is unable to stand upright on its own; always remove stakes and guy wires after 1 year. Staking of planted trees is generally not required, as the natural movement of the tree in wind will strengthen the root system. Only stake trees in areas where sidewalks or other obstructions will not allow the roots to spread and strongly anchor the tree.

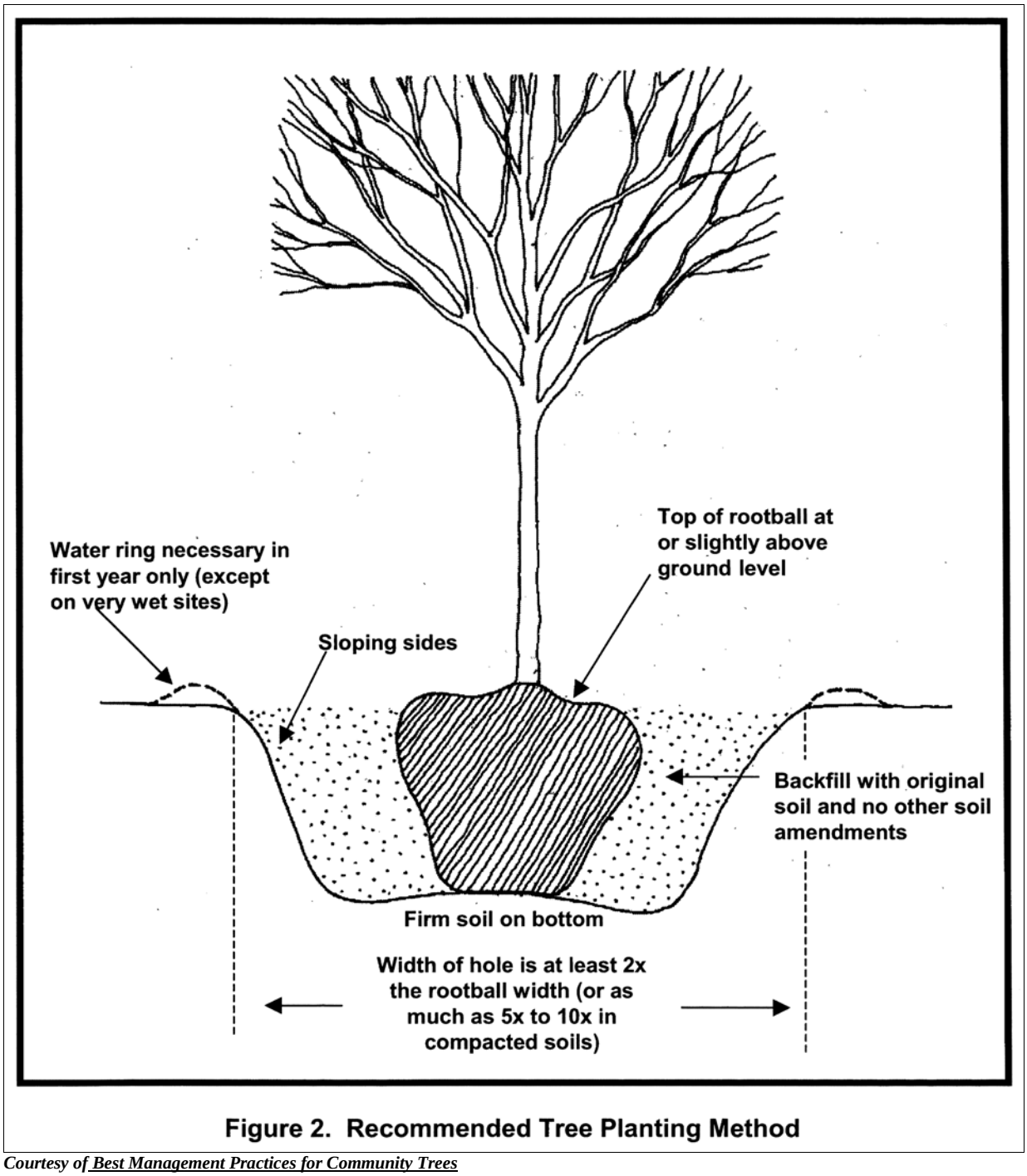


Figure 2. Recommended Tree Planting Method

Courtesy of Best Management Practices for Community Trees

New Tree Maintenance

- Mulch newly planted trees with leaves, pine straw, or other organic materials to 3-4" in depth and in a 5-foot radius around the tree, or as wide as possible; keep the mulch at least 5 inches from the tree trunk.
- Prune only dead, broken, crossed, or rubbing branches; prune annually thereafter.
- Water in the amount of 1" per week in the absence of adequate rainfall.

- Establish tree protection zones (TPZs) around new trees during construction activities.
- Inspect newly planted trees regularly to evaluate their condition and maintenance needs.
- Remove tree watering rings after one year.
- Remove stakes and guy wires after one year.

3.2 Acceptable Planting Locations

The Subdivision and Land Development Ordinance Section 11.38(c)(1) stipulates the planting locations for new subdivisions. For replacing shade trees, the Landscape and Shade Tree Commission will review all Shade Tree permit applications to approve the planting locations. See the sections below for guidance.

Site Selection

- Place trees where they have plenty of room to grow to maturity without their health or form being compromised by conflicts with infrastructure.
- Provide trees with an adequate amount of soil volume for tree growth and stability.
- Make sure there is now and will be at tree maturity adequate clearance from overhead utility lines, pedestrian and vehicular traffic, buildings, signs, and streetlights.

Between Sidewalk and Curb

This is the traditional location for shade trees. In existing subdivisions this is the preferred planting location.

Between Sidewalk and Property Line

This is the preferred location for shade trees in new subdivisions, as it allows the trees more room in which to grow, allows better sight distances for street traffic, presents fewer conflicts with underground and overhead utilities, and will require less pruning to keep branches from the cartway of the street. Ensure that there is at least five (5) feet of green space available between the sidewalk and the building restriction line. The trees are to be planted three (3) feet from the sidewalk. Additional street right-of-way or a shade tree easement will have to be dedicated so that the Township may exercise some control over the new shade trees, should this option is chosen.

In tight areas with many driveways, light poles and underground utilities

Ensure that shade trees are planted at least ten (10) feet from driveways and underground utilities and twenty (20) feet from light poles. Smaller shade tree species should be chosen in these locations.

In more open areas with few driveways, light poles and underground utilities

Ensure that shade trees are planted at least ten (10) feet from driveways and underground utilities and twenty (20) feet from light poles. Larger shade tree species should be chosen in these locations.

Under overhead wires

Every effort should be made to keep the trees as far from the wires as possible. Trees should not be planted directly under the wires unless no other alternative is possible. Smaller shade tree species should be chosen in these locations.

In areas without sidewalks

Ensure that shade trees are planted at least ten (10) feet from driveways and underground utilities and twenty (20) feet from light poles. The shade trees should be planted approximately two (2) feet inside of the street right-of-way.

4 Pruning and Maintenance

When pruning shade trees, please follow the guidelines below:

4.1 Pruning

(Portions courtesy of Best Management Practices for Community Trees)

Penn State produced an excellent pruning guide. A copy has been provided in the chapter appendix.

Pruning is the deliberate removal of tree branches and limbs to achieve a specific objective in the alteration of a tree's size, spread, health, and form. Regular inspections to determine a tree's pruning needs should be a part of every tree maintenance program. Always determine your objective before beginning pruning.

The American National Standards Institute (ANSI) and the International Society of Arboriculture publish tree pruning and safety standards, known as ANSI A300 Standards for Tree Care Operations.

The benefits of regular and correct tree pruning are:

- Better tree form, health, and structural integrity
- Removal of decaying and diseased wood
- Decrease in overall risk of limb failure

Some of the common mistakes made in tree pruning include:

- Improper techniques such as topping, stub cuts, flush cuts, and stripping the bark beneath the pruning cuts
- Using spikes to climb trees for pruning
- Waiting until limbs get large to prune them
- Pruning trees on a crisis only basis
- Pruning to reduce tree size as a substitute for proper tree selection and placement

Best Management Practices for Tree Pruning

- Hire only experienced professionals to prune trees; arborists certified by the International Society of Arboriculture are required to pass a written test of basic arboricultural knowledge and to attend continuing education courses to maintain their certification.
- NEVER "top" trees. This is an unacceptable practice and greatly decreases tree health, safety, and longevity.
- NEVER use climbing spikes or spurs while pruning trees, except during an emergency rescue.
- Trees should be inspected before climbing to determine the amount and extent of hazards, and the tree owner should be notified of potentially hazardous or harmful conditions.

- Keep pruning equipment sharp, clean, and in good operating condition.
- When pruning limbs that show evidence of disease, clean pruning equipment between trees.
- Always prune trees back to the parent branch or a lateral that is at least $\frac{1}{3}$rd the diameter of the branch being pruned.
- Prune just outside of the branch collar.
- At time of planting, prune only to remove dead, broken, crossed, or rubbing branches.
- Prune trees when young to develop branch structure, strength, and form.
- Prune off one of two leaders on trees with co-dominant (forked) stems.
- Prune trees regularly throughout their life to maintain vehicular, pedestrian, and sight clearance, and to remove deadwood and broken branches.
- Make proper pruning cuts using the 3-cut method, avoiding stub cuts, flush cuts, and wounds to remaining limbs and trunk (see Figure 3).
- Do not remove more than ¼ of the foliage of a mature tree in any one growing season.
- Do not remove more than 1/3 of the foliage of a young tree in any one growing season.
- Do not remove more than ¼ of the foliage from a branch unless you are removing the entire branch.
- Always wear personal protective safety equipment while pruning, including safety glasses.
- NEVER prune (or remove) trees located near energized electrical service or other utility lines; to have a tree growing beneath utility lines pruned or removed, contact your utility service provider.
- Talk to your utility provider about their needs for clearance and their pruning techniques designed to maintain that clearance.
- Employ natural target pruning and crown reduction pruning when pruning trees for line clearance instead of “topping”.

When removing a branch, make your cut back to the trunk or parent limb, just outside the branch collar, at an approximately 45 degree angle to the branch bark ridge. In Figure 3, Cut I is made first, then Cut 2 is made just outside of Cut 1. At this time the majority of the branch begins to fall, breaks at Cut 1, and is removed without stripping the bark below Cut 1. Cut 3 is then made just outside the branch collar or swelling at the base of the branch and the remainder of the branch or limb is removed.

