



# **Tree Management Handbook**

**A Compilation of Helpful Information & Guidelines  
for Citizens and Developers**

Last Updated: February 2011



**The Lake Lure Tree Management Handbook** provides summaries of Town Regulations and other helpful information for citizens and developers alike, regarding the cultivation and protection of a mountain forest that incidentally contains a thriving town. It is expected that the material included here will be updated as needed to remain current on the best and most practical methods of advancing that goal.

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# *Introduction*

## **The Way We Do Things Here**

By Paula Jordan

The people of Lake Lure are committed to the preservation of the natural environment and scenic beauty of our valley. As stated in the town Vision Statement:

*“Lake Lure, the gem of the Carolinas, is a mountain lake community that has a harmonious balance of interests of our citizens, businesses and visitors, achieved through open communication and managed growth that emphasizes fiscal responsibility and stewardship of our natural beauty and environment.”*

The level of commitment to this goal, and agreement on key means of implementing it, were powerfully demonstrated by the community survey conducted for the 2007 – 2027 Comprehensive Plan. [http://www.townoflakelure.com/LL\\_comp\\_plan.htm](http://www.townoflakelure.com/LL_comp_plan.htm) (See the survey results in Appendix 3, especially the following sections: Highlights, Page 3; Lake Lure Vision, Page 7, especially Question #9; Natural Resources, Page 10.)

Listed below are the features considered to be most in need of protection, followed by Town and/or State regulations for their management and protection:

- ✓ The safety and water quality of our river, streams, and lakes.
  - Sedimentation and Erosion Control Regulations
  - The state-required 25-foot minimal-disturbance buffer bordering Lake Lure
  - Tree protection regulations – included in the Subdivision and Zoning Regulations
  - Mountain and Hillside Development Regulations
  - Boating safety regulations – included in the Lake Use – Boating Regulations at [http://www.townoflakelure.com/lake\\_use\\_boating.htm](http://www.townoflakelure.com/lake_use_boating.htm)
- ✓ The natural forested appearance of ridgelines, slopes, and valleys.
  - Tree protection regulations – included in the Subdivision and Zoning Regulations
  - Land clearing regulations – included in the Subdivision and Zoning Regulations
  - Mountain and Hillside development regulations
- ✓ The health and well-being of indigenous species and their habitat, particularly those listed as rare, threatened, and/or endangered
  - All of the above.
- ✓ For additional practices relating to Lake Lure Tree Management Regulations, see Chapter 7 of this Handbook.

# *Chapter 1*

## **What's so Special about Lake Lure and the Hickory Nut Gorge**

By Clint Calhoun

## **What Is so Special about Lake Lure and the Hickory Nut Gorge?**

The Hickory Nut Gorge, as it has been called since the first settlers came to this region, is considered not only one of the most beautiful, but also one of the most biodiverse areas in North Carolina. It shelters both mountain and Piedmont species of plants including beautiful flowering trees and showy wildflowers as well as large canopy trees and a broad range of rare plant species. These varying ecologies and plant communities support, in turn, a remarkable number of rare and endangered animal species and several small human communities.

Lake Lure, which lies at the bottom end of the Gorge, is an example of how a thriving urban community can integrate itself into a forest community. It has accomplished this through a combination of wise land management and town design; carefully crafted environmental ordinances, including the tree protection regulations; and responsible stewardship by a population devoted to the health and beauty of the natural environment that surrounds them.

Hickory Nut Gorge is a steep low elevation gorge located on the edge of the Blue Ridge Escarpment which marks the edge of the Blue Ridge Mountains. The gorge actually sits over the geographic dividing line separating the mountains and the Piedmont of North Carolina. Hickory Nut Gorge was formed primarily by the Broad River and the swift-moving streams that feed it. As they flowed, the streams cut through geologic faults, slowly wearing away the rock material and creating the gorge as it is today. The primary branch of Hickory Nut Gorge begins at Hickory Nut Gap above the community of Gerton and drops approximately 1800 feet in base elevation before it ends in Lake Lure, ten miles away.

