ANCHORAGE FORESTRY HANDBOOK

An Educational Guide to the Appreciation of Trees Within Our Community

Anchorage Forestry Handbook

A Guide for the Appreciation of Trees

Foreword

A huge challenge is waiting for you – right out there in your own yard. No, not grass that needs cutting or bushes that need trimming. This challenge, if you meet it, will add to the value and beauty of your property and, perhaps best of all, will fill you with a deep feeling of personal accomplishment.

What is this mysterious, monumental task? It is planting trees, especially those that will form the next generation of lovely green tunnels embracing Anchorage's streets.

Table of Contents

Part 1: Why We Plant Trees

Ecological Benefits of Planting Trees

- Reforestation efforts create and maintain a wildlife habitat
- Trees reduce water runoff. Less runoff means fewer pollutants in waterways and lessens the chance of flooding. Trees, plants, and mulch reduce soil erosion.
- Trees improve air quality and absorb carbon dioxide from gas-operated machines.
- Deciduous trees planted near a home reduce indoor temperatures in summer and allow the sun's rays to reach the house in the winter, saving money and conserving resources.

Landowner & Community Benefits of Planting Trees

- Trees promote a home's privacy, screening it from nearby homes and roadways, while reducing street noise and the glare of headlights.
- Landscaping with shrubs, trees, and other plantings increases property value.
- Trees and landscaped areas increase the community's appeal for residents, visitors, and prospective buyers.
- Landscaping is a cost-effective tool for improving and sustaining a high quality of life on city easements, businesses, schools, or in private yards.

Benefits of Trees

The benefits that trees provide from social, communal, environmental, and economic perspectives.

Most trees and shrubs in cities or communities are planted to provide beauty or shade. While these are excellent benefits, woody plants serve many other purposes. The benefits of trees can be grouped into social, communal, environmental, and economic categories.

Social Benefits

Human response to trees goes well beyond simply observing their beauty. We feel serene, peaceful, restful, and tranquil in a grove of trees. We are "at home" there.

The calming effect of nearby trees and urban greening can significantly reduce workplace stress levels and fatigue, calm traffic, and even decrease the recovery time needed after surgery. Trees can also reduce crime. Apartment buildings with high levels of greenspace have lower crime rates than nearby apartments without trees.

The stature, strength, and endurance of trees give them a cathedral-like quality. Because of their potential for long life, trees are frequently planted as living memorials. We often become personally attached to trees that we, or those we love, have planted.

The strong tie between people and trees is often evident when community residents speak out against the removal of trees to widen streets or rally to save a particularly large or historic tree.

Communal Benefits

Even when located on a private lot, the benefits provided by trees can reach well out into the surrounding community. Likewise, large-growing trees can come in conflict with utilities, views, and structures that are beyond the bounds of the owner's property. With proper selection and maintenance, trees can enhance and function on one property without infringing on the rights and privileges of neighbors.

City trees often serve several architectural and engineering functions. They provide privacy, emphasize views, or screen out objectionable views. They reduce glare and reflection. They direct pedestrian traffic. Trees also provide background to and soften, complement, or enhance architecture.

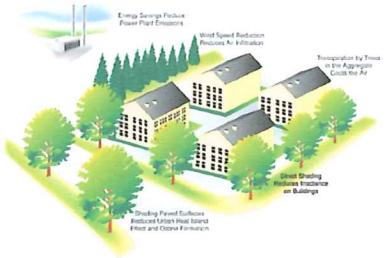
Trees bring natural elements and wildlife habitats into urban surroundings, all of which increase the quality of life for residents of the community.

Environmental Benefits

Trees alter the environment in which we live by moderating climate, improving air quality, reducing stormwater runoff, and harboring wildlife. Local climates are moderated from extreme sun, wind, and rain. Radiant energy from the sun is absorbed or deflected by leaves on deciduous trees in the summer and is only filtered by branches of deciduous trees in winter. The larger the tree, the greater the cooling effect. By using trees in the cities, we can moderate the heat-island effect caused by pavement and buildings in commercial areas.

Wind speed and direction is affected by trees. The more compact the foliage on the tree or group of trees, the more effective the windbreak. Rainfall, sleet, and hail are absorbed or slowed by trees, providing some protection for people, pets, and buildings. Trees intercept water, store some of it, and reduce stormwater runoff.

Air quality is improved through the use of trees, shrubs, and turf. Leaves filter the air we breathe by removing dust and other particulates. Rain then washes the pollutants to the ground. Leaves absorb the greenhouse gas carbon dioxide during photosynthesis and store carbon as growth. Leaves also absorb other air pollutants – such as ozone, carbon monoxide, and sulfur dioxide – and release oxygen.



By planting trees and shrubs, we return developed areas to a more natural environment that is attractive to birds and wildlife. Ecological cycles of plant growth, reproduction, and decomposition are again present, both above and below ground. Natural harmony is restored to the urban environment.

Economic Benefits

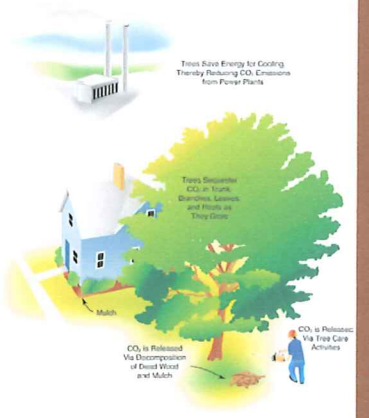
Property values of landscaped homes are 5 to 20 percent higher than those of non-landscaped homes.

Individual trees and shrubs have value, but the variability of species, size, condition, and function makes determining their economic value difficult. The economic benefits of trees are both direct and indirect.

Direct economic benefits are usually associated with energy costs. Air-conditioning costs are lower in a tree-shaded home. Heating costs are reduced when a home has a windbreak.

Trees increase in value as they grow. Trees, as part of a well maintained landscape, can add value to your home.

The indirect economic benefits of trees within a community are even greater. Customers pay lower electricity bills when power companies build fewer new facilities to meet peak demands, use reduced amounts of fossil fuel in their furnaces, and use fewer measures to control air pollution. Communities can also save money if fewer facilities must be built to control stormwater in the region. To the individual, these savings may seem small, but to the community as a whole, reductions in these expenses are often substantial.



Trees Require an Investment

Trees provide numerous aesthetic and economic benefits, but also incur some costs. Investing in a tree's maintenance will help to return the benefits you desire. The costs associated with large tree removal and replacement can be significant. In addition, the economic and environmental benefits produced by a young replacement tree are minimal when compared to those of a mature specimen. Extending the functional lifespan of large, mature trees with routine maintenance can delay these expenses and maximize returns.

An informed home owner can be responsible for many tree maintenance practices. Corrective pruning and mulching gives young trees a good start. Shade trees, however, quickly grow to a size that may require the services of a professional arborist. Arborists have the knowledge and equipment needed to prune, treat, fertilize, and otherwise maintain a large tree. Your garden center owner, university extension agent, community forester, or consulting arborist can answer questions about tree maintenance, suggest treatments, or recommend qualified arborists.

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Part 2: Planning for Your New Tree

Choosing a Site for Your New Tree

Right Tree, Right Place – Select a site in your yard that gives the tree its best chance for survival.

Issues to consider:

- Check the soil type at the selected site. Then pick an appropriate tree for that type of soil. (See Appendices for Soil Information)

- Know what your tree will look like when it matures. Avoid obstructions and potential collisions with power lines, cables, other trees, streets, or buildings.

- If a street is near the site, choose a tree that will not block the view or be a hazard to drivers.

- Determine the abiotic conditions, for example:
    - How much light does the site receive?
    - Will other trees and buildings protect the site from harsh winds?
    - Will the tree at that site have "wet feet" year round, seasonally, or only during a rainstorm?
    - What are the soil conditions at the proposed site?

- Calculate the size of the hole needed for the new tree. Do not damage existing plant material, such as sizeable roots from other nearby trees.

- Are there underground utilities on your property? Contact Before You Dig (BUD) buried cable location service (1-800-752-6007) to ensure that your proposed digging will not disrupt utilities. You may be legally responsible for damaging underground utilities.

- Is water available at the site? New trees need consistent watering to establish the tree's root system. If you plant a tree, take the time to water it properly.

What to Look for When Buying a Tree

The nursery where the tree is purchased should know the approximate height of the tree at maturity. A tree too large for a site leads to severe pruning or topping as it grows.

Balled & Burlapped

Containerized

Bare-Root

You may select a balled & burlapped, container-grown, or bare-root tree. Some tips for choosing:

- Is the container or balled tree intact? If the container is broken or the burlap rotted, the root system may be damaged.
- Is the tree root-bound? Are the roots tightly compacted from sitting too long in a balled mass or in the container?
- Has the trunk been protected? Greatly damaged bark areas (other than normal pruning) will affect the tree's health. Buy a tree with an undamaged trunk. Bark protects the tree from disease and insect invasion.
- Has the tree been watered and packed in at the nursery? A balled tree should be packed in mulch to conserve moisture within its root system. Balled trees are vulnerable during the warm months, while in cold months they must be protected from freezing.
- Bare-root trees get off to a more vigorous start compared to containerized roots which typically need more time to adjust to transplanting. Bare-root trees typically surpass the size of larger containerized trees in only a few years.
- Check the nursery's guarantee policy and time limit. Comparison shop at various nurseries for specific trees.
- Buy balled trees as close to the planting time as possible (spring, or fall to early winter)

Preparing a Site for Planting

- Clear the site of grass, weeds, and other obstructions.
- Dig a saucer-shaped hole **twice** the diameter of the ball of the tree.
- The hole for balled & burlapped and container-grown trees and shrubs should be as deep as the root ball. Make sure the root collar will be at or a little above the ground level when the tree is planted. Bare root plants require a hole slightly deeper than the root system.

- Score grooves in the bottom and sides of the hole so that they are not smooth. This allows water to percolate into and out of the newly dug hole.
- Do not use fertilizer or chemicals, or fill the hole with peat moss, potting soil, or other organic materials. These products can kill young trees. Use the soil from the hole to fill around the root system.
- Make sure ample water is available.
- Protect the new tree from lawn mowers, weed-eaters, livestock, deer, and rodents.

Part 3: Planting Your New Tree and Maintaining Its Health

Make sure the root mass on any tree (bare-root, balled & burlapped, or container-grown) is fully intact, protected, and planted accordingly. Each tree species has its own guidelines. Read about the tree you are planting for specific needs such as sun, soil, and moisture requirements as well as hardiness zones.

Steps to Follow When Planting Your Tree

1. Plant the tree no deeper than it had been growing. Do not loosen soil at the bottom of the hole, which might settle and lower the tree. Dig a hole whose width is at least twice the diameter of the root ball.

2. Stretch out the roots if they are from a container. With a balled tree, remove the metal basket first; then, once it is in the planting hole, remove the burlap and binding twine from around the tree. For bare-root trees, prune any broken or extremely long roots. Do not bend roots in a circle so they could fit in the planting hole. This will cause the roots to girdle and will ultimately kill the tree.

3. If your soil is heavy clay, beware of slick sides created by a shovel. The clay glazes and can seal out water, turning the planting hole into a death trap. Use your shovel to slice jagged gashes in the sides of the hole so the tree's feeder roots can grow outward.

4. Backfill with the soil you have removed. Do not add peat moss, manure, or fertilizer. They create an environment so different from the rest of the yard that the tree roots may never bother to penetrate into the outlying soil.

5. Stake the tree only if the tree is more than two inches in diameter.

6. Mulch around the tree so your mower and weed-eaters do not get close to the trunk of the tree. Even a minor cut from a weed-eater can do serious damage. Mulch should not be deeper than three inches, and it should be kept away from the trunk's surface. Many bark problems are caused by constant moisture and rotting due to mulch rather than inserts that bore. (See Appendices for Mulching Information)

7. Allow your new tree to remain in its site for a year without adding any fertilizer. Plants do better if they are allowed to recover from the shock of being transplanted before fertilizer is added to stimulate further growth. The goal in the first few years

of your tree's life is to establish a healthy root system before encouraging above ground growth. If you choose to fertilize your trees, do so in the fall or winter when the tree is dormant. Watch not to over-fertilize, and be aware of fertilizer impact on aquatic areas nearby. (See Appendices for Fertilizer Information)

8. Your new tree needs to be watered regularly for the first year after being transplanted. Newly transplanted trees need one inch of water a week. Soaker hoses can help the water penetrate into the tree roots more effectively than sprinklers or hoses placed at the base of the tree. Slow irrigation is the best watering technique for your new tree.

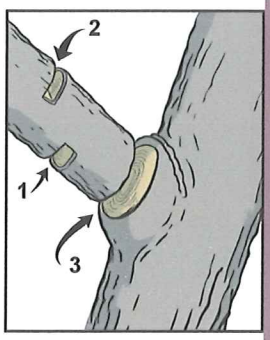
Pruning Young Trees

Proper pruning is essential in developing a tree with a strong structure and desirable form. Trees that receive the appropriate pruning measures while they are young will require less corrective pruning as they mature.

Keep these few simple principles in mind before pruning a tree:

- Always have a purpose in mind before making a cut. Each cut has the potential to change the growth of the tree.
- Poor pruning can cause damage that lasts for the life of the tree. Learn where and how to make the cuts before picking up the pruning tools.
- Trees do not heal the way people do. When a tree is wounded, it must grow over the damage. As a result, the wound is contained within the tree forever.
- Small cuts do less damage to the tree than large cuts. Correcting issues when a tree is young will reduce the need for more drastic pruning later.

Making the Cut



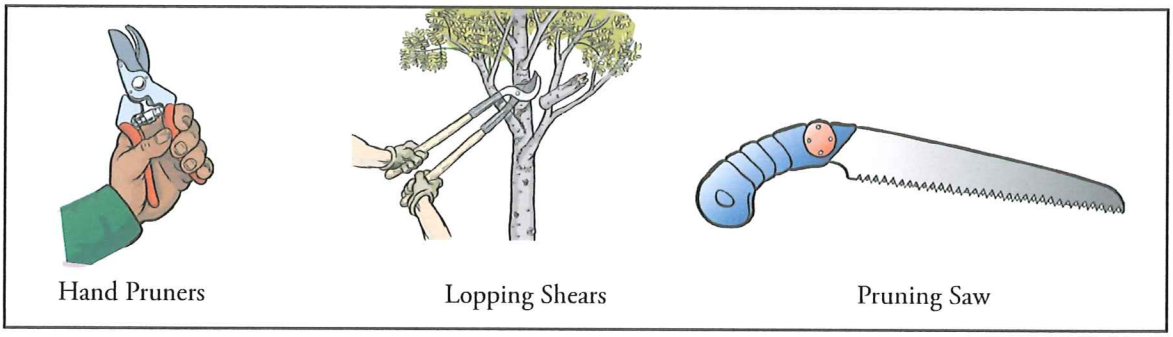
Pruning cut location is critical to a tree's growth and wound closure response. Make pruning cuts just outside the branch collar to avoid damaging the trunk and compromising wound responses. Improper pruning cuts may lead to permanent internal decay.