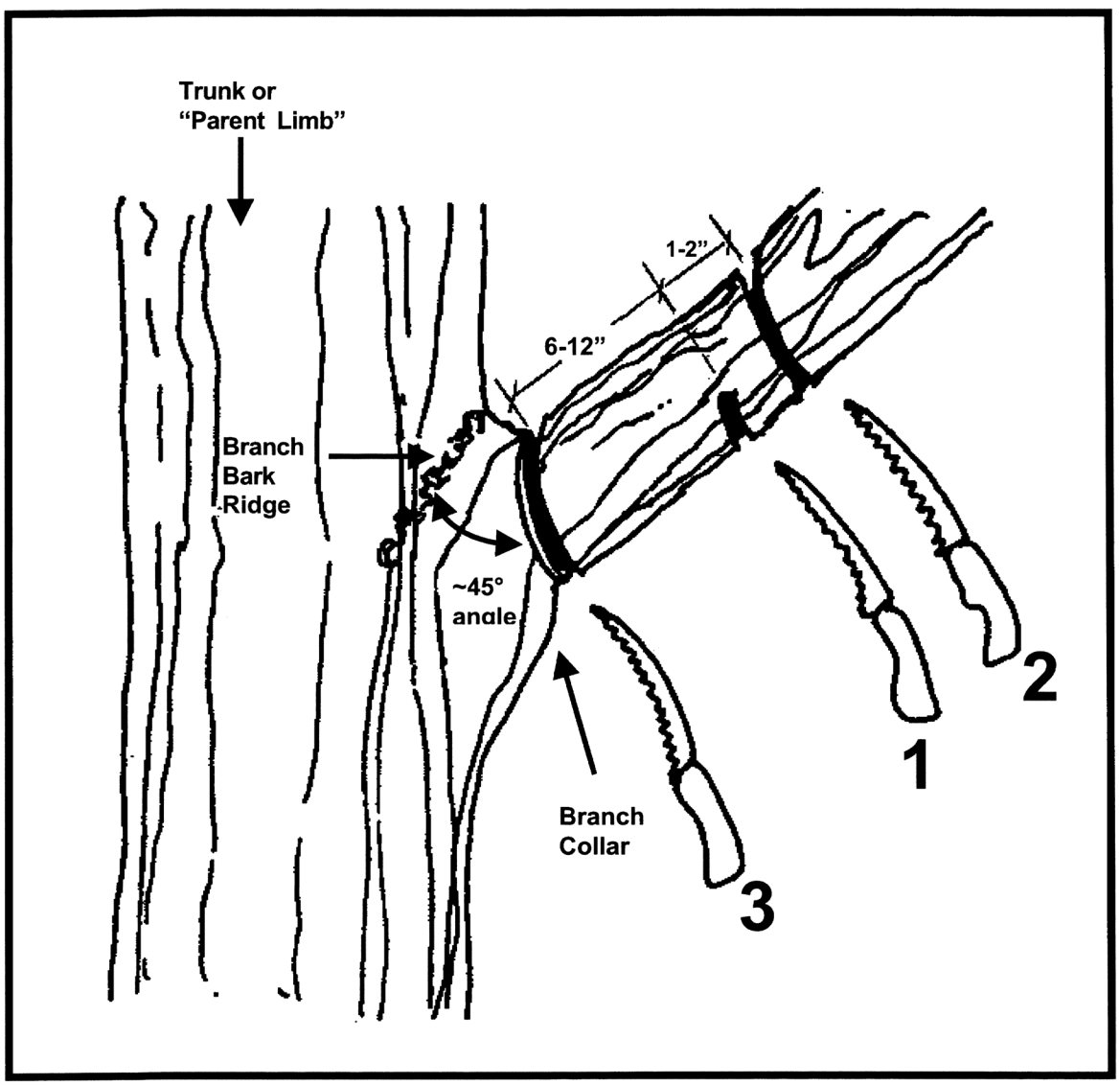


Figure 3. The 3-Cut Pruning Method

Courtesy of Best Management Practices for Community Trees

4.2 Topping

Topping shade trees in not acceptable. Topping weakens a tree and will likely lead to the tree's early death.

4.3 Mulching

(Courtesy of Best Management Practices for Community Trees)

Mulching is the application of organic material on top of the ground over a tree's root system to improve soil moisture and fertility and to enhance root and tree growth. The objective in mulching is to recreate the conditions found in undisturbed, natural woodlands. Mulching the around the trunk of a tree is encouraged, as it retains moisture for the roots. However, when

applying mulch, do not pile the mulch against the tree's trunk. Mulch against a tree's bark can trap moisture against the bark and cause it to rot. Mulch against the trunk can also encourage insect infestation of the bark surrounding the trunk. Form a "donut" of mulch around the tree. This will direct moisture toward the tree and keep the bark dry.

Mulching provides benefits to trees because it:

- Retains soil moisture
- Moderates soil temperatures
- Suppresses weed growth
- Improves soil fertility and structure over time
- Recreates the natural conditions under which trees grow in the forest, conditions which includes a thick layer of leaves and composted organic matter
- Eliminates the need for mowing and weed trimming around the base of trees

When mulching, these common mistakes are often made:

- Lack of regular mulch applications
- Mulch ring is much too small and covers very little of the root zone of the tree
- Mulch is piled up in a "volcano" fashion around the tree trunk
- Mulch is touching the tree trunk
- Black plastic, pine bark, or other impermeable materials are used for "mulch"
- String weed trimmers are used to cut weeds within mulch beds, often damaging tree trunks in the process

Best Management Practices for Tree Mulching

- Use organic materials such as pine straw, leaves, aged wood chips, and compost; avoid grass clippings, pine bark, plastic, and rocks.
- For newly planted trees, mulch an area at least six feet around the tree.
- For established trees, mulch out to the dripline or as far out as practical.
- Spread mulch in an even layer, 3-4" deep; avoid mounding the mulch around the tree trunk.
- Keep mulch at least 5 inches from the tree trunk to avoid creating favorable places for pests.
- Mulch twice per year, in the late spring and in fall during leaf fall.
- Use a tree's own leaves for mulch.
- Avoid using string weed trimmers around the base of trees to remove weeds within mulch beds; hand pull weeds or use a contact herbicide to kill weeds.

As simple as mulching can be, if done improperly it can cause problems for the tree such as insect, disease, and rodent damage, or a decrease in soil aeration or moisture. Use Figure 4 as a guide for recommended mulching methods.

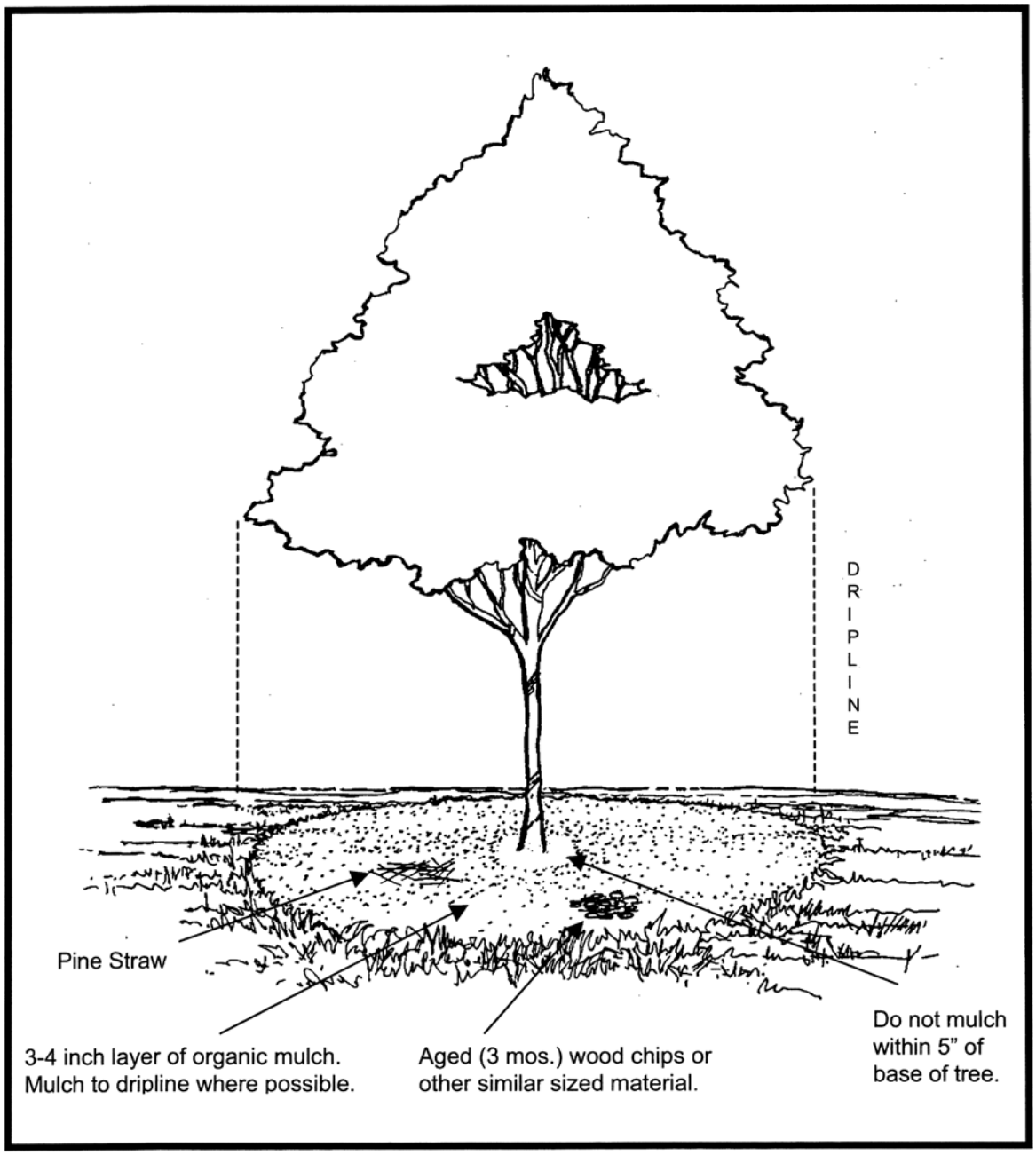


Figure 4. Recommended Method for Tree Mulching

Courtesy of Best Management Practices for Community Trees

4.4 Fertilization

(Courtesy of Best Management Practices for Community Trees)

Soil Health Maintenance is the preservation of natural soil conditions that are conducive to plant growth. Preserving soil health is essential to preserving tree root health, which in turn promotes whole tree health. While it seems that some trees will grow anywhere, most trees are particular about the soil conditions under which they will thrive.

Soil consists of basic components--mineral matter, organic matter, soil organisms, and pore spaces that hold water and oxygen. Both the texture of the soil (relative components of sand, clay, and loam) and the structure of the soil (arrangement of soil particles) are important factors in determining how much water and oxygen a soil can hold.

Soil fertility is also important, and can be evaluated using standard tests that measure the amount of phosphorous, potassium, calcium, magnesium, zinc, and manganese in the soil. The availability of these elements is affected by soil pH and organic matter content. Soil tests can determine the soil pH (acidity/alkalinity) and the amount of organic matter present by weight. The Penn State Cooperative Extension Service provides free soil sampling advice and soil sample analyses for a nominal fee.

Maintaining soil health and adequate soil volume provides the following benefits:

- Improved tree survival, growth, and longevity
- Maintenance of structural integrity of the root system and reduction in the probability of whole tree failure
- Allows for root development without intrusion of roots into sewer lines, reduced soil erosion and improved water quality

To maintain healthy soil and tree roots avoid these common mistakes within (and as far as possible beyond) the tree's critical root zone (CRZ):

- Compacting soil with foot, vehicle, and equipment traffic and materials storage
- Cutting roots by trenching for utility line installation or repair
- Grade changes, including cuts and fills
- Change in water drainage patterns and water levels
- Removal of topsoil without replacement
- Soil contamination from equipment washouts, vehicle and lawn maintenance chemicals
- Lack of adequate soil volume within and around hardscapes such as tree wells, plazas, and parking lots
- Fertilization without testing
- Heavy applications of fertilizer
- Heavy applications of weed and feed products to turf within the root zones of trees

Trees require adequate volumes of soil in which their roots can expand, allowing for tree growth. How much is enough? The amount of soil volume required by a tree varies with the species. An "adequate" volume of 920 cubic feet of healthy soil is recommended per square foot of tree trunk cross sectional area at dbh (per Kim D. Coder). Optimally, this volume is calculated for the potential, future diameter of the tree, and not its current size. The minimum soil depth recommended is 2.0 feet and the maximum soil depth is 3.0 feet.

It is very important to recognize that a tree's requirement for growing space and soil rooting volume increases as tree age and size increases. At the time they are planted, trees should be provided with enough growing space for their future, mature size. If adequate soil volumes are not available throughout a tree's life, then much more intensive management is required and the tree will be reduced in size, condition, and useful life span.