As Hickory Nut Gorge formed and deepened, natural erosive forces continued to shape the gorge walls and slopes. A multitude of topographic features were created, resulting in a physically complex area. These variations in topography were enhanced by slope direction, moisture, and elevation and create a complex range of habitats that goes from extremely hot and dry to unusually cool and moist. This unusual topography is one of the most important reasons for the high biodiversity found in Hickory Nut Gorge.

Another factor contributing to the biodiversity of the gorge has to do with the geology of the area. The primary rock type found in Hickory Nut Gorge is Henderson augen gneiss (pronounced "nice") which dominates the gorge walls and forms the many outcroppings and smooth granite domes that are characteristic of the area. This gneiss is an acidic rock in nature and therefore the soils associated with it are lower in pH. In the southeastern section of Hickory Nut Gorge, a more alkaline rock type occurs, overlaying the Henderson gneiss. This rock type, called amphibolite, contains high levels of calcium, magnesium, and iron. The presence of amphibolite, because of its alkaline nature, raises the soil pH in many parts of the gorge. This wider pH range between acidic and alkaline creates better soil conditions for a host of plants and plant communities.

It is this range of microclimates in the Gorge, resulting from the unusual topography and climatological aspects, that provides habitat for the diversity of plant and animal communities found here. Ridges and south-facing slopes are typically dry and have more

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acidic soils. They support plants such as mountain laurel, various pine, oaks, hickories, and blueberries. North-facing slopes are generally moist and support a mixed community dominated by hemlock, tulip poplar, oaks, and maples. Cove hardwood forests tend to dominate the lower slopes and drainage areas. These forests are where the greatest species diversity is found, supporting the broad range of flowering understory trees, showy wildflower species, and large canopy trees such as oaks, hickories, poplars, and basswood.

The town of Lake Lure has maintained a special character and distinction since its development in the late '20s, due in part to the way the land has been managed and developed. Early development was done in such a way as to leave much of the forest intact while at the same time providing tasteful viewsheds, allowing property owners to enjoy the beauty of the area but still maintain the integrity and "specialness" of a forest community. This is not to say that mistakes have not been made, but it is evident that much thought and planning went into the development of Lake Lure and as such, its leaders have shown a desire to protect the land from overuse and overdevelopment by protecting trees and other natural resources. This is quite an accomplishment, considering the history of logging in the area. Hickory Nut Gorge, over the course of the early 20<sup>th</sup> century, experienced several phases of logging. Today, much of the forest in Hickory Nut Gorge is second and third growth, but it is hard to tell this in many places, due to the size of many of the trees that are found throughout the Gorge.

If you want to know how special Hickory Nut Gorge and Lake Lure are, just ask the people who live here. Most all would agree that there is not a more beautiful area to live. The climate is moderate, the people are friendly, there's lots to see and do, and it offers a degree of isolation that many people seek, having lived in areas where the rat race never ends and the tallest thing you see is a skyscraper. Hickory Nut Gorge, with its towering cliff faces, cascading waterfalls, staggering views, and plant diversity that attracts wildflower hunters and leaf lookers from across the region, is a gem that is certainly worth protecting.

## *Chapter 2*

### **A Summary of Town Regulations on Tree Management**

By Paula Jordan and Clint Calhoun

- 2.1 What a SUBDIVISION DEVELOPER needs to know about TREE PROTECTION**
- 2.2 What PROPERTY OWNERS should know before clearing and/or grading their lots for DEVELOPMENT**
- 2.3 What PROPERTY OWNERS should know before clearing and/or grading their lots with NO DEVELOPMENT planned**
- 2.4 Information for TREE SERVICES PROVIDERS**



## **2.1 What a SUBDIVISION DEVELOPER needs to know about TREE PROTECTION**

- **How is “development” defined?**

Construction, reconstruction, conversion, alteration, relocation, or enlargement of a structure; mining, excavation, or landfill, or any use or extension of the use of land.