If a large branch must be shortened, prune it back to a secondary branch or a bud. Cuts made between buds or branches may lead to stem decay, sprout production, and misdirected growth.

Pruning Tools

Small branches can be cut easily with hand pruners. Scissor-type or bypass-blade hand pruners are preferred over the anvil type as they make cleaner, more accurate cuts. Cuts larger than one-half inch (1.27 cm) in diameter should be made with lopping shears or a pruning saw.

Hedge shears should be used for shaping hedges only. Do not use shears to prune a tree. Whatever tool you use, make sure it is kept clean and sharp.

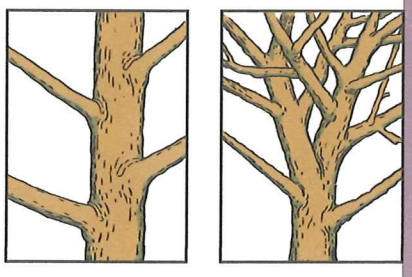


Hand Pruners | Lopping Shears | Pruning Saw

Establishing a Strong Scaffold Structure

A good structure of primary branches should be established while the tree is young. These limbs, called scaffold branches, are a mature tree's framework. Properly trained young trees will develop a strong structure that requires less corrective pruning as they mature. The goal in training young trees is to establish a strong, central trunk with sturdy, well-spaced branches. This form mimics tree growth in forest settings where outward branching is limited by neighboring trees.

Some tree species develop some or all of these characteristics naturally, even when grown openly in an urban or park setting. Others may require more frequent attention.



Good Structure **Poor Structure**

Trunk Development

For most young trees, maintain a single dominant leader growing upward. Do not prune back the tip of this leader or allow secondary branches to outgrow the main leader. Sometimes, a tree will develop double leaders known as codominant stems. Codominant stems can lead to structural weaknesses, so it is best to remove or shorten one of the stems while the tree is young.

A tree's secondary branches contribute to the development of a sturdy, well-tapered trunk. When numerous branches are being removed, it is preferable to retain some, at least temporarily, to promote trunk diameter growth.

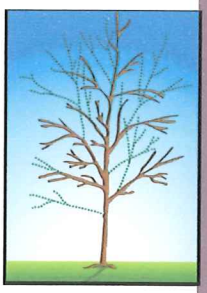
Permanent Branch Selection

Most of the branches present on a young tree at planting will be pruned away at maturity to provide clearance for mowing, pedestrians, and/or vehicle traffic.

The height of the lowest permanent branch is determined by the tree's intended function and location in the landscape. The road side of a street tree may be raised to 16 feet (5 m) to accommodate traffic. In most other situations, 8 feet (2.4 m) of clearance is sufficient. Trees used as screens or wind breaks, however, usually branch low to the ground.

Sufficient branch spacing and balance, both vertically and radially, is important. The space between permanent branches should be approximately 3 percent of the tree's eventual height (for example, 1.5 feet [0.5 m] for a tree that can grow to be 50 feet [15 m] tall).

Beyond spacing, the strength of branch structure depends on the relative size of the branches and branch angles. Branches similar in diameter to the trunk or limb from which they arise are more prone to failure than those smaller in diameter.



Narrow angles of attachment or tight crotching can enclose bark within a branch union. Such growth is called included bark, a condition that weakens the branch attachment and may lead to failure when the tree matures. Branches with weak attachments should be pruned while still small. Balance should be considered by retaining some branches in each direction radially, spreading from the center outward. Make sure one scaffold branch is not allowed to grow directly above another.

When pruning, be sure not to remove too many branches. Leaves and their supporting branches are major sites of food production and storage. Eliminating too much of the canopy can "starve" the tree, reduce growth, and increase stress. No more than 25 percent of the crown should be removed in one pruning.

Newly Planted Trees

Pruning of newly planted trees should be limited to the removal of dead or broken branches. All other pruning should be withheld until the second or third year, when a tree has recovered from the stress of transplanting.

Wound Dressings

Despite any claims otherwise, research has shown that wood dressings do not reduce decay or speed wound closure and rarely prevent insect or disease infestations. Most experts recommend that wound dressing not be used.

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Why Topping Hurts Trees

Learn why topping is not an acceptable pruning technique and discover recommended alternatives.

Topping is perhaps the most harmful tree pruning practice known. Yet, despite more than 25 years of literature and seminars explaining its harmful effects, topping remains a common practice.

Topping is cutting branches back to stubs or lateral branches not large enough to sustain the remaining branch.

What is Topping?

Topping is the indiscriminate cutting of tree branches to stubs or to lateral branches that are not large enough to assume the terminal role. Other names for topping include "heading," "tipping," "hat-racking," and "rounding over."

Topping is often used to reduce the size of a tree. A homeowner may feel that a tree has become too large for his or her property, or that tall trees may pose an unacceptable risk. Topping, however, is not a viable method of height reduction and certainly does not reduce future risk. In fact, topping will increase risk in the long term.

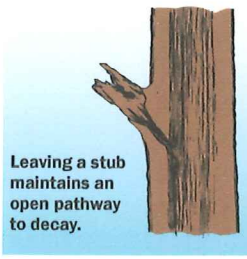
Topping Stresses Trees

Topping can remove 50 to 100 percent of a tree's leaf-bearing crown. Leaves are the food factories of a tree. Removing them can temporarily starve a tree and trigger various survival mechanisms. Dormant buds are activated, forcing the rapid growth of multiple shoots below each cut. The tree needs to put out a new crop of leaves as soon as possible. If a tree does not have the stored energy reserves to do so, it will be seriously weakened and may die.

A stressed tree with large, open pruning wounds is more vulnerable to insect and disease infestations. The tree may lack sufficient energy to chemically defend the wounds against invasion, and some insects are actually attracted to the chemical signals trees release.

Topping Leads to Decay

Correct pruning cuts are made just beyond the branch collar at the point of attachment. The tree is biologically equipped to close such a wound, provided the tree is healthy enough and the wound is not too large. Cuts made along a limb between lateral branches create stubs with wounds that the tree may not be able to close. The exposed wood tissues begin to decay. Normally, a tree will "wall off," or compartmentalize, the decaying tissues, but few trees can defend the multiple severe wounds caused by topping. The decay organisms are given a free path to move down through the branches.



Leaving a stub maintains an open pathway to decay.

Topping Can Lead to Sunburn

Branches within a tree's crown produce thousands of leaves to absorb sunlight. When the leaves are removed, the remaining branches and trunk are suddenly exposed to high levels of light and heat. The result may be sunburn of the tissues beneath the bark, which can lead to cankers, bark splitting, and death of some branches.

Topping Can Lead to Unacceptable Risk

New shoots develop profusely below a topping cut.

The survival mechanism that causes a tree to produce multiple shoots below each topping cut comes at great expense to the tree. These shoots develop from buds near the surface of the old branches. Unlike normal branches that develop in a socket of overlapping wood tissues, these new shoots are anchored only in the outermost layers of the parent branches and are weakly attached.

The new shoots grow quickly, as much as 20 feet (6 m)in one year in some species. Unfortunately, the shoots are prone to breaking, especially during windy or icy conditions. While the original goal was to reduce risk by reducing height, risk of limb failure has now increased.

Topping Makes Trees Ugly

The natural branching structure of a tree is a biological wonder. Trees form a variety of shapes and growth habits, all with the same goal of presenting their leaves to the sun. Topping removes the ends of the branches, often leaving ugly stubs. Topping destroys the natural form of a tree. Without leaves (for up to six months of the year in temperate climates), a topped tree appears disfigured and mutilated. With leaves, it is a dense ball of foliage, lacking its simple grace. A tree that has been topped can never fully regain its natural form.

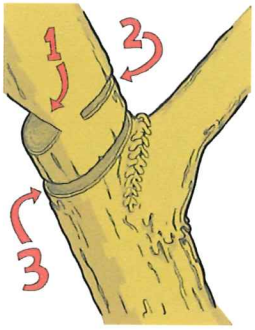
Topping Is Expensive

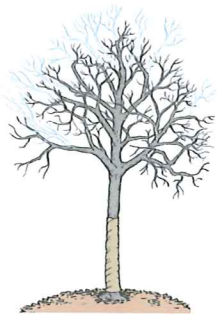
The cost of topping a tree is not limited to only the job cost. Some hidden costs of topping include:

- Increased maintenance costs. If the tree survives, it will likely require corrective pruning within a few years (e.g., crown reduction or storm damage repair). If the tree dies, it will have to be removed.
- Reduced property value. Healthy, well-maintained trees can add 10 to 20 percent to the value of a property. Disfigured, topped trees are considered an impending expense.
- Increased liability potential. Topped trees may pose an unacceptable level of risk. Because topping is considered an unacceptable pruning practice, any damage caused by branch failure of a topped tree may lead to a finding of negligence in a court of law.

Alternatives to Topping

Sometimes a tree must be reduced in height or spread, such as for providing utility line clearance. There are recommended techniques for doing so. Small branches should be removed back to their point of origin. If a larger limb must be shortened, it should be pruned back to a lateral branch that is large enough (at least one-third the diameter of the limb being removed) to assume the terminal role. This method of branch reduction helps to preserve the natural form of the tree. However, if large cuts are involved, the tree may not be able to close over and compartmentalize the wounds. Sometimes the best solution is to remove the tree and replace it with a species that is more appropriate for the site.





Proper branch reduction preserves natural form.

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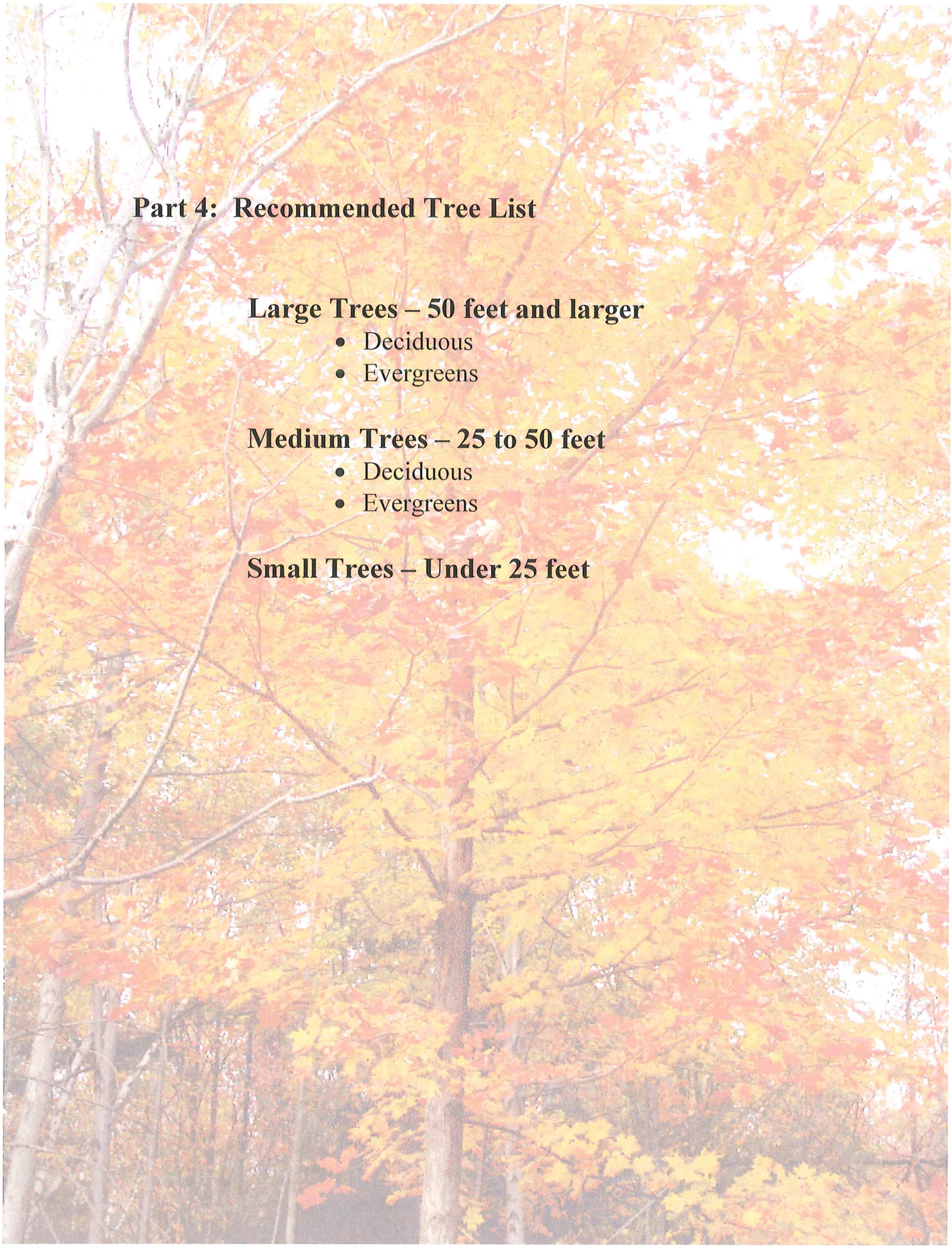


Part 4: Recommended Tree List

Large Trees – 50 feet and larger

- Deciduous
- Evergreens

Medium Trees – 25 to 50 feet

- Deciduous
- Evergreens

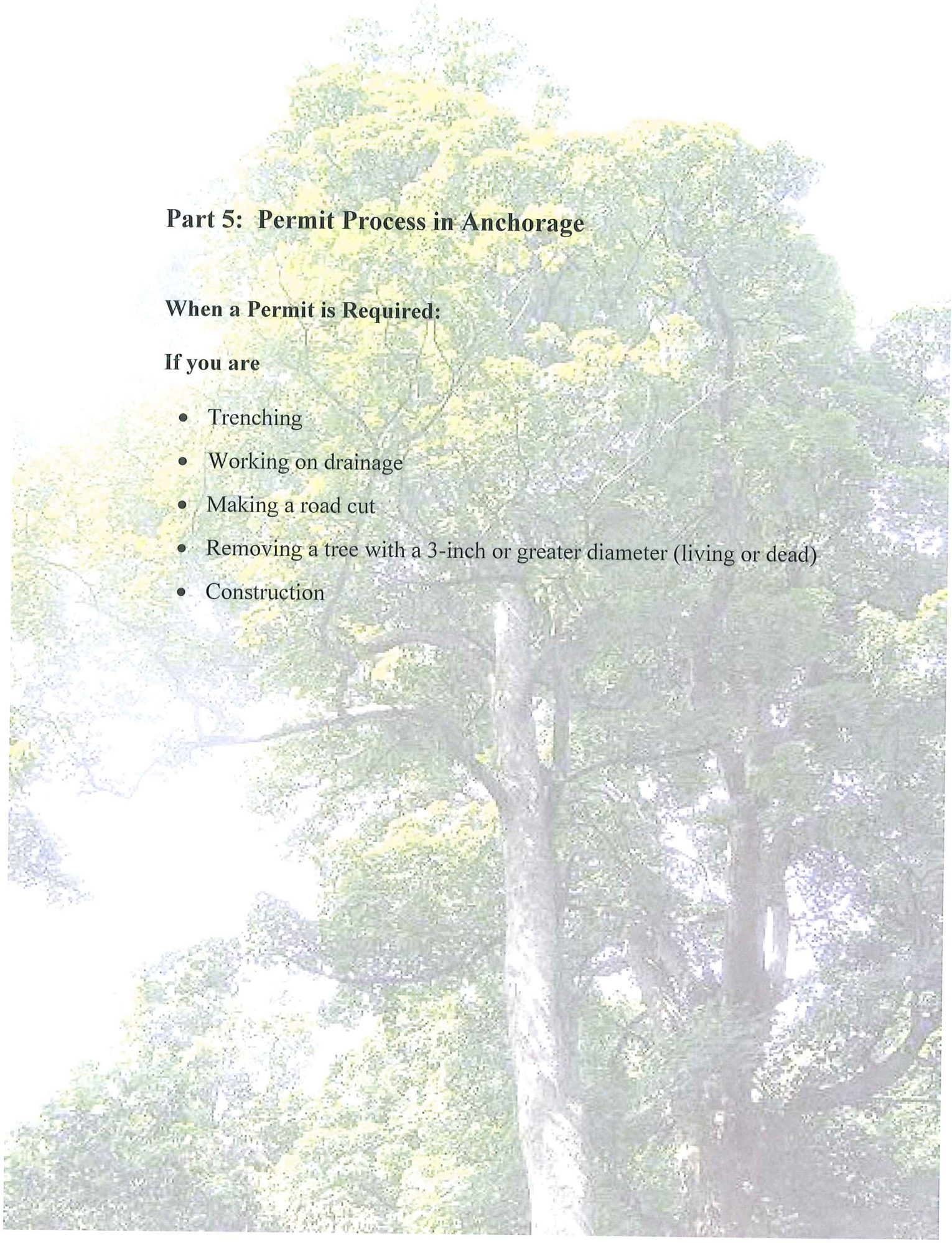
Small Trees – Under 25 feet

Anchorage Recommended Tree List

LARGE TREES 50'+	
Deciduous	
Sugar Maple	*Acer saccharum*
Red Maple	*Acer rubrum*
Yellow Buckeye	*Aesculus flava*
River Birch	*Betulus nigra*
Northern Catalpa	*Catalpa speciosa*
Common Hackberry	*Celtis occidentalis*
Katsuratree	*Cercidiphyllum japonicum*
Turkish Filbert	*Corylus colurna*
Hardy Rubber Tree	*Eucommia ulmoides*
American Beech	*Fagus grandifolia*
European Beech	*Fagus sylvatica*
Gingko	*Gingko biloba* -male cultivars only
Kentucky Coffeetree	*Gymnocladus dioicus*
European Larch	*Larix decidua*
Tulip Poplar	*Liriodendron tulipifera*
Dawn Redwood	*Metasequoia glyptrostroboides*
Black Gum	*Nyssa sylvatica*
Amur Corktree	*Phellodendron amurense*
London Plane Tree ('Yarwood' cultivar only)	*Platanus x acerifolia 'Yarwood'*
White Oak	*Quercus alba*
Swamp White Oak	*Quercus bicolor*
Nuttall Oak	Quercus dentate
Chinkapin Oak	*Quercus muehlenbergii*
Pin Oak	*Quercus palustris*
Willow Oak	*Quercus phellos*
Chestnut Oak	*Quercus prinus*
Bur Oak	*Quercus macrocarpa*
Red Oak	*Quercus rubra*
Shumard Oak	*Quercus shumardi*
Japanese Pagodatree	*Styphnolobrum japonicum*
Baldcypress	*Taxodium distichum*
Littleleaf Linden	*Tilia cordata*
Silver Linden	*Tilia tomentosa 'Sterling'*
American Elm	*Ulmus americana 'Valley Forge'*
Patriot Elm	*Ulmus minor 'Patriot'*
Chinese Elm	*Ulmus parvifolia*
Japanese Zelkova	*Zelkova serrata*
Evergreen	
White Fir	*Abies concolor*
Nordman Fir	*Abies nordmanniana*
Norway spruce	*Picea abies*
Serbian Spruce	*Picea omorika*
Oriental Spruce	*Picea orientalis*
Colorado Spruce	*Picea pungens*
Eastern White Pine	*Pinus strobus*
Canadian Hemlock	*Tsuga canadensis*

Anchorage Recommended Tree List

MEDIUM TREES 25-50'	
Deciduous	
Trident Maple	*Acer buergerianum 'Trident'*
Hedge Maple	*Acer campestre*
Paperbark Maple	*Acer griseum*
Norway Maple	*Acer platanoides*
Red Horsechesnut	*Aesculus x carnea)*
American Hornbeam or Ironwood	*Carpinus betulus*
American Yellowwood	*Cladrastis kentuckea*
Tricolor beach	*Fagus sylvatica 'Roseo Marginata'*
Carolina Silverbell	*Halesia caroliniana*
Amur Maackia	*Maackia amurensis*
American Hophornbeam or Ironwood	*Ostrya virginiana*
Sourwood	*Oxydendrum arboretum*
Persian Parrotia	*Parrotia persica*
Amur Corktree	*Phellodendron amurense*
Weeping Flowering Cherry	*Prunus subhirtella pendula*
Japanese Tree Lilac	*Syringa reticulata*
Evergreens	
American Holly	*Ilex opaca*
Lacebark Pine	*Pinus bungeana*
Limber Pine	*Pinus flexilis*
Korean Pine	*Pinus koreana*
SMALL TREES **Under 25'**	
Japanese Maple	*Acer palmatum*
Downy Serviceberry	*Amerlanchier arborea*
Flowering Redbud	*Cercis canadensis*
White Fringetree	*Chionanathus virginicus*
Flowering Dogwood	*Cornus florida*
Kousa Dogwood	*Cornus kousa*
Corneliancherry Dogwood	*Cornus mas*
'Butterflies' Cucumbertree Magnolia	*Magnolia acuminata 'Butterflies'*
Saucer Magnolia	*Magnolia x soulangeana*
Star Magnolia	*Magnolia stellata*
Umbrella Magnolia	*Magnolia tripetala*
Sweetbay Magnolia	*Magnolia virginiana*
Crabapple	*Malus species (choose disease resistant cultivars)*
Kwanzan Flowering Cherry	*Prunus serrulata 'Kwanzan'*



Part 5: Permit Process in Anchorage

When a Permit is Required:

If you are

- Trenching
- Working on drainage
- Making a road cut
- Removing a tree with a 3-inch or greater diameter (living or dead)
- Construction

Why a Permit is Required

Trenching, road cuts, and drainage work all require a permit so that the property owner and the city achieve the best possible solution to a problem, such as trenching an area without excessively disturbing the roots of trees.

Tree removal permits are required for all trees 3-inches or greater in diameter, for both living and non-living trees. Anchorage's tree protection and preservation ordinance requires that all trees removed must be replaced within one year. The permit process affords a tracking mechanism to insure replanting is completed.

A Construction/Tree Preservation Plan is required before any new construction is begun. The City's Forester will meet with the property owner and the builder on site to determine where building materials can be stored and the construction vehicles will park, in addition to providing advice on how to minimize injury to any trees on the property during the construction process.

If you have any questions regarding the permit process, call City Hall at 245-4654.

FORESTRY PERMIT PROCEDURES

Permit forms available at City Hall or at www.cityofanchorage.org

Tree Removal

The Anchorage Code of Ordinances defines a tree as any self-supporting, woody plant of a species, which normally, in the area, grows at maturity to an overall height of a minimum of 15 feet. The process to remove a tree is as follows:

- Trees with a trunk diameter of three (3) inches or more, the homeowner must fill out a Tree Removal Notification. Return completed form to City Hall along with a photo of the tree(s) to be removed.
- If you have a tree that is damaged in severe weather and needs to be removed immediately, you may remove the tree and notify City Hall to complete the Tree Removal Notification.
- The Tree Removal Notification expires after 60 days.
- For each tree removed, one tree must be re-planted somewhere on the property within one year.

Forestry Permits

- **Construction/Tree Preservation Plan**
  Complete the Construction/Tree Preservation Plan and provide a sketch or plat indicating the house, location of proposed work, all trees within 75 feet of the proposed work, stockpiling, parking for construction vehicles, protective fencing, ingress and egress for construction vehicles, and dumpsters.

- **Trenching**
  A trench is defined as a narrow cut in the ground exceeding 12 feet in length. It's always best to check with City Hall to confirm if your cut in the ground is considered a trench. Some projects that are included in trenching, but not limited to, are:

  - ❑ Gas Line
  - ❑ Water Line
  - ❑ Electric Line or Invisible Fence
  - ❑ Sewer Line
  - ❑ New Septic System or Septic Repair
  - ❑ Bury Phone or Cable Line
  - ❑ Irrigation System (new or repairs)
  - ❑ Drainage Work (City Engineer approval also required)
  - ❑ Driveway Extension
  - ❑ New Patio or Patio Extension
  - ❑ Landscape Lighting
  - ❑ Landscaping trench more than twelve linear feet

- Contact City Hall to schedule a meeting with the City Forester. Meetings are scheduled on Monday mornings and will take place at the site.
- The permit must be returned to City Hall no later than 5:00 pm the Friday preceding the Monday morning meeting.
- For your protection, ***both the property owner and the contractor must be present at the meeting.***

IT IS A VIOLATION OF THE CITY'S FORESTRY ORDINANCE TO TRENCH WITHOUT A PERMIT. THE SCHEDULE OF PENALTIES IS ATTACHED.

ANCHORAGE CITY ORDINANCE §90.99 – APPENDIX A: SCHEDULE OF PENALTIES

List of Violations	Amount of Penalty
Construction without a Tree Preservation Plan	$500
Tree removal without a permit/notification	$200 per tree
Tree removal not shown on Tree Preservation Plan	$250 per tree
Replacement trees not planted within allotted time period	$200 per tree
Replacement trees which do not meet required specifications	$100 per tree
Trenching without a permit/Trenching not shown on Tree Preservation Plan	$100 per violation, plus $10 per foot for each length of trench in excess of 12 fee; $125 minimum to a maximum of $500
Protective fences not in place	$250
Material stored inside fenced areas	$400
Vehicles inside fenced areas	$200 per vehicle
Evidence of grade change or soil disturbances inside area required to be protected by fences	$500
Ingress and egress not shown on Tree Preservation Plan	$125
Material or soil stockpiles not shown on Tree Preservation Plan	$150 per stockpile
Vehicles parked in locations other than indicated on Tree Preservation Plan	$50 per vehicle
Paint or other chemicals improperly disposed of	$50 per offense
Failure to properly maintain green space	$150
Failure to comply with Stop Work Order	$500

Under the following circumstances, the applicable penalty will be twice the amount shown above, to a maximum of $500:

1. Recurring or uncorrected violations following the issuance of a warning, Stop Work Order, or a Notice of Civil Penalty.
2. More than five violations found on a single platted lot within any 12-month period.
3. Any violation affecting a historic or specimen tree.
4. Any violation resulting in damage certified by the City Forester as likely to cause irreversible injury or death to six or more trees with a caliper of over four inches each.
5. The presence of aggravating circumstances which demonstrate the violator's conscious indifference to the consequences of his or her acts which constitute a violation of this chapter.

(Ord. 91-11, passed 11-25-91; Am. Ord. 2-2012, passed 2-13-12)

CITY OF ANCHORAGE
TREE REMOVAL NOTIFICATION

Complete this form prior to removal of any living or dead trees that have a trunk diameter of three (3) inches or more.

Any tree(s) for which this form is filed, may be removed ten (10) days after the notification is received by the City Clerk, unless the Forestry Department requests a field check and/or orders a delay of the removal.

If the tree(s) covered by this notification are not removed within sixty (60) days of the date on the notification, you must resubmit the notification before removing any trees.

The tree protection and preservation ordinance requires all trees that are removed, to be replaced within one year of removal. Replacement trees must be a minimum of 1 inch in diameter (measured at 4 ½ feet above the existing grade) and of nursery grade. As an alternative, the owner-occupant may elect to replace trees at a ratio of one replacement tree for each three trees removed, provided that the tree species shall be selected from a list, maintained by the City Clerk, of trees approved by the City Forester for use under the replacement ratio option.

Property Owner's Name_____

Street Address:_____ Phone:_____

Tree Removal Company_____Phone:_____

Approximate diameter, height, and species (if known) of each tree to be removed:

Reason for removal of each tree:

Are the trees located at the above address?_____

If not, where are they located?_____

I certify that the above information is true and correct to the best of my knowledge, and that I will, within one year of the date of the removal of the tree(s) described above, plant replacement(s) for each tree removed, in accordance with the provisions of Section 7 of the Anchorage Tree Protection and Preservation Ordinance.

_____ _____

Owner-Occupant Signature Date

INSTRUCTION SHEET

CONSTRUCTION/TREE PRESERVATION PLAN

1. Complete the top of the Construction/Tree Preservation Plan listing the name, address, and phone number of the property owner and contractor.

2. Provide a sketch in the space provided on the Construction/Tree Preservation Plan or a plat, indicating the following:

    a. location of the house, driveway, and any outbuildings
    b. location of the proposed work to be completed (indicate the routes for all utilities)
    c. location of all trees within 75 feet of the proposed work to be completed
    d. location of stockpiling (soil and materials)
    e. location for parking of construction vehicles and any heavy equipment
    f. location of fencing to be used as protective barriers
    g. the ingress and egress for all construction vehicles
    h. location of any dumpsters

3. Complete the questions on page 2.

4. All permit meetings are scheduled for Monday mornings at the following times: 8:45, 9:30, 10:15, and 11:00. To make an appointment, contact City Hall at 245-4654. During certain times of the year, appointments fill up quickly. The permit application must be returned to City Hall no later than 5:00 p.m. the Friday preceding the Monday morning meeting.

5. **For your protection, both the property owner and the contractor must be present at the meeting to sign the permit.** If the homeowner is not able to attend, a letter stating so and confirming that the he concurs with what the contractor will be presenting must be turned in at the time the permit is submitted.

6. **Before beginning construction, please present a copy of the Jefferson County building permit to City Hall.**

CITY OF ANCHORAGE

Permit # _____

CONSTRUCTION/TREE PRESERVATION PLAN

Type of Project to be Completed _____ Application Date _____

Property Owner's Name _____ Phone Number _____

Property Address of Proposed Work _____

Mailing Address of Property Owner (please include zip code) _____

Contractor's Name _____ Phone Number _____ Fax Number _____

Use the space below, or an attachment, to provide a detailed drawing of the proposed work. Both professional drawings or detailed sketches are accepted. Mark all trees within 75 feet of the proposed work.

BOTH THE PROPERTY OWNER AND THE CONTRACTOR MUST BE PRESENT AT THE MEETING OR THE PERMIT WILL NOT BE ISSUED.

To be completed at the on-site meeting:

I agree to comply with the provisions as stated above and am aware that failure to do so can result in stop work orders and/or fines. Copies of ordinances are available at Anchorage City Hall, P. O. Box 23266, Anchorage, KY 40223, and are available online at www.cityofanchorage.org. This permit is not valid until all required signatures are obtained and a permit number has been issued by the City.

Contractor/Builder _____ Property Owner _____

City Forester _____ Date _____

Please answer the following questions:

1. Indicate the types of equipment to be used for clearing, grading, and digging, and provide a statement describing the plan to limit their access to tree preservation areas on the property.

2. State the methods of disposal of chemicals, paints, solvents, and other substances that are toxic to plants.

3. State the areas to be used for stockpiling and trash and the process for removal.

4. What type of signs and fencing will be posted indicating the protected areas?

5. State the minimum number of trees to be planted after the work has been completed.

CITY OF ANCHORAGE

Permit # _____

_____
Type of Permit (trenching, drainage, roadcut, etc.)

_____ _____
Type of Project to be Completed Application Date

_____ _____
Property Owner's Name Phone Number

_____
Property Address of Proposed Work

_____
Mailing Address of Property Owner (please include zip code)

_____ _____
Contractor's Name Phone Number Fax Number

Use the space below, or an attachment, to provide a detailed drawing of the proposed work. Both professional drawings or detailed sketches are accepted. Mark all trees within 75 feet of the proposed work.

BOTH THE PROPERTY OWNER AND THE CONTRACTOR MUST BE PRESENT AT THE MEETING OR THE PERMIT WILL NOT BE ISSUED.

To be completed at the on-site meeting:

I agree to comply with the provisions as stated above and am aware that failure to do so can result in stop work orders and/or fines. Copies of ordinances are available at Anchorage City Hall, P. O. Box 23266, Anchorage, KY 40223, and are available online at www.cityofanchorage.org. This permit is not valid until all required signatures are obtained and a permit number has been issued by the City.

_____ _____
Contractor/Builder Property Owner

_____ _____
City Forester Date

_____ _____
City Engineer or other City Official Date

Appendices

I. Soil Testing – What It Is and What It Does
University of Kentucky Cooperative Extension Service

II. Taking Soil Test Samples
University of Kentucky Cooperative Extension Service

III. Mulch Myths
University of Kentucky Cooperative Extension Service

IV. Principles of Home Landscape Fertilization
University of Kentucky Cooperative Extension Service

V. Pruning Landscape Trees
University of Kentucky Cooperative Extension Service

VI. 24 Ways to Kill a Tree
Virginia Cooperative Extension Service

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY • COLLEGE OF AGRICULTURE

SOIL TESTING:

What It Is and What It Does

W.O. Thom, K.L. Wells, L.W. Murdock, and F. Sikora, Department of Agronomy

What Is Soil Testing?

Soil testing is a special chemical analysis that provides a guideline for lime and fertilizer needs of soils when considered in conjunction with post-fertilizer management and cropping history. A soil testing service is available to every Kentucky citizen through the University of Kentucky Agricultural Experiment Station and Cooperative Extension Service. There is a small service charge to cover the cost of handling and laboratory operation.

Why Soil Test?

Different soil types, different fields, and often areas within the same field vary in the availability of plant nutrients. Also, a field may contain a low level of one nutrient and a high level of another nutrient. Such variations are usually due to differences in:

- previous fertilizer and lime applications
- cropping history
- nutrient contents of the parent materials, and
- losses of surface soil through erosion.

Soil testing is the best way to identify these differences and to adjust liming and fertilization practices.

Soil test results should be included in a record system for each production field on a farm, along with the amounts of lime and fertilizer applied each year, the crops grown, and the yields obtained. In an effective sampling program, each production field should be tested at least every three to four years. Some intensive cropping systems should be sampled every two to three years. Annual sampling is preferable for high cash crops, e.g., alfalfa and double-crop silage production. Only through such a record system can fertility and/or production levels be monitored over time. This is valuable information when making decisions on fertilizer investments and production practices.

How Does It Work?

Soil samples, carefully collected according to instruction (see Kentucky Cooperative Extension Service publication AGR-16, *Taking Soil Test Samples*), are delivered with the necessary information to the local county Extension office. Samples are then sent to the laboratory for testing. After considering soil test levels, past fertilization and liming, cropping history, and the crop to be fertilized or limed, county Extension agents base their lime and fertilizer recommendations on guidelines in Kentucky Cooperative Extension Service publication AGR-1, *Lime and Fertilizer Recommendations.*

For correct lime and fertilizer rates, the soil test must be calibrated with crop yield responses to lime and fertilizer applications. Personnel from the University of Kentucky Department of Agronomy annually conduct field experiments throughout Kentucky to provide a basis for the guidelines published in AGR-1. Recommendations in AGR-1 apply only to test levels obtained in laboratories under supervision of the University of Kentucky College of Agriculture and **should not be used for soil test values from any other laboratories where testing procedures may differ.**

What Tests Are Made?

- **Routine Soil Test**—All samples tested by the University of Kentucky labs are routinely analyzed for pH (water), pH (buffer), and extractable phosphorus, potassium, calcium, magnesium, zinc, and an estimated CEC.
- **Greenhouse Saturation Test**—This special test includes pH (water), pH (buffer), nitrate-nitrogen, soluble salts, and extractable phosphorus, potassium, calcium, and magnesium.
- **Other Special Tests**—See your county Extension agent for details.

Why Is Additional Information Needed?

Along with the soil sample, you need to submit the appropriate "information form" (available at your county Extension office) for either:

- agricultural soils
- home gardens, lawn, and turfgrass
- commercial horticultural crops, or
- greenhouse crops.

Your county Extension agent needs the information on the appropriate form to make recommendations.

What about Nitrogen Tests?

Neither the amount of organic matter nor the amount of nitrate has proven to be a reliable indicator of available nitrogen for field crops grown under Kentucky conditions. For this reason, present nitrogen recommendations for field crops are based on past cropping history, soil management, soil properties, and experimental data.

The University of Kentucky Soil Testing Lab does provide an optional "organic matter" and a "greenhouse saturation" test (the latter includes nitrate-nitrogen). These tests are most useful for greenhouse, landscaping, and specialty crops. However, the nitrate-nitrogen results from this test may be used in unusual situations to help determine if large amounts of nitrogen have been lost during extended wet periods or flooding, or if nitrogen levels are adequate for crop growth from heavily manured fields.

More recently, some states have used soil nitrate concentration when corn is 8 to 12 inches high to adjust N fertilizer rates at sidedressing. Kentucky has limited research data to demonstrate consistent results from this testing. The greatest opportunity for this test may be in fields receiving manure or organic N nutrient sources.

What about Tests for Secondary Nutrients and Micronutrients?

Predicting deficiencies for secondary nutrients and micronutrients from a soil test is much more difficult than for the major nutrients. Most micronutrient tests and recommendations were developed for specific soil types and conditions, and it is difficult to adapt these tests to a wide range of soil types and other conditions.

Calcium and magnesium levels are determined routinely in the Soil Testing Lab. Calcium deficiency in field crops has not been observed in Kentucky. Many field trials have been conducted with applications of magnesium on several Kentucky field crops. These trials have shown only slight yield increases at a few locations where testing has indicated extremely low magnesium levels and have shown no response to additional magnesium at locations with low magnesium soil tests. However, the soil test will indicate when the possibility of a response exists.

The **zinc** test can detect low soil levels but does not always reliably determine when crop yield responses will occur in a specific year. As in the case for many of the micronutrients, weather and soil conditions strongly influence the availability of soil zinc to the plant. Field trials in Kentucky have indicated that low zinc test levels in Central and South Central counties are more likely to indicate zinc deficiency (corn and snapbeans) than in other areas of the state. Low zinc levels combined with high phosphorus and pH levels are usually associated with zinc deficiency. Guidelines for interpreting the zinc soil test for corn are listed in AGR-1.

Deficiencies of **boron, molybdenum, and manganese** in certain crops do exist in some areas of Kentucky. Because of the rather specific crop needs for boron, molybdenum, or manganese, producers should contact their county Extension agent about the need for these micronutrients.

For field crops grown on Kentucky soils, the addition of **iron, copper, or sulfur** has resulted in no measured yield increase. The University will continue to monitor these nutrients in crops and soils but will not offer testing until economic yield or quality increases have been shown.

What Is Cation Exchange Capacity?

Because of the negative charges in their chemical structure, most clay minerals and soil organic matter have the ability to attract or retain positively charged ions (cations) of calcium (Ca^{++}), magnesium (Mg^{++}), potassium (K^{+}), aluminum (Al^{+++}), hydrogen (H^{+}), and others. Attraction between the clay minerals and these ions is weak enough that an exchange between ions can occur; those ions most strongly attracted or occurring at higher concentrations in the soil solution may displace other ions from exchange "sites" on the clays.

The capacity of a soil to retain cations under specific conditions is called the "cation exchange capacity" (CEC). This property affects the availability of potassium, calcium, and magnesium to plants. The term used to report CEC is milliequivalents/100 grams (me/100g) of soil.

A recent addition to the Kentucky soil test results reports a "calculated CEC" that uses results from the current extractant in the Kentucky Soil Test Lab (Mehlich III). This extractant is different from most standardized research procedures used to measure CEC. The information on the soil test report is strictly an "estimate" of potentially exchangeable ions based on the amount of potassium, calcium, and magnesium extracted by the Mehlich III extractant, and an "estimate" of hydrogen from the buffer pH reading. Therefore, the CEC reported as part of the soil test results is usually higher and should not be directly compared to results conducted by the research method.

Fortunately, most Kentucky agricultural soils are rather uniform in their CEC due to the vast majority having a silt loam texture. The few high-clay soils occurring in certain areas have much higher CEC's, and the rare sandy loams have much lower CEC's. Because these variations are localized, county Extension agents can use their personal knowledge of the local soils to make any adjustment in fertilizer rates for those occasional soils with unusually low or high CEC's.

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UK COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY — COLLEGE OF AGRICULTURE

Taking Soil Test Samples

W.O. Thom, G.J. Schwab, L.W. Murdock, and F.J. Sikora

The most important part of making fertilizer recommendations is collecting a good, representative soil sample. Soil test results and fertilizer recommendations are based solely on the few ounces of soil submitted to the laboratory for analysis. These few ounces can represent several million pounds of soil in the field. If this sample does not reflect actual soil conditions, the results can be misleading and lead to costly over- or under-fertilization. It is necessary to make sure that the soil sample sent to the laboratory accurately represents the area sampled.

Sample Timing

Soil samples can be collected through much of the year, although fall (September to December) or spring (February to April) are the best times. Fall sampling will often result in a faster return of results and recommendations. Fall sampling will also allow the grower time to have the fertilizer applied well before planting the next crop. However, fall sampling results in lower pH and soil test K levels when conditions are dry. In either case, a field should always be sampled the same time of the year in order to make historical comparisons.

Most fields should be sampled every three to four years. High-value crops, such as tobacco, commercial horticultural crops, alfalfa, red clover, and corn silage, should be sampled annually so that plant nutrient levels can be monitored more closely. Application of manure can change soil test phosphorus, potassium, and zinc levels dramatically, so sampling manured fields each year is also recommended.

Tools You Need

A soil probe, auger, garden trowel, or a spade and knife are all the tools you need to take the individual cores that will make up the "field" sample (Figure 1). You will also need a clean, dry, plastic bucket to collect and mix the sample cores. Be sure not to use galvanized or rubber buckets because they will contaminate the sample with zinc. Soil sample boxes or bags and information forms for submitting samples are available at all county Extension offices.

Collecting Field Crop Samples

An individual sample should represent no more than 20 acres except when soils, past management, and cropping history are quite uniform. The most representative sample can be obtained from a large field by sampling smaller areas on the basis of soil type, cropping history, erosion, or past management practices (Figure 2). For example, a portion of a field may have a history of manure application or tobacco production while the other part does not. Phosphorus and potassium levels will likely be higher in these areas, causing the rest of the field to be under-fertilized if the field is sampled as one

Figure 1. A soil probe, auger, or spade and knife should be used in sampling soils. The spade sample must be trimmed as shown.

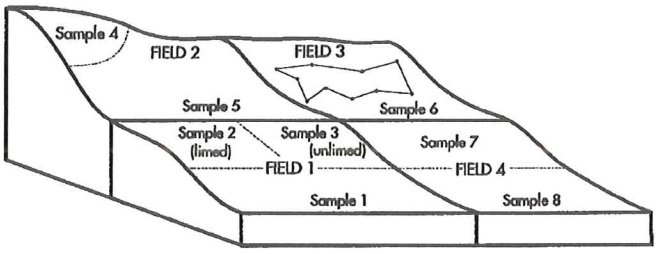

Figure 2. This shows how four fields might require the analysis of one to three composite samples for determining fertility needs. Each composite must contain 10 or more cores, as shown for Sample 6 in Field 3.

unit. It is much better to collect separate samples from these areas because their nutrient requirements are likely quite different from the rest of the field.

If a few years of yield maps are available, these can help identify areas of the field that should be sampled separately.

Soil sampling can also be used to "troubleshoot" areas of the field that are visually different or are consistently low yielding when compared to the rest of the field. Take a sample both from the poor growing area and adjacent areas of good growth. Keep good records indicating where each sample was taken.

Collect at least 10 soil cores for small areas and up to 30 cores for larger fields. Take the soil cores randomly throughout the sampling area and place them in the bucket. **Do not sample:**

- back furrows or dead furrows,
- old fencerows,
- areas used for manure or hay storage and livestock feeding, and
- areas where lime has been piled in the past.

Grid Soil Sampling

With new advances in agriculture and the availability of global positioning satellites, it is now possible to divide a field into smaller units or grid cells that can be sampled individually. Soil test results from each grid can be used to prepare nutrient availability maps of fields. Variable-rate fertilizer and lime applications are then based on these maps. Grid soil sampling and prescription fertilizer maps may result in more accurate recommendations and may lead to greater efficiency in fertilizer use.

Currently the industry standard grid size is 2.5 acres, but Kentucky research shows that variability within areas as small as one acre can be as great as the variability within the entire field. Because soil variability is so high, it is important to treat each grid cell as a field. At least 10 random samples should be collected across the entire grid cell, rather than a few cores from the center of the grid (Figure 3). Grid sampling can be a good way to identify old field boundaries or parts of fields that have had different management in the past if they are unknown to the current producer. This intensive sampling is costly, and limited Kentucky research has not shown a predictable economic benefit when it is compared to the current recommended method of sampling according to soil type, past history, or past management zones.

Sampling after Banded Fertilizer Applications

Care must be taken when sampling no-till fields that have had fertilizer applied in bands rather than broadcast. Phosphorus, potassium, and zinc are immobile in the soil and remain in the concentrated band for several years after application. If these bands are completely avoided during sampling, soil test results will be lower than "actual," leading to over-fertilization. If bands are included too often, soil test results will be higher than "actual," causing an underestimation of fertilizer needs for the crop.

When the location of the bands is known, it is best to sample in the band one time for every 20 cores taken. If the location of the band is unknown, it is best to take pairs of random samples. The first core is completely random, and the second core is taken one-half the band spacing distance in a direction perpendicular to the band direction. For example, if banded fertilizer was applied on 30-inch spacing, the first core would be randomly selected, and the second sample would be taken 15 inches away (perpendicular to the direction of the band). This process would be repeated at least 10 times in a small field and up to 30 times in a larger field. The more cores that are collected, the more closely the sample will represent "actual" field conditions.

Collecting Lawn or Garden Samples

Sample gardens, lawns, and landscaped areas separately. Collect cores randomly from each area. The area to sample for trees includes the soil below the width of the tree. For shrubs, flower beds, and gardens, sample just the soil where the plants are growing. You should sample problem areas and areas with shrubs, trees, or flower beds separately from other turf or lawn areas. **Do not sample:**

- compost areas,
- under the drip-line of trees, and
- close to driveways or streets.

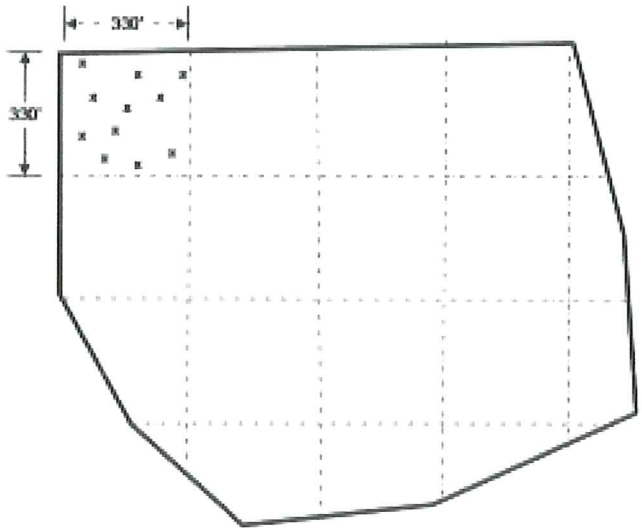

Figure 3. A field can be divided into 2.5-acre grid cells, as shown in the diagram above. Each cell should be treated as an individual field, and approximately 10 random cores should be taken from each cell.

Sample Depth

One commonly overlooked component of soil sampling is the depth of soil to be tested. Most plant nutrients accumulate at the soil surface. This nutrient stratification is a result of past broadcast fertilizer applications and decomposition of plant residue on the soil surface. Because there is a higher concentration of nutrients on the soil surface, soil test values usually go down as the sample depth is increased. To obtain accurate and consistent (between different years) results, samples must be taken to the following depths for these areas:

Tilled Areas—Take soil cores to the depth of the tillage operation (usually 6 to 8 inches).

Non- or Reduced-Tilled Areas—Take soil cores to a depth of 3 to 4 inches for pastures, no-till planting (where fertilizer or lime remains on the soil surface), and minimum-till planting (where fertilizer is incorporated only in the surface 1 to 2 inches).

Lawns and Turfgrasses—Collect soil cores to a depth of 3 to 4 inches.

Sample Preparation

After all cores for an individual sample are collected and placed in the bucket, crush the soil material and mix the sample thoroughly (Figure 4). Allow the sample to air dry in an open space free from contamination. **Do not dry the sample in an oven or at an abnormally high temperature.** When dry, fill the sample container with the soil (Figure 5).

Figure 4. Break up clods while a sample is moist, and spread out to air dry in a clean area.

Sampling and preparing the soil for submission is only half of the process. The other equally important part is filling out a sample information sheet so that the desired crop, tillage, and other information can be considered when making the fertilizer recommendation (Figure 5). The sample information sheet contains all the important information required to provide accurate lime and fertilizer recommendations. Sample information sheets for the University of Kentucky Soil Testing Laboratory can be found on the Web at <http://soils.rs.uky.edu/sample1.htm>. The types of forms available are the:

- agricultural form,
- home lawn and garden form, and
- commercial horticulture form.

Figure 5. Thoroughly mix the air-dried sample, fill the sample bag or box, mark with your sample designation, fill out the information sheet, and take the sample to your county Extension office.

Each form asks for primary and alternative crops, as well as other background information. The amount of background information needed depends on the crop to be grown. Table 1 is provided as a guide to the background information needed for major agricultural crops (a) and home lawn and garden plants (b). Help on filling out the forms can be provided by your county Extension office.

It is very important to complete the pertinent sections of the sample information form. This will assure that you receive the most accurate fertilizer recommendations possible. Soil samples should be taken to your county Extension office; from there they will be sent to the UK Soil Testing Laboratory. Results and recommendations will be e-mailed to the county office usually within one to two weeks of submission.

Table 1. List of required crop information for accurate lime and fertilizer recommendations.

A. Agricultural Soil Sample Form

	Primary Crop			
Required Information	**Corn**	**Soybeans**	**Tobacco**	**Forages**
Previous crop	yes[1]	no[2]	yes	no
Primary management	yes	no	no	yes
Previous management	yes	no	no	no
Primary use	yes	no	no	yes
Previous use	no	no	no	no
What was there 2 years ago?	no	no	yes	no
Soil drainage	yes	no	yes	no

B. Home Lawn and Garden Soil Sample Form

	Primary Crop		
Required Information	**Vegetables & Fruits**	**Turfgrass**	**Landscape Plants**
Turfgrass location	no[2]	yes[1]	no
General information	no	yes	no

[1] Yes = Information is needed for accurate recommendations.
[2] No = Information is not needed for accurate recommendations.

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HO-106

Mulch Myths

William M. Fountain, Horticulture

Mulch is one of the essentials of good landscaping. It can be used to protect trees, suppress weeds, fertilize plants and retain soil moisture. Like many traditional practices, the use of mulch has some myths attached to it. You can improve the look of your landscape as well as the health of your plants and trees by learning the facts—and discarding the myths—about mulch.

Myth 1: Mulch will attract termites to my house.

Fact: Termites are not attracted to mulch. They may feed on mulch if and only if they are already present. Termites prefer better quality wood such as construction debris buried in the backfill. Pine bark and cypress are the least attractive to termites.

Myth 2: Freshly chipped wood will suck the nitrogen out of the soil.

Fact: Nitrogen does not move up into the mulch, and mulch sitting on the soil surface will not take large amounts of nitrogen from the soil. However, organic matter such as sawdust incorporated into the soil can tie up significant amounts of nitrogen. Over time compost and mulch will release nitrogen and other mineral elements for plant use.

Myth 3: If *some* mulch is good, *more* is better.

Fact: Three inches of mulch is all that you need on the soil surface and only two inches if you are using a finely ground mulch. More mulch than this keeps oxygen and water from getting to the plant roots and causes roots to grow up into the mulch.

Myth 4: Piling mulch against the trunk of a tree will protect the trunk.

Fact: Mulch piled against the trunk of a tree will keep the trunk moist, causing the bark to decay. The moist trunk is a more attractive food source for mice, insects and fungi. Keep mulch four (4) inches from the trunk.

Myth 5: You need to add fresh mulch every year.

Fact: You only need to replace mulch if it has completely broken down. The amount of time this breakdown takes varies with the type of mulch. Always check the depth of the mulch on top of the soil before adding more. Remember, three inches maximum! Scratching the surface of the mulch with a cultivator will freshen its appearance.

Mulching is one of the best things that we can do for plants in our landscapes or one of the worst things we can do to them. Proper mulching encourages the development of fine roots enabling the plant to take up more water and mineral elements than is possible under turf. This image shows samples of roots taken from opposite sides of the same white oak. One side was under turf, the other had been mulched for only one year. (image used with permission of G. Watson, Morton Arboretum)

Fresh wood chips should be composted for a minimum of 4 to 6 weeks. This is especially important if the chips are mixed with leaves.

Finely ground mulch lasts a shorter time because it decays more rapidly than coarse mulch. The rapid decomposition results in the mulch becoming hydrophobic (afraid of water). Hydrophobic mulch sheds water keeping it from entering the soil.

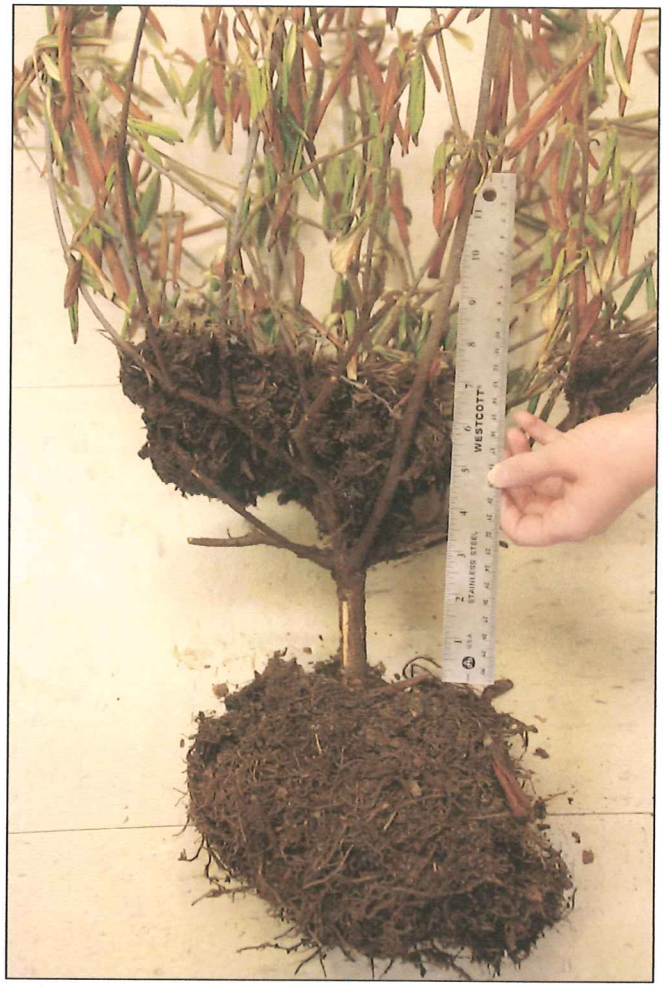
Myth 6: Putting landscape fabric under mulch makes your mulch last longer.

Fact: You actually want the mulch to break down and slowly become incorporated into the soil. Decomposed mulch improves drainage in heavy clays and helps retain moisture in sandy soils. The gradual decomposition of mulch is Mother Nature's way of fertilizing plants.

Myth 7: Landscape fabric/weed mats prevent weeds from growing.

Fact: Many weeds (Bermudagrass, nut sedge, nimblewill and others) can poke through landscape fabric. Weed seeds that land on the surface of landscape fabric will root through the fabric and are extremely difficult to pull.

Mulch should be no deeper than 2 or 3 inches and should go out to the dripline of a tree.



Mulching too deep killed this rhododendron.

Piling mulch up against the trunk is called "volcano mulching" and will result in damage to the trunk, development of surface roots and prevents water from getting to the soil.

Surface roots on a red maple resulting from volcano mulching.

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Principles of Home Landscape Fertilization

R.E. Durham, A.J. Powell, J.R. Hartman, W.O. Thom, and W.M. Fountain

Plants growing in a home landscape co-exist with one another in a nonnative environment. The urban landscape includes combinations of trees, shrubs, and turf, all of which have most of their absorptive roots intermingled in the top 3 to 4 inches of soil. During home construction, many urban soils are compacted, or topsoil is removed. The remaining soil, which often is higher in clay, is spread over the surface to make an almost impenetrable material. This situation often reduces oxygen and nitrogen within the root zone, lowers available water, and reduces root penetration into the soil.

It is easy to visualize competition for light, nutrients, and water when one observes grass attempting to grow under a shade tree. However, root competition may be just as intense over the entire lawn. Roots from large trees compete with turf in unshaded as well as shaded lawn areas, since the roots may extend horizontally at least two times a tree's height. Even trees in a neighboring lawn may be competing with the turf.

The question is, "Can one fertility program promote growth and/or quality for all landscape plants in a managed lawn?" The answer is "No." Each situation is unique, and several choices exist for home landscape fertility programs. Consider the following aspects when deciding on the best program for a specific landscape.

Soil Testing

What Is Measured?

Soil testing is the basis for many fertility recommendations. A soil test can be obtained for a nominal fee through your county Extension office. An agricultural soil test reports the pH and levels of phosphorus, potassium, calcium, magnesium, and zinc. Although nitrogen is the most important component of many fertilizers, the soil test does not provide information about nitrogen because nitrogen is rapidly lost through leaching (it is carried away by soil water), or it is removed by plants. Specialized soil tests can be obtained for an extra fee. However, such tests are not normally used unless a specific plant nutrient problem is suspected and needs verification. Perhaps the most valuable information revealed through the soil test is soil pH. See *Soil Testing* (AGR-57) and *Taking Soil Test Samples* (AGR-16), available at your county Extension office.

When Do You Test?

Soil testing should be done before trees and shrubs are planted and the lawn is seeded. In an established landscape, a soil sample can be taken any time. Take subsamples from eight to 10 locations in the area you have identified—front yard, backyard, garden area, etc.—within 3 to 4 inches of the surface. Put the subsamples into a clean plastic container. After all subsamples are in the container, crush and mix them and remove any thatch and live plant material. Remove 1 pint of the mixed soil and place it in a special bag or box available from the county Extension office.

Taking subsamples deeper than 3 to 4 inches dilutes the important soil close to the surface. In a landscape situation, the fertilizer or lime is applied to the surface with little or no tillage, so most of the crucial soil fertility reactions and nutrient uptake occur in the top 2 to 3 inches of soil.

This publication first discusses each aspect of fertility and then assesses different type of fertilizers.

Acidity (pH)

Soil acidity is measured as "pH." Soil pH is an index of the amount of acidity present. The pH scale ranges from 0 to 14. At pH 7, soil is neutral. At pH levels below 7, soil is acid ("sour"), and at pH levels above 7, it is alkaline ("sweet").

Acid Soil

Most turfgrass species will perform best at a pH between 6 and 7. A pH as low as 5 does not present severe problems to turf except that it may encourage development of Kentucky bluegrass thatch. Since tall fescue accumulates no thatch, it does well at low pH levels. A soil pH between 5 and 7 is within the range of adaptation for most tree and shrub species (although azaleas and rhododendrons may prefer a pH of 4.5 and should certainly be maintained at pH levels below 6.0).

For acid-loving plants, you may need to increase the soil's acidity. If the soil is above a pH of 6.5, the most practical thing to do is to bring in additional soil to form a berm—a shelf around the plant. For shrubs like rhododendrons and azaleas, berms should be at least 20 inches tall at the edge and a minimum of 3 feet across—large enough to provide an adequate rooting area for the plant at maturity. Berms are not recommended for trees because of trees' extensive root system. The soil for the berm should consist of a 50:50 mixture of topsoil and peat moss. For soils with pH below 6.5, sulfur can be added according to the amount shown in Table 1.

Table 1. Suggested application of ordinary powdered sulfur to reduce the pH of an 8-inch layer of soil.

Original pH of Soil (based on water pH value)	Sulfur Needed to Reach pH of									
	4.5		5.0		5.5		6.0		6.5	
	Sand	Loam	Sand	Loam	Sand	Loam	Sand	Loam	Sand	Loam
5.0	2/3	2	—	—	—	—	—	—	—	—
5.5	1 1/3	4	2/3	2	—	—	—	—	—	—
6.0	2	5 1/2	1 1/3	4	2/3	2	—	—	—	—
6.5	2 1/2	8	2	5 1/2	1 1/3	4	2/3	2	—	—
7.0	3	10	2 1/2	8	2	5 1/2	1 1/3	4	2/3	2

Note: Since pH reduction is often needed for a single plant or small group of plants, sulfur use per 100 sq ft is indicated. Although aluminum sulfate is often recommended to gardeners for increasing the acidity of the soil, it has a toxic salt effect on plants if it is used in large amounts, and small amounts are not effective. About 7 lb of aluminum sulfate is required to accomplish the same effects as 1 lb of sulfur.

Alkaline Soil

A soil pH just above 8, which is the maximum found in Kentucky, will not detrimentally affect turf, although it will be a serious problem for woody plant species such as azaleas, rhododendrons, dogwoods, hollies, oaks, and blueberries. Other species, such as butterfly bush, beech, and the viburnums, may grow well at a pH of 7 or above.

Plants should be matched to a soil's natural pH as much as possible, since permanently adjusting soil pH to a radically different level is difficult. However, even if the pH is not optimum for a particular species, plants rarely die because of a pH problem alone. Improper soil pH will, however, reduce plant growth rate and cause yellowing (chlorosis), especially between veins of new leaves. This stress, if severe, will allow otherwise harmless microorganisms to attack the affected plant and cause the death of roots, branch tips, or even whole plants.

Adjusting Soil Acidity Levels

What to Use

If soil pH correction is needed, agricultural limestone can be applied to raise pH (make the soil less acid), and finely ground, elemental sulfur or aluminum sulfate can be applied to lower pH (make the soil more acid). Since these materials are normally surface-applied in landscape situations, they adjust the pH in only a few inches of soil at the top. Changing soil pH may take several months or years, and repeat applications are often needed. Lime or sulfur can be applied at any time of year. Tables 1, 2, and 3 provide recommended amounts of these materials to adjust soil pH. If most of your woody plants need a soil pH below 5.5, select either tall fescue or one of the fine fescues for the lawn instead of Kentucky bluegrass.

For most urban landscapes, maintaining a soil pH between 5.5 and 6.0 is the best compromise. Reducing the pH beyond this range would not be necessary except for azaleas and rhododendrons. Since these woody plants are normally grown in beds or on a berm, pH could be adjusted by applying sulfur around the plants' roots.

How Much to Use

The amount of lime or sulfur needed to adjust pH depends on the

- amount of change needed.
- soil texture.
- fertilizer used.

Tables 1, 2, and 3 give general guidelines, but soil tests should be taken periodically to evaluate pH. Soil test results often give two figures for soil pH: a value for water pH and one for buffer pH. The buffer pH provides a better estimate of how much lime or sulfur is needed to change soil pH because it takes into account the soil's buffering capacity. A soil with high buffering capacity is more resistant to changes in the pH. Clay loam soils usually have more buffering capacity than sandy loam soils, for example.

Before planting, lime or sulfur should be broadcast evenly on the soil and worked into the top several inches. If woody plants and turf are already established, a surface broadcast application is the only alternative. Immediate irrigation after applying sulfur will help prevent foliage burn.

Table 2. Amount of agricultural limestone needed (silt-loam soil) in terms of water pH to raise pH to 6.4.

Water pH Value	Agricultural Limestone (lb/1,000 sq ft)
Above 6.4	0
6.4 - 5.8	0 - 100
5.8 - 5.2	100 - 200
Below 5.2	200

Table 3. Amount of agricultural limestone needed to raise pH to 6.4 in terms of buffer pH.

Buffer pH Value	Agricultural Limestone (lb/1,000 sq ft)
6.7	70
6.6	100
6.5	115
6.4	140
6.3	160
6.2	190
6.1	210
6.0	230
5.9	245
5.8	255
5.7	280
5.6	315
5.5	325

Besides sulfur, the use of acid mulches (such as pine needles, composted sawdust, and acid peat) and continued use of ammonium sulfate as a nitrogen fertilizer tend to increase soil acidity. Almost all nitrogen sources increase soil acidity, but to a lesser degree than ammonium sulfate.

Nitrogen

Nitrogen is the nutrient most responsible for plant growth and vigor, and yet it is the nutrient most often deficient or misused in urban landscapes. Before deciding whether or not to use nitrogen, decide on your objectives for landscape appearance.

Why Do You Want to Fertilize?

Fertilization objectives for *shade trees* could include

- promoting rapid growth so young trees quickly become large and functional.
- maintaining health and appearance of mature trees.
- attempting to rescue declining trees. (However, in some circumstances, providing nitrogen to a declining tree only worsens the tree's condition.)

Fertilization objectives for *turfgrass* could include

- promoting thick, lush, green growth even if it needs a lot of maintenance.
- maintaining a healthy, persistent turf that needs less mowing and maintenance.
- having a grassy area for erosion control or utility that requires minimum upkeep.

Furthermore, by examining the landscape periodically, you may be able to tell by the way the plants look whether nitrogen is needed. For example, if mature trees are consistently adding 6 inches of new twig growth annually, no additional nitrogen is needed. On the other hand, if turfgrass or plants are growing slowly and appear off-color (pale green) or weak, nitrogen may be needed. Finally, a landscape is a complex system, and a single program, while adapted for some plants in the yard, may be disastrous for others. You may need either to compromise or use nitrogen at different times in different areas of the landscape.

Factors Influencing Nitrogen Use

The following factors will influence how nitrogen might be used in the landscape.

- In many urban environments, the low organic matter content of disturbed soils makes it necessary to apply nitrogen annually to maintain growth and quality for turf and ornamentals.
- In many mature and natural landscapes, trees and turf live harmoniously without added nitrogen because nutrients are recycled from decaying plant residue or from original soil organic matter. Shredding grass clippings and fallen leaves with a mulching mower and recycling them into the landscape will reduce the need for fertilization.
- In most home lawns, if a tree is big enough to be aesthetically pleasing, adding nitrogen fertilizer to force rapid growth would be senseless.
- Rapid turfgrass growth due to heavy nitrogen fertilization increases stress on the grass, which then requires more mowing, irrigation, and pest control and often requires thatch control.
- Turf that grows in heavy shade will survive only when it has low nitrogen fertility during the late spring and summer months. High levels of nitrogen applied to such areas are harmful because the grass is forced to metabolize nitrogen, requiring more energy (light). As light becomes the limiting growth factor, shaded turf is soon depleted of energy and will deteriorate. As this happens, moss, algae, and vining weeds become established. However, you can still fertilize the tree under these circumstances. Since most active tree roots are growing beyond the tree canopy, tree fertilization can be accomplished by reducing the nitrogen rate in the most shaded turf area and increasing the rate on unshaded turf nearby.
- Many shade trees can tolerate and respond to high rates of nitrogen (up to 6 lb of N per 1,000 sq ft) in infertile soils; conifers and broadleaf evergreens should not be overfertilized (fertilize to a maximum of 3 lb of N per 1,000 sq ft).
- Lush, succulent, nitrogen-stimulated growth may make landscape plants more susceptible to insect infestations. Under these circumstances, plants in the rose family will be more susceptible to fire blight, other trees and shrubs may succumb to powdery mildew or rust, and turfgrass may be more susceptible to patch diseases.
- Weak, nitrogen-deficient growth may make landscape plants more susceptible to canker and decay diseases and turfgrass more susceptible to the diseases of red thread and dollar spot and to weed infestations.

When Should Fertilizer Be Applied?

Fall and winter are the best times to fertilize most landscape plants and grasses that grow in Kentucky. The annual amount of nitrogen should be split into two or three applications approximately six weeks apart to benefit both turf and woody plants. (Nitrogen applied to turf between April and September can promote excessive top growth and thus decrease resistance to drought, disease, and heat.)

Do not apply nitrogen to woody plants between July 1 and November 1, since some of the less winter-hardy plants may not harden in time for winter weather.

Fall and winter fertilization benefits turfgrass because it promotes root and tiller growth needed for improved health and density. Woody plants and turf can absorb nitrogen any time in late fall and early winter that soil temperatures are above 32°F.

How Much Nitrogen Should Be Applied?

Refer to landscape maintenance objectives to determine needs that may exist. Nitrogen is normally applied at rates expressed as pounds of actual nitrogen (N) per 1,000 sq ft. If a fertilizer contains 10 percent N and 2 lb N is needed, then 20 lb of fertilizer would be spread over 1,000 sq ft. The percentage of nitrogen contained in a package of fertilizer is stated on the

Table 4. Sample programs for nitrogen fertilizer in the landscape.

Annual Nitrogen Application (lb/1,000 sq ft)	Effect on Turfgrass	Effect on Woody Plants
0	Quality and growth minimum. Tall fescue more tolerant of low fertility. Weeds may become dominant in sparse bluegrass lawns.	Mature healthy plantings will continue moderate growth. Immature woody plants will not achieve adequate growth.
2	Good quality and growth. Optimum for most turfgrass sites that cannot be irrigated and are not heavily used.	Mature, healthy plantings will achieve good growth. May stimulate some growth of young plants
4	Lush, high-maintenance turfgrass. May be detrimental if irrigation and pest control are mismanaged or if heavy shade exists.	May push unneeded growth for mature plants. Young plants can attain size more rapidly at this rate.
6	Problematic for bluegrass and fescue lawns. Thatch accumulates in bluegrass. Excessive growth is succulent and susceptible to disease. Root system tends to be shallow, thereby increasing drought susceptibility. Excessive top growth is at the expense of good root development. Without irrigation during dry periods, bluegrass lawns will die. Unless applied in three equal doses at three separate intervals (minimum of six weeks apart) or unless applied during cold weather, lawn will be burned with excess fertilizer.	Will cause shoots to lengthen considerably, and the succulent growth may be more susceptible to disease. Difficult to know how woody plants actually use the available nitrogen in root growth vs. shoot growth. When extension growth is important (that is, small landscape tree needing maximum extension growth to provide shade for house), this amount of fertilizer may be warranted, but only in the rarest of cases. It is excessive in 99% of cases. Regular irrigation is a must when following this program.

Note: "Landscape" means an established landscape having turfgrass, shrubs, and small, medium, and large shade trees; disturbed, low organic matter soil; tree leaves (but not grass clippings) removed; and fertilizer applied to the soil surface. When tree leaves and grass clippings are finely shredded with a mulching mower and recycled in the landscape, fertilizer needs are reduced.

package and is expressed by the first number in a series; that is, 10-10-10 has 10 percent N, 33-0-0 has 33 percent N, etc. The consequences of applying nitrogen at different rates in the landscape are presented in Table 4.

Phosphorus and Potassium

All plants need a favorable phosphorous (P) and potassium (K) level. Kentucky soils usually have adequate phosphorous and potassium for tree and grass survival except for the P level in many western Kentucky soils. However, Kentucky soils may not have the optimum rates of phosphorous and potassium needed for maximum growth, color, tolerance to heat and cold, and resistance to drought. (Note that if grass clippings are removed regularly during mowing, soil K may decrease more rapidly than if the clippings are not removed.)

To be sure of the fertility level, have soil tested every three to four years. Table 5 gives the amounts of phosphorous and potassium that should be applied according to soil test levels.

Table 5. Phosphate and potash levels for established lawn and woody ornamentals.

	lb/1,000 sq ft	
Soil Test Level	Phosphate	Potash
High (above 60 P, 300 K)	0-1	0-1
Medium (60-30 P, 300-200 K)	1-2	1-2
Low (below 30 P, 200 K)	3-5	3-5

Calcium and Magnesium

Calcium (Ca) and magnesium (Mg) are important components needed for plant structure, metabolism, and photosynthesis. They are seldom so deficient in Kentucky soils that they inhibit growth. As grass clippings and leaves decompose in a landscape situation, much calcium is recycled. A soil test is the best method of determining calcium status.

When soil becomes too acid, agricultural lime can be applied to add calcium. Dolomitic lime adds both magnesium and calcium. If soil needs to be maintained at acid pH levels, calcium and magnesium can be applied as soluble fertilizer. Soluble calcium is available in gypsum or calcium nitrate. Soluble magnesium is available in epsom salts (magnesium sulfate) or sulfate of potash (magnesia).

In other states, magnesium has been found to be deficient for some landscape plants, but this situation has not been confirmed in Kentucky. Magnesium deficiency is usually described as "interveinal chlorosis," or yellowing of tissue between the veins of leaves. Other limitations within the root zone, such as soil compaction, soil oxygen, heat, cold, drought, root damage, air pollution, diseases, insects, and certain chemicals, may also cause leaf chlorosis. Although careful observation and plant/soil testing can greatly narrow the possible causes, most people will still have difficulty determining the exact cause of chlorosis.

Minor Nutrients

Deficiencies in minor nutrients are uncommon in Kentucky soils. Kentucky's soils are high in iron, although most of the iron is only slightly available to plants. Treatment of some chlorotic trees with iron (for example, iron sequestrene foliar sprays or iron chloride injections) do help leaves become greener, at least temporarily. In addition, when soil pH decreases, chlorosis symptoms abate. Iron applied to the surface of soils that have a pH of 6.5 or higher is chemically tied up and not available for immediate plant root uptake. Therefore, soil and foliar iron treatments may have to be done every year to correct an iron deficiency in certain species growing in near-neutral or high pH soils. Certainly, reducing soil pH will provide better long-term control of chlorosis where high iron-requiring species like pin oaks are desired.

Types of Fertilizer

Nutrient deficiencies can be corrected by applying single-ingredient fertilizers, such as ammonium nitrate (N), urea (N), triple super phosphate (P), and muriate of potash (K). They can also be corrected by making appropriate applications of a combination fertilizer such as 10-10-10, 5-10-10, or 20-20-20. Specialty fertilizers marketed for certain ornamentals and grasses can also be used effectively but may not be more beneficial than more economical, farm-type fertilizers. However, specialty fertilizers are convenient to use because the package often gives specific rate and calibration information, and the fertilizer often contains some slow-release (organic) nitrogen that reduces the potential for foliar burn.

Dry vs. Liquid Fertilizers

There is essentially no difference between the nutrient availability of fertilizers applied in dry form and those applied in liquid form. Liquid fertilizers do not move deeper into the soil than dry fertilizers. Both require water from rainfall or irrigation to make nutrients available for root uptake.

Foliar vs. Soil-Applied Fertilizers

On Foliage

Foliar applications of fertilizers give only a temporary response and do not give a long-term solution to a fertility problem. To prevent serious foliage burn, foliar fertilizers must be diluted.

On or in the Soil

Broadcast applications of fertilizer on the soil are effective, since most roots of woody plants and turf grow near the soil surface. Liquid fertilizers can also be applied below the soil surface with a lance or a water needle. Similarly, dry fertilizers may be applied through holes drilled into the soil or made by a punch bar. However, injecting liquid fertilizer or putting dry fertilizer into holes is not the most efficient way to apply fertilizer. Since the absorptive (feeder) roots of most tree and shrubs are in the top few inches of soil and fertilizers move downward with water, much of the fertilizer is placed below the root zone and thus cannot be absorbed if either of these methods is used. Fertilizer that is not taken up by plants will ultimately enter the groundwater, causing potentially serious pollution problems.

Contact: R.E. Durham, Department of Horticulture

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Pruning Landscape Trees

Flowering and shade trees in the landscape require periodic pruning to control size and shape, to correct undesirable growth, and to remove low-hanging or damaged branches.

The pruning tools for trees are the same as those required for ornamental shrubs:

- Hand pruners are used for branches 1/4 to 1/2 in. in diameter.
- Loppers are used for cuts more than 1/2 in. in diameter.
- Pruning saws are used to remove larger limbs.

Note: Do not use fine-toothed carpenters' saws. Hedge shears are of no use in pruning trees unless a formal hedge or screen is desired.

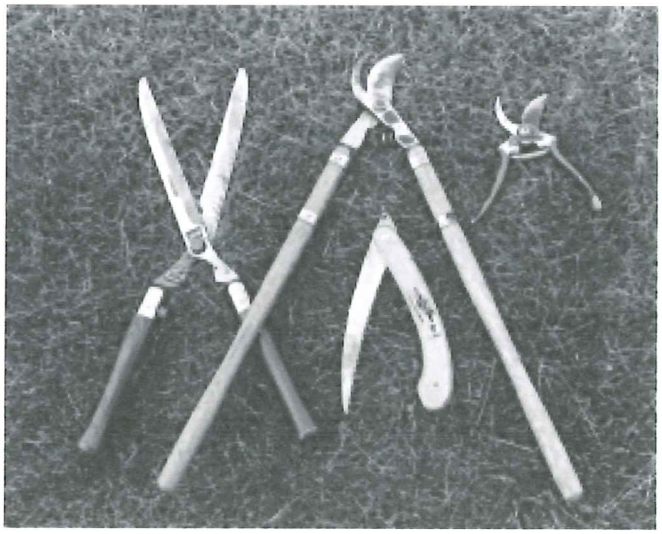

Figure 1.—Tools used in pruning include (left to right) hedge shears, loppers, pruning saw, and hand pruners.

When to Prune

Flowering Trees

Ornamental trees that flower before June first should be pruned immediately after flowering. These include redbuds, smoke trees, magnolias, flowering and kousa dogwoods, hawthorns, crabapples, flowering cherries, peaches, pears, and plums.

Trees that flower after June first should be pruned in winter or spring before new growth begins. These include goldenrain trees, sourwoods, and other late-flowering trees.

Shade Trees

Trees restore themselves more rapidly if they are pruned in early spring before they leaf out. The framework is bare, and you can easily see which branches need to be removed. When pruning is done in early spring, the plants are soon in full leaf and actively photosynthesizing, thus providing food and energy required for closing or sealing wounds after pruning.

Some trees, such as birch, yellowwood, elm, pine, spruce, fir, and maple, will bleed excessively if pruned in the spring. Bleeding, or loss of sap, will not harm the tree, but may be unsightly or messy around the home. Bleeding may be reduced by pruning such trees when they are in full leaf (June).

What Trees to Prune and How to Do It

Making Cuts

There are methods for pruning trees to get the best results. Proper pruning involves removing dead, dying, or living branches without damaging or removing the branch collar. (See Fig. 2)

Start at the top of the tree and work down. This makes it easier to shape the tree.

- Make the cut at the bark ridge of the branch. This is the point where the branch meets the main stem.
  - — Don't flush cut. Cuts made into the bark ridge are too close; these "flush cuts" may remove tissue that signals the plant to set boundaries for resisting the spread of infection. Thus, the tree is not able to compartmentalize the injury made at pruning.
  - — Don't dehorn. Leaving several inches or several feet of branch beyond the bark ridge is an equally serious mistake, called dehorning, pollarding, or topping the tree. Callous tissue will not form from the stub wound. The stub dies back to the bark ridge, and often infection spreads deeper into the tree because the wound was not compartmentalized. (See Fig. 3)

Figure 2.—Notice the location of the bark ridge marking the branch collar.

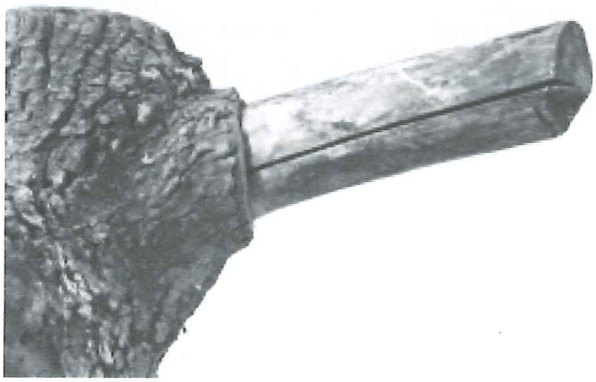

Figure 3.—Stubs remaining after pruning die back and the decay often spreads to the interior of the tree.

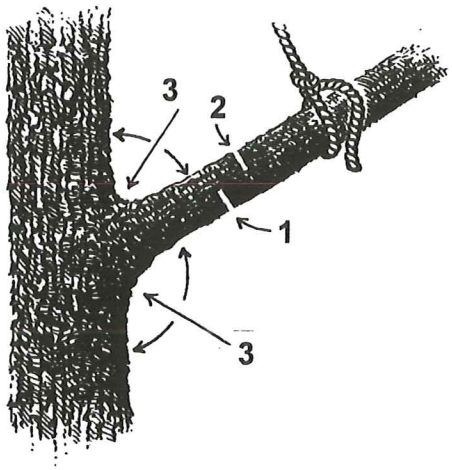

Figure 4.—The downward stroke is for stubbing the branch and removing excess weight. The final cutting stroke is at the branch collar, matching its angle, and leaving the collar intact.

- To make a cut properly, stub the branch on the downstroke. Then make an upstroke cut at the branch bark ridge that forms the slightly swollen branch collar, leaving the branch collar intact. The cut line should be at an angle downward that is approximately the same as the angle of the branch bark ridge. (See Fig. 4)

Treating Cut Areas

Do not paint wounds. When cuts are made properly at the branch bark ridge, trees are able to compartmentalize, or set boundaries, at the injury (pruning) site. This process helps resist the spread of infection. Trees can resist the spread of microorganisms if they are fast and effective in setting the boundary defense system, but some are fast and others slow at this process.

No matter how efficiently or inefficiently the tree sets boundaries, wound dressings do not stop decay and actually increase the rate of decay. Therefore, it is not necessary to paint wounds once a cut is made. Rather, leave the tree to its own defenses.

Pruning Trees is an Annual Job

If minor pruning is done every year, the job is manageable and the plant remains healthy. A beautiful plant form is retained, and pruning cuts remain virtually unnoticed unless close inspection is made.

However, when plants are neglected over a period of years, major pruning considerably changes the plant's form. Furthermore, removing large amounts of wood at one time is detrimental to the plant's health.

Pruning Newly Planted Trees

Corrective pruning of a tree at the time of planting sometimes works for the tree's good. Dead, damaged, or misshapen branches can create problems later and therefore should be removed at planting time.

- **Do not remove the leader or central stem.**
- **Do not remove tips of branches** unless they are growing to the tree's interior, creating a crowded condition.
- **Remove the less dominant branch** if two branches are growing at a tight angle.

Prune newly planted trees to remove problem branches and to "shape up" the tree to a form typical of the species. Generally, entire branches should be removed, as shown in these "before" and "after" pruning shots of *Stewartia pseudocamellia* (see Figs. 5 and 6).

Figure 5.—Before pruning.

Figure 6.—After pruning.

Pruning Young Established Trees

A regular pruning program begun while trees are young will prevent extensive repair work when they are older.

- **Establish well-spaced branches** when the tree has been planted for approximately two years. This allows stronger limbs and a better canopy to develop because sunlight is more evenly distributed through the tree.
- **Prune young trees so that major scaffold branches are spaced vertically 18 to 24 inches apart** (more for larger trees). Choose five to seven main scaffolds that are evenly distributed radially; leave these, and remove other branches. In this way, you prevent any one branch from growing directly over another.

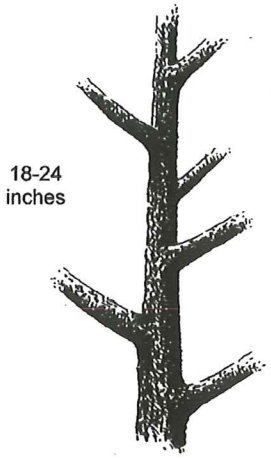

Figure 7.—Major scaffold branches should be spaced vertically at least 18 to 24 inches apart.

- **Do not remove or cut back the central leader in trees where it forms the trunk.** Such trees include tulip trees, black gums, sweet gums, pin and shingle oaks, 'Aristocrat' Callery pears, and other conical or pyramidal trees (see Fig. 8). Other trees have a modified leader: maples, ashes, honey locusts, lindens, dogwoods, flowering crabapples, and other shade or flowering trees with oval or round canopies (see Fig. 9). This modified leader may be cut back lightly to a lateral twig or bud if desired.

Figure 8.—The sweet gum is a dominant leader tree.

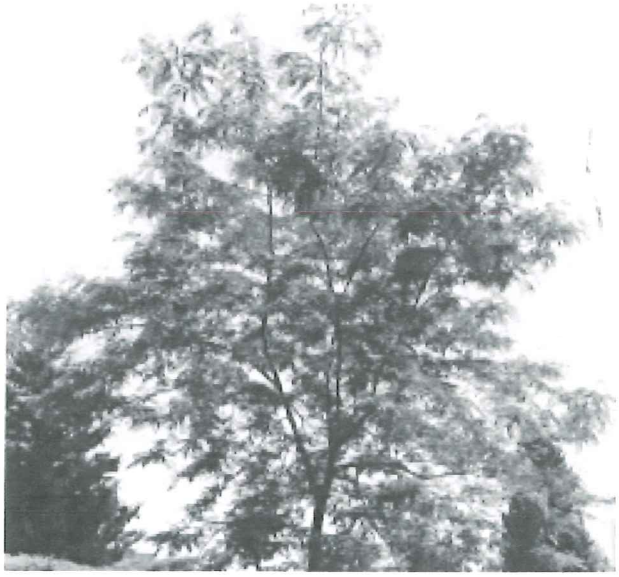

Figure 9.—An example of a modified leader tree is the honey locust.

- **Remove one of the two branches forming tight forks** to allow the tree's normal shape to develop. If one of the balanced branches is not removed during early development, bark will accumulate in the angle of the two branches. Because this wood is weak, a heavy load of ice or a strong wind may break one of these branches or split them apart.

Figure 10.—Note this plant's tendency to develop two forks each time it forms a new set of branches. Keep the stronger branch, and remove the weaker (less desirably placed) one.

- **Remove or cut back any side branches that assume dominance** unless this growth is desirable (i.e., it replaces a damaged leader). Remove or cut back these side branches to an outfacing bud or side branch lower than the leader (see Fig. 11).
- **Remove branches that may develop into potential hazards,** such as low-hanging branches that interfere with traffic.

Pruning Large Trees

Pruning requirements for large, mature trees are the same as those listed for younger plants. The major difference is size: working in large trees can be dangerous. When pruning is necessary, it is best to obtain the service of a certified arborist.

Figure 11.—Branches growing much faster than the rest of this juniper need to be totally removed so the plant will resume its natural pyramid form again.

- **Pruning cannot replace proper plant selection and planting under power lines.** Large shade trees cannot develop properly under power lines and thus should not be planted there. Remove them totally once they become too large.
- **Do not** try to remove trees or limbs that are under and in power lines yourself.
- **Do not top trees.** Homeowners are sometimes "conned" into topping or dehorning trees as a "rejuvenation" process. Large branches are cut back leaving only stubs, while all small branches are removed. This process is not recommended. The shape of the tree is ruined, and the large

Figure 12.—Dehorned trees are unsightly and prone to quick decline. Never leave stubs of branches in pruning.

wounds will not heal properly. Furthermore, the new witches' broom type growth is more susceptible to disease, insect attack, and storm damage. The tree's useful life is greatly reduced.

- **Prune out dead, dying, or diseased twigs and branches.** Southern magnolias, like the one in Fig. 13, often suffer extensive winter damage. The tree needs to be opened, and the damaged branches must be removed at the branch collar of the main stem.
- **Remove branches that cross or rub against other branches.** Continued rubbing causes open wounds that enable diseases and insects to get inside the tree. If you see rubbing branches on a tree like this southern magnolia (see Figs. 14, 15, 16), you must choose which limb to remove.

Figure 13.—A southern magnolia suffering from extensive winter damage should be reshaped after the dead wood is removed.

Figure 14.—Continuous rubbing provides easy access for diseases and insects.

Figure 15.—Which limb do you remove? The smaller or less thrifty one.

Figure 16.—The smaller branch was saved.

***Analysis**—We kept the smaller branch because it was healthier, showed better leaf development and placement, and grew to the outside rather than crowding other branches in the interior of the tree. In removing the other branch, we took care not to damage the healthy one and not to leave a stub.*

- **Remove water sprouts,** which develop on many ornamental plants such as crabapples, hawthorns, flowering cherries, flowering peaches and blackhaws. These rapidly growing, vertical shoots need to be removed because they seldom flower or fruit and will eventually destroy the shape of the tree. They also rob the tree of needed nutrients that could be used for developing flowers or fruit. These shoots should be removed at the point of origin (see Figs. 17, 18, 19, 20).

Figure 17.—Water sprouts grow vertically from the branches and cause crowding in the middle of the plant. They should be removed as they appear.

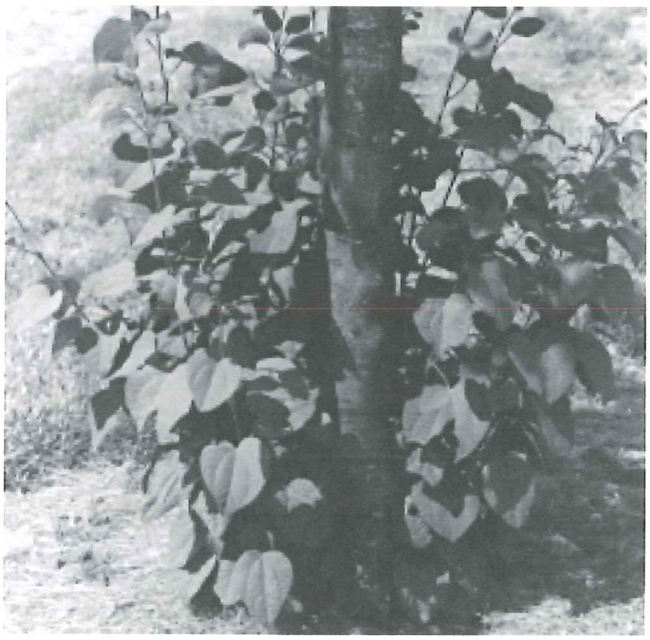

Figure 18.—Suckers growing near the base of the Katsura tree's trunk (above) may rob the plant of nutrients and water. Therefore, they should be removed.

Figure 19.—To remove suckers, use a hand pruner close to the ground, removing the sucker as close to its origin as possible.

Figure 20.—This picture shows the same Katsura tree with all suckers removed.

Pruning Multistemmed Trees

Multistemmed trees, such as the Washington hawthorn and saucer magnolia, present special problems. They usually become thick and matted in the center. To keep the multistemmed effect, the center should be kept open. Remember when pruning multistemmed trees that the stems compete with each other. The weaker member will be crowded out.

- Give major limbs growing room and enough open space to display leaves, flowers, and fruits.
- Completely remove:
  - -deadwood,
  - -suckers,
  - -sprouts,
  - -crossing limbs,
  - -branches growing toward the center of the plant, and
  - -branches with narrow angles.
- **Never stub a limb to reduce its size.**

Figure 21.—Multistemmed trees require annual pruning to prevent this type of cluttered, untrained growth habit.

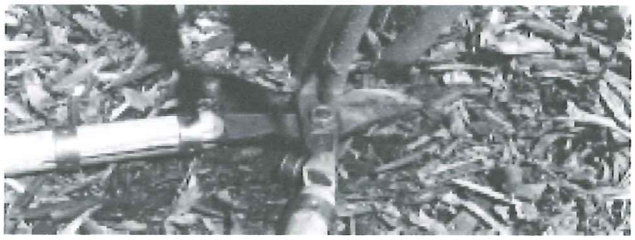

Figure 22.—Remove entire branches at soil level when pruning mutistemmed trees.

Figure 23.—The multistemmed tree has been opened by the removal of excess branches. Old or unthrifty branches should be cut first; then, remove additional branches to reshape the plant into a desirable form.

Figure 24.—Growth of extra branches is not uncommon when a tree is under stress from pruning or environmental conditions. This is a typical example of how latent buds will be forced into growth. These undesirable branches should be removed as they occur, definitely before their diameter interferes with the normal development of the branch to the left of the tree.

Figure 25.—The same tree after pruning shows how the new branches can be taken out without harming the tree's basic structure.

Figure 26.—Unusual growth forms can occur on plant material such as the upright branch in the center of this photo, which has looped around the branch above and adjacent to it. Though it gives an interesting form, it should be removed before it rubs open wounds or girdles another branch.

Figures 27-28.—Pruning of roots is also necessary at times. These are two examples of girdling roots. Girdling roots can develop when roots are not spread out at planting time. As the trunk and roots grow in diameter, the encircling root chokes or strangles the tree since there is no way for it to loosen itself. The situation gets progressively worse, until the tree dies from lack of food and water transport in the phloem and xylem vessels.

Treat it by severing the root at the point of attachment. A wood chisel usually makes the job easier than using a pruning saw. Leave the root in place, since pulling it loose may expose open wounds caused by the rubbing of roots and trunk.

Figure 29.—Trees, even when they are young, should have a flared base where the framework roots form off the trunk similar to the flared roots seen in this photo. When a trunk descends into the ground straight rather than with this type of flare, you should suspect girdling roots similar to the top photo.

Figure 30.—When girdling roots are not corrected, the tree may simply snap at soil level. This photo shows why a large tree toppled for seemingly no good reason. Close examination of the remains showed this severe case of girdling roots.

Figure 31.—Not all Callery pears are noted for narrow branching angles. The cultivar 'Aristocrat' is noted for the potential of horizontal branching, as shown here.

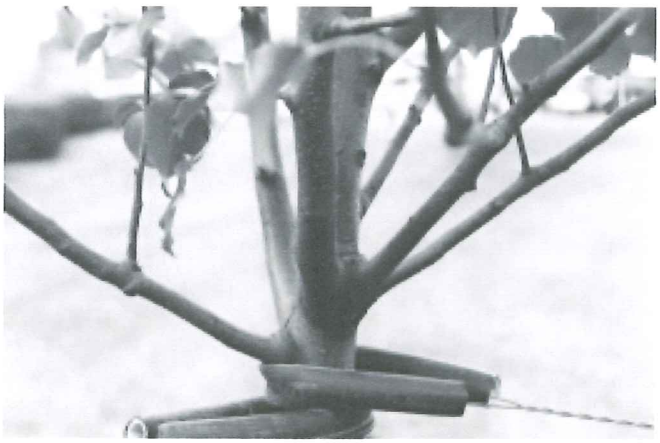

Figure 32.—Many young trees are not pruned correctly in the nursery and are sold with this quantity and arrangement of branches. If left like this, the plant will develop problems as the branches increase in diameter.

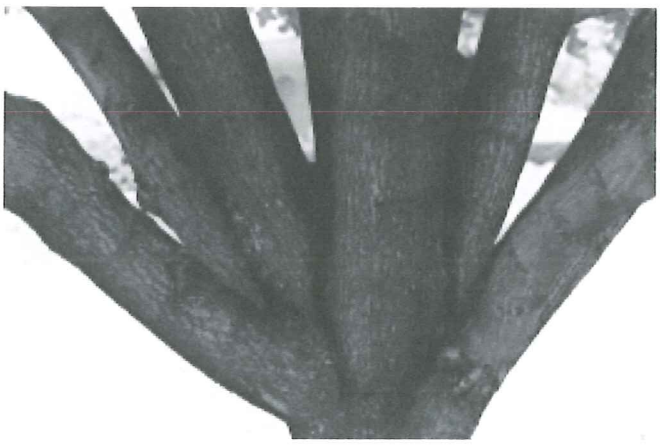

Figure 33.—In time, the tree will grow to be like this—CROWDED!

Figure 34.—When there has been too much branch competition, the tree will lose branches in high winds.

Figure 35.—This Callery pear did not develop horizontal branching and has the potential to develop structural problems. Training and pruning at a young age would have avoided this problem.

QUICK RULES OF PRUNING

Flowering Trees and Shrubs

As a rule of thumb, if it flowers before June 1st, prune it after flowering. If it flowers after June 1st, prune it before flower buds are visible.

Spring Flowering

Aesculus	(horse chestnut, buckeye)
Amelanchier	(serviceberry, sarvistree, shadbush)
Carpinus	(hornbeam)
Carya	(pecan, hickory)
Castanea	(chestnut)
Cercis	(redbud)
Chionanthus	(fringetree)
Cladrastis	(yellowwood)
Cornus	(dogwood)
Corylus	(filbert)
Crataegus	(hawthorn)
Halesia	(silverbell)
Hamamelis	(witchhazel)
Ilex	(holly)
Magnolia	(magnolia)
Malus	(crabapple, apple)
Prunus	(cherry, plum)
Pyrus	(pear)

Summer Flowering

Albizzia	(mimosa)
Cotinus	(smoke tree)
Koelreuteria	(goldenrain tree)
Sophora	(Japanese pagodatree)
Oxydendrum arboreum	(sourwood)

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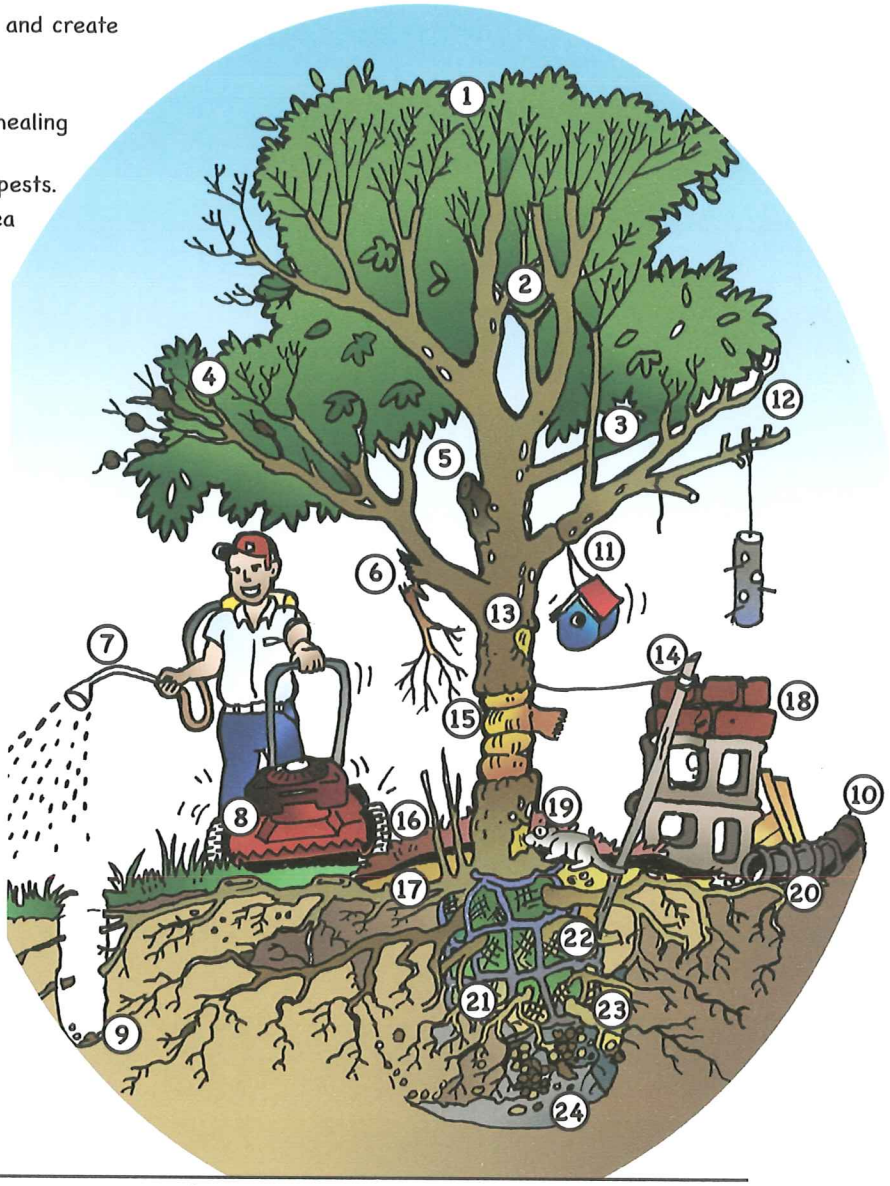
24 Ways to Kill a Tree

Bonnie Appleton, Extension Specialist, Hampton Roads AREC

Few residential trees die of "old age." Mechanical damage and improper tree care kill more trees than any insects or diseases. Avoid making the tree-damaging mistakes shown in the diagram below. Few of these items alone would kill a tree, but multiple problems will certainly stress, and could eventually kill, a tree.

1. "Top" tree to encourage watersprouts that weaken tree and encourage pests.
2. Leave co-dominant leaders to encourage "V" growth and splitting during winds and storms.
3. Leave crossing branches to rub protective bark and create wounds.
4. Ignore insect or disease damage.
5. Coat pruning cuts with paint or sealer to slow healing and promote pest problems.
6. Leave broken branches unpruned to encourage pests.
7. Spray unapproved herbicides over tree root area to weaken tree.
8. Damage roots and trunk with lawn equipment.
9. Rip through roots when digging trenches.
10. Plant close to house or obstacle to reduce adequate tree and root growing space.
11. Attach items to tree to damage bark and girdle branches with wire and rope.
12. Prune randomly to leave branch "stubs."
13. Prune flush cuts to reduce wound closure.
14. Leave tree staked until guy wire girdles trunk.
15. Leave wrap on to constrict trunk growth and rot bark.
16. Pile up excessive mulch to encourage rodent damage and bark rot.
17. Put non-porous black plastic under mulch.
18. Stack items atop roots to cause soil compaction.
19. Leave ball roping on to girdle trunk.
20. Plant near downspout to assure excessive water or water lightly to encourage shallow root growth.
21. Leave top of wire basket in place to girdle roots.
22. Leave treated or synthetic burlap on to prevent root growth.
23. Dig hole too narrow and over amend backfill to discourage proper root spread.
24. Dig hole too deep or fill with gravel to collect water and drown roots.



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How NOT to Kill a Tree

1. Do not top trees. Tree heights can be lowered by proper crown reduction that doesn't stimulate watersprout production.

2. When a tree is young, select one or the other of the competing upright branches to be the main branch and cut the other off.

3. Remove branches that cross and rub in order to prevent bark wounds.

4. Monitor for insects and diseases and treat appropriately if they are found.

5. Do not use anything to cover pruning cuts or wounds – trees seal their own wounds.

6. Cut broken branches off at the branch bark collar.

7. Spray the lawn with herbicides that will not damage trees.

8. Mulch around the tree to avoid hitting the tree trunk with lawn or edging equipment and to protect surface roots.

9. Dig around roots whenever possible but when not, make a clean pruning cut on the tree side of the root.

10. Know how big a tree will grow (height and width) and space accordingly away from houses and other obstacles.

11. Insert a nail or screw into your tree to which a wire or line can be attached. The tree will seal around the small wound made by the nail or screw.

12. Cut branches back to laterals so you don't leave stubs to which the branches will die back.

13. Do not make flush cuts. Cut on the outside of the branch bark collar.

14. Stakes generally aren't needed on small residential trees, but if they are, remove them after one year to avoid any damage.

15. Do not wrap the trunk with anything except a wide wire cage if animals are a problem.

16. Do not put mulch in contact with the trunk, and then pile mulch only 2 to 3 inches over the roots.

17. Do not put any type of fabric or plastic material under your mulch.

18. Do not stack items atop the roots; it causes soil compaction.

19. Take the ball roping off around the tree trunk. If the tree is in a container, remove the container before planting.

20. Divert water from the roots of trees that don't like wet soil, but when you water, water deeply to encourage deep root growth.

21. Remove the top horizontal round of wire from the basket. It is not necessary to remove the entire basket.

22 Remove the burlap, regardless of type, from atop the ball and down several inches on the ball side. It is not necessary to remove all the burlap.

23. Dig the hole at least twice as wide as the root system to encourage lateral root growth out of the root ball. Do not amend backfill for individual tree holes. Only amend if the entire planting area can be equally amended.

24. Dig your hole only as deep as the root system and do not put gravel in the bottom of the planting hole unless you install a drain to actively pull extra water away.

Additional Extension publications that can help you with tree planting and pruning: 430-295 and 430-455 through 430-462 at www.ext.vt.edu

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