Best Management Practices for Soil Health Maintenance

- Maintain favorable soil conditions for root and tree growth at all times.
- Maintain adequate soil volumes for root growth throughout the life of the tree.
- Sample soil to provide baseline information on nutrient availability, organic matter content, and pH.
- Fertilize trees only as necessary and based upon the results of soil tests.
- Maintain a pH of 5.0 to 6.0 for optimal tree growth for evergreen conifers, and 6.0 to 7.0 for most broadleaf trees; know the pH requirements of your trees.
- Maintain a soil organic matter content of 5%.
- Mulch trees to increase soil nutrient levels and organic matter content and improve soil structure.
- Consider applications of mycorrhizae forming fungi (beneficial, naturally occurring) to improve water and nutrient uptake of trees in soils with low fertility.
- Use trees with non-aggressive root systems near underground sanitary and storm sewer pipes; plant trees as far from pipes as possible.
- Use root barriers to encourage roots to grow deeper near sidewalks, driveways, and walkways.
- Preserve native soils; if topsoil must be removed for construction or site grading, store on site and outside of the CRZ of protected trees, and replace after grading is complete.
- Maintain soil bulk densities below 1.4 glcc in clay soils, and 1.8 glcc in sandy soils.
- Maintain macro-pore space between 12 to 21% of soil volume.
- Avoid soil compaction within the CRZ; compaction decreases the amount of available water and oxygen and can injure or kill tree roots.
- Avoid parking vehicles or heavy equipment, or storing construction materials, beneath trees.
- Use vertical mulching techniques to improve soil aeration.
- Consider the use of "structural soils" to improve root penetration while achieving soil compaction standards.

4.5 Tree Irrigation

(Courtesy of Best Management Practices for Community Trees)

Irrigation involves the regular application of water to the root systems of a tree in the CRZ to supplement rainfall. Water is essential to tree growth, the absorption of elements and nutrients, and the production of food energy. Irrigation may be done simply using a hose, sprinkler, or bucket, or may be accomplished with a large capacity water tank or installed irrigation system.

Irrigation provides benefits such as:

- Better tree growth with fewer periods of stress and less susceptibility to insect and disease infestation
- Better tree survival, less replanting, more economical tree establishment costs
- Requires visits to the tree which can also serve as a time for regular tree inspections

  - When watering trees, avoid these common mistakes:

- Newly planted or damaged trees are not watered regularly during hot and dry periods
- Too little water is applied during each irrigation period, or water runs off and does not penetrate the soil
- Small amounts of water are applied too often, encouraging shallow rooting
- Trees are watered too much and too frequently, keeping roots and soil "waterlogged"
- Tree trunks are "watered" and remain wet for prolonged periods of time
- Watering rings created at planting are not removed after one year

Best Management Practices for Tree Irrigation

- Plant trees at or slightly above ground level to avoid creating a place where excessive water accumulates.
- Match tree species to soil moisture conditions, utilizing upland and drought resistant trees where soil moisture is typically low, and lowland and flood tolerant species where soil moisture is typically high or where the site is frequently flooded.
- Mulch trees to conserve water.
- Water trees before they show signs of water stress.
- In the absence of adequate rainfall, apply 1 inch of water per week during the growing season throughout the root zone of newly planted trees, damaged trees, or trees under stress.
- Water during the hours of 10 p.m. to 8 a.m.
- Water less often with greater amounts of water rather than more often with smaller amounts of water.
- Apply water evenly throughout the outermost 75% of the CRZ.

- Apply water slowly to avoid runoff outside of the CRZ.
- Water during winter droughts, especially evergreen trees, but only if the soil surface temperature is greater than 40 degrees.

The amount of water required for a tree depends upon its age, trunk diameter, and the size of its root zone. To determine the amount of water to apply to your tree's root zone, first calculate the radius of the CRZ. Then, calculate the number of seconds it takes you to fill a 5-gallon bucket of water with the hose or water delivery system you are using. Match that time to the closest number of seconds listed in Table 6 and to the radius of your CRZ to find the total application time required to water your tree. These numbers assume that you are watering the outermost 75% of the CRZ.

Table 6. Approximate Watering Time to Apply One Inch of Water Across Various Sized Critical Root Zones

Radius of CR2 (ft)	Volume of Water (gals) to Equal 1"	Total Application Time (minutes and hours) at a Delivery Rate of 5 Gallons Per Minute				
		5 sec	15 sec	30 sec	45 sec	60 sec
5	37	1 min	2 min	4 min	6 min	7 min
10	147	3 min	7 min	15 min	22 min	30 min
15	330	6 min	17 min	33 min	50 min	1 hr
20	587	10 min	29 min	1 hr	1 hr 30 min	2 hrs
25	917	15 min	46 min	1 hr 30 min	2 hr 30 min	3 hrs
30	1,322	22 min	1 hr	2 hrs	3 hr 30 min	4 hrs 30 min
35	1,799	30 min	1 hr 30 min	3 hrs	4 hr 30 min	6 hrs
40	2,349	39 min	2 hrs	4 hrs	6 hrs	8 hrs
45	2,973	50 min	1 hr 30 min	5 hrs	7 hrs 30min	10 hrs
50	3,670	1 hr	3 hrs	6 hrs	9 hrs	12 hrs

4.6 Pest Management

(Courtesy of Best Management Practices for Community Trees)

Pest Management is the control of weeds, insects, fungi, bacteria, or other tree pests through a variety of techniques and at a level that meets your management objectives. The best approach to pest management is an integrated one that utilizes prevention, biological controls, and--when warranted and absolutely necessary--chemical controls.

The benefits of timely pest management include:

- Increase in knowledge of impact and life cycle of tree pests
- Reduction in the number of trees affected
- Increased tree health with timely pest identification and management

Some common mistakes made in managing tree pests include:

- Trees are planted that are highly susceptible to common pests
- Changes in tree condition and pest symptoms and signs are ignored
- Pest problems are allowed to reach catastrophic proportions before treatment is considered
- Pesticides are over-used or are selected as the first option
- Pesticides are applied at a stage when they are ineffective on or do not reach the pest
- Tree trunks are painted white to defend against insects (this is not effective)

Best Management Practices for Pest Management

- Plant trees where their needs will match the site conditions to prevent stress and predisposition of trees to pest attacks.
- Mulch to relieve soil moisture stress and to suppress weeds; pull weeds by hand where necessary around the base of trees.
- Protect tree roots, trunks, and limbs from wounds. Wounds are entry points for insects and diseases.
- Learn the habits and life cycle of the pests affecting your trees, and know when to apply pesticides for the greatest effect.
- Hire only experienced and knowledgeable professionals to apply pesticides.
- Do not apply any soil active herbicides or weed-and-feed lawn formulations over the root systems of trees.
- Contact the Penn State Cooperative Extension Service for instructions on collecting insect and disease organisms or signs for analysis and identification.

5 Protecting Shade Trees

(Courtesy of Best Management Practices for Community Trees)

5.1 Overview

Tree Protection is any activity designed to preserve tree health by avoiding damage to tree roots, trunk, or crown. All trees should be protected throughout their lives from damage to maximize their health, useful life, function, and benefits. Small, newly planted trees need as much protection as large, mature trees. Tree protection can be passive or active.

Passive tree protection involves simply avoiding any disturbance or harmful activity near the tree. Active tree protection is required during land development, building construction and maintenance, infrastructure installation and maintenance, and other landscape changes that will have a major impact upon trees. For successful tree protection to occur, a good understanding of the concepts of the critical root zone (CRZ) and tree protection zone (TPZ) is required (see Section 1). Basically, both the CRZ and the TPZ extend out from the tree trunk 1.5 feet for every 1-inch of trunk diameter. A 20-inch diameter tree has a TPZ of 30 feet (radius around the tree).

Benefits

- Reduced long-term tree maintenance and replacement costs
- Reduced site preparation and grading costs
- Larger trees and greater canopy cover providing instantaneous benefits
- Positive feedback from neighbors and good public relations
- More diverse native plants and animals; many native trees are unavailable in nurseries and are difficult to re-establish
- Healthier trees, forest ecosystem, and environment

Common Mistakes

- No one knowledgeable about trees is involved in the planning and protection processes
- Tree conservation and protection are not considered in development planning
- Tree protection and “preservation” measures are attempted only after damage has occurred
- Tree protection zones are not established around trees on construction sites
- Tree protection zones are not clearly marked
- Tree protection zones are not large enough
- Fencing around tree protection zones is not sturdy enough
- Tree trunk and crown are protected, but soil and roots are not
- Tree protection is not monitored or enforced

In addition to avoiding the above mistakes, avoid these harmful activities and types of damage within the CRZ and TPZ:

- Removing topsoil during grading without replacing it before planting trees
- Trenching for utility line installation or repair
- Trenching for irrigation system installation
- Grade changes including both soil cuts and soil backfill
- Root damage by grading or grubbing
- Compacting soil with equipment, vehicles, material storage, and foot traffic
- Soil contamination from equipment washouts (especially concrete) and vehicle maintenance
- Installation and paving of parking lots, driveways, and walkways
- Placing nails, screws, and spikes in trunks to attach mail boxes, signs, lighting, or other structures
- Trunk wounds and broken limbs from vehicles and heavy equipment
- Trunk wounds from string weed trimmers and lawn mowers
- Fire injury or excessive heat

Some tree species and some individual trees of the same species are more tolerant than others to these activities and damage. A tree's tolerance depends not only upon the species but also upon the conditions present prior to and at the time of the damage. Tree health, soil aeration and moisture, the time of year the damage occurs, how long the damage lasts, its severity, and the weather conditions prior to, during, and after the damage all contribute to the tree's response.

Successful, active tree protection involves three phases. The first phase is planning for tree protection activities prior to the beginning of construction and meetings with all parties assigned responsibility for tree protection. The second phase is implementation and monitoring of the agreed upon tree protection measures. The third phase is follow-up tree maintenance after the activity is complete. Then, ongoing protection should be practiced for all trees on a daily basis.

5.2 Best Management Practices

Planning

- Plan and budget for tree conservation and protection as part of the development process.
- Plan for tree protection at least one growing season prior to the beginning of construction activities, where possible.
- Employ the services of a professional arborist, urban forester, or other tree care professional to assist in tree protection planning, implementation, monitoring, and follow-up maintenance.
- Plan for and protect trees located on adjacent property, protecting that portion of the roots, trunk, and crown growing into or over your property.

- Evaluate soil health and past site damage and incorporate into tree protection measures.
- Evaluate existing trees and select trees that will be conserved and protected based upon their location, species quality, health, and benefits.
- Remove trees within 30 feet of the proposed building or structure.
- Remove trees that cannot be protected, those having less than 15%-25% of their total height composed of tree crown, or those with more than one-third of the trunk wounded.
- Do not remove the best trees and conserve the poorest quality trees during thinning.
- Do not save trees that will not be protected.
- Conserve and protect trees in groupings where possible to facilitate their protection and maintenance and to keep the forest structure intact.
- Establish substantial penalties for tree damage and non-compliance with tree protection requirements.
- Complete pre-construction tree maintenance, which should include mulching of the CRZ, fertilization, supplemental irrigation as necessary, and pruning to remove dead, structurally weak, and low hanging branches.

Implementation and Monitoring

- Educate all workers on site about tree protection techniques and requirements.
- Establish a TPZ equal to a tree's CRZ.
- Establish TPZs early, prior to construction, using barriers or sturdy fencing around individual trees or groups of trees.
- Protect high value trees not only with barriers, but also with stem, branch, and root padding or wraps.
- Clearly identify the perimeter of TPZs with high visibility signs.
- Establish one access route into the site and one exit route out of the site.
- Confine construction offices, vehicular parking, worker break sites, and material storage to places outside of TPZs.
- Alter the route of underground and overhead utility lines that would require trenching or severe pruning of protected trees.
- Do not trench or excavate the soil within CRZs. Tunnel or bore at least 18 inches beneath CRZs to install utility lines.
- Where tree roots must be cut, make only sharp, clean cuts to promote root regeneration.
- Remove badly damaged trees that can attract insect and disease pests.
- Monitor compliance with tree protection requirements and tree health regularly during construction.

Follow-up Maintenance

- Complete post-construction tree maintenance, including pruning, mulching, fertilization, irrigation, and soil aeration where necessary.
- Apply at least 1 inch of water per week by deep watering in the absence of adequate rainfall.
- Fertilize trees with phosphorus, potassium, calcium, magnesium, and other macro- and micro-nutrients as indicated by a soil test, but wait at least one year to apply any nitrogen.
- Fertilize lightly with nitrogen after 1 year, and then make annual light nitrogen applications for the next 3 to 5 years.
- Inspect trees annually for at least 3 and up to 5 years after construction to look for changes in condition and signs of insects or disease, and to determine maintenance needs.
- Remove trees that are badly damaged or in irreversible decline.
- Continue to protect not only the large, established trees on the site but also those newly planted in the landscape.

Ongoing Protection

- Maintain an invisible passive TPZ (at the future, maximum CRZ) around all trees throughout their lives.
- Avoid damage to tree trunks and bark from mowers and string weed trimmers.
- Avoid trenching in the CRZ for utility line and irrigation system installation.
- Avoid damage to tree limbs and trunks during home maintenance and repair projects.
- Avoid soil contamination from oil, gasoline, paint, paint thinner, or other chemical washouts.
- Avoid crown (leaf) contamination from airborne particles from sanding, plaster repair, etc.
- Avoid digging within the CRZ to plant shrubs, flowers, and turf that will compete with the tree for water and nutrients.
- Avoid attaching wires, cables, conduit, mailboxes, or other objects to trees.
- Do not park or drive cars, trucks, or heavy equipment within the CRZ.
- Avoid placing paved walkways and driveways within the CRZ of valuable, large, and mature trees.
- Keep the CRZ mulched at all times.
- Increase a tree’s CRZ and TPZ as the tree gets older and grows larger.

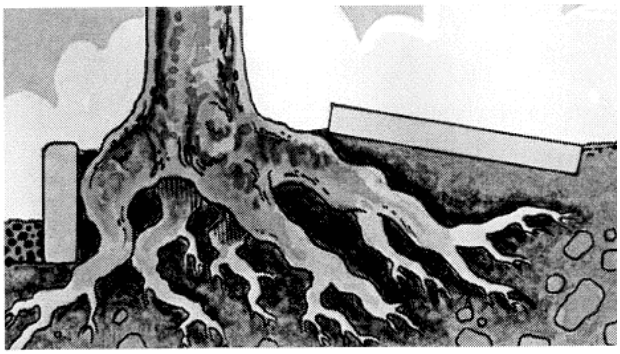
6 Shade Tree Conflicts

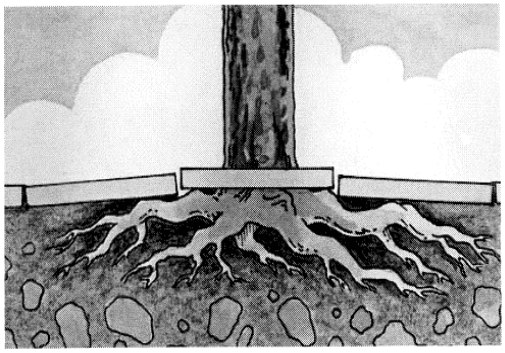
6.1 Sidewalk

One of the most common side effects of shade trees is roots displacing sidewalk. There are many solutions to this problem. Should the problem be minor in nature, the section of sidewalk can be lifted, smaller roots removed and the sidewalk reset into position. Concrete patch material may be used to bridge any gaps between separated sidewalk sections, or remove tripping hazards caused by elevated or depressed sidewalk sections. Should the problem involve larger roots, more radical measures may be required. The sidewalk may have to be removed and rebuilt completely to better accommodate the tree, or the tree may have to be removed to accommodate the sidewalk. Should the tree be removed, it will be likely that a replacement shade tree will have to be planted in its place. In any event, for sidewalk and/or curbing replacement, a Driveway/Sidewalk/Curbing Permit will be required. For a shade tree removal, a Shade Tree permit will also be required. During the review process, the Landscape and Shade Tree Commission will determine if a replacement tree is to be required. Property owners are welcome to meet with the Landscape and Shade Tree Commission to discuss the problems.

Lifted Sidewalks

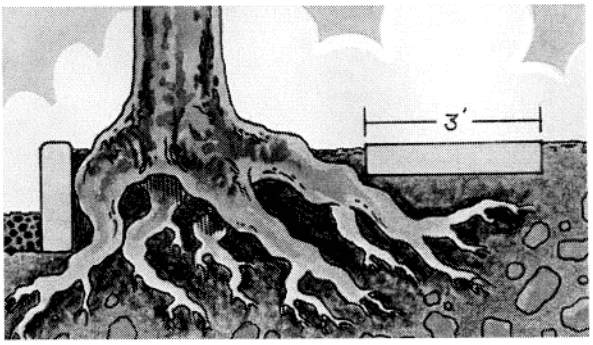
When tree roots lift a sidewalk, the best solution is…





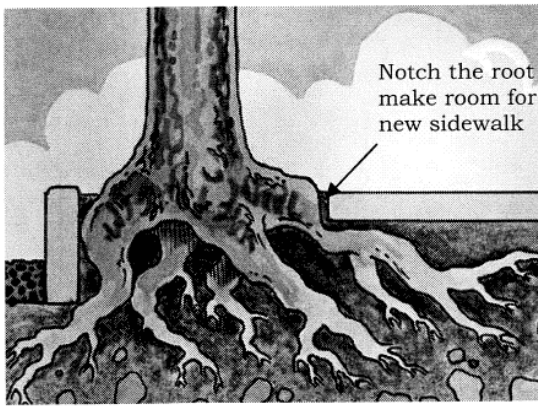
If you are installing a new sidewalk, you can go around a tree, or create a large tree pit covered with bricks that can be removed as the tree grows.

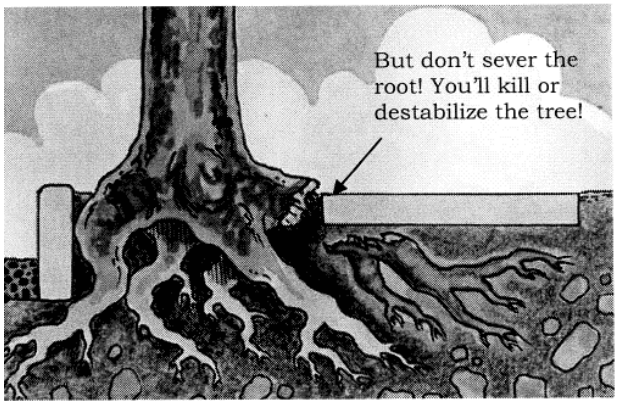
If you have room...to reduce the width of the sidewalk.



courtesy of Pottstown's Shade Tree Program

If you don't have room to go around tree roots, you can "shave" the roots with a hatchet by removing small roots and notching large ones about 3 inches below ground level to allow room for a new sidewalk over the roots.

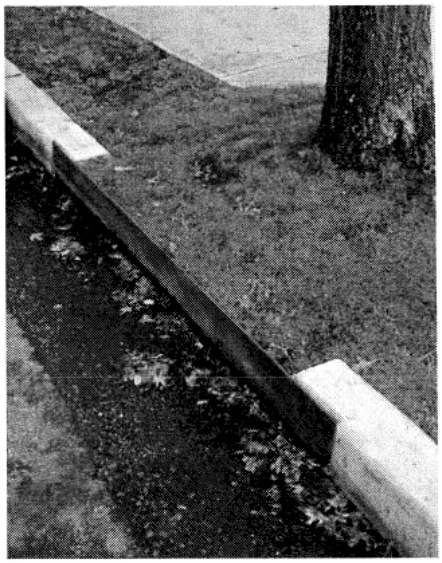




courtesy of Pottstown's Shade Tree Program

6.2 Curbing

Larger shade trees can push curbing into the street, sometimes to the extent of destroying the curbing itself. The property owner is responsible for the maintenance of the curbing. The remedy to the situation is similar to that of sidewalk. If a single large root is the problem, notch, do not cut, the offending root. If the problem is more than a single root, the concrete curbing may be replaced by a steel curb as shown below. In extreme cases, the tree may have to be removed entirely. If any work is to be done on the curbing or street, please contact Public Works Department. A Driveway/Curbing/Sidewalk permit will also be required for the work in the right-of-way of a public street.



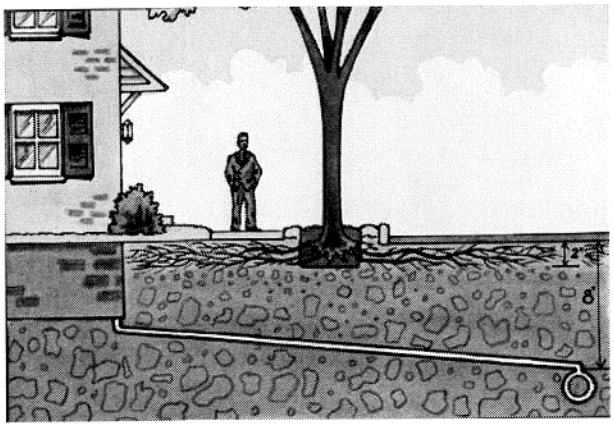
Courtesy of Pottstown's Shade Tree Program

6.3 Surface Rooting

Surface rooting is a situation where the roots of a tree run close to or at the surface of the ground. The subsurface roots may cause the ground and/or turf above to be elevated. Exposed roots may cause tripping hazards or may be easily struck by lawn mower blades. Some tree species will send up shoots, or "suckers", from exposed roots. Surface rooting is a tendency of certain tree species. Short of removing the tree itself, there is little that can be done to deter a species that will surface root. Care should be taken with damaged roots, as a open wound can allow pests to attack and damage the tree.

6.4 Underground Utilities

Ninety percent of a tree's roots grow in the top 30 inches. Even so, the only way tree roots can enter a sewer pipe is if there is a break or leak, just as the only way rain can enter a surface building is through a leaky roof.



Tree roots will not penetrate a sound sewer line. If tree roots enter a sewer line, it is because the pipe is faulty. When a sewer pipe breaks or leaks because of age or improper installation, nutrients and water ooze into the surrounding soil. This will attract any nearby roots, which will thrive and may even enter the defective pipe and block the passage.

Modern sewer pipe is made of iron or plastic. Problems can be prevented by:

* Proper construction of new sewer lines, including tight joints and a firm soil base.
* Repair or replacement of defective sewers. Repeated blockage may indicate a damaged pipe.

Courtesy of Pottstown's Shade Tree Program

6.5 Above-Ground Utilities

Branches cause many conflicts with above-ground utilities. In the case of a tree/utility conflict, contact the owner of the utility—usually the electric, phone or cable company. The Township does not own, nor have responsibility for, overhead utilities. Contact the Township only in cases where downed lines may present a hazard to residents.
PPL will trim trees so as to minimize conflicts with overhead power lines. If you have questions regarding their pruning procedures, contact PPL.

7 Removing and Replacing Shade Trees

Tree Removal and Replacement are activities that will have to occur for every tree at some point. The overall goals of tree removal and replacement are to maintain public safety and community forest health while also preserving tree canopy cover.

There are many reasons why trees must be removed. They may be growing in the wrong location, without adequate growing space, and are in conflict with hardscape (driveways, walkways, etc.) or other infrastructure (buildings, roadways, overhead utility lines). They may be old trees that are at the end of their normal life span. They may be dead or in poor or hazardous condition and require removal to protect the safety of the owner or the public in general. Whatever the reason for removal, the site should be evaluated to determine if another tree can be planted in the same or a nearby location to maintain tree canopy cover in the area.

The benefits of timely tree removal and replacement include:

- Reduced risk of failure with the prudent removal of trees
- Reduced risk of pest infestations and damage to other trees
- Additional space for new, vigorously growing trees
- Dynamic, diverse community forest
- Maintenance of tree stocking levels

Common mistakes made in tree management that cause tree removals include:

- Trees are not provided with adequate space to grow to maturity
- Large maturing trees are planted beneath utility lines
- Trees are neglected and not routinely maintained
- Tree preservation activities are undertaken only when a tree is in poor condition
- Trees in poor condition without reasonable chances for improvement or repair are left to fall apart instead of being removed
- Trees are planted that have a characteristic unsuitable for their location

Best Management Practices for Tree Removal and Replacement

- Have an experienced arborist evaluate tree health and risk for failure before removing old, large, landmark, or historic trees, or trees damaged in a storm.
- Hire only experienced professionals to remove trees.
- Reduce the number and frequency of necessary tree removals through proper tree selection, placement, protection, and maintenance.
- Evaluate trees at risk for failure using standard methods which include the assessment of the probability of failure, size of part that may fail, and the targets that may be affected should the tree fail.
- Remove trees in irreversible health decline and poor condition.

- Removes trees creating a hazardous situation that cannot be remedied with pruning, cabling and bracing, or removal of the target
- Remove trees with characteristics in conflict with the site (oak with large acorns planted in a parking lot).
- Remove trees located where growing space is inadequate.
- Remove trees with unattractive form, or messy, hazardous, or noxious flowers or fruit.
- Replace trees wherever and whenever possible, planting large canopy trees if space permits.
- Request the local power company to remove trees located near or beneath utility lines; do not attempt to remove these trees yourself.
- To preserve landmark or historic trees with an increased risk of partial or whole tree failure as long as possible, consider removing the target by restricting public access or moving valuable structures.
- Positively identify ownership before authorizing tree removal.

APPENDICES

Chapter 2 Community Forestry Education Project Fact Sheet

Buying Quality Community Trees

What does that mean?

- **Buying trees is like buying anything else: you need 1) to write detailed specifications before seeking bids, and 2) to check over the actual trees on delivery.**

Why is it important?

- **The first step in avoiding *future* hazard trees is to plant high quality stock.**
- Poor stock will end up costing you much more money in the long run because of:
  - increased rates of maintenance
  - shorter life span.
- The best insurance:
  - deal with a reputable nursery
  - establish careful specifications
  - reserve the right to reject upon delivery
  - get a two-year warranty if possible

But can't you save a lot of money by buying cheap trees?

- **If you have a knowledgeable and critical eye, it *is* possible to save money.**
- But trees are usually cheap for a reason:
  - they may be an undesirable species
  - they can have diseases
  - they often show poor structure
  - they may have dried out

What do you look for?

- ***OVERALL***
  - health and vigor (at least 4-6" between the old bud scar and the end of the twig)
  - symmetrical general form, with a balance between height and spread
  - freshly dug trees grown for your particular use in a climate similar to yours
- ***CROWN***
  - a single and undamaged central leader (except for certain ornamental trees)
  - well-spaced branches that are evenly distributed around the trunk
  - no branches with a narrow angle to the trunk (except for trees like Japanese zelkova)
  - no sign of insects or diseases (egg masses, leaf problems, grubs, etc.)
- ***TRUNK***
  - a straight trunk, with no damage except minor scrapes and cuts
  - the caliper size you need (in an urban situation, at least 2" is often specified)
  - no recent pruning wounds
  - no signs of insects (e.g., borer holes) or disease (e.g., sunken areas)
- ***ROOTS***
  - a well developed root system, but not a dense mass from being pot-bound
  - no girdling roots--make sure to look, or at least reach your hand down
  - if balled and burlapped, only natural burlap or wire baskets
  - a rootball sized to the height of the tree (see *American Standard for Nursery Stock***)**

How can I be sure we plant high-quality trees?

- Deal with a reputable nursery
- Inspect all stock carefully
- Be sure all your specifications state: "All plants must conform to the current edition of the *American Standard for Nursery Stock ANSI Z60.1*"

TREE ROOT DAMAGE

Why does this topic matter?

- **The survival of urban trees depends critically on the health of the roots.**
- **Roots and shoots are linked** through a kind of circulatory system: what hurts the one, hurts the other.
- Roots supply water and nutrients to the shoots, and get back sugar and other compounds they need to live.
- Roots also store food, synthesize hormones, and provide support.
- Most tree roots lie in the top 6-18" of the soil, and usually extend far out from the trunk.

When does damage happen?

- When something cuts the roots, stops them from growing, or prevents them from breathing, it causes damage and threatens the life of the tree.

- Common urban activities that often damage roots include:

    - building construction
    - road widening
    - utilities repair
    - sidewalk replacement
    - lawn parking
    - patio or paving installation
    - grade change
    - stockpiling on the ground

- Damage to the root system can often be detected from discoloration, reduced size, or death of part or all of the tree's crown.

How do these acts hurt the tree?

- **Loss of support.** When the big buttress roots are cut close to the tree, the tree has no support on that side and is prone to windfall.
- **Loss of water.** Cutting the roots that supply water makes the tree vulnerable to drought, and also to pests that attack water-stressed trees.
- **Loss of nutrients.** Roots must grow to take up many nutrients**,** and when the soil is compacted by traffic or other loads, roots are unable to penetrate it.
- **Loss of food**. Roots, like people, must be able to breathe to use the food they get from the leaves. When roots are smothered, they die from starvation.

How can the roots be protected?

- Fence off the ground underneath the tree's crown *before* construction begins. If traffic must go through that area, first put down 12" of gravel or coarse mulch.
- Work with your utility company to tunnel under tree roots, when appropriate.
- When replacing sidewalks, lay them around (or up and over) the roots of older trees.
- Don't raise the soil grade over roots more than a few inches without special precautions to make sure they can get the oxygen they need.
- Set paving blocks in sand, and don't mortar them together.
- Mulch wide and 2-6" deep, especially younger trees trying to establish their roots.

Staking Trees

What is it?

- Staking is a technique used to protect, anchor, and support recently transplanted trees.

Do I need to stake trees?

- **NOT USUALLY. Most young trees can stand unsupported, and will be stronger without stakes.**
- **Staking actually delays the creation of a strong tree.**
- Trunk movement signals the lower trunk and roots to produce increased growth. A better trunk taper and root system results.
- Research shows that bare-root trees can stand unstaked as well as B&B or containerized ones.

When is staking recommended?

- There are certain situations where staking can be advisable:
  - very large tree size
  - fall-planted evergreens
  - high wind conditions
  - very weak trunk
  - high population pressure

What are the potential drawbacks of staking?

- Poor trunk development at the base of the tree.
- Increased trunk caliper near the support ties, which produces a negative trunk taper and restricts the vascular tissue conducting water, nutrients, and sugars.
- Wounding or girdling from ties too tight against the trunk, especially when they are left on too long..
  - concentrated pressure from narrow ties (e.g. elastic webbing, wire, or even wire through a hose) will crush or cut through the bark.
- More wind throw and wind damage later, particularly when the tree is staked rigidly.
  - most susceptible are shallow-rooted evergreens and trees with a large "sail."

What are the current recommendations?

- **Don’t stake if you don’t have to.**
- **Remove stakes and ties within 1 year.** The problems start when they are left on.
- **Use flexible ties with a broad, smooth surface.**
- *If* vandalism is a consideration: instead of staking, try planting larger caliper trees, or encircling the tree with heavy posts, wire, or metal grill work.
- *If* protecting from mowers and foot traffic: sink three 4' stakes halfway into the ground, 15" or so from the tree, and run a line between them to make a triangle.
- *If* follow-up maintenance within 1 year is unlikely: use 2" x 2" pine stakes, and UV degradable ties. The stakes and ties will fall off by themselves.

If staking because the trunk is too weak: place the ties 6" above the lowest point where, when you hold the trunk, the top will still return upright after being bent to the side.

Chapter 4

Pruning Landscape Trees

Contents

PENNSTATE
College of Agricultural Sciences

Why Should Trees Be Pruned?

Proper pruning of landscape trees improves their structural strength, maintains their health, enhances their beauty, and increases their value. Pruning is advisable if:

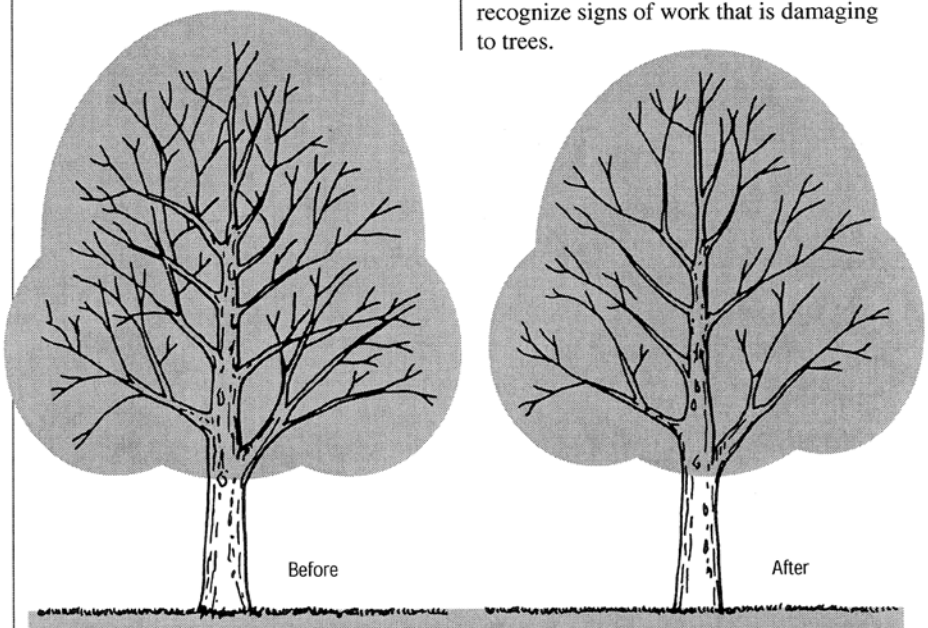
- trees have crossing branches, weak crotches, or other defects
- branches are dead, dying, decayed, or hazardous
- lower branches interfere with people or vehicles, or block visibility of signs
- branches are growing into buildings or utility wires
- limbs have been broken by storms
- trees have grown too large and might injure people or damage property

Landscape trees not only make homes and communities more beautiful, but they also improve our environment and can increase the value of a property up to 20 percent. Trees are truly assets that need to be enhanced and protected. Proper pruning is definitely a worthwhile investment!

Who Is Qualified to Prune Trees?

Simple types of pruning, such as cutting lower branches from small trees, can be done by anyone who understands plants and has the proper tools. But only qualified arborists should train young trees or climb into larger trees to prune them. That type of tree work requires knowledge of scientifically based pruning techniques, tree physiology, and safety practices, as well as working experience with various tools and tree species. Because proper pruning is complicated and examples of shoddy and unsafe work abound, national standards have been developed for the best methods and safety. Any potentially hazardous activity associated with climbing trees, using power tools, and especially working near electric lines should be left to qualified professionals who follow the national tree safety standards.

This circular offers guidance for those who want to prune young trees. It also can help you find a qualified tree professional, understand proper pruning practices, and recognize signs of work that is damaging to trees.



Thinning a tree removes unwanted branches, reduces weight, and allows light and air penetration.

Selecting a Tree Care Professional

A qualified and reputable person or company should be hired to perform tree work, not an individual with a chain saw trying to make a fast buck. It is very difficult, if not impossible, to repair damage that has been done by poor pruning. In tree work, the old adage "you get what you pay for" is usually true. Tree care practices have changed in the last ten years based on the latest research, and will continue to change. It is important to hire a qualified arborist, preferably a Certified Arborist, who keeps up with proper, safe tree care techniques and will provide high-quality work at a fair price. The following guidelines can help you to select a qualified arborist and ensure proper tree care.

Always have at least two or three tree care firms examine and bid on your tree work. Usually, these firms will do so at no cost. For referrals, contact a local municipal arborist, the cooperative extension office in your county, the International Society of Arboriculture (ISA), or the National Arborists Association (NAA). Tree care professionals are members of professional organizations such as the ISA and the NAA. (See the concluding section For More Information.). Reputable tree service companies generally do not solicit door to door, as they rely mainly on repeat customers. If possible, include a Certified Arborist among those whom you contact to examine your trees. Arborists certified by the ISA have passed a test of their knowledge and must continue their education to maintain competency.

Ask for a written estimate detailing the work to be done from everyone who examines your trees. Terminology used on bids should match the tree pruning guidelines and standards explained later in this publication. If terms like topping or rounding-over are used, be wary of improper pruning and consider another firm. Do not blindly accept the lowest bid. Remember, in tree work a good job can be slightly more expensive. Try to schedule work in fall or winter, when rates may be lower. Ask to be shown proof of liability insurance and worker's compensation insurance.

Ask the bidders where you can see trees they have pruned and examine their work firsthand. The following are indicators that proper pruning has been done:

- use of thinning cuts, rather than topping, heading, or stub cuts, so that the natural form and branching habit of the species is preserved
- cuts placed just outside the branch collar, not flush cuts
- absence of torn bark where branches have been cut, and no sign of bark punctured by climbing spurs
- no "lion-tailing," or clumps of foliage at the ends of branches caused by removing all or most of the inner foliage
- cut surfaces untreated with wound dressing or tree paint, which can injure trees

Once you have decided on an arborist, demand a written contract that briefly but clearly states all of the following:

- type and amount of work to be completed and the techniques to be used, with reference to the *ANSI A 300 Tree Pruning Standards* or *International Society of Arboriculture Tree Pruning Guidelines*
- total cost of work to be done, not just total cost per tree
- who will be responsible for clean-up work and to what extent
- who will receive any firewood or other products
- starting and completion dates

Do not pay in advance, but wait until all terms of your contract have been fulfilled.

Use the following information to ensure that your trees will be pruned in the proper manner and for the right reasons. Familiarity with pruning methods will help you hire a qualified arborist who will do the job right.

Types of Pruning Cuts

—A *thinning cut* removes a branch at its point of origin on the trunk, or shortens a limb to a lateral branch large enough to resume the growth of the pruned limb (Fig. 1). Thinning cuts leave no stubs. They are used to remove damaged, dead, or weak branches, reduce the length and weight of heavy limbs, or reduce the height of a tree. Thinning cuts are placed so as to distribute ensuing growth throughout a tree and retain or enhance a tree's natural shape. In almost all cases, thinning cuts are the proper type of cut to use in tree pruning.

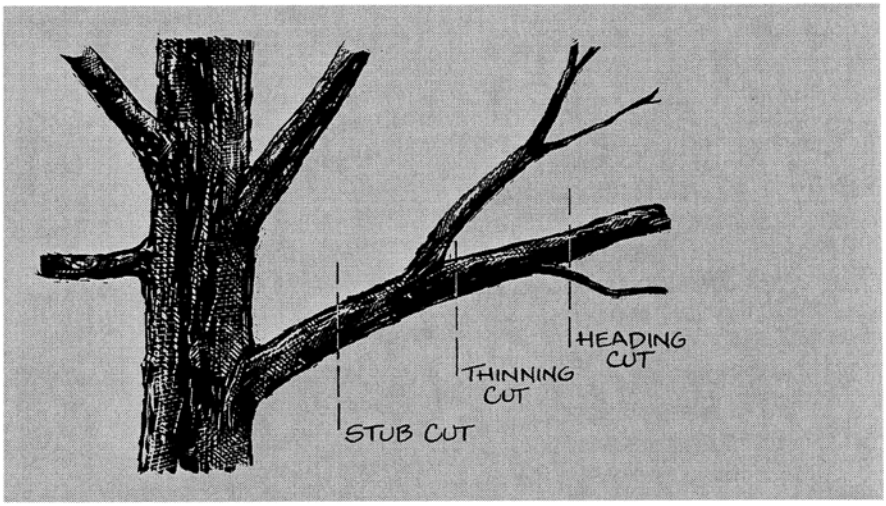


Fig. 1. When using thinning cuts, always remove or shorten a branch to a side branch that is at least one-third the size of the one being cut. A branch that is 3 inches in diameter would be pruned back to a side branch that is at least 1 inch in diameter. Do not remove more than 25 percent of a mature tree's foliage in any year.

Thinning cuts on larger branches can be referred to as drop crotch pruning.

—A *heading cut* trims a branch back to a bud, or trims a branch or leader back to a small branch not large enough to assume the growth of the pruned branch. Heading cuts are only appropriate for specific reasons that apply to some species. Heading cuts should only be used when pollarding trees or shaping terminal flowering plants such as roses; they should not be used for topping trees. Topping has been described as the "ultimate in destructive practices," and in almost all cases it permanently damages a tree's health, structure, and appearance.

—A *stub cut* is like a heading cut but is made indiscriminately to a point on a branch or leader where no bud or branch exists. A stub cut, like a heading cut, is used when a tree is topped. Topping is only appropriate when sections of limbs are cut off during the removal of a tree.

Tree Topping

Topping of trees using stub cuts and heading cuts should not be done for several reasons. Topping reduces the ability of a tree to produce food. Shock and long-term declining health resulting from topping can make a tree more susceptible to insect and disease problems and can lead to its death. By removing the branches that protect a tree's crown, topping can lead to sun scalding of remaining branches. The stubs and sun scalds resulting from topping cuts are highly vulnerable to insect invasion and the spores and actions of decay fungi. Numerous water sprouts resulting from topping are weakly attached and grow so rapidly that a tree can regain its original height in a short time with a more dense and unwieldy crown. With their natural form and beauty disfigured, topped trees are ugly to most people. Topping can reduce the value of a large ornamental tree by thousands of dollars. Although tree topping may cost less and take less time and knowledge than using thinning cuts (the proper pruning technique), you would be paying for an inferior service.

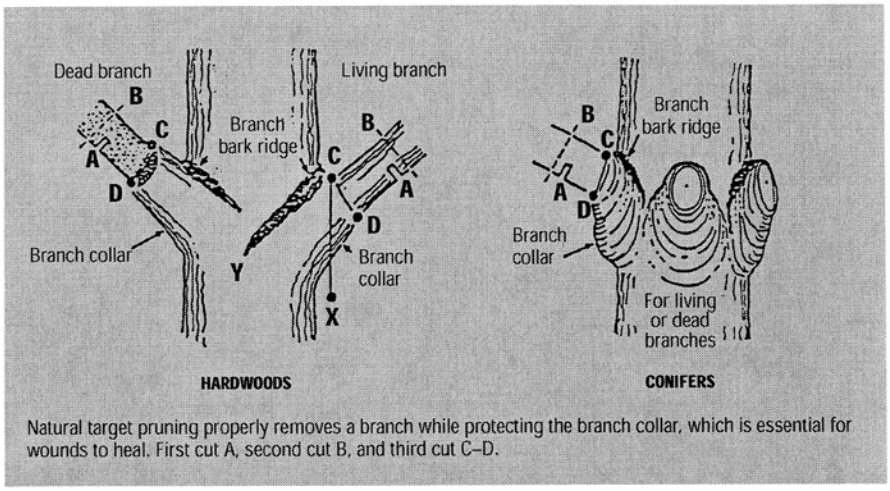
Training Young Trees

Before pruning a young tree, it is important to consider the natural form and desired future growth of the tree. Some trees like pines and sycamores have strong central trunks and require little pruning. Others, such as oaks and maples, branch out more. Pruning should accentuate the natural branching habit of a tree and should also correct structural problems. By correcting any defect in the structure of a young tree, pruning helps develop a mechanically stronger and healthier tree.

A few minutes of thoughtful pruning spent on a young tree can eliminate hours of costly future maintenance and corrective pruning on mature trees. Ideally, pruning should be done over several years, whether it is to provide clearance or to train a young tree. Prune as little as possible in the first two years after a tree has been planted, so there will be enough temporary branches and leaves to produce food for the growth of roots, trunk, and branches. Newly planted trees will gradually restore the balance between roots and branches; excessive pruning can be detrimental and delay the return to normal growth. When a tree is planted, prune only broken, malformed, or diseased branches. Remove any double leader so that one dominant trunk is maintained. When you prune a branch, do not leave a stub or cut flush against the trunk. To remove a branch, make a slanting cut just outside the branch collar (the swollen area at the base of the branch next to the trunk depicted in Fig. 2). Removing branches before they exceed 1 inch in diameter will keep pruning wounds small.

Clearance requirements are an important consideration. Street trees or trees along walkways and driveways must have limbs high enough to safely accommodate pedestrians and vehicular traffic, signs, and lights. Branches that grow 6 feet off the ground will always remain at that height and may droop as they grow longer. Trees grow from the tips and the tops, not from the bottom. If clearance is not a problem, keep branches on the tree to help the tree grow. The need to prune for clearance can be minimized by purchasing trees that have been nursery grown to street tree specifications.

About two or three years after planting a tree, examine it closely and prune any broken, malformed, or diseased branches. Also, remove any suckers from the base of the tree. Step back and look at the tree from all sides to select the permanent



Natural target pruning properly removes a branch while protecting the branch collar, which is essential for wounds to heal. First cut A, second cut B, and third cut C–D.

Fig. 2. To promote closing of a pruning wound by wound wood, always use the three-step or natural target pruning method when removing a branch. This pruning method protects the branch collar (the shoulder rings and swollen base of a branch) and prevents the tearing of bark. Do not leave a stub when you prune a branch, and do not cut flush against a trunk. Thinning cuts should be made with sharp tools and should be kept as small as possible, clean and smooth.

branches and branch structure that the tree will have for its lifetime. When deciding which branches to remove, consider the following (see Fig. 3):

- Thin or prune back any unusually long branch that competes with the leader for dominance.
- Remove any branch that crosses or rubs another, keeping the branch that conforms to the natural form of the tree. Thin out excessively crowded branches.
- Wide angles between the limb and trunk are stronger than narrower ones. Remove branches that have much narrower angles between branch and trunk than are typical for the species.
- Remove the lower branches to provide safe clearance and visibility, gradually over several years.
- Branches should be well spaced along and around the trunk of a tree.
- To correct defects or to thin out an overly dense crown, a young, vigorous tree can have as much as 35 percent of its foliage removed while the tree's structure is being established.
- Avoid pruning trees from the time of bud break until leaves have grown to full size.
- Prune hawthorns, crabapples, pears, and other flowering trees immediately after flowering, thus allowing a tree to develop flower buds for next spring.

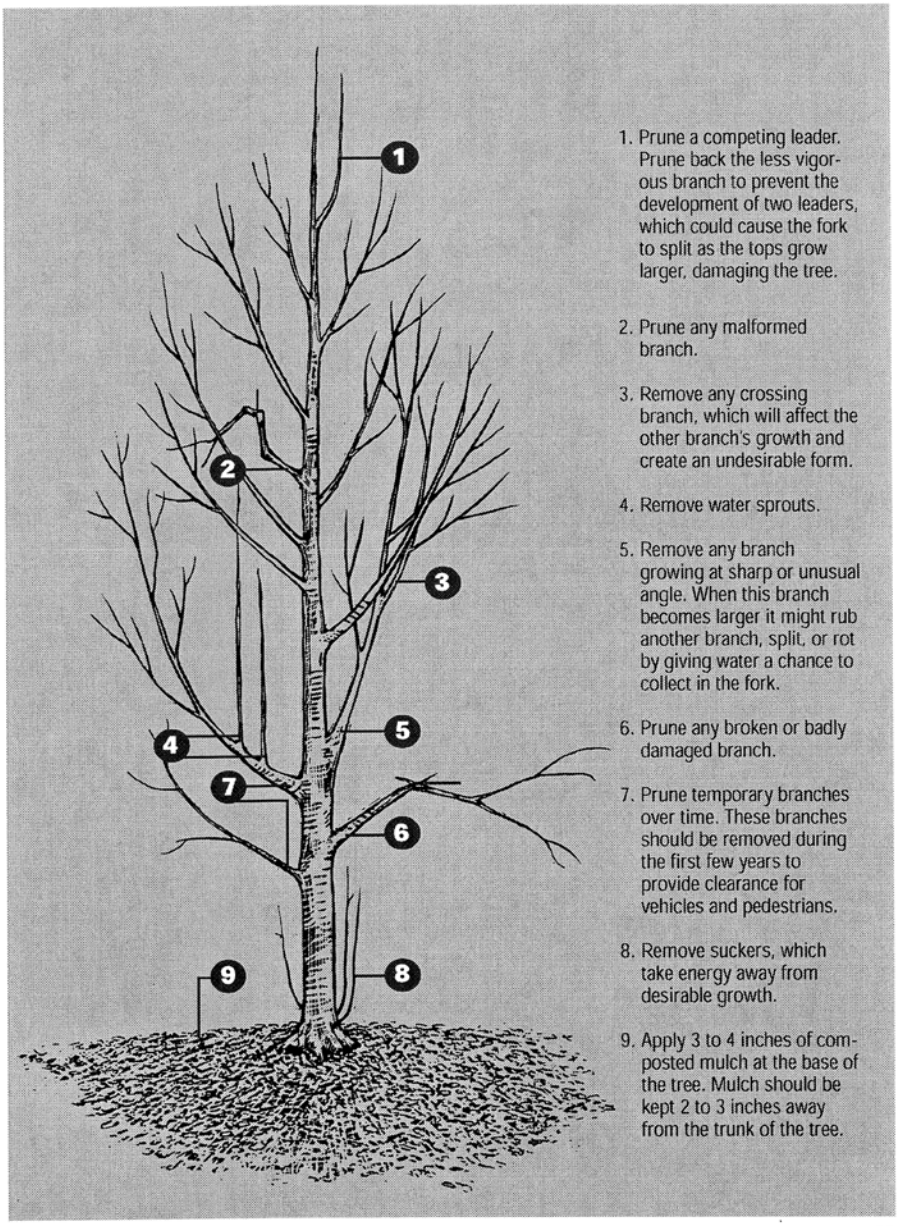


Fig. 3. This figure shows examples of branches that should be pruned from newly planted trees. To promote good structure and lessen the need for future pruning, trees should be properly pruned during the first one to five years. Balance between roots and branching will be restored naturally, which is preferable to compensatory pruning. To promote root establishment and growth, as many branches as possible should remain.

When the tree is four to six years old, take another close look at its structure. Again, prune the tree as already described. The ideal mature tree will have lateral branches that are 18 to 24 inches apart on the trunk and one strong leader. However, some trees differ, such as Japanese maple and other ornamentals, which are meant to have a more bushy appearance. It may take repeated pruning efforts over a number of years to attain an ideal structure. Remember to retain enough branches on the tree to keep it healthy and vigorous.

Some types of trees have better branching habits than others. Branching also can be affected by nursery pruning practices. Many problems can be avoided by purchasing a high-quality tree of the right species that is suited to its purpose and to the site where it is to be planted. Properly prune your young tree to lower future maintenance costs and to create a beautiful and safe mature tree.

Pruning Mature Trees

Not all mature trees need to be pruned. Some only require pruning every 5 to 10 years. The need for pruning can be reduced by planting the right type of tree in the proper place and by properly pruning a tree when it is young. Pruning a mature tree excessively or incorrectly causes more damage than good. When a vigorous branch is cut from a tree, part of the tree's ability to produce food is removed and a wound is created where decay organisms may enter.

Mature trees should only be pruned for specific purposes and in a manner that protects and preserves the tree's natural form. Pruning should focus on maintaining tree structure, shape, health, and safety. Types of pruning recommended by the American National Standards Institute and the International Society of Arboriculture are described below:

Crown cleaning—removes dead, dying, diseased, crowded, weakly attached, or low-vigor branches and water sprouts.

Crown thinning—selectively removes branches to increase light penetration and air movement and reduce the weight of heavy limbs.

Crown raising—removes lower branches to provide clearance for buildings, vehicles, pedestrians, and signs.

Crown reduction—reduces the size and spread of crowns using thinning cuts, resulting in fewer sprouts than heading or stub cuts, and maintaining the structural integrity and natural form of the tree (Fig. 4).

Crown restoration—improves the structure and appearance of trees that have been storm-damaged or deformed by heading or stub cuts.

Vista pruning—thins selectively to open a specific view of an object or scenery.

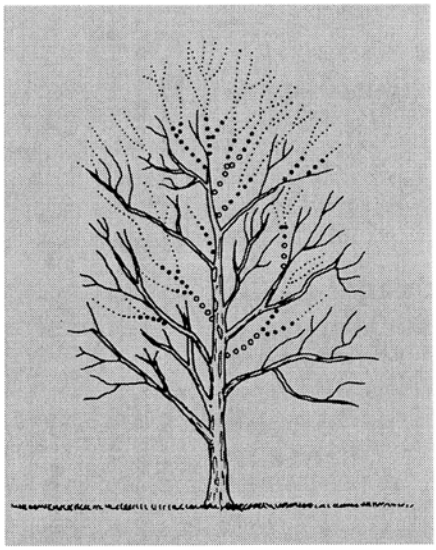


Fig. 4. The preferred method for reducing the size of a crown is the use of small thinning cuts. Using larger thinning cuts that remove a large branch or leader to a large branch is commonly called crotching or drop-crotching. Even though large wounds may result from drop-crotching, this method of pruning is preferable to heading or stub cuts.

Utility Pruning

Trees that can grow or fall into utility wires require special pruning practices. Utility pruning is designed to prevent interruption of electric service, improve public safety, and protect utility workers. Only specially trained line clearance tree trimmers are permitted to prune trees close to electrified lines that carry more than 750 volts, according to regulations of the U.S. Department of Labor Occupational Safety and Health Administration and the American National Standards Institute. If you plan to prune or remove a tree requiring a person, tool, equipment, or any part of the tree to reach within 10 feet of an electrified line exceeding 750 watts, the work must be performed by a qualified line clearance tree trimmer, or the utility company must be notified several days in advance so that proper safety precautions can be arranged.

Wires leading from a pole-mounted transformer to a residential electrical meter generally carry less than 750 volts, but to be safe, check with your local utility company.

Utility companies determine the amount of clearance that is needed between trees and electric lines to maintain reliable and safe service, based on their experience and studies. Clearances between trees and wires depend on voltages that vary among primary and secondary conductors, and growth rates that differ among tree species. Professional tree service contractors are employed by utilities to prune periodically to specific clearances.

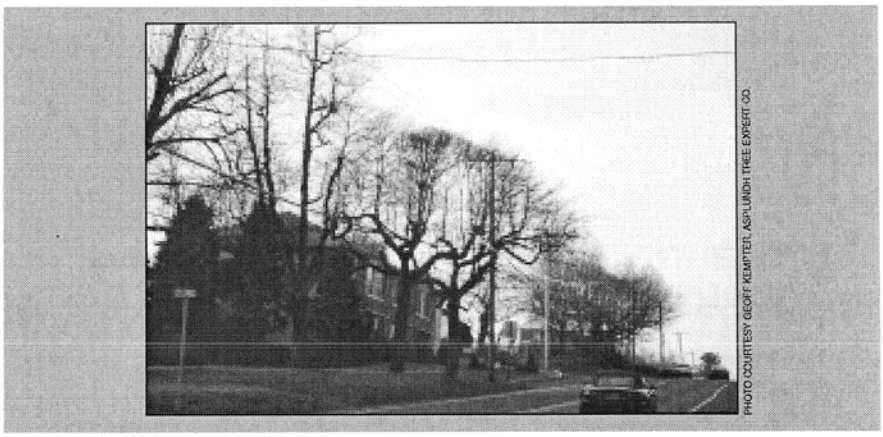
Utility pruning practices have changed greatly during the 1990s. Research has shown that tree wounds do not heal, but are compartmentalized both physically and chemically to prevent the spread of decay and closed by wound wood. Accordingly, utilities specify the placement of pruning cuts to utilize natural defense mechanisms of trees and promote faster closure of pruning wounds. Directional pruning, or drop crotch pruning, is used because it is better for tree health and structure than topping trees or leaving branch stubs (Fig. 4). In directional pruning, growth of branches is directed away from wires by pruning those that can grow too close, while allowing extension of branches that will not interfere with electric lines. Topping of trees with heading cuts is avoided wherever possible, as it damages tree health and encourages vigorous sprouting that increases the frequency of pruning cycles. Also, the tunnel or side-wall effect of clearing a row of trees to a uniform distance sometimes can be softened by pruning some branches back various distances, even to the trunk.

Some trees will appear to be disfigured by the pruning practices of utility companies (Fig. 5 and Fig. 6). In particular, trees that previously were topped or rounded-over will be difficult to reshape with directional pruning. Any tall-growing tree that is under or close to electric wires cannot retain a completely natural shape and should be considered for removal if severe pruning is required or has been done in the past.

Two alternatives can be used to reduce unattractive aspects of utility pruning and to lower line clearance costs. Both involve the replacement of large trees, either gradually or in groups, depending on the circumstances and preferences of people in the neighborhood. A formal street tree design with uniformly spaced trees of the same kind and size requires removal and planting all at the same time. An informal planting design can be implemented over several years, with less disruption in the appearance of the neighborhood.

Trees that are replanted should be smaller species that will not grow into wires at maturity. The right tree for planting under utility wires should be no taller than 20 to 30 feet at maturity. Adequate space for root growth also is an important consideration in relation to tree size and placement. Low-growing trees are most appropriate if the space for roots between a sidewalk and the street is less than 4 feet wide. Medium-size trees, up to 45 feet at maturity, can be planted near utility lines if they are offset at least 15 feet from the nearest wire. Consider other open spaces away from utility lines for the placement of larger trees, being careful to plant them far enough away from buildings. *Street Tree Factsheets*, a publication available from Penn State, can help you choose the right tree to plant near or beneath utility lines.

Many communities have developed constructive relationships with their utility company to optimize pruning practices and tree removals. Good communication between communities and utility companies will help reduce any problems, and a notification requirement can alert an official, tree commissioner, or municipal arborist of impending tree pruning or removal. A community representative then can talk with the utility forester to address any concerns, and thus improve pruning quality that meets community standards.



Fig, 5. Trees under these wires were topped improperly several years ago. Vigorous regrowth of slender branches from the stubs of thicker branches grew into the wires, requiring pruning for clearance.

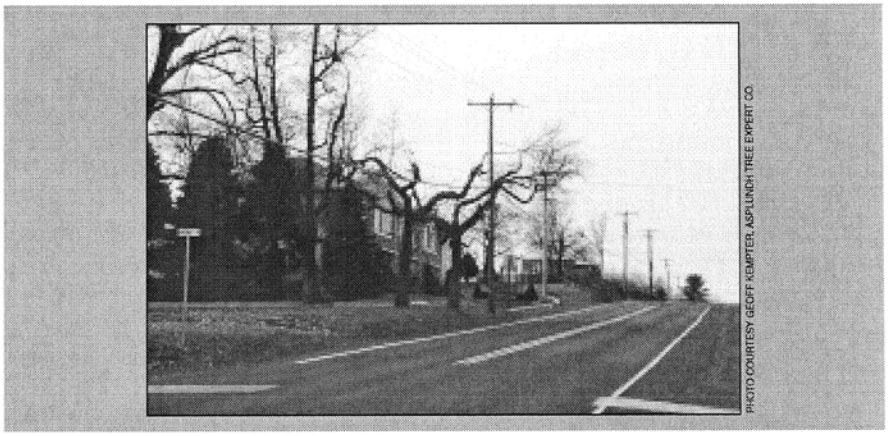


Fig. 6. After directional pruning of the same trees, branches directed away from the wires were retained, instead of removing all of these branches according to previous practices. Much of the regrowth will now occur on those retained branches, without interfering with the wires. Although the shape of the trees appears unnatural in the winter, they will be more normal in appearance when covered with foliage and will be healthier throughout the year.

For More Information

Arboriculture: Care of Trees Shrubs, and Vines. Hall, Inc., Englewood Cliffs, NJ 07632.

Modern Arboriculture. Shigo and Trees, Associates, 4 Denbow Road, Durham, NH 03824-3105.

How to Prune Young Shade Trees. (Other publications on tree care and maintenance are also available.) The National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410.

Standard Practices for Trees, Shrubs, and Other Woody Plant Maintenance. (ANSI A300) International Society of Arboriculture, PO Box GG, Savoy, IL 61874. Phone: 217-355-9411.

Standard Practices for Tree Care Operations—Pruning, Trimming, Repairing, Maintaining, Removing Trees, and Cutting Brush—Safety Requirements. (ANSI Z133.1-1994) International Society of Arboriculture, PO Box GG, Savoy, IL 61874. Phone: 217-355-9411.

Street Tree Fact Sheets. Publications Distribution Center, 112 Agricultural Administration Building, The Pennsylvania State University, University Park, PA 16802-2602.

Tree-Pruning Guidelines. (Other publications on tree care and maintenance are also available.) International Society of Arboriculture, PO Box GG, Savoy, IL 61874. Phone: 217-355-9411.

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from the

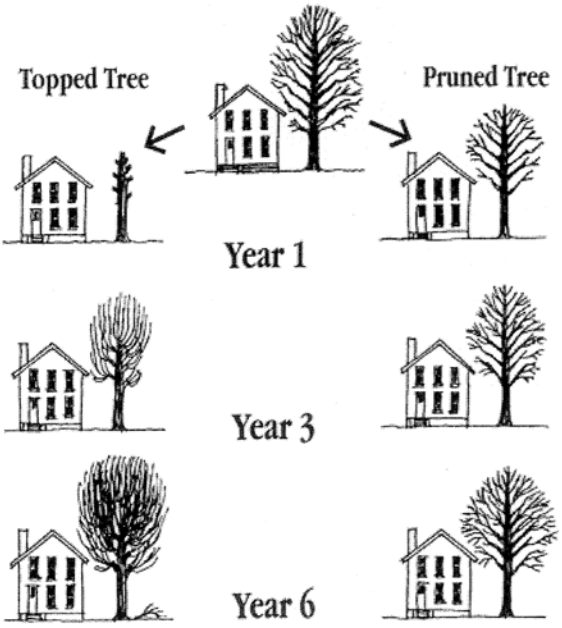
TREE CITY USA®
BULLETIN

Don't Top Trees!

Never cut main branches back to stubs. The sight of topped trees is all too common in the communities and along the roadways of America—trunks with stubby limbs standing naked in the landscape, trees stripped of all dignity and grace. Trees are often topped because they grow into utility wires, interfere with views or solar collectors, or simply grow so large that they worry the landowner. But, as one arborist has said, "Topping is the absolute worst thing you can do for the health of your tree."

Why NOT to "Top:" 8 Good Reasons

1. **Starvation:** Topping removes so much of the tree's leafy crown that it dangerously reduces the tree's food-making ability.
2. **Shock:** By removing the protective cover of the tree's canopy, bark tissue is exposed to the direct rays of the sun. The resultant scalding can cause the tree's death.
3. **Insects and Disease:** The exposed ends of topped limbs are highly vulnerable to insect invasion or decay fungi spores.
4. **Weak Limbs:** New branches that grow from a stubbed limb are weakly attached and more liable to break from snow or ice weight.
5. **Rapid New Growth:** Instead of controlling the height and spread of the tree, topping has the opposite effect. New branches are more numerous and often grow higher than before.
6. **Tree Death:** Some tree species can't tolerate major branch loss and still survive. At best, they remain weak and disease-prone.
7. **Ugliness:** A topped tree is a disfigured tree. Even with new growth it never regains the grace and character of its species.
8. **Cost:** The true cost of topping is often hidden — lower property values, expense of removal and replacement if the tree dies.



Proper Pruning — The Alternative to Topping

When a decision is made to reduce the size of an older tree, it can be topped, or it can be pruned properly. Although the speed and nature of regrowth will depend on species and local factors, any comparison between irresponsible topping and competent pruning will be dramatic.

- **Year 1:**
  The topped tree is an ugly stub and a remnant of a once lovely tree. If pruned properly, the tree's size is reduced but form and beauty are retained.
- **Year 3:**
  Vigorous sprouts have sprung out of the topped tree in large numbers and are growing with abnormal rapidity. The pruned tree adds growth, but it does so more slowly and distributes it more normally.
- **Year 6:**
  In a relatively short time, the topped tree is as tall — and far bushier and more dangerous — than it was to begin with. The properly pruned tree is safer, more beautiful, and its size is better controlled.

The National Arbor Day Foundation®
100 Arbor Avenue • Nebraska City, NE 68410

Mulching Trees

What is that?

- **Mulching refers to the placement of any material on the ground around plants.**
- Mulches can be divided into *organic* and *inorganic* materials.
- Organic mulches break down over time and become part of the soil, inorganic ones do not.

What good is it?

- **There are so many benefits to mulching trees, it is hard to even count them.**
- *Almost all mulches* make significant contributions:
  - protect trunk from mowers, weedwhackers, etc.
  - conserve soil moisture
  - impede weed growth
  - reduce soil erosion
  - restrict soil cracking
  - limit salt build-up
- *Most organic mulches* add further features:
  - protect the roots from traffic
  - cut down soil compaction
  - improve soil fertility & structure
  - moderate soil temperatures
- "Green mulch" such as pachysandra or vinca also brings many of these benefits, although it will compete with the tree to some extent for water and nutrients.
- When possible, do not grow grass beneath trees, especially young trees, because it is highly competitive against them and will restrict their growth.
- And, oh yes, *all mulch* looks good.

What problems can mulch cause?

- **Except for needing to be renewed now and then, mulches give very few problems.**
- Avoid *fresh organic mulches***,** i.e., those that have not been leached or composted. They often 1) deplete soil nitrogen, especially if small in size and thickly applied, and 2) can be toxic, especially mulch made of conifer (cedar, for example) sawdust and bark.
- *Many mulches,* if put on too thick or against the trunk, actually tend to increase stress, disease and insect troubles, especially on poorly drained clay soils.
- *Geotextile fabrics* can lead to higher temperatures, and it is hard to get weeds out of them. If you use them, be sure to cut slits for air and water movement.
- *Black plastic* and *peat moss* should be avoided altogether as tree mulch.

What is the best mulch to use?

- **There is no single best mulch,** but organic mulches such as composted bark, branches, and leaves are much better for the tree and often cheaper as well.

How do you put it on?

- **To the tree's dripline,** if possible. Remember, the dripline moves out as trees grow.
- **No higher than the heel of your hand.** Anything from 2-6" will benefit the tree.
- **Not against the trunk.** The mulch should look like a donut when you are through.

Chapter 6
Community Forestry Education Project Fact Sheet

TREES AND SIDEWALKS

What's the problem?

- **Trees often ruin sidewalks, and sidewalk repair often kills trees.**
- This conflict comes from the fact that sidewalks and trees have competing needs.
    - Trees need a soil that is moist and loose, and that they can push aside as they grow.
    - Sidewalks need to be smooth (but not flat) on a soil that will not shift with a load.
- Trees and sidewalks are costly and valuable, so *both* needs must be taken seriously.

How do they damage each other?

- Most of the **damage to sidewalks** is caused as roots become thicker through *secondary growth.*
    - Sidewalk damage is often caused by the soil in its expansion and contraction.
    - The buttress roots supporting the tree cause the worst damage.
    - Roots often follow cracks, because there they find the water and air they need.
- Most of the **damage to trees** comes when the main roots are cut close to the trunk.
    - When larger roots are cut, trees lose mechanical support from that side, and become more likely to cause harm from windthrow.
    - Main root cutting also heavily reduces the flow of water and nutrients to the crown, causing especially older trees to die in 3-5 years.

How can I avoid cutting the roots?

- **If a tree is in poor condition, it is best to remove the tree and replace the sidewalk.**
- For trees in good condition, a sidewalk can be curved around the trunk (at least 2-3').
- In some cases, a raised edge can simply be ground down, or smoothed over with asphalt.
- The new sidewalk may be ramped up and over the roots by starting further away.
- You can also do minimal excavation, and then pour asphalt directly over the roots.
- Gravel, mulch, pavers set in sand, or asphalt can be used instead of concrete.

If I decide I have to cut the roots, how can I least harm the tree?

- **The farther you cut from the trunk, the less threat to the tree's health, and the less danger of creating a hazard.**
- **Try not to cut roots over 2" in diameter.**
- Roots recover better from being severed when you
    - cut them cleanly with a saw instead of breaking them with a backhoe
    - protect them from drying out while work is going on
    - mulch and water well afterwards
    - provide slow-release fertilizer in early fall or spring

How can future damage to sidewalks be avoided?

- **Provide enough space for the species you want to plant.**
- Try to keep large-growing trees in tree lawns 10' wide or greater, medium trees in lawns 6-10' wide, and small trees in 4-6' lawns. Plant no trees in lawns under 4' wide.
- Give species with many large surface roots (like Norway maple) lots of room.
- Don't rely on root barriers--the roots do grow down, but then come right back up!

Consider experimenting with a structural soil mix that will better tolerate root growth.

HOW TO KILL A TREE STUMP

What is this about?

- You often can't kill a tree just by cutting it down.
- Sprouting from the stump or the roots is a fundamental strategy by trees (and even more by shrubs) for survival and reproduction.
- In a natural setting, sprouting is an effective guard against the repeated loss of stems--e.g., through deer browsing of seedlings, or destruction by fire of mature trunks.

Why is it important?

- **In urban settings, stump sprouts are a significant maintenance problem. It can be costly to remove young sprouts, and hazardous to let them grow.**
- Young stump sprouts must be removed annually by mechanical or chemical means. If the stump is cut at ground level, sprouts can be controlled by mowing.
- If allowed to grow, such sprouts routinely produce multiple large trunks leaning away from each other that can pose a hazard.

Which common urban species cause the most trouble?

- Cottonwood and other poplars, boxelder and the "soft" maples, lindens, tree-of-heaven, willow, beech, red oak, crabapples and other trees in the rose family, and green ash.
- Some species (like black locust) pose particular problems because of their ability to sprout from roots, even well away from a tree whose stump has been ground out.

What mechanical means are effective in urban settings?

- **Stump removal.** Grinding out the stump and large roots sharply reduces basal sprouting. A few species will still continue to sprout from smaller roots.
- **Accelerated decay.** Cut at soil level, add slow-release fertilizer, and mound with soil.

What about chemical means?

- **Growth regulators.** Some forms of 2,4-D have proven effective when applied during the later part of the growing season by "frilling" (squirting into fresh trunk cuts), "cut-stumping" (painting or spraying on fresh stumps), or injection. Multiple applications may be required. Follow label directions.
- **Phloem-transported compounds.** Concentrated glyphosate-based herbicides are very effective during the later part of the growing season when applied by frilling, cut-stumping, or injection. Follow label directions. Phloem-transported compounds sometimes pass to other nearby trees--especially when same species--through root grafts ("backflash"), so be careful.

PLEASE NOTE: Consult the appropriate state office for registered pesticides that are labeled in your region for use on woody plants. All pesticides are subject to varying restrictions. Furthermore, changes in pesticide regulation occur constantly and human errors are still possible.

Recommended Resources

American Standard for Nursery Stock

ANSI A300-1995 American National Standard for Tree Care Operations—Standard Practices (Pruning)

ANSI A300 (Part 2) — 1998 American National Standard for Tree Care Operations—Standard Practices (Fertilization)

ANSI Z133. 1-1994 American National Standard for Tree Care Operations—Safety Requirements

Building Greener Neighborhoods: Trees as Part of the Plan 2nd Edition by Jack Petit, Debra L. Bassert, and Cheryl Kollin, National Association of Home Builders Press and American Forests.

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Diseases of Trees and Shrubs by Wayne A. Sinclair, Howard H. Lyon, Warren T. Johnson; Comstock Publishing, July 1, 1987 [ISBN: 0801415179]

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Principles and Practice of Planting Trees and Shrubs, by Gary W. Watson, E. B. Himelick; International Society of Arboriculture, July, 1997 [ISBN: 1881956180]

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Shading Our Cities: A Resource Guide For Urban And Community Forests edited by Gary Moll and Sara Ebenreck; Washington, D.C. : Island Press, 1989; [PL 5.7200 S52 1989]

Trees & Building Sites by Gary Watson and Dan Neely, International Society of Arboriculture.

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"Trenching and Tunneling Near Trees: A Field Pocket Guide for Qualified Workers" by Dr. James R. Fazio, National Arbor Day Foundation

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www.arborday.org

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Head, Constance, et al., Athens-Clarke County, Athens, GA, 2001

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Pottstown Shade Tree Commission, Borough of Pottstown, PA