- **How do I know if my development is a subdivision?**

Please see the definition of ‘Subdivision’ in Chapter 8 of this Handbook. Also refer to the brochure entitled “Subdividing Land in Lake Lure,” available at Town Hall and on the Town web site at [http://www.townoflakelure.com/CDD\\_Pamphlets/Subdivision%20pamphlet.pdf](http://www.townoflakelure.com/CDD_Pamphlets/Subdivision%20pamphlet.pdf)

- **What are the basic rules?**

All land clearing and grading is prohibited except the minimum needed to install roads, community utilities, or facilities to be used in common by property owners. Tree topping is strongly discouraged and could result in license revocation for tree services providers (See Chapter 7.1 of this Handbook). There are more rules for development on steep slopes and some ridgelines. Please see Chapter 6 of this Handbook, then the town subdivision and zoning regulations if more information is required.

- **How is “land clearing” defined?**

Tree removal, underbrushing, grubbing, or any activity that removes live woody plants such as trees and shrubs.

- **Are all trees and shrubs protected?**

No. Only significant trees, and stands of native shrubs 100 square feet or greater in area, are protected.

- **How is a “significant tree” defined?**

Any stable, healthy tree at least as large as the diameter listed as significant for that species in subdivision regulations or in Chapter 4 of this Handbook.

- **What is a native shrub?**

Mountain Laurel, Rhododendron, or any shrub species listed in Chapter 3 of this Handbook.

- **What’s wrong with tree topping?**

Cutting back the tree top or limbs larger than 3 in. removes the normal canopy, disfigures, and can kill a tree. See Chapter 7.1 of this Handbook for approved pruning methods.

- **Do I have to protect all significant trees?**

No, but the fewer trees there are on the property you are subdividing, the more of them you must protect. Please see the subdivision regulations for details on preparing a tree protection plan.

- **What is a tree protection plan?**

Notations of protected trees and forest areas on the plat, estimates of pre- and post-development forest coverage (See Chapters 2 and 5 of this Handbook), and other information

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on trees that must be provided in the subdivision approval process. Please see the subdivision regulations for full details.

- **Do I have to be careful with protected trees?**

Yes. A visible boundary such as an orange barrier fence must be set up around protected trees and forest areas before development begins, and kept in good repair until development is finished, to show workers which trees and shrubs they must protect from accidental damage. The subdivision regulations describe the types of damage to be avoided.

- **What if I cut or damage too many trees?**

New native trees, in sizes appropriate for successful planting and in numbers sufficient to equal the total diameters of the improperly cut or damaged trees, must be planted on the property and remain in good health for three years. Significant fines may also apply.

## **2.2 What PROPERTY OWNERS should know before clearing and/or grading their lots for DEVELOPMENT**

- **How is “development” defined?**

Construction, reconstruction, conversion, alteration, relocation, or enlargement of a structure; mining, excavation, or landfill, or any use or extension of the use of land.

- **Are there any permits required to cut trees?**

Permits apply to disturbance of land for the purposes of development. A Land Disturbance Permit is required if more than 500 square feet are disturbed (100 square feet or more if within 50 feet of a watercourse). A land disturbance permit will allow the developing property owner to remove only the trees that are specified in the site plan, not including dead or hazardous trees or trees that are not considered “significant.” If you hire a tree services provider to perform tree removal work, that person or business must be licensed by the Town of Lake Lure.

- **How does a tree services provider get licensed?**

Such person or entity must submit a license application, processing fee, and be able to demonstrate knowledge of good tree management principles, particularly those contained in the Town’s *Tree Management Handbook*, and with Town regulations concerning trees and landscaping. An examination is required unless the tree professional can provide proof of a professional certification (i.e. arborist, forester). NC licensed foresters are not required to be licensed by the Town.

- **How is a “hazardous” tree defined?**

(1) A dead or diseased tree likely to fall or drop limbs on a road, structure, or other area where property exists or people reside. (2) Any tree of a species prone to flammability in dry weather that is within 30 feet of a flammable structure where property exists or people reside. See Chapter 7.4 of this Handbook. (3) Any tree that interferes with routine activities of people, such as obstructing visibility for motorists or interfering with utilities.

- **How is a “significant tree” defined?**

Any stable, healthy tree at least as large as the diameter listed as significant for that species. See the zoning regulations at [www.townoflakelure.com](http://www.townoflakelure.com), or Chapter 4 of this Handbook.

- **What are the rules for developing my lot?**

Do not begin any clearing or grading without an approved land disturbance permit (Erosion and Sedimentation Control regulations) and an approved site plan, and until structure boundaries and clearable areas have been staked as shown on the site plan. No significant trees may be cut in areas not approved on the site plan. Tree-topping is strongly discouraged and could result in license revocation for tree services providers (See Chapter 7.1 of this Handbook for approved pruning methods). For more clearing and grading details, see Section 92.120 of the Zoning Regulations and, then call town staff (828-625-9983) for information and advice.

- **Are all trees protected?**

No. Only significant trees and areas of native shrubbery exceeding 100 sq.ft.

- **What is a native shrub?**

Mountain Laurel, Rhododendron, and other species listed in Chapter 3 of this Handbook.

- **Do I have to protect all significant trees?**

No, but the fewer trees you have, the more of them you need to protect. See the zoning regulations for details on preparing a tree protection plan.

- **What is a tree protection plan?**

Information recorded on the site plan about the trees, shrubs, and forest areas to be protected, forest coverage on the land before and after development, etc., as given in the zoning regulations.

- **Do I have to be careful with protected trees?**

Yes. A visible boundary such as an orange barrier fence must be set up around protected trees, shrubs, and forest areas before clearing or grading begins and kept in good repair until development is finished, to show which trees and shrubs must be protected. See the zoning regulations for the types of damage to be avoided.

- **What's wrong with tree topping?**

Cutting back the tree top or limbs larger than 3 in. removes the normal canopy, disfigures, and can kill a tree. See Chapter 7.1 of this Handbook for approved pruning methods.

- **What if I cut or damage too many trees?**

New native trees, in sizes appropriate for successful planting and in numbers sufficient to equal the total diameters of the improperly cut or damaged trees, must be planted on the property and remain in good health for three years. Significant fines may also apply.

## **2.3 What PROPERTY OWNERS should know before clearing and/or grading their lots with NO DEVELOPMENT planned**

- **How is “development” defined?**

Construction, reconstruction, conversion, alteration, relocation, or enlargement of a structure; mining, excavation, or landfill, or any use or extension of the use of land.

- **Are any permits required to cut trees?**

Permits apply to disturbance of land for the purposes of development. A Land Disturbance Permit is required if more than 500 square feet are disturbed (100 square feet or more if within 50 feet of a watercourse). A land disturbance permit will allow the property owner to remove only the trees that are specified in the site plan, not including dead or hazardous trees or trees that are not considered “significant.” If you hire a tree services provider for tree removal work, that person or business must be licensed by the Town of Lake Lure.

- **How does a tree professional get licensed?**

Such person or entity must submit a license application, processing fee, and be able to demonstrate knowledge of good tree management principles, particularly those contained in the Town’s *Tree Management Handbook*, and with Town regulations concerning trees and landscaping. An examination is required unless the tree professional can provide proof of a professional certification (i.e. arborist, forester). NC licensed foresters are not required to be licensed by the Town.

- **How is a “hazardous” tree defined?**

(1) A dead or diseased tree likely to fall or drop limbs on a road, structure, or other area where property exists or people reside. (2) Any tree of a species prone to flammability in dry weather that is within 30 feet of a flammable structure where property exists or people reside. See Chapter 7.4 of this Handbook. (3) Any tree that interferes with routine activities of people, such as obstructing visibility for motorists or interfering with utilities.

- **How is a “significant tree” defined?**

Any stable, healthy tree at least as large as the diameter listed as significant for that species. See Chapter 4 of this Handbook.

- **What are the rules for clearing/grading my lot?**

Do not begin any clearing or grading without an approved land disturbance permit (see the Erosion and Sedimentation Control Regulations) and an approved site plan and Land Clearing Authorization. Tree-topping is strongly discouraged and could result in license revocation for tree services providers (See Chapter 7.1 of this Handbook for approved pruning methods). For more clearing and grading details, see Section 92.120 of the Zoning Regulations and, then call town staff (828-625-9983) for information and advice.

- **How much of my lot may I clear or grade?**

You may clear or grade your lot as you wish up to one acre or 25 percent of the acreage of the lot, whichever is greater, except that you may not clear, grade or remove vegetation within 50 feet of the right-of-way of any public street or traveled way, within 30 feet of any adjoining property boundary, or within any trout buffer. See Section §96.07 (A) of the Erosion and

Sedimentation Control Regulations. If you need a temporary work road across a setback, it must be built with the least possible disruption to trees or to the natural contour of the land.

- **Do I have to protect trees in setback areas?**

Yes. A visible boundary such as an orange barrier fence must be set up around setback areas before clearing or grading begins, and kept in good repair until the work is finished. See the zoning regulations for the types of tree damage to be avoided.

- **What about harvesting trees under an approved forestry plan?**

You may cultivate and harvest trees on state-designated forestry land as specified in state law. However, if you cut more trees on forestry land than town regulations allow, state law provides that the town may withhold approval for development on that land for 3 or 5 years.

- **What's wrong with tree topping?**

Cutting back the tree top or limbs larger than 3 in. removes the normal canopy, disfigures, and can kill a tree. See the Chapter 7.1 of this Handbook for approved pruning methods.

- **What if I cut or damage trees in setback areas?**

New native trees, in sizes appropriate for successful planting and in numbers sufficient to equal the total diameters of the improperly cut or damaged trees, must be planted on the property and remain in good health for three years. Significant fines may also apply.

## 2.4 Information for TREE SERVICE PROVIDERS

- **Who can cut trees in Lake Lure?**

The regulations allow anyone to cut trees in Lake Lure, so long as all pertinent rules and regulations are being followed however there are specific requirements for tree service providers that the average property owner does not have to meet.

- **What is a tree service provider?**

A tree service provider is any person or entity who provides tree services to an individual for compensation. Tree services are described as any work pertaining to the removal of portions or the entirety of trees or other woody vegetation by any means, including, without limitation, cutting, trimming, topping, pruning, grading, and the application of chemicals.

- **What are the requirements to be a tree services provider in Lake Lure?**

In order to provide tree services for compensation in Lake Lure, a person or entity wishing to do so must fill out an application for a license, pay the license fee, and pass an examination demonstrating proficiency and knowledge of proper tree management principles, particularly those described in this handbook. Knowledge of the Town of Lake Lure tree regulations is also required. Upon issuance of the license from the Town, the tree services provider must agree to a code of ethics regarding proper tree management principles.

- **Are certified arborists and foresters required to take the exam?**

If a tree services provider can provide evidence that he/she is a certified arborist or NC licensed forester, then he/she does not have to take the exam because they have demonstrated sufficient knowledge and ability and have pledged to uphold the standards and ethics of their certifying body. A certified arborist must still apply for a license from the Town however a NC licensed forester is exempt from this requirement. Certified arborists should provide a copy of their certification when applying for their license.

- **How long is the license period and when does it expire?**

Once you have been licensed with the Town and paid the fee, the license is perpetual. In other words, there is no expiration date. There is no renewal process or fee. A license can be suspended or revoked. In the case of a revocation, a tree services provider would have to re-apply and pay the fee in order to be re-instated.

- **What causes a license to be suspended or revoked?**

If a licensed tree services provider fails to abide by Town regulations concerning trees and landscaping, adhere to the Code of Ethics for licensed individuals, or follow the guidance of the *Tree Management Handbook*, then their license may be suspended or revoked in addition to any other penalties they might face. Certified arborists and licensed foresters could also face having a complaint filed against them to their respective boards.

- **What happens if a tree services provider cuts trees and doesn't get a license?**

Enforcement action will be taken against the tree services provider in the form of civil penalties for every tree that is damaged or removed. Other penalties may also apply.

- **Why does the licensing requirement only apply to tree services providers and not individual property owners wanting to cut trees?**

The Town of Lake Lure recognizes that property owners have a right to do certain things on their land without having to seek permission. Removing trees is no exception. Most property owners do not have the knowledge or skill level that a tree services provider offers, so it would be unfair to require individual property owners to be licensed.

- **Why do tree services providers have to be licensed?**

Because property owners are hiring someone whom they believe is a professional, the Town of Lake Lure feels that professionalism should be shown by insisting that tree services providers are not only performing a service to landowners but are also educating landowners on the benefits of trees and helping the landowner to make good choices that will improve the overall health of trees in Lake Lure and prevent needless removal.

- **What does the exam involve?**

The exam is a tool to test the tree services provider's knowledge on ethical tree management practices. The exam will be open book and consists of 50 multiple choice questions related to tree management. A score of 80% or greater is required to pass. If someone fails to pass the examination on the first attempt, that person will be allowed to re-test after 30 days. No license will be granted until the applicant passes the exam.

- **Is there a study guide for the exam?**

The *Tree Management Handbook* is where the exam questions are derived from. A copy can be picked up at Town Hall or downloaded from the Town of Lake Lure website ([www.townoflakelure.com](http://www.townoflakelure.com)).

- **Does a licensed tree services provider have to get permission from the Town to cut trees?**

In most cases, the answer is no. Once licensed, permission is given to cut trees as needed as long as all regulations are being followed and as long as no trees are being removed from the trout buffer. Tree removal in the trout buffer requires permission from the Environmental Management Officer and the NC Division of Land Resources.



## *Chapter 3*

### **Native Plant Recommendations For Hickory Nut Gorge and Lake Lure**

By Clint Calhoun.

**Note: For information on the fire-hardiness of native species,  
see Chapter 7.4 of this handbook.**

## **Hickory Nut Gorge Natural History**

As noted in Chapter one, the Hickory Nut Gorge is a steep low elevation gorge formed on the edge of the Blue Ridge Mountains by the Broad River and the swift-moving streams that feed it. As the Gorge formed and deepened, a multitude of topographic features were created, resulting in a physically complex area. These variations in topography, enhanced by slope direction, moisture, and elevation, create a complex range of habitats that goes from extremely hot and dry to unusually cool and moist. This unusual topography is one of the most important reasons for the high biodiversity found in Hickory Nut Gorge.

The geology of the area also plays a part. Henderson augen gneiss (pronounced “nice,”) the primary rock type found in Hickory Nut Gorge, is an acidic rock in nature, so the soils associated with it are lower in pH. In the southeastern section of the Gorge amphibolite, a more alkaline rock, overlays the Henderson gneiss. This rock type contains high levels of calcium, magnesium, and iron and, because of its alkaline nature, raises the soil pH in many parts of the gorge. This wider pH range between acidic and alkaline creates better soil conditions for a host of plants and plant communities.

It is the range of microclimates, resulting from the unusual topography and aspects, that provides habitat for the vast array of plant communities and rare species found here. The typically dry, more acidic soils of the ridges and south-facing slopes support plants such as mountain laurel, pines, oaks, blueberries, and hickories. The generally moist North-facing slopes support a mixed community dominated by hemlock, tulip poplar, oaks, and maples. The lower slopes and drainage areas tend to cove hardwood forests where the greatest species diversity is found, supporting a broad range of flowering understory trees, showy wildflower species, and large canopy trees such as oaks, hickories, poplars, and basswood.

### **What is a Native Plant?**

Native plants are generally defined as plants that are indigenous to a particular area. They are a natural element of the regional landscape. Depending on how strictly the term is applied, nativity can be restricted to small areas such as specific ecological communities, or can basically describe any plant that occurred in North America prior to European settlement. Native plants are adapted to the specific conditions in which they are found. Entire ecological communities are often dominated by a particular native species, creating interactions with other species that are vital for survival. Native plants and their associated communities can be greatly affected by various forms of disturbance, including the introduction of “exotic” plant species.

### **What is an Exotic Plant?**

An exotic plant is a plant that is not native to this country or region, but has been introduced from another country or region either directly, deliberately, or accidentally by human action. Many of our exotics were introduced because of some positive quality they possessed that would make them desirable as ornamentals, food sources, erosion control, or as breeding stock for creating hybrids. Most exotic plants are harmless to the environment and many are beneficial, but some can be problematic.

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Exotics become a problem when they interfere with the normal biological function of native species and their associated plant communities. These exotic plants are labeled as “invasive” because they invade and take over natural areas. Exotic invasive species cause problems because:

- They reproduce at an irregular, unnatural rate or produce large numbers of seeds.
- They out-compete native plants for resources.
- They lack natural predators.
- They reduce the natural biodiversity, creating monocultures (areas of only one species).
- They disrupt the natural balance of ecological communities.
- They reduce critical habitat for many rare plants and animals.
- Some exotics are vectors for disease and exotic insects.

Examples of exotic invasive plants are:

- Kudzu
- Oriental bittersweet
- Princess tree or Royal Paulownia
- Japanese honeysuckle
- Tree-of-heaven
- Japanese stiltgrass
- English ivy

### **Benefits of Native Plants**

There are benefits to using native plants. Natives are hardy and able to withstand regional weather extremes. Natives are environmentally friendly; promote biodiversity and land stewardship. They restore regional landscapes and prevent further exotic introductions. They also inspire a ‘sense of place’ and pride in our mountain communities.

### **Landscaping With Native Plants**

Landscaping with native plants is often not as easy as it sounds and it is very important that you do your homework before planting. It is imperative that plants be matched up with the right site conditions or else your level of success will not be very high. Consider the following tips:

- Light is one of the big factors that go into planning a native landscape. Most people have a location in mind for their garden. It’s important to know what the light situation of the site is going to be. Look at the location from an “all day long” point-of-view. How much sun exposure does the area receive? Where are the shady spots? Does a sunny spot in the morning become shade in the afternoon? Can you change the lighting situation to suit your needs and the needs of your plants?

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- Water is another important factor in planning native landscapes. One very important reason for having a native plant garden is ease of maintenance. Most people want a garden that they are not going to have to water constantly and that can survive occasional droughts. Native plants meet this requirement as long as the plants being used will survive in the conditions presented in the garden. This is where sufficient knowledge of ecotypes and forest conditions is helpful. Plan your landscape based on the amount of water available to the site. If you have a spring near your garden area, this might be something you want to capitalize on. If things are dry year round because of the sun exposure or low moisture retention of the soil, plant drought tolerant species.
- Look at your soil. Most native plants, under natural conditions, grow in soils that contain a fair amount of organic material. Most soils in our area have a pH from slightly alkaline (7.5 to 8.0) to weakly acidic (around 5.5). This is important to know so that the plants you choose will perform well. Contact your local Cooperative Extension Service office for a soil analysis. A soil analysis will tell you if you need to make any amendments to the soil. Often amendments can be made by simply applying humus and mulch. In some cases it may be necessary to add fertilizer and/or lime to the soil.
- Pick your plants. Choose plants that will suit your needs and conditions. It is important to understand the conditions under which these plants grow in the wild so that you can best model this. Think about what plants grow well together. Choose a broad spectrum of plants that will get you through the seasons. There's nothing worse than having just spring plants in a garden that should go year round.
- Create plant layers. It is important to have defined plant layers in a native landscape. If you walk into the woods, you see trees, shrubs, herbaceous plants (wildflowers). The different height layers help to filter light, air, and moisture and create the conditions necessary for survival. Include in your garden a nice mixture of trees and shrubs. They don't have to be big because you may have space limitations, but trees and shrubs will help your wildflowers succeed.
- Choose showy and subtle plants. Many people are often disappointed in native gardens because they often are not "showy enough." Nature dazzles us with both showy and subtle species. Often the more subtle species are the ones that will really grab your attention. Remember that you are planting a native landscape not an ornamental garden and it's all about perspective. Think about what plants will look good together based on color, foliage, occurrence in nature, etc.
- Don't be disappointed if you don't get immediate results. Native landscapes often need a little time to grow and mature. Many wild plants (even nursery grown stock) go through a little bit of "shock time." It may take a while for plants to get over this. This may also require a little "babying" until the plants begin to thrive. The more ideal the conditions are for the plants, the higher the likelihood for quick adjustment and better plant growth.

## Lake Lure TREE MANAGEMENT Handbook

- Consider space requirements. All plants need a certain amount of space. This is especially important when you have a lot of different plants that may all have different requirements. Spacing should typically be random. Let nature do the rest.
- Enhance your landscape with items such as rocks and boulders, or other natural materials. Rocks can really bring out certain characteristics of plants. They also help break up the terrain by providing a more natural, uneven look.
- Buy nursery propagated plants and make sure you get them from a reputable dealer. There are several good nurseries and greenhouses that deal in native species. Often these companies will have good, healthy stock so the chances of your plants surviving are much better. It's always good to ask the company where it gets its plants. Do they grow them from seed or tissue culture or do they buy them from somewhere else? Make sure you are not buying transplanted material. It is unethical and in some cases, illegal to remove wildflowers and other native species from their natural habitat. Very often transplants will not perform well, particularly if the conditions are not precisely matched upon re-planting. Many species have certain soil fungus associations which cannot be duplicated. Some good examples are trilliums and orchid species such as lady's-slippers, crane fly orchids, showy orchis, and many others. Plants transplanted from these conditions very often do not survive and the practice of transplanting has led to the decline and extinction of many plant species.








































































































### **Planting for Wildlife**

An added value of using native species is the benefit to wildlife. Native plants help to sustain native butterflies, moths, and other beneficial insects; native birds, reptiles, mammals, and other fauna. In the spring, migrating and nesting birds rely on the insects of our forests to sustain them as they exert energy in their long distance travels and in raising young. In fall, the high energy fruits that are produced by such plants as flowering dogwood, spicebush, magnolia, and Virginia creeper once again provide a quick pick-me-up for migrating birds. Trees such as beech, oak, and hickory provide nesting places as well as nuts and acorns that are useful to a variety of wildlife. During the winter months, evergreen trees such as American holly, white pine, and hemlocks provide both shelter and food.

### **Using the Plant List**

This plant list is comprised of plants that are native to the Hickory Nut Gorge and Lake Lure area as well as some overlap species that occur in the surrounding mountains and Piedmont. The list provides critical information for choosing the correct plant for your site, as well as some general information about flower color, plant uses, etc. The key following the list defines what the individual symbols signify and how they should be used with regards to plant selection. Remember that not all plants will work in the same planting situations. When in doubt, consult a native plant professional or your local Cooperative Extension office.

## Native Plant Recommendations For Hickory Nut Gorge and Lake Lure

Common Name	Scientific Name	Color	Uses			Light	Water
			W	H	C		
<b>Large Trees</b>							
Red maple	<i>Acer rubrum</i>			•	•		
Sugar maple	<i>Acer saccharum</i>			•	•		
Yellow buckeye	<i>Aesculus octandra</i>		•	•	•		
Sweet birch	<i>Betula lenta</i>		•	•	•		
River birch	<i>Betula nigra</i>		•	•	•		
Bitternut hickory	<i>Carya cordiformis</i>		•		•		
Pignut hickory	<i>Carya glabra</i>		•		•		
Shagbark hickory	<i>Carya ovata</i>		•		•		
Sand hickory	<i>Carya pallida</i>		•		•		
Beech	<i>Fagus grandifolia</i>		•		•		
White ash	<i>Fraxinus americana</i>		•	•			
Green ash	<i>Fraxinus pennsylvanica</i>		•	•			
Black walnut	<i>Juglans nigra</i>		•		•		
Tulip poplar	<i>Liriodendron tulipifera</i>		•	•	•		
Cucumber tree	<i>Magnolia acuminata</i>		•	•	•		
Fraser magnolia	<i>Magnolia fraseri</i>		•	•	•		
Black gum	<i>Nyssa sylvatica</i>		•	•	•		
Sycamore	<i>Platanus occidentalis</i>				•		
Black cherry	<i>Prunus serotina</i>		•		•		
White oak	<i>Quercus alba</i>		•		•		
Chestnut oak	<i>Quercus montana</i>		•		•		
Water oak	<i>Quercus nigra</i>		•		•		
Red oak	<i>Quercus rubra</i>		•		•		
Black willow	<i>Salix nigra</i>				•		
Basswood	<i>Tilia heterophylla</i>		•		•		
Eastern hemlock	<i>Tsuga canadensis</i>		•	•	•		
Carolina hemlock	<i>Tsuga caroliniana</i>		•	•	•		
<b>Small Trees</b>							
Serviceberry	<i>Amelanchier arborea</i>		•	•	•		
Devil's-walkingstick	<i>Aralia spinosa</i>		•	•			
Paw paw	<i>Asimina triloba</i>		•	•	•		
Ironwood	<i>Carpinus carolina</i>			•	•		
Chinquapin	<i>Castanea pumