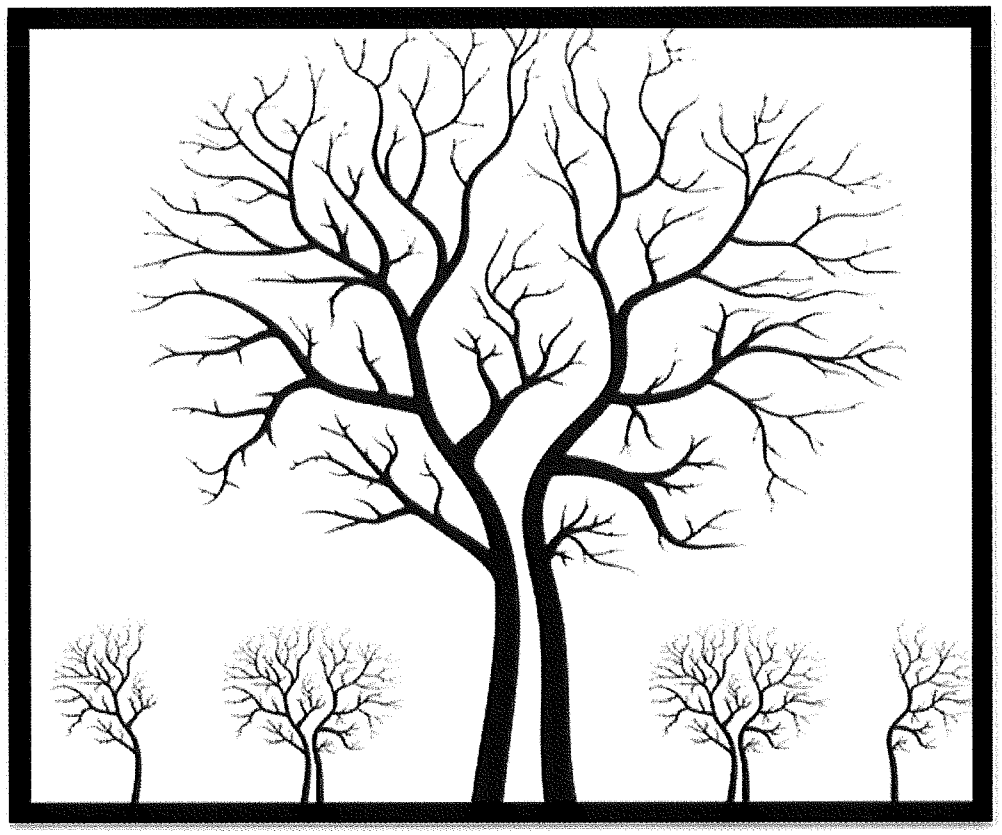
Liberty Township

Tree Planting

And

Management

Policy



Adopted: 11/1/99 by Resolution 99-259
Amended: 8/8/11 by Resolution 11-0808-09

Liberty Township Tree Planting and Management

Tree Advisory Committee

ESTABLISHMENT: Per Resolution Number 99-259 adopted on November 1, 1999, Liberty Township Board of Trustees created and established a Township Tree Advisory Committee and approved a Tree Policy governing the planting of street trees in or on the tree lawn, in or on the public rights-of-ways within Liberty Township, Delaware County, Ohio.

Tree Advisory Committee Members are appointed by the Township Administrator/Board of Trustees.

The Tree Advisory Committee shall consist of five (5) members: a Homeowner's Association representative or the Developer (as appropriate) (may be a different representative and on a case by case basis), the Township Administrator, the Road Superintendent, the Zoning Inspector, and a Township Trustee. The Committee may invite other specialists and guests as desired to study any issue. The Committee will meet as needed to address issues as they arise.

PURPOSE: The Tree Advisory Committee shall have the authority to study, investigate, plan, advise, report and recommend to the Township Administrator and the Board of Trustees, any action, program, plan or regulations which the Tree Advisory Committee shall find or determine to be necessary or advisable for the pruning, trimming, planting, replanting, maintenance, care, preservation, removal and disposition of "street tree(s)" in or on the "tree lawn", in or on the Township's road rights-of-way, and in or on property owned by Liberty Township.

OPERATION: The Committee should meet on a case by case basis to advise the Township Trustees on substantial forestry and tree related issues.

POLICY CHANGE: All requests for changes / deviations in the Tree Policy as adopted will be submitted to the Tree Advisory Committee through the Township Administrator's Office for review. All proposed changes will be submitted to the Township Trustees for final consideration and approval.

Policy and Procedure

SECTION 1: DEFINITIONS

LARGE TREES
Trees that mature at forty-five (45) feet or more in height.

MEDIUM TREES
Trees that mature at or between twenty-five (25) feet and up to forty-five (45 feet) in height.

PROPERTY OWNER
The owner of such property as shown by the County Auditor's plat of Liberty Township, Delaware County, Ohio, including the executor, administrator, or beneficiary of the estate of a deceased owner.

RIGHT-OF WAY
The traveled portion of any public way including the strip of land lying between the property line and the portion of the street used for vehicular traffic.

STREET
The entire width of every public way including, but not limited to, highways, avenues, lanes, alleys and courts.

STREET TREES
Trees planted in tree lawns.

TOPPING
The severe cutting back of limbs to stubs larger than three (3) inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree.

TREE(S)
A tall, growing, woody plant with one (1) or more perennial main stems or trunks which develops branches capable of being pruned to at least six (6) feet above the root ball within five (5) years of planting.

TREE LAWN
That strip of land lying between sidewalk and curb or, where no sidewalks exist, between the property line and the curb or, where no curb exists, between the property line and the pavement on all streets within Liberty Township. The tree lawn defines the area within which street trees may be planted.

Policy and Procedure

SECTION 2: SPECIES TO BE PLANTED

The street tree list, which is Appendix A, identifies those species approved for planting within tree lawns in Liberty Township. No species other than those listed may be planted within a tree lawn without the prior written permission of the Township Administrator, Road Superintendant or Zoning Inspector and/or the Tree Advisory Committee.

The street tree list Appendix A shall be reviewed and updated by the Tree Advisory Committee annually and /or as requested by the Township Trustees.

SECTION 3: SELECTION AND INSTALLATION

Street trees selected for planting shall have outstanding form, be nursery-grown in accordance with good horticultural practices, be free from damage, disease and insects and shall meet the current standards of the American Association of Nurserymen.

The minimum trunk caliper for street trees shall be two (2) inches for large trees and one and three-fourths (1¾) inches for medium street trees as measured six (6) inches above grade. All street trees are to be balled and burlapped.

All street trees are to be installed in the centerline of the tree lawn in conformity with the planting detail diagram available at the township offices.

Installation and replacement of street trees for any reason shall be at the expense of the Homeowner's Association, or the owner of the property where street trees exist or are proposed, or the owner of the property directly adjacent to the right-of-way where street trees exist or are proposed.

SECTION 4: TREE SPACING AND DISTANCE REQUIREMENTS

The street tree list categorizes approved species into two (2) size categories: large and medium. Both size categories have associated spacing requirements. No spacing other than that indicated below will be allowed unless written permission is received from the township representative (listed in Section 2).

Spacing	Minimum	Maximum	Minimum Tree Lawn Widths
Large Trees	35 feet	50 feet	6 feet
Medium Trees	20 feet	35 feet	4 feet

Policy and Procedure

SECTION 4: TREE SPACING AND DISTANCE REQUIREMENTS - Cont'd

In areas lacking sidewalks and/or curbs, street trees shall be located no less than seven (7) feet from the edge of the roadway pavement and in no case shall street trees be planted in such a manner as to allow the root system to undermine structural integrity of the road nor impede drainage of the road or ditch or other drainage system.

No street tree shall be planted within ten (10) feet of any fireplug, traffic control signs / devices, and street name signs. No street tree shall be planted within the sight triangle of a street intersection, as defined by the Delaware County Engineer and Ohio Department of Transportation specifications.

SECTION 5: UTILITIES

No street tree may be planted within twenty-five (25) feet of an overhead utility wire, or within five (5) feet of any underground water line, sewer line or other utility.

The Board of Trustees or a duly authorized representative may remove or cause to be removed any street tree, trees or parts thereof which are judged to be injurious to existing sewers, electric power lines, gas lines, water lines, or other public improvements within the road right-of way.

No street trees may be planted within any roadside drainage ditch or swale.

The property owner is required to contact the Ohio Utility Protection Service (OUPS) to determine the location of any underground utilities at least three (3) working days prior to the commencement of planting.

SECTION 6: TREE PRUNING

It shall be the primary responsibility of any property owner, homeowners' association or other agent owning property including or adjacent to with one or more street trees within the road right-of-way to prune or cause to be pruned such tree(s) in a manner that the tree(s) will not shade or obstruct street lights or street signs or any traffic control signs or devices, or obstruct pedestrian or vehicular traffic on sidewalks and streets.

A township representative (Road Superintendent) may prune any street tree, trees or part thereof within the road right-of-way which are judged to be injurious to the public health, safety and welfare.

Mature street trees are to be symmetrically pruned to a free and clear canopy height of fourteen (14) feet.

SECTION 7: MUTILATION, TOPPING AND REMOVAL

No person shall destroy or mutilate any street tree in the right-of-way or any other public place. Mutilation includes, but is not limited to, attaching or placing ropes, wires (other than tree guy wires), signs or posters on trees, carving or defacing, or allowing any gaseous, liquid or solid substance harmful to trees to come in contact with their roots, bark or leaves.

It shall be prohibited as a normal practice for any person or firm to top any street tree or other tree on public property. However, severely damaged trees and certain trees where other pruning practices are impractical may be exempted by determination of the tree advisory committee or the township.

Whoever removes any street tree is also responsible for removal of any remaining stump below ground level unless other mutual agreements are reached in advance. No person shall remove a tree from the road right-of-way for any reason without the prior approval of the Township Zoning Inspector when there is a development plan identifying and/or requiring a certain kind of tree.

Attachments:

Approved Trees for Street Tree Use

Unacceptable Trees for Street Tree Use

Watering Newly-Planted Trees

Guying and Staking

How to Prune Trees

Mature Tree Care

Insect & Disease Problems

Managing Disease and Insects in Your Trees

Tree Planting Diagram: Well-Drained Soils

Tree Planting Diagram: Poorly-Drained Soils

Liberty Township Tree Planting and Management
Approved Street Tree List

LARGE TREES-45' AND OVER IN HEIGHT

Latin Name	Common Name
Acer rubrum `Autumn Flame	Autumn Flame Red Maple
Red Sunset	Red Sunset Red Maple
October Glory	October Glory Red Maple
Acer x freemanii Autumn Blaze	Autumn Blaze Red Maple
Acer saccharum Green Mountain	Green Mountain Sugar Maple
Cladrastis lutea	American Yellow-wood
Corylus colurna	Turkish Filbert
Liquidambar styraciflua Moraine	Moraine Sweetgum
Platanus xacerifolia Bloodgood	London Planetree
Quercus coccinea	Scarlet Oak
Quercus imbricaria	Shingle Oak
Quercus rubra Borelis	Red Oak
Quercus shumardii	Shumard Oak
Taxodium distichum	Bald Cypress
Tilia Americana Redmond	Redmond American Linden
Tilia cordata Greenspire	Greenspire Littleleaf Linden
Tilia tomentosa	Silver Linden
Ulmus parvifolia	Chinese Elm
Zelkiva serrata Green Vase	Green Vase Japanese Zelkova
Village Green	Village Green Japanese Zelkova

MEDIUM TREES---25' TO 45' IN HEIGHT

Latin Name	Common Name
Acer campestre	Hedge Maple (tree form)
Acer x freemanii Celebration	Celebration Maple
Acer truncatum Norwegian Sunset	Norwegian Sunset Maple
Pacific Sunset	Pacific Sunset Maple
Amelanchier laevis	Serviceberry (tree form)
Gleditsia triacanthos var. Inermis	Thornless Honeylocust
Imperial	Imperial Honeylocust
Majestic	Majestic Honeylocust
Shademaster	Shademaster Honeylocust
Skyline	Skyline Honeylocust
Nyssa sylvatica	Black Tupelo
Ostrya virginiana	American Hophornbeam
Phellodendron amurense Macho	Macho Amur Corktree
Prunus saargentii	Sargent Cherry
Pyrus calleryana Aristocrat	Callery Pear
Autumn Blaze	
Cleveland Select	
Redspire	

Liberty Township Tree Planting and Management
Unacceptable Trees for Street Use

Common Name	Scientific Name
Box Elder	Acer negundo
Silver Maple	Acer saccharinum
Ohio Buckeye, Horsechestnut	Aesculus glabra
Tree of Heaven	Ailanthus altissima
European White Birch	Betula pendula
Paper Birch	Betula papyrifera
Northern Catalpa	Catalpa speciosa
White Ash	Fraxinus Americana L.
Autumn Purple White Ash	Fraxinus Americana Autumn Purple
Biltmore Ash	Fraxinus biltmoreana
Carolina Ash	Fraxinus caroliniana Mill.
European Ash	Fraxinus excelsior–European Ash
Black Ash	Fraxinus nigra Marshall
Marshalls Seedless Green Ash	Fraxinus pennsylvanica
Summit Green Ash	
Patmore Ash	
Pumpkin Ash	Fraxinus profunda (Bush) Bush
Blue Ash	Fraxinus quadrangulata Michx.
Indigo Ash	Fraxinus tremillium
Ginkgo (female)	Ginkgo bilboa
Osage-orange	Maclura pomifera
Mulberry	Mores species
Poplar	Populus species
Bradford Pear	Pyrus calleryana Bradford
Upright English Oak	Quercus robur Fastigiata
Black Locust	Robinia pesudoacacia
Willow	Saliz species
European Mountain Ash	Sorbus aucuparia
Siberian Elm	Ulmus pumila

Liberty Township Tree Advisory Committee

Members:

Township Administrator

Road Superintendent

Zoning Inspector

Representative from Homeowners Association or Developer

Township Trustee

Draft

Watering Newly Planted Trees and Shrubs

By Alan Siewert, Urban Forester ODNR Div. of Forestry

Introduction

Transplanting trees and shrubs is not a natural process. Trees in the wild do not grow with dense root systems waiting to be dug. Nurseries work very hard to create a plant which will survive the difficult and stressful process of transplanting. But with even the best nursery practice only 10% to 30% of the tree's existing root system is captured in the root ball that comes with the tree.

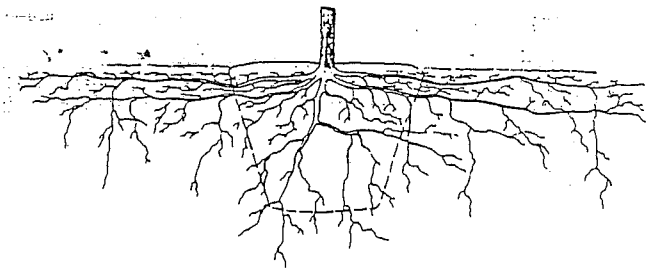


Fig. 1. Only 20% of the root system is captured in the root ball when the tree is properly dug.

The time it takes to regenerate these lost roots depends on the size of the tree that was transplanted. Studies have shown that trees here in Ohio take about one year for every inch caliper to re-grow the lost roots. That means a two inch tree will have to survive on a reduced root system for two years and a 6 inch tree for 6 years. During this re-establishment time the tree's growth will be drastically reduced and cases have been reported that a 2 inch tree at planting was larger than a 6 inch tree at planting 5 years after planting. Bigger is not always better.

Need for Water

Water is the lifeblood of the tree. The nutrients it carries are crucial to carry on photosynthesis which in turn produces carbohydrates to re-grow the roots lost during transplanting. This water is extracted from the soil around the roots. Newly planted trees must get 100% of its water from 20% of its original root area. The soil in the root ball is heavily "mined" for water during the re-establishment stage and can dry out long before the surrounding soil does. Routine watering is essential for newly planted trees even if established trees are doing fine.

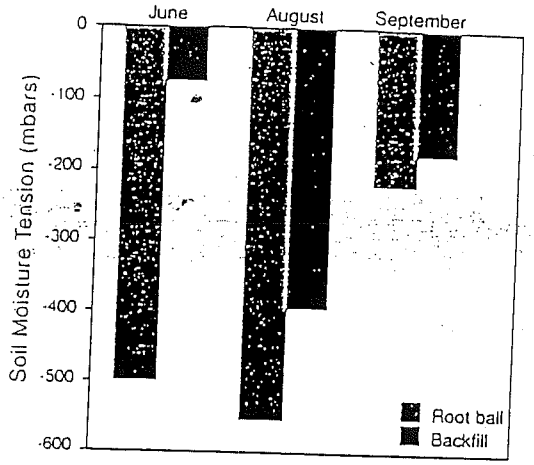


Fig 2. Transplanted trees rely almost entirely on root ball moisture for much of the first growing season. Root ball soils dry out more rapidly (more negative indicates drier soil) while backfill remains moist.

The Long Term Effects of No Water

The tree's trunk, branches and roots are made of long cells. These cells form tubes that reach from the roots to the leaves. When these tubes are formed by the cambium they are full of water. As water evaporates from the leaves water is sucked up the tree. When water is pushed into the roots through osmosis, water is pushed up the tree in these columns.

When there is no water in the soil to be pushed into the roots the leaves keep sucking on the columns of water. Wind and low humidity cause the leaves to suck harder and the tension on the column of water increases. Like a rubber band the water column can only be pulled so hard before it snaps. **Once broken the water column will never form again.**

Trees live on water columns which were formed in the past two to three growing seasons(spring and early summer). Loss of these columns through a careless watering schedule can effect the tree's health and re-establishment by reducing their ability to move water. Forgetting to water once can have a significant effect for the next three years if it does not kill the tree outright.

Water

How often:

Trees should be watered, elementally after planting or within 4 to 6 hours of planting. Even if it is raining during the planting the tree still needs additional water. **Root balls dry out very quickly while above ground.**

After planting, the trees should be watered once a week from the time they are planted until they lose their leaves in the fall and the pull of water is gone. Water may be skipped in a given week if the tree received 1 inch of rainfall or more that week. Rainfall credit can not accumulate. If the tree received 3 inches of rain one week you still need to water the next two weeks if no rain fell.

In some cases such as sandy soil or bare root trees, biweekly waterings may be beneficial.

How Much:

The quantity of water needed each week depends on the size of the tree. As a rule of thumb a tree needs 5 gallons of water plus 5 gallons for each inch caliper. For example a two inch caliper tree needs 15 gallons of water per week. 5 for the tree + 5 x 2 inches = 15 Total.

Size of tree	Quantity of water per week
1 inch	10 gal.
2 inch	15 gal.
3 inch	20 gal.
4 inch	25 gal.
5 inch	30 gal

Too much water can kill the tree. Saturated soils have little oxygen and the roots literally drown.

Speed of Application:

The single greatest mistake made in watering is putting the right amount of water on too fast. The water must be given time to soak into the soil and if applied too fast not enough water gets into the root ball. Water must be applied at a rate less than 2 to 3 gallons per minute. In some cases the water may still run off the surface of the root ball and the rate must be reduced. Water should be applied to the surface of the soil. Deep root waters can put the water too deep and leave critical surface roots dry.

Five gallon buckets with two or three 1/8 inch holes drilled in the bottom can deliver accurate amounts of water to the tree. A slow trickle from a garden hose can also be effective. Calibration of the flow is well worth the effort. **Too much water can wash a watering berm or mulch away, cost extra money in water bills and kill the tree**. Using a known volume container, open the valve on the garden hose a known amount like 1/8 of a turn. Measure the time it takes to fill the container. If a small volume is used, less than 1 gallon, make several measurements to account for changes in water pressure. Using these measurements calculate the time needed to apply the right amount of water for the tree and use that time for watering each tree.

Other Cultural Techniques to Help Establish New Trees

Watering Berm:

A watering berm is a ridge of soil circling the root ball. It is raised higher than the surrounding soil and holds a pool of water and directs it to the root ball. The watering berm must be made at the edge of the root ball not the edge of the planting pit. The water must get to the root ball which is being mined for water.

Mulch:

A two to three inch deep mulch layer can greatly benefit the establishment of a new tree. Trees in mulch beds will have 4 times as many roots and have three times the trunk calper of their counterparts in the grass in two years.

GUYING AND STAKING

By T. Davis Sydnor

I. GENERAL

Guying and staking is a procedure used to stabilize plants during their establishment period. It is considered by some as the hallmark of a well-done landscape installation as in wrapping. In my judgment, it is cosmetic except where the site is characterized by high winds. Industry standards such as *Landscape Specifications Guidelines* as endorsed by the Ohio Nursery and Landscape Association (ONLA) gives such things as heights of attachment, guy wire size, ground attachment and hose size and should be followed.

II. REQUIREMENTS

A. Required for the following reasons:

1. High prevailing winds - In a site with high prevailing winds it is often necessary to guy and/ or stake the plant in order to hold the plant upright during the transplant establishment period. Plants in the longer term are likely to be wind sculpted in a site with high prevailing winds and staking will not prevent this.

2. Container grown plants - Some container-grown plants do require stabilization by guying and or staking. Container plants which have been improperly grown and which are too weak to support themselves must be supported. This type of plant absolutely requires staking but is not a desirable plant for the landscape and should have been rejected as a cull rather than planted.

3. Customer request - If a customer demands guying and/or staking, of course, it should be provided.

B. Not required: In most instances, guying and staking is essentially cosmetic and serves no function in establishment. There have been many plants planted without guying and staking. Indeed, most of the plants transplanted during nursery production are not staked even when transplanted bare root. Further, the risk of mechanical injury is another concern.

III. CONSEQUENCES OF STAKING

A. Physiological differences

1. Plants that are staked are taller growing than their unstaked counterparts are

2. Less trunk caliper - The main stem of a staked plant will be smaller in diameter than its unstaked comparison.

3. Smaller root system - A staked tree will have a less developed root system than a similar unstaked one.

4. Less trunk taper - A staked tree has a trunk that tapers more slowly than a normal tree.

5. More wind resistance - A tree which is staked is not free to move and bend in the wind and thus offers more wind resistance than would a plant which had been grown without staking and which is more flexible.

6. More stress per unit of cross sectional area - Because a staked tree is taller and less flexible than its unstaked counterpart, greater stresses are encountered. Because of its smaller trunk caliper there is actually, more stress per cross sectional square inch throughout the stem.

7. Mechanical injury - Mechanical injury is increased for plants which have been staked. Allowing the plant to grow normally seems to reduce the amount of mechanical injury caused by high winds. Additionally, guy wires or screw eyes invariably cause some mechanical injury.

8. Uneven xylem - Staked trees have a tendency to have uneven xylem. Xylem tends to develop more rapidly away from the stake. This results in uneven xylem development and can cause a curvature of the stem when the plant is released from the stake.

B. Vandalism - many people claim a major reason for guying and or staking particularly in urban areas is that it reduces vandalism. This report was made when some trees were planted along High street in 1987 and destroyed before the stakes could be installed. The opposite feeling has also been expressed many times. Some people feel that encasing plants in heavy stakes actually increases vandalism by making it a greater challenge to see if the plants can be damaged. Certainly, the issue of whether or not vandalism is decreased or increased is open. My estimate is that vandalism would be both favored and reduced depending on the situation. If stakes, for example, are viewed as being more ornamental than a challenge, vandalism may be reduced. If on the other hand the stakes were viewed as greater challenge, vandalism would be more severe, if not more frequent.

C. Australian Experiment - In the 1960s, an Australian experiment was done on some pines growing near the beach. A number of plants were staked using telephone poles. The plants were held extremely rigid and left staked for 5 years. They came in and removed the stakes. An equal number of control plants had also been left, in the same location. These plants had not been staked. Shortly after the plants were unstaked, a storm came and all of the staked plants were broken at the point where they had originally been attached to the stakes. The trees, which had been growing naturally without staking, were not damaged.

IV. PROPER SIZES FOR GUYING AND STAKING DECIDUOUS TREES

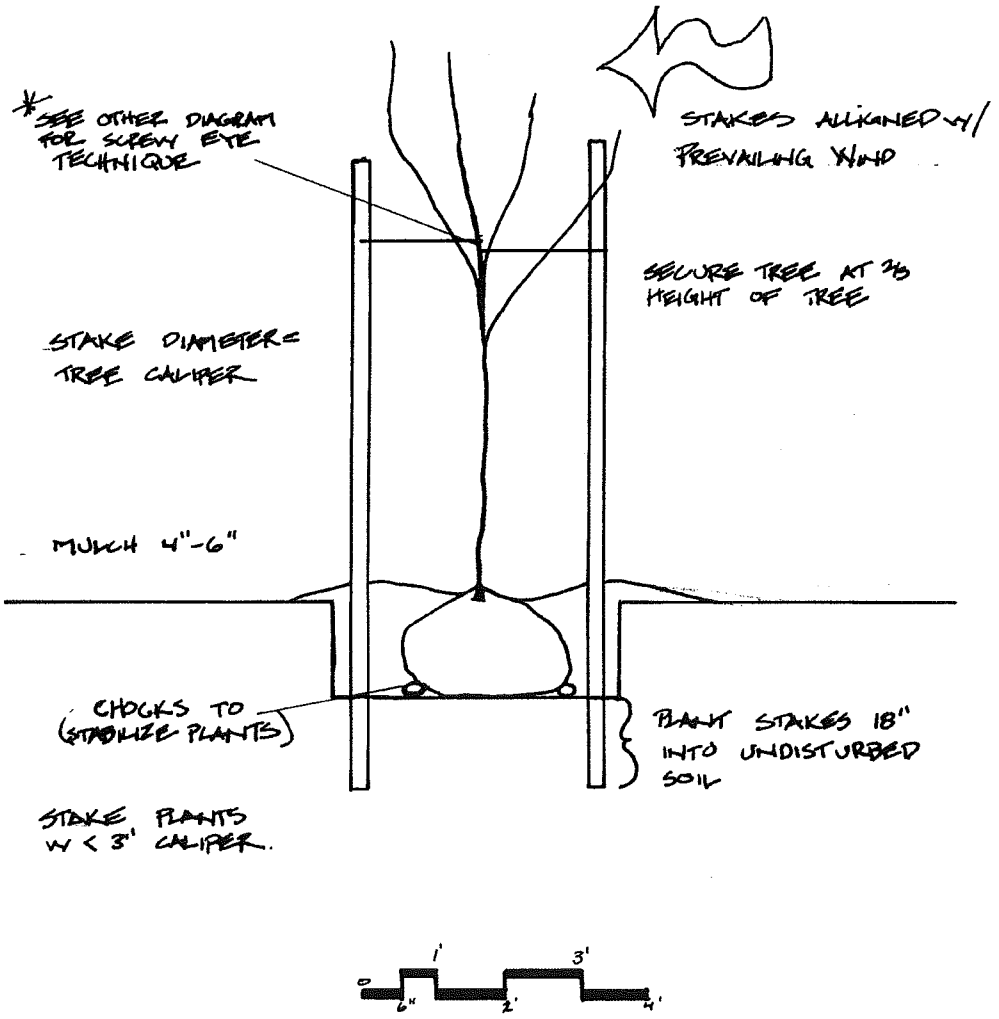
A. Plants less than 3" caliper - Plants of this size would be staked with at least two stakes of the same caliper as the plant being staked.

B. Plants greater than 3" in caliper but less than 5" in caliper - Guy wires rather than stakes are used for plants of this size. The wires are attached to the ground using stakes.

C. Plants greater than 5" caliper - Trees of this size are guyed as earlier, however, the guy wires are attached to deadmen or earth anchors as a soil attachment rather than stakes.

V. STAKING DECIDUOUS TREES TO 3-INCH CALIPER

Figure 6.1 Diagram of a standard staking procedure for a tree less than 3"caliper. Diagram by Kevin Konrad.



A. Procedures

1. Select stakes the same caliper (diameter) as the tree that is being staked or as specified in industry standards.

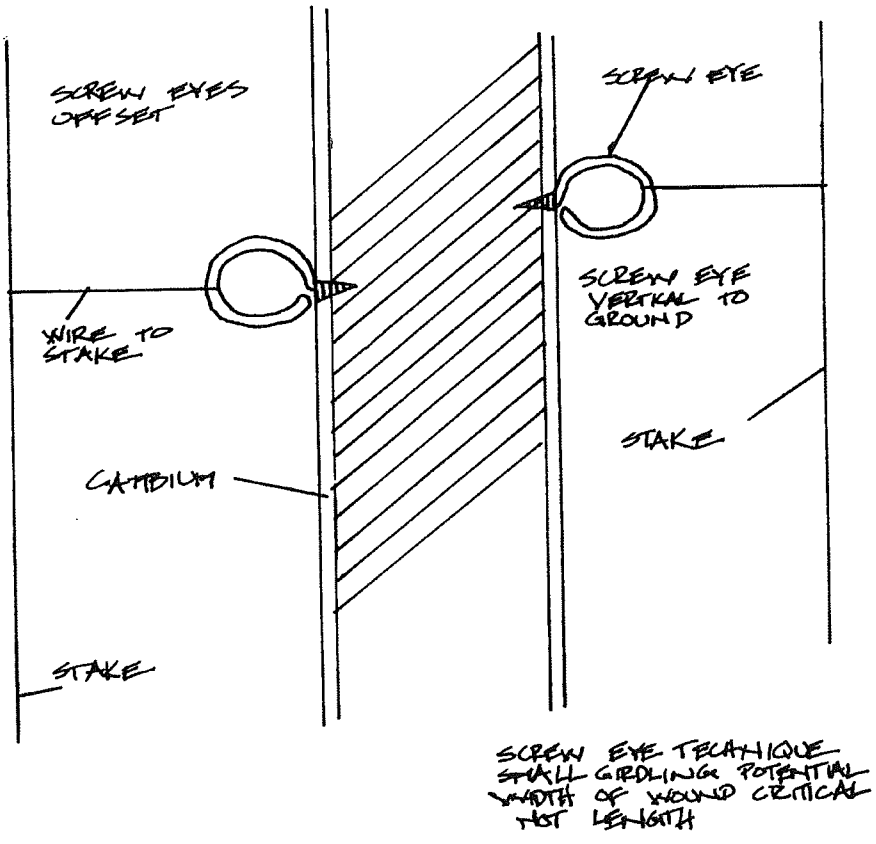
2. Drive stakes 18" into the undisturbed soil in the bottom of the hole. The stakes are aligned with the prevailing wind where possible.

3. Stakes are then cut to the length specified by industry standards such as *Landscape Specifications Guidelines* as endorsed by the Ohio Nursery and Landscape Association (ONLA). Normally the stakes extend just above the lowest branches. Higher stake heights would be desirable but would be considerably more expensive.

4. Attach the guy wires from the stakes to the tree as diagramed below. Wire size is dictated by published industry standards.

    a. A new technique for attaching guy wires (Fig. 6.2).

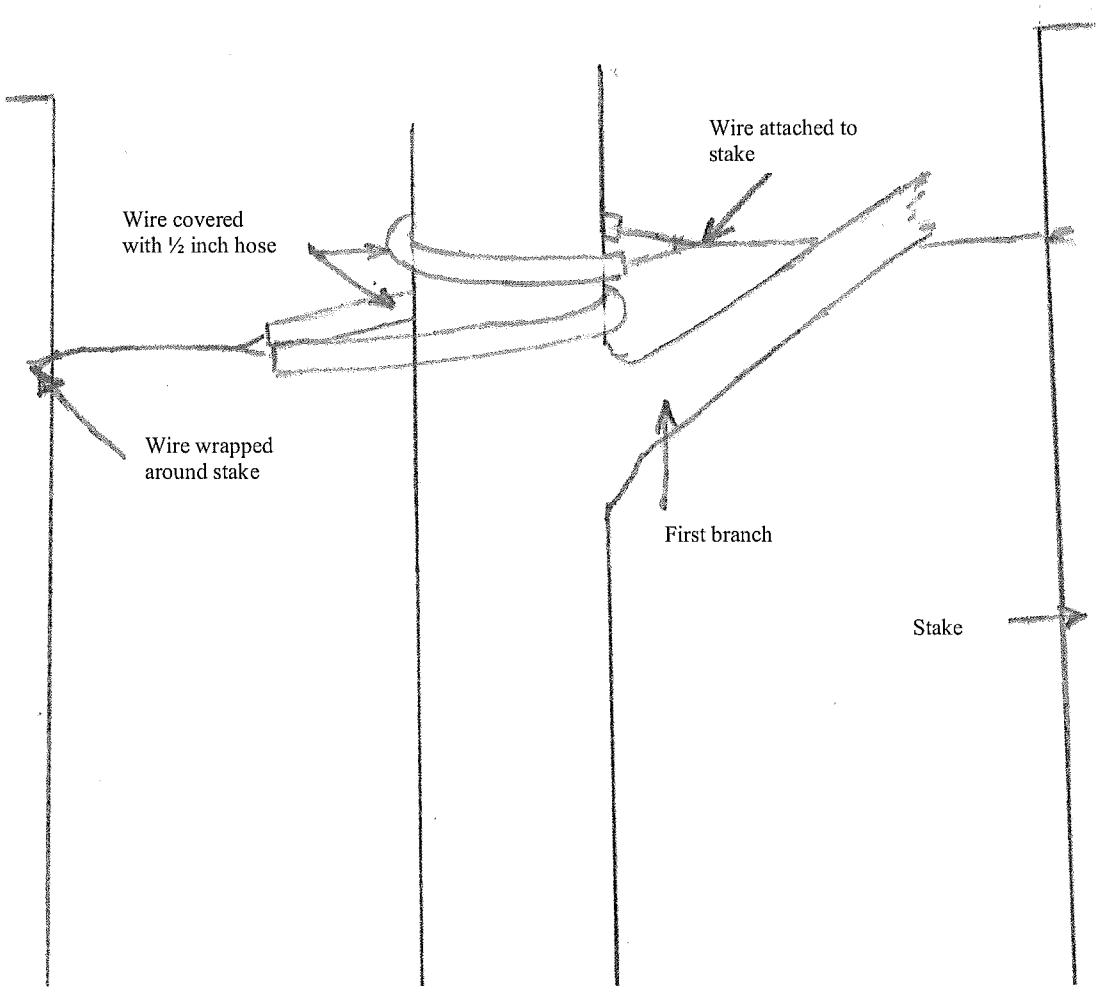
Figure 6.2 Diagram of attachment of support wires using screw eyes. Diagram by Kevin Konrad is not to scale.



b. Procedure for new technique - Screw eyes can be used for attachment. I even recommend this kind of procedure. The screw eyes would not be directly opposite one another and the wires would be attached directly to the screw eyes. The screw eye would be oriented such that it was in line with the axis of the main stem or perpendicular to the ground. This attachment technique would prevent any possibility of girdling which is a greater danger than the injury caused by the screw eyes themselves.

c. Old technique for attaching guy wires (Fig. 6.3). This technique has the potential for serious girdling of 100% or more. Failure to remove guy wires is common and a frequent cause of plant loss in the landscape. Properly done with removal in a timely manor, this technique can result in little damage.

Figure 6.3 Diagram of attachment using hose covered wire by author is not to scale.

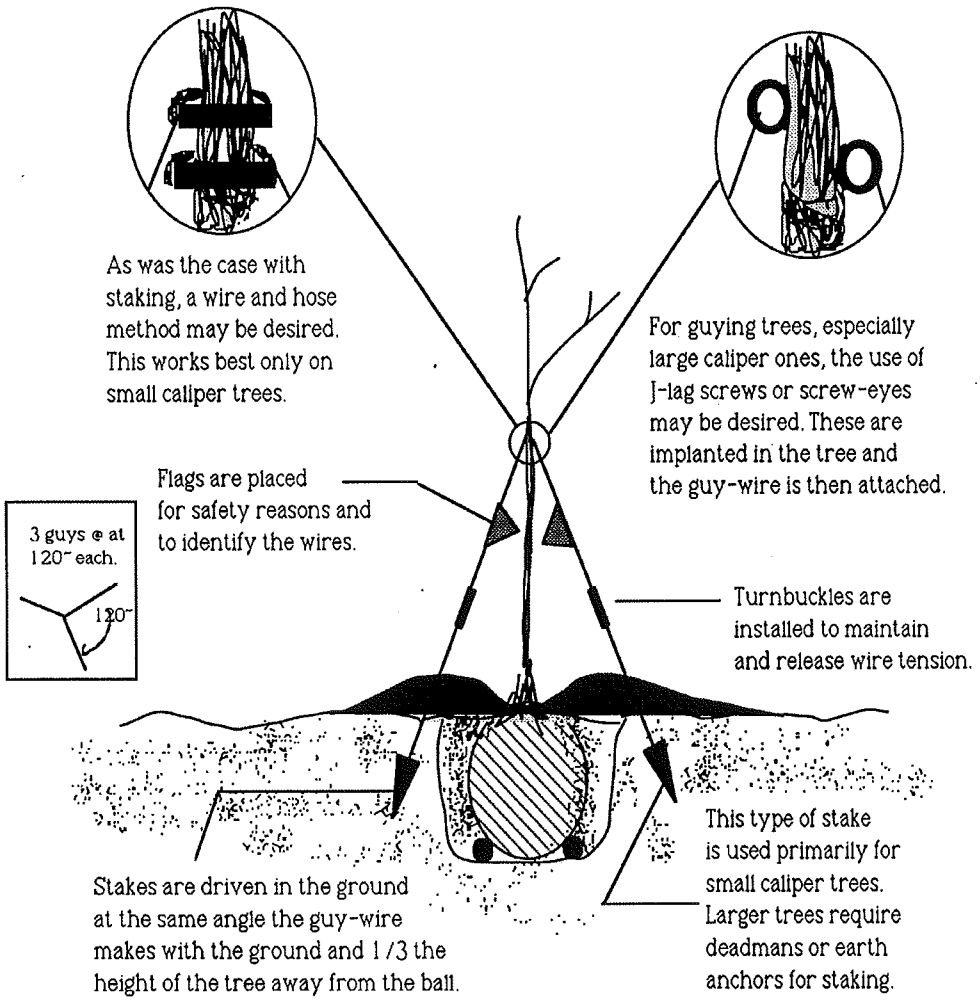


d. Procedure for old technique – Properly sized wires are used to encircle the main stem and encased in 1/2" plastic hose. The thought is that this will protect the tree from mechanical injury. The problem is that if the wire is left for any period of time, the guy wire and the hose can end up imbedded deeper in the tree and the girdle is even more severe. This technique has the potential for completely girdling the main stem if guy wires are not removed in a timely manner.

VI. GUYING THREE-INCH AND LARGER DECIDUOUS TREES

A. Guying three to five inch caliper trees. (Fig. 6.4)

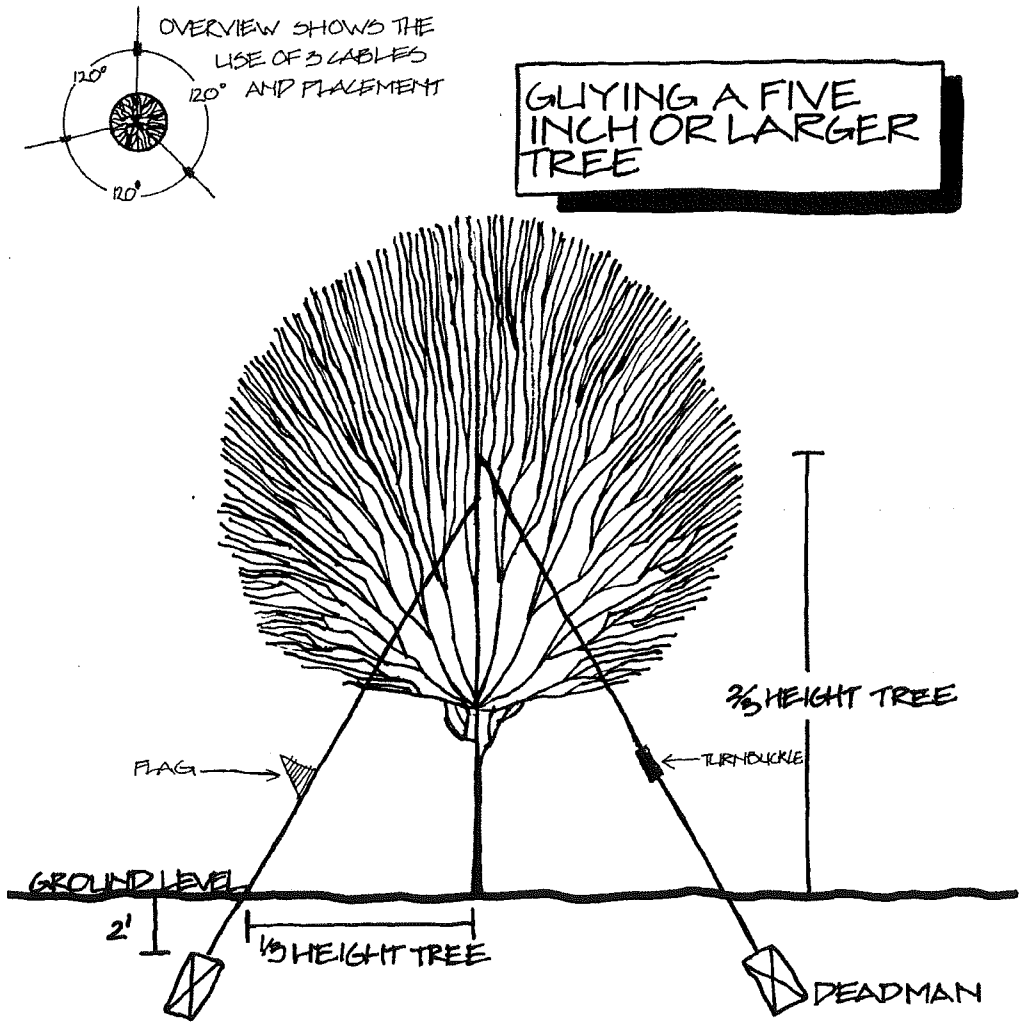
Figure 6.4 Diagram of the guying technique required for a tree between 3 and 5" caliper. Diagram by Joseph Russ. Drawing is not to scale.



2. Procedure - Procedure for guying following transplanting is to place the attachment as was done for staking. Attachments are made according to industry standards, as was the case for staking. More commonly, the point of attachment is just above the lowest branch of the tree. The stake that the guy wire is attached to is then placed out from the main stem of the tree. Half the height at which the guy wire is attached is the distance from the tree to the point where the guy wire is secured to the ground. The stake is then driven in line with the wire. This type of procedure insures much better stabilization then the more common technique of pounding the stake in at 90° angle to the line of pull. A flag is normally recommended to be placed about 1/2 of the height of the guy wire attachment so that it can be seen easily.

B. Guying five inch and greater caliper trees. (Fig 6.5)

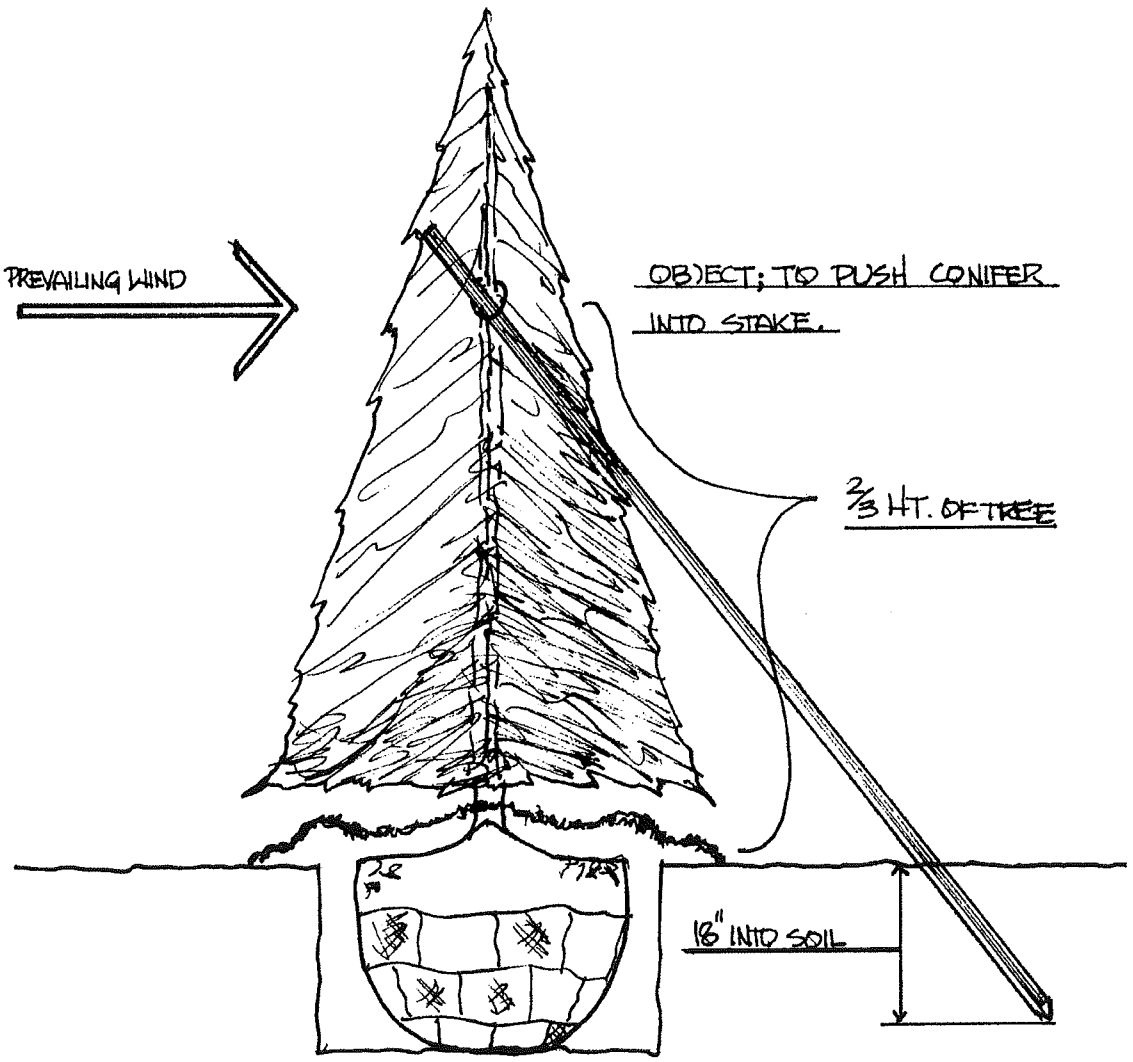
1. Figure 6.5 Diagram of the proper procedure to guy a 5" caliper or larger tree. Diagram by Jay Duecaster.



2. Procedure - The attachment is similar to the previous guying diagrams for staking. Again, three wires are used and placed at 120° angles. Again, the height of attachment, wire size, and hose size are dictated by industry standards. The deadmen (18" long 6 x 6 log or timber) are buried 2' deep. Guy wires are to be secured at the lowest branch. Earth anchors can be used in place of deadmen if desired. Properly sized guy wires are then attached to the tree. Trees of this size are normally secured such that a turnbuckle is placed in each guy wire. This allows the slack to be removed. Guy wires must be maintained taut if they are to do their job.

VII. STAKING CONIFERS

A. Figure 6.6 Diagram of a staking frequently employed for conifers. Diagram by Robert Knecht is not to scale.



B. Procedure - A single stake is employed. The stake is driven 18" into undisturbed soil and attached at 2/3 the height of the tree. Attachment can be by screw eye or hose as diagramed earlier. Under normal circumstances, conifers may not require staking because of their more stable configuration with the bulk of the foliage low in the tree's crown.

VIII. COSTS

Guying or staking normally increases the cost of planting between 15 and 20 percent. Stated another way, if guying is not used one can get eight plants for the price of seven. In any event, the cost of guying and or staking is relatively high. This cost must be measured against potential benefits and the increased risk of mechanical injury associated with guying and staking.

NA-FR-01-95

USDA Forest Service

Northeastern Area State and Private Forestry

HOW to Prune Trees

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Introduction

The objective of pruning is to produce strong, healthy, attractive plants. By understanding how, when and why to prune, and by following a few simple principles, this objective can be achieved.

Why Prune

The main reasons for pruning ornamental and shade trees include safety, health, and aesthetics. In addition, pruning can be used to stimulate fruit production and increase the value of timber. Pruning for *safety* (Fig. 1A) involves removing branches that could fall and cause injury or property damage, trimming branches that interfere with lines of sight on streets or driveways, and removing branches that grow into utility lines. Safety pruning can be largely avoided by carefully choosing species that will not grow beyond the space available to them, and have strength and form characteristics that are suited to the site.

Pruning for *health* (Fig. 1B) involves removing diseased or insect-infested wood, thinning the crown to increase airflow and reduce some pest problems, and removing

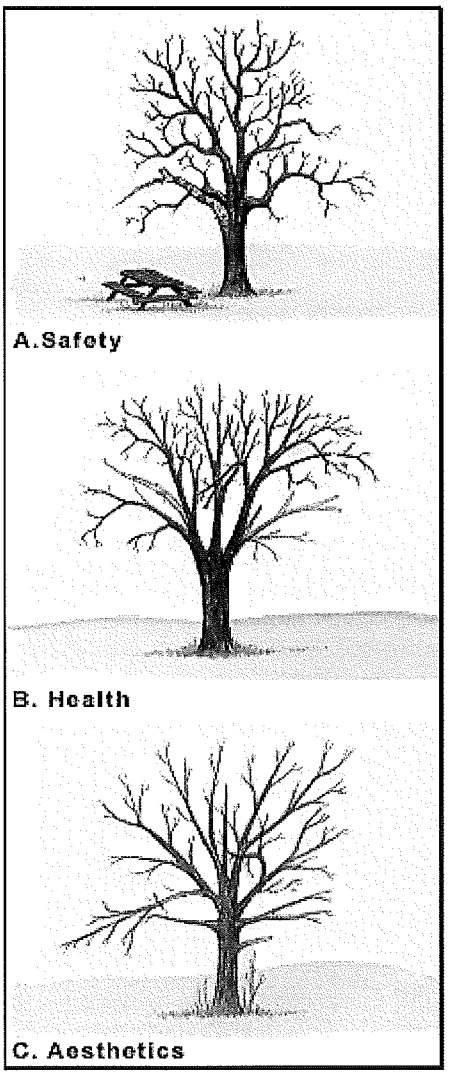


Figure 1. Reasons for pruning.

crossing and rubbing branches. Pruning can best be used to encourage trees to develop a strong structure and reduce the likelihood of damage during severe weather. Removing broken or damaged limbs encourage wound closure.

Pruning for *aesthetics* (Fig. 1C) involves enhancing the natural form and character of trees or stimulating flower production. Pruning for form can be especially important on open-grown trees that do very little self-pruning.

All woody plants shed branches in response to shading and competition. Branches that do not produce enough carbohydrates from photosynthesis to sustain themselves die and are eventually shed; the resulting wounds are sealed by **woundwood** (callus). Branches that are poorly attached may be broken off by wind and accumulation of snow and ice. Branches removed by such natural forces often result in large, ragged wounds that rarely seal. Pruning as a cultural practice can be used to supplement or replace these natural processes and increase the strength and longevity of plants.

Trees have many forms, but the most common types are pyramidal **(excurrent)** or spherical (**decurrent**). Trees with pyramidal crowns, e.g., most conifers, have a strong central stem and lateral branches that are more or less horizontal and do not compete with the central stem for dominance. Trees with spherical crowns, e.g., most hardwoods, have many lateral branches that may compete for dominance.

To reduce the need for pruning it is best to consider a tree's natural form. It is very difficult to impose an unnatural form on a tree without a commitment to constant maintenance.

Pollarding and **topiary** are extreme examples of pruning to create a desired, unnatural effect. Pollarding is the practice of pruning trees annually to remove all new growth. The following year, a profusion of new branches is produced at the ends of the branches. Topiary involves pruning trees and shrubs into geometric or animal shapes. Both pollarding and topiary are specialized applications that involve pruning to change the natural form of trees. As topiary demonstrates, given enough care and attention plants can be pruned into nearly any form. Yet just as proper pruning can enhance the form or character of plants, improper pruning can destroy it.

Pruning Approaches

Producing strong structure should be the emphasis when pruning young trees. As trees mature, the aim of pruning will shift to maintaining tree structure, form, health and appearance.

Proper pruning cuts are made at a node, the point at which one branch or twig attaches to another. In the spring of the year growth begins at buds, and twigs grow until a new node is formed. The length of a branch between nodes is called an internode.

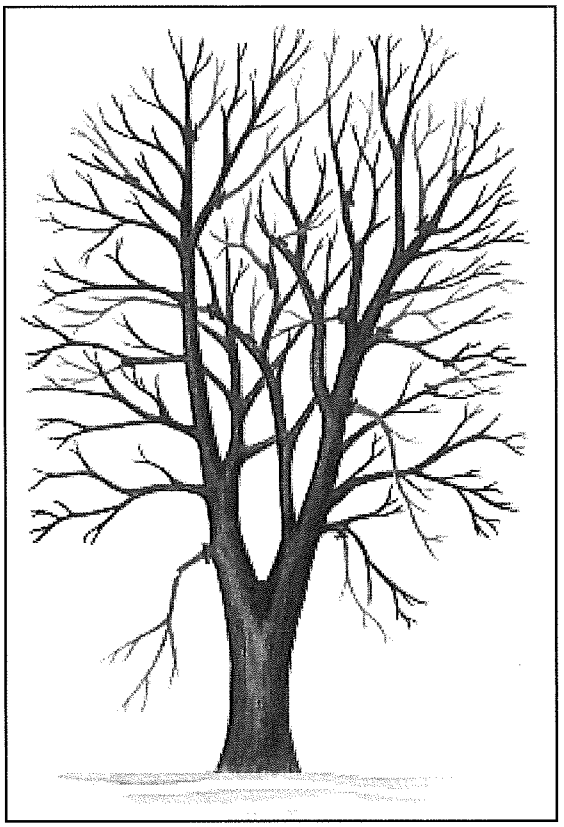


Figure 2. Crown thinning - branches to be removed are shaded in blue; pruning cuts should be made at the red lines. No more than one-fourth of the living branches should be removed at one time.

The most common types of pruning are:

1. *Crown Thinning* (Fig. 2)

Crown thinning, primarily for hardwoods, is the selective removal of branches to increase light penetration and air movement throughout the crown of a tree. The intent is to maintain or develop a tree's structure and form. To avoid unnecessary stress and prevent excessive production of epicormic sprouts, no more than one-quarter of the living crown should be removed at a time. If it is necessary to remove more, it should be done over successive years.

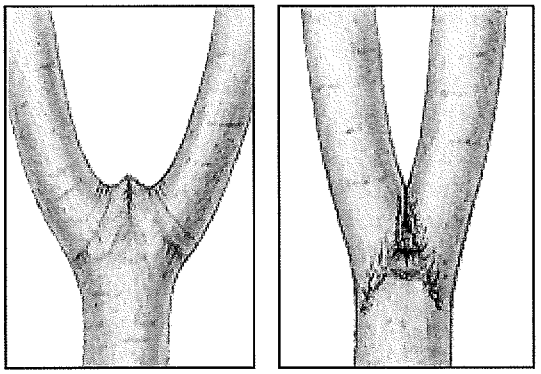


Figure 3. Types of branch unions.

Branches with strong U-shaped angles of attachment should be retained (Fig 3A). Branches with narrow, V-shaped angles of attachment often form **included bark** and should be removed (Fig. 3B). Included bark forms when two branches grow at sharply acute angles to one another, producing a wedge of inward-rolled bark between them. Included bark prevents strong attachment of branches, often causing a crack at the point below where the branches meet. Codominant stems that are approximately the same size and arise from the same position often form included bark. Removing some of the lateral branches from a codominant stem can reduce its growth enough to allow the other stem to become dominant.

Lateral branches should be no more than one-half to three-quarters of the diameter of the stem at the point of attachment. Avoid producing "lion's tails," tufts of branches and foliage at the ends of branches, caused by removing all inner lateral branches and foliage. Lion's tails can result in sunscalding, abundant **epicormic sprouts**, and weak branch structure and breakage. Branches that rub or cross

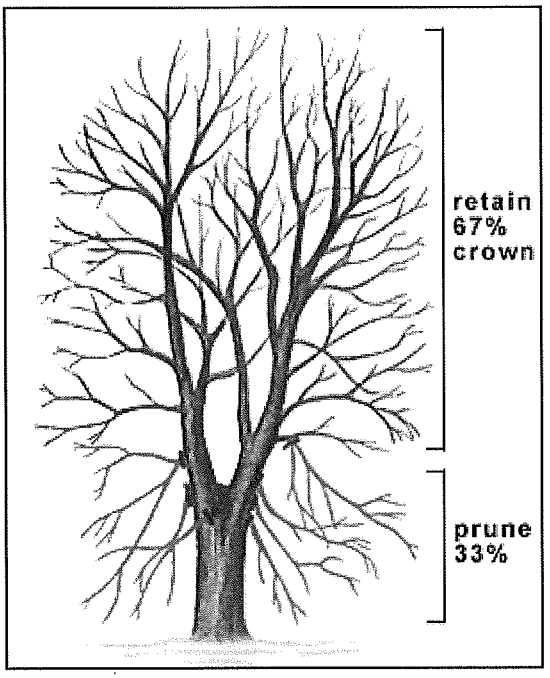


Figure 4. Crown raising - branches to be removed are shaded in blue; pruning cuts should be made where indicated with red lines. The ratio of live crown to total tree height should be at least two-thirds.

another branch should be removed.

Conifers that have branches in whorls and pyramidal crowns rarely need crown thinning except to restore a dominant leader. Occasionally, the leader of a tree may be damaged and multiple branches may become codominant. Select the strongest leader and remove competing branches to prevent the development of codominant stems.

2. *Crown Raising* (Fig. 4)

Crown raising is the practice of removing branches from the bottom of the crown of a tree to provide clearance for pedestrians, vehicles, buildings, lines of site, or to develop a clear stem for timber production. Also, removing lower branches on white pines can prevent blister rust. For street trees the minimum clearance is often specified by municipal ordinance. After pruning, the ratio of the living crown to total tree height should be at least two-thirds (e.g., a 12 m tree should have living branches on at least the upper 8 m).

On young trees "temporary" branches may be retained along the stem to encourage taper and protect trees from vandalism and sun scald. Less vigorous shoots should be selected as temporary branches and should be about 10 to 15 cm apart along the stem. They should be pruned annually to slow their growth and should be removed eventually.

3. *Crown Reduction* (Fig. 5)

Crown reduction pruning is most often used when a tree has grown too large for its permitted space. This method, sometimes called **drop crotch pruning**, is preferred to topping because it results in a more natural appearance, increases the time before pruning is needed again, and minimizes stress (see drop crotch cuts in the next section).

Crown reduction pruning, a method of last resort, often results in large pruning wounds to stems that may lead to decay. This method should never be used on a tree with a pyramidal growth form. A better long term solution is to remove the tree and replace it

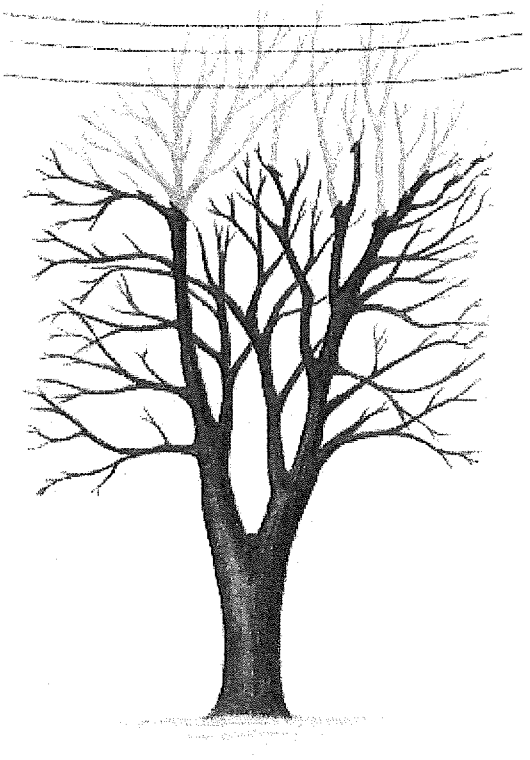


Figure 5. Crown reduction - branches to be removed are shaded in blue; pruning cuts should be made where indicated with red lines. To prevent branch dieback, cuts should be made at lateral branches that are at least one-third the diameter of the stem at their union.

with a tree that will not grow beyond the available space.

Pruning Cuts

Pruning cuts should be made so that only branch tissue is removed and stem tissue is not damaged. At the point where the branch attaches to the stem, branch and stem tissues remain separate, but are contiguous. If only branch tissues are cut when pruning, the stem tissues of the tree will probably not become decayed, and the wound will seal more effectively.

1. *Pruning living branches* (Fig. 6)

To find the proper place to cut a branch, look for the **branch collar** that grows from the stem tissue at the underside of the base of the branch (Fig. 6A). On the upper surface, there is usually a **branch bark ridge** that runs (more or less) parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar.

A proper cut begins just outside the branch bark ridge and angles down away from the stem of the tree, avoiding injury to the branch collar (Fig. 6B). Make the cut as close as possible to the stem in the **branch axil**, but outside the branch bark ridge, so that stem tissue is not injured and the wound can seal in the shortest time possible. If the cut is too far from the stem, leaving a branch stub, the branch tissue usually dies and woundwood forms from the stem tissue. Wound closure is delayed because the woundwood must seal over the stub that was left.

The quality of pruning cuts can be evaluated by examining pruning wounds after one growing season. A concentric ring of woundwood will form from proper pruning cuts (Fig. 6B). **Flush cuts** made inside the branch bark ridge or branch collar, result in pronounced development of woundwood on the sides of the pruning wounds with very little woundwood forming on the top or bottom (Fig. 7D). As described above, stub cuts result in the death of the remaining branch and woundwood forms around the base from stem tissues.
When pruning small branches with hand pruners, make sure the tools are sharp enough

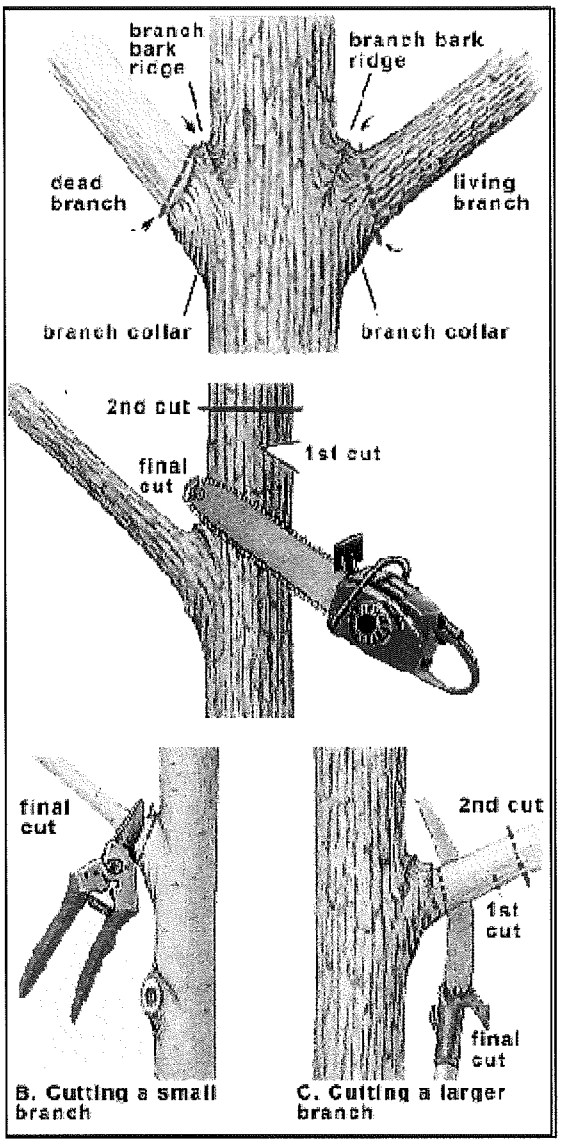


Figure 6. Pruning cuts

to cut the branches cleanly without tearing. Branches large enough to require saws should be supported with one hand while the cuts are made. If the branch is too large to support, make a three-step pruning cut to prevent bark ripping (Fig. 6C).

1. The first cut is a shallow notch made on the underside of the branch, outside the branch collar. This cut will prevent a falling branch from tearing the stem tissue as it pulls away from the tree.
2. The second cut should be outside the first cut, all the way through the branch, leaving a short stub.
3. The stub is then cut just outside the branch bark ridge/branch collar, completing the operation.

2. *Pruning dead branches* (Fig. 6)

Prune dead branches in much the same way as live branches. Making the correct cut is usually easy because the branch collar and the branch bark ridge, can be distinguished from the dead branch, because they continue to grow (Fig. 6A). Make the pruning cut just outside of the ring of woundwood tissue that has formed, being careful not to cause unnecessary injury (Fig. 6C). Large dead branches should be supported with one hand or cut with the three-step method, just as live branches. Cutting large living branches with the three step method is more critical because of the greater likelihood of bark ripping.

3. *Drop Crotch Cuts* (Fig. 6D)

A proper cut begins just above the branch bark ridge and extends through the stem parallel to the branch bark ridge. Usually, the stem being removed is too large to be supported with one hand, so the three cut method should be used.

1. With the first cut, make a notch on the side of the stem away from the branch to be retained, well above the branch crotch.

2. Begin the second cut inside the branch crotch, staying well above the branch bark ridge, and cut through the stem above the notch.
3. Cut the remaining stub just inside the branch bark ridge through the stem parallel to the branch bark ridge.

To prevent the abundant growth of epicormic sprouts on the stem below the cut, or dieback of the stem to a lower lateral branch, make the cut at a lateral branch that is at least one-third of the diameter of the stem at their union.

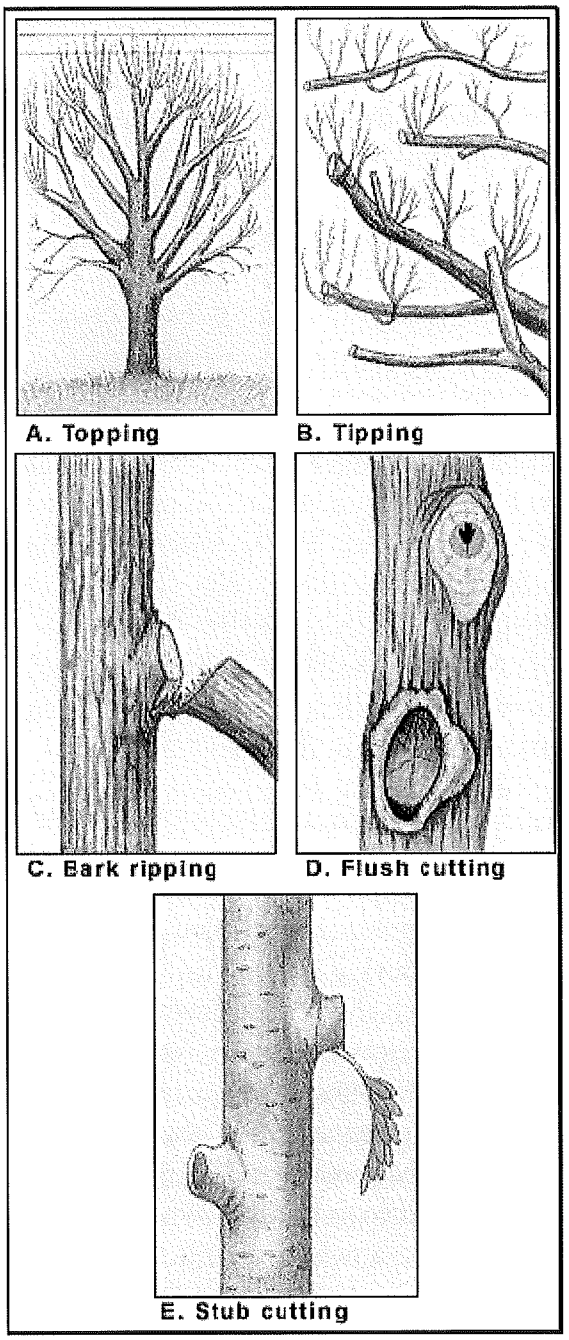
Pruning Practices That Harm Trees

Topping and **tipping** (Fig. 7A, 7B) are pruning practices that harm trees and should not be used. Crown reduction pruning is the preferred method to reduce the size or height of the crown of a tree, but is rarely needed and should be used infrequently.

Topping, the pruning of large upright branches between nodes, is sometimes done to reduce the height of a tree (Fig. 7A). Tipping is a practice of cutting lateral branches between nodes (Fig. 7B) to reduce crown width.

These practices invariably result in the development of epicormic sprouts, or in the death of the cut branch back to the next lateral branch below. These epicormic sprouts are weakly attached to the stem and eventually will be supported by a decaying branch.

Improper pruning cuts cause unnecessary injury and bark ripping (Fig. 7C). Flush cuts injure



stem tissues and can result in decay (Fig. 7D). **Stub cuts** delay wound closure and can provide entry to canker fungi that kill the cambium, delaying or preventing woundwood formation (Fig. 7E).

When to Prune

Conifers may be pruned any time of year, but pruning during the dormant season may minimize sap and resin flow from cut branches.

Hardwood trees and shrubs *without showy flowers*: prune in the dormant season to easily visualize the structure of the tree, to maximize wound closure in the growing season after pruning, to reduce the chance of transmitting disease, and to discourage excessive sap flow from wounds. Recent wounds and the chemical scents they emit can actually attract insects that spread tree disease. In particular, wounded elm wood is known to attract bark beetles that harbor spores of the Dutch elm disease fungus, and open wounds on oaks are known to attract beetles that spread the oak wilt fungus. Take care to prune these trees during the correct time of year to prevent spread of these fatal diseases. Contact your local tree disease specialist to find out when to prune these tree species in your area. Usually, the best time is during the late fall and winter.

Flowering trees and shrubs: these should also be pruned during the dormant season for the same reasons stated above; however, to preserve the current year's flower crop, prune according to the following schedule:

- Trees and shrubs that flower in early spring (redbud, dogwood, etc.) should be pruned immediately after flowering (flower buds arise the year before they flush, and will form on the new growth).
- Many flowering trees are susceptible to fireblight, a bacterial disease that can be spread by pruning. These trees, including many varieties of crabapple, hawthorn, pear, mountain ash, flowering quince and pyracantha, should be pruned during the dormant season. Check with your county extension agent or a horticulturist for additional information.
- Trees and shrubs that flower in the summer or fall always should be pruned during the dormant season (flower buds will form on new twigs during the next growing season, and the flowers will flush normally).

Dead branches: can be removed any time of the year.

Pruning Tools

Proper tools are essential for satisfactory pruning (Fig.6). The choice of which tool to use depends largely on the size of branches to be pruned and the amount of pruning to be done. If possible, test a tool before you buy it to ensure it suits your specific needs. As with most things, higher quality often equates to higher cost.

Generally speaking, the smaller a branch is when pruned, the sooner the wound created will seal. Hand pruners are used to prune small branches (under 2.5 cm diameter) and many different kinds are available. Hand pruners can be grouped into by-pass or anvil styles based on the blade configuration. Anvil style pruners have a straight blade that cuts the branch against a small anvil or block as the handles are squeezed. By-pass pruners use a curved cutting blade that slides past a broader lower blade, much like a scissors. To prevent unnecessary tearing or crushing of tissues, it is best to use a

by-pass style pruner. Left- or right-handed types can be purchased.

Slightly larger branches that cannot be cut with a hand pruner may be cut with small pruning saws (up to 10 cm) or lopping shears (up to 7 cm diameter) with larger cutting surfaces and greater leverage. Lopping shears are also available in by-pass and anvil styles.

For branches too large to be cut with a hand pruner or lopping shears, pruning saws must be used. Pruning saws differ greatly in handle styles, the length and shape of the blade, and the layout and type of teeth. Most have tempered metal blades that retain their sharpness for many pruning cuts. Unlike most other saws, pruning saws are often designed to cut on the "pull-stroke."

Chain saws are preferred when pruning branches larger than about 10 cm. Chainsaws should be used only by qualified individuals. To avoid the need to cut branches greater than 10 cm diameter, prune when branches are small.

Pole pruners must be used to cut branches beyond reach. Generally, pruning heads can cut branches up to 4.4 cm diameter and are available in the by-pass and anvil styles. Once again, the by-pass type is preferred. For cutting larger branches, saw blades can be fastened directly to the pruning head, or a separate saw head can be purchased. Because of the danger of electrocution, pole pruners should not be used near utility lines except by qualified utility line clearance personnel.

To ensure that satisfactory cuts are made and to reduce fatigue, keep your pruning tools sharp and in good working condition. Hand pruners, lopping shears, and pole pruners should be periodically sharpened with a sharpening stone. Replacement blades are available for many styles. Pruning saws should be professionally sharpened or periodically replaced. To reduce cost, many styles have replaceable blades.

Tools should be clean and sanitized as well as sharp. Although sanitizing tools may be inconvenient and seldom practiced, doing so may prevent the spread of disease from infected to healthy trees on contaminated tools. Tools become contaminated when they come into contact with fungi, bacteria, viruses and other microorganisms that cause disease in trees. Most pathogens need some way of entering the tree to cause disease, and fresh wounds are perfect places for infections to begin. Microorganisms on tool surfaces are easily introduced into susceptible trees when subsequent cuts are made. The need for sanitizing tools can be greatly reduced by pruning during the dormant season.

If sanitizing is necessary it should be practiced as follows: Before each branch is cut, sanitize pruning tools with either 70% denatured alcohol, or with liquid household bleach diluted 1 to 9 with water (1 part bleach, 9 parts water). Tools should be immersed in the solution, preferably for 1-2 minutes, and wood particles should be wiped from all cutting surfaces. Bleach is corrosive to metal surfaces, so tools should be thoroughly cleaned with soap and water after each use.

Treating wounds

Tree sap, gums, and resins are the natural means by which trees combat invasion by pathogens. Although unsightly, sap flow from pruning wounds is not generally harmful; however, excessive "bleeding" can weaken trees.

When oaks or elms are wounded during a critical time of year (usually spring for oaks, or throughout the growing season for elms) -- either from storms, other unforeseen mechanical wounds, or from necessary branch removals -- some type of wound dressing should be applied to the wound. Do this immediately after the wound is created. In most other instances, wound dressings are unnecessary, and may even be detrimental. Wound dressings will not stop decay or cure infectious diseases. They may actually interfere with the protective benefits of tree gums and resins, and prevent wound surfaces from closing as quickly as they might under natural conditions. The only benefit of wound dressings is to prevent introduction of pathogens in the specific cases of Dutch elm disease and oak wilt.

Pruning Guidelines

To encourage the development of a strong, healthy tree, consider the following guidelines when pruning.

General

- Prune first for safety, next for health, and finally for aesthetics.
- Never prune trees that are touching or near utility lines; instead consult your local utility company.
- Avoid pruning trees when you might increase susceptibility to important pests (e.g. in areas where oak wilt exists, avoid pruning oaks in the spring and early summer; prune trees susceptible to fireblight only during the dormant season).
- Use the following decision guide for size of branches to be removed: 1) under 5 cm diameter - go ahead, 2) between 5 and 10 cm diameter - think twice, and 3) greater than 10 cm diameter - have a good reason.

Crown Thinning

- Assess how a tree will be pruned from the top down.
- Favor branches with strong, U-shaped angles of attachment. Remove branches with weak, V-shaped angles of attachment and/or included bark.
- Ideally, lateral branches should be evenly spaced on the main stem of young trees.
- Remove any branches that rub or cross another branch.
- Make sure that lateral branches are no more than one-half to three-quarters of the diameter of the stem to discourage the development of co-dominant stems.

- Do not remove more than one-quarter of the living crown of a tree at one time. If it is necessary to remove more, do it over successive years.

Crown Raising

- Always maintain live branches on at least two-thirds of a tree's total height. Removing too many lower branches will hinder the development of a strong stem.
- Remove basal sprouts and vigorous epicormic sprouts.

Crown Reduction

- Use crown reduction pruning only when absolutely necessary. Make the pruning cut at a lateral branch that is at least one-third the diameter of the stem to be removed.
- If it is necessary to remove more than half of the foliage from a branch, remove the entire branch.

Glossary

Branch Axil: the angle formed where a branch joins another branch or stem of a woody plant.

Branch Bark Ridge: a ridge of bark that forms in a branch crotch and partially around the stem resulting from the growth of the stem and branch tissues against one another.

Branch Collar: a "shoulder" or bulge formed at the base of a branch by the annual production of overlapping layers of branch and stem tissues.

Crown Raising: a method of pruning to provide clearance for pedestrians, vehicles, buildings, lines of sight, and vistas by removing lower branches.

Crown Reduction Pruning: a method of pruning used to reduce the height of a tree. Branches are cut back to laterals that are at least one-third the diameter of the limb being removed.

Crown Thinning: a method of pruning to increase light penetration and air movement through the crown of a tree by selective removal of branches.

Callus: see woundwood.

Decurrent: a major tree form resulting from weak apical control. Trees with this form have several to many lateral branches that compete with the central stem for dominance resulting in a spherical or globose crown. Most hardwood trees have decurrent forms.

Epicormic Sprout: a shoot that arises from latent or adventitious buds; also know as water sprouts that occur for on stems and branches and suckers that are produced from the base of trees. In older wood, epicormic shoots often result from severe defoliation or radical pruning.

Excurrent: a major tree form resulting from strong apical control. Trees with this form have a strong central stem and pyramidal shape. Lateral branches rarely compete for dominance. Most conifers and a few hardwoods, such as sweetgum and tuliptree, have excurrent forms.

Flush Cuts: pruning cuts that originate inside the branch bark ridge or the branch collar, causing unnecessary injury to stem tissues.

Included Bark: bark enclosed between

branches with narrow angles of attachment, forming a wedge between the branches.

Pollarding: the annual removal of all of the previous year's growth, resulting in a flush of slender shoots and branches each spring.
Stub Cuts: pruning cuts made too far outside the branch bark ridge or branch collar, that leave branch tissue attached to the stem.

Tipping: a poor maintenance practice used to control the size of tree crowns; involves the cutting of branches at right angles leaving long stubs.

Topping: a poor maintenance practice often used to control the size of trees; involves the indiscriminate cutting of branches and stems at right angles leaving long stubs. Synonyms include rounding-over, heading-back, dehorning, capping and hat-racking. Topping is often improperly referred to as pollarding.

Topiary: the pruning and training of a plant into a desired geometric or animal shape.

Woundwood: lignified, differentiated tissues produced on woody plants as a response to wounding (also known as callus tissue).

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"How to Prune Trees" was written to help people properly prune the trees they care about. If you doubt your ability to safely prune large trees, please hire a professional arborist. Information in this publication can be used to interview and hire a competent arborist.

Mature Tree Care

Think of tree care as an investment. A healthy tree increases in value with age—paying big dividends, increasing property values, beautifying our surroundings, purifying our air, and saving energy by providing cooling shade from summer's heat and protection from winter's wind.

Providing a preventive care program for your landscape plants is like putting money in the bank. Regular maintenance, designed to promote plant health and vigor, ensures their value will continue to grow. Preventing a problem is much less costly and time-consuming than curing one once it has developed. An effective maintenance program, including regular inspections and the necessary follow-up care of mulching, fertilizing, and pruning, can detect problems and correct them before they become damaging or fatal. Considering that many tree species can live as long as 200 to 300 years, including these practices when caring for your home landscape is an investment that will offer enjoyment and value for generations.

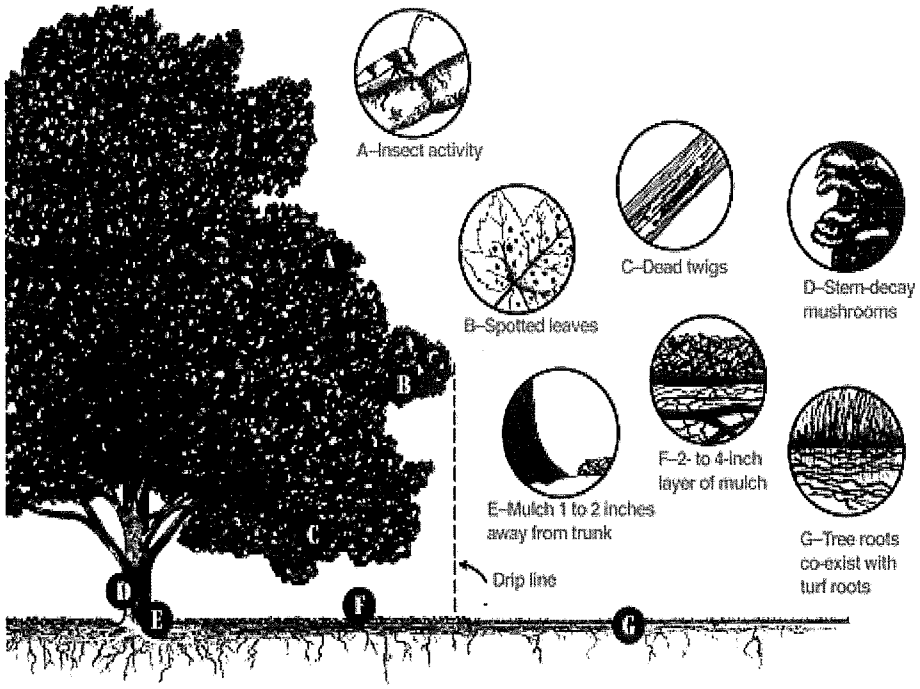
Tree Inspection

Tree inspection is an evaluation tool to call attention to any change in the tree's health before the problem becomes too serious. By providing regular inspections of mature trees at least once a year, you can prevent or reduce the severity of future disease, insect, and environmental problems. During tree inspection, be sure to examine four characteristics of tree vigor: new leaves or buds, leaf size, twig growth, and absence of crown dieback (gradual death of the upper part of the tree).

A reduction in the extension of shoots (new growing parts), such as buds or new leaves, is a fairly reliable cue that the tree's health has recently changed. To evaluate this factor, compare the growth of the shoots over the past three years. Determine whether there is a reduction in the tree's typical growth pattern.

Further signs of poor tree health are trunk decay, crown dieback, or both. These symptoms often indicate problems that began several years before. Loose bark or deformed growths, such as trunk conks (mushrooms), are common signs of stem decay.

Any abnormalities found during these inspections, including insect activity and spotted, deformed, discolored, or dead leaves and twigs, should be noted and watched closely. If you are uncertain as to what should be done, report your findings to your local ISA Certified Arborist or other tree care professional for advice on possible treatment.



Mulching

Mulching can reduce environmental stress by providing trees with a stable root environment that is cooler and contains more moisture than the surrounding soil. Mulch can also prevent mechanical damage by keeping machines such as lawn mowers and string trimmers away from the tree's base. Further, mulch reduces competition from surrounding weeds and turf.

To be most effective in all of these functions, mulch should be placed 2 to 4 inches deep and cover the entire root system, which may be as far as 2 or 3 times the diameter of the branch spread of the tree. If the area and activities happening around the tree do not permit the entire area to be mulched, it is recommended that you mulch as much of the area under the drip line of the tree as possible (refer to diagram). When placing mulch, care should be taken not to cover the actual trunk of the tree. This mulch-free area, 1 to 2 inches wide at the base, is sufficient to avoid moist bark conditions and prevent trunk decay.

An organic mulch layer 2 to 4 inches deep of loosely packed shredded leaves, pine straw, peat moss, or composted wood chips is adequate. Plastic should not be used because it interferes with the exchange of gases between soil and air, which inhibits root growth. Thicker mulch layers, 5 to 6 inches deep or greater, may also inhibit gas exchange.

Fertilization

Fertilization is another important aspect of mature tree care. Trees require certain nutrients (essential elements) to function and grow. Urban landscape trees can be growing in soils that do not contain sufficient available nutrients for satisfactory growth and development. In these situations, it may be necessary to fertilize to improve plant vigor.

Fertilizing a tree can improve growth; however, if fertilizer is not applied wisely, it may not benefit the tree at all and may even adversely affect the tree. Mature trees making satisfactory growth may not require fertilization. When considering supplemental fertilizer, it is important to know which nutrients are needed and when and how they should be applied.

Soil conditions, especially pH and organic matter content, vary greatly, making the proper selection and use of fertilizer a somewhat complex process. When dealing with a mature tree that provides considerable benefit and value to your landscape, it is worth the time and investment to have the soil tested for nutrient content. Any arborist can arrange to have your soil tested at a soil testing laboratory and can give advice on application rates, timing, and the best blend of fertilizer for each of your trees and other landscape plants.

Mature trees have expansive root systems that extend from 2 to 3 times the size of the leaf canopy. A major portion of actively growing roots is located outside the tree's drip line. It is important to understand this fact when applying fertilizer to your trees as well as your turf. Many lawn fertilizers contain weed and feed formulations that may be harmful to your trees. When you apply a broadleaf herbicide to your turf, remember that tree roots coexist with turf roots. The same herbicide that kills broadleaf weeds in your lawn is picked up by tree roots and can harm or kill your broadleaf trees if applied incorrectly. Understanding the actual size and extent of a tree's root system before you fertilize is necessary to determine how much, what type, and where to best apply fertilizer.

Pruning

Pruning is the most common tree maintenance procedure next to watering. Pruning is often desirable or necessary to remove dead, diseased, or insect-infested branches and to improve tree structure, enhance vigor, or maintain safety. Because each cut has the potential to change the growth of (or cause damage to) a tree, no branch should be removed without a reason.

Removing foliage from a tree has two distinct effects on its growth. Removing leaves reduces photosynthesis and may reduce overall growth. That is why pruning should always be performed sparingly. Overpruning is extremely harmful because without enough leaves, a tree cannot gather and process enough sunlight to survive. However, after pruning, the growth that does occur takes place on fewer shoots, so they tend to grow longer than they would without pruning. Understanding how the tree responds to pruning should assist you when selecting branches for removal.

Pruning mature trees may require special equipment, training, and experience. If the pruning work requires climbing, the use of a chain or hand saw, or the removal of large limbs, then using personal safety equipment, such as protective eyewear and hearing protection, is a must. Arborists can provide a variety of services to assist in performing the job safely and reducing risk of personal injury and damage to your property. They also are able to determine which type of pruning is necessary to maintain or improve the health, appearance, and safety of your trees.

Removal

Although tree removal is a last resort, there are circumstances when it is necessary. An arborist can help decide whether or not a tree should be removed. Professionally trained arborists have the skills and equipment to safely and efficiently remove trees. Removal is recommended when a tree

- is dead, dying, or considered irreparably hazardous

- is causing an obstruction or is crowding and causing harm to other trees and the situation is impossible to correct through pruning
- is to be replaced by a more suitable specimen
- should be removed to allow for construction

With proper maintenance, trees are attractive and can add considerable value to your property. Poorly maintained trees, on the other hand, can be a significant liability. Pruning or removing trees, especially large trees, can be dangerous work. It should be performed only by those trained and equipped to work safely in trees. For more information on mature tree care, contact your local ISA Certified Arborist.

The PHC Alternative

Maintaining mature landscapes is a complicated undertaking. You may wish to consider a professional Plant Health Care (PHC) maintenance program, which is now available from many landscape care companies. A PHC program is designed to maintain plant vigor and should initially include inspections to detect and treat any existing problems that could be damaging or fatal. Thereafter, regular inspections and preventive maintenance will ensure plant health and beauty. Refer to our Plant Health Care brochure for more information.

E-mail inquiries: isa@isa-arbor.com

UPDATED JULY 2005

Developed by the International Society of Arboriculture (ISA), a non-profit organization supporting tree care research around the world and is dedicated to the care and preservation of shade and ornamental trees. For further information, contact:
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UPDATED SEPTEMBER 2005

Insects & Disease Problems

Insects and diseases can threaten tree health. As soon as you notice any abnormality in your tree's appearance, you should begin a careful examination of the problem. By identifying the specific symptoms of damage and understanding their causes, you may be able to diagnose the problem and select an appropriate treatment.

Stress

Basic elements that influence plant health include sufficient water and light, and a proper balance of nutrients. Too much or too little of any of these environmental conditions may cause plant stress.

Environmental stress weakens plants and makes them more susceptible to insect and disease attack.

Trees deal with environmental stresses, such as shading and competition for water and nutrients in their native environment, by adjusting their growth and development patterns to reflect the availability of the resources. Although trees are adapted to living in stressful conditions in nature, many times the stresses they experience in the landscape are more than they can handle and may make them more susceptible to insects and diseases.

Diagnosis

Correct diagnosis of plant health problems requires a careful examination of the situation.

1. **Accurately identify the plant.** Because many insects and diseases are plant-specific, this information can quickly limit the number of suspected diseases and disorders.
2. **Look for a pattern of abnormality.** It may be helpful to compare the affected plant with other plants on the site, especially those of the same species. Differences in color or growth may present clues as to the source of the problem. Nonuniform damage patterns may indicate insects or diseases. Uniform damage over a large area (perhaps several plant species) usually indicates disorders caused by such factors as physical injury, poor drainage, or weather.
3. **Carefully examine the landscape.** The history of the property and adjacent land may reveal many problems. The number of species affected may also help distinguish between infectious pathogens that are more plant-specific as compared to chemical or environmental factors that affect many different species. Most living pathogens take a relatively long time to spread throughout an area, so if a large percentage of plants becomes diseased virtually overnight, a pathogen is probably not involved.
4. **Examine the roots.** Note their color: brown or black roots may signal problems. Brown roots often indicate dry soil conditions or the presence of toxic chemicals. Black roots usually reflect overly wet soil or the presence of root-rotting organisms.
5. **Check the trunk and branches.** Examine the trunk thoroughly for wounds because they provide entrances for pathogens and wood-rotting organisms. Wounds can be caused by

weather, fire, lawn mowers, and rodents, as well as a variety of other environmental and mechanical factors. Large defects may indicate a potentially hazardous tree.

6. **Note the position and appearance of affected leaves.** Dead leaves at the top of the tree are usually the result of environmental or mechanical root stress. Twisted or curled leaves may indicate viral infection, insect feeding, or exposure to herbicides. The size and color of the foliage may tell a great deal about the plant's condition. Make note of these and any other abnormalities.

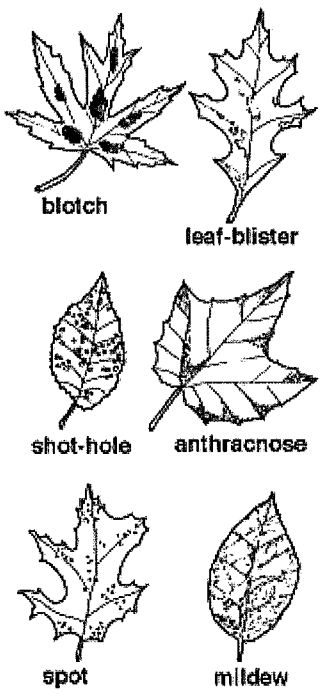
Diseases

Three things are required for a disease to develop:

- the presence of a pathogen (the disease-causing agent)
- plant susceptibility to that particular pathogen
- an environment suitable for disease development

Plants vary in susceptibility to pathogens. Many disease-prevention programs focus on the use of pathogen-resistant plant varieties. Even if the pathogen is present and a susceptible plant host is available, the proper environmental conditions must be present over the correct period of time for the pathogen to infect the plant.

Diseases can be classified into two broad categories: those caused by infectious or living agents (diseases) and those caused by noninfectious or nonliving agents (disorders).



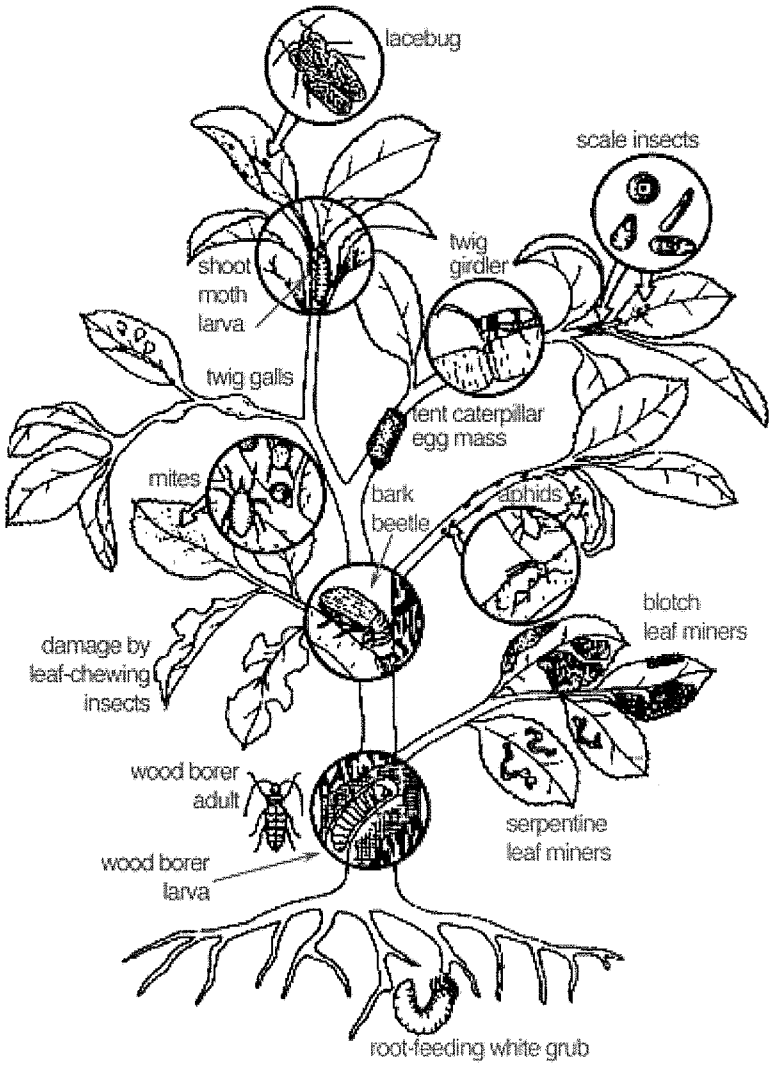
Examples of infectious agents include fungi, viruses, and bacteria. Noninfectious diseases, which account for 70 to 90 percent of all plant problems in urban areas, can be caused by such factors as nutrient deficiencies, temperature extremes, vandalism, pollutants, and fluctuations in moisture. Noninfectious disorders often produce symptoms similar to those caused by infectious diseases; therefore, it is essential to distinguish between the two in order to give proper treatment.

Insects

Some insects can cause injury and damage to trees and shrubs. By defoliating trees or sucking their sap, insects can retard plant growth. By boring into the trunk and branches, they interfere with sap flow and weaken the tree structure. Insects may alsocarry some plant diseases. In many cases, however, the insect problem is secondary to problems brought on by a stress disorder or pathogen.

It is important to remember that most insects are beneficial rather than destructive. They help with pollination or act as predators of more harmful species. Therefore, killing all insects without regard to their kind and function can actually be detrimental to tree health.

Insects may be divided into three categories according to their method of feeding: chewing, sucking, or boring. Insects from each group have characteristic patterns of damage that will help you determine the culprit and the proper treatment. Always consult a tree care expert if you have any doubt about the nature of the insect problem or the proper treatment.



Chewing insects eat plant tissue such as leaves, flowers, buds, and twigs. Indications of damage by these insects is often seen by uneven or broken margins on the leaves, skeletonization of the leaves, and leaf mining. Chewing insects can be beetle adults or larvae, moth larvae (caterpillars), and many other groups of insects. The damage they cause (leaf notching, leaf mining, leaf skeletonizing, etc.) will help in identifying the pest insect.

Sucking insects insert their beak (proboscis) into the tissues of leaves, twigs, branches, flowers, or fruit and then feed on the plant's juices. Some examples of sucking insects are aphids, mealy bugs, thrips, and leafhoppers. Damage caused by these pests is often indicated by discoloration, drooping, wilting, leaf spots (stippling), honeydew, or general lack of vigor in the affected plant.

Boring insects spend time feeding somewhere beneath the bark of a tree as larvae. Some borers kill twigs and leaders when adults feed or when eggs hatch into larvae that bore into the stem and develop into adults. Other borers, known as bark beetles, mate at or near the bark surface, and adults lay eggs in tunnels beneath the bark.

Treatment

The treatment method used for a particular insect or disease problem will depend on the species involved, the extent of the problem, and a variety of other factors specific to the situation and local regulations. Always consult a professional if you have any doubt about the nature of the problem or proper treatment.

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UPDATED SEPTEMBER 2005

Managing Disease and Insects in Your Trees

After investing countless hours of hard labor and hard-earned dollars on tree landscaping, the last thing you need is to see your efforts ruined by an onslaught of disease and insects. The first step in protecting your valuable green assets is prevention.

Be sure to plant trees that are well suited to your location and that are resistant to common insect and disease infestations. Most insects and diseases take advantage of plants that are under stress so watering, mulching, and pruning are essential to preventing outbreaks.

Proper diagnosis is also key to treating the problem. The following are a few of the most asked-about tree diseases and insects in Ohio.

Diseases:

Powdery Mildew

This disease makes your plants look as though they've been sprinkled with powder. Commonly found on crabapples, dogwoods, English oak, and catalpa trees, some mildews affect older leaves first. When new shoots are diseased, you'll notice leaf curling, shoot stunting and twisting.

While this deforming disease definitely makes a tree less aesthetically appealing, the good news is that powdery mildew doesn't usually kill. However, your tree may be less able to rebound during stressful periods like winter.

If you want to prevent powdery mildew from attacking your trees in the first place, keep water from standing on the leaves for long periods of time. Water only early in the day and thin surrounding vegetation to increase sunlight and improve air circulation around foliage.

Leaf Spots

Fungal leaf spots appear regularly in Ohio. They often cause homeowners endless worry, but their damage is usually minimal and fungicides are rarely necessary. These diseases generally winter on fallen leaves and then re-infect trees in spring. Tar spot and frogeye leaf spot are two of the most common.

Tar spot is very obvious as yellow-green circles on the leaves' upper surfaces during spring. By mid to late summer, the circles become tar-like spots. Tar spot is found on maples, especially Amur, Japanese, red, and silver varieties.

Frogeye leaf spot affects most crabapples. Spots are roughly circular and develop into tannish spots with purple to red borders. Later in the season, the spots enlarge and the

interior turns gray giving it a "frog eye" appearance. This is also a minor disease and treatment is usually unnecessary.

Since fungal leaf spots spread from the fruiting bodies on fallen leaves, the best protection is to rake up the leaves and remove them from the area.

Insects:

Chewing Insects

These insects eat your tree's leaves. Spring and fall cankerworm, tent caterpillar, gypsy moth, leafminers, and Japanese beetles are the usual suspects. Trees generally bounce back from an attack of these defoliators, but repeated infestations will weaken a tree and may eventually destroy it.

Boring Insects

Boring insects tunnel into the stem, roots, or twigs of a tree. Some lay eggs and the offspring burrow more deeply into the wood blocking off the tree's water-conducting tissues. If the infestation is serious, the upper leaves will be starved of nutrients and moisture and your tree could die. Be on the lookout for entry/exit holes in tree bark, small mounds of sawdust at the tree or branch base, and branch wilting and dying. Boring culprits are the Asian longhorn beetle, bronze birch borer, dogwood borer, two-lined chestnut borer, ash borer, and elm bark beetle.

Sucking Insects

These insects do their damage by sucking the liquid from leaves and twigs. One type of sucking insect called scales lives on the outside of a branch and forms a hard protective outer coating while feeding on the plant juices. Telltale signs of these pests are scaly formations on branches, leaf dieback and sticky, sweet excretions. These excretions often turn black when colonized by sooty mold fungus. Other sucking insects include, aphids, leafhoppers, spider mites, and thrips.

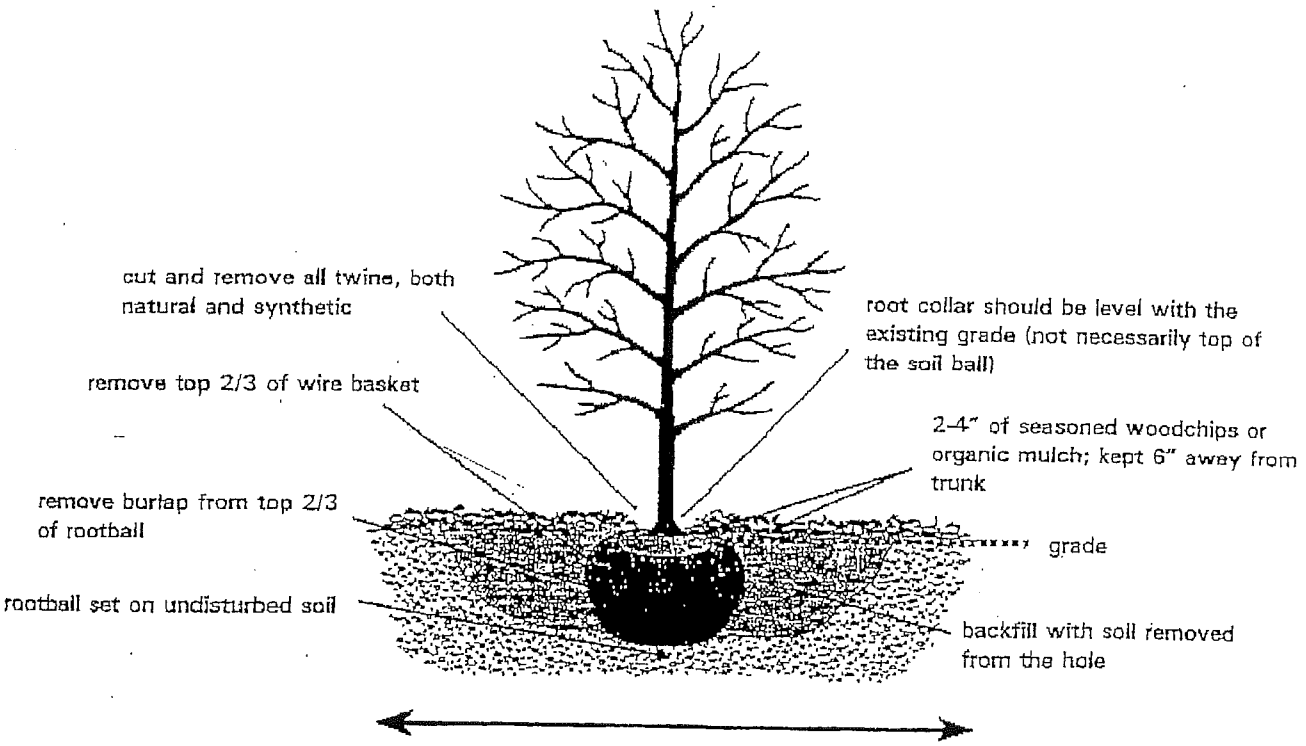
The best way to keep your trees healthy is to give Mother Nature a helping hand, or should I say "eye?" Visually inspect trees several times during the growing season and note any changes. Early detection helps prevent irreversible damage.

For more recommendations on treating diseases and insect infestations in your trees, check with your local urban forester, nursery, or county Extension office for advice, or go online to www.ohioline.osu.edu.

Feature Article Credit:
ODNR
http://www.dnr.state.oh.us/Home/urban/features/treebugs/tabid/5461/Default.aspx

Liberty Township
Tree Planting Guide

TREE PLANTING DIAGRAM
FAIRLY WELL-DRAINED SOILS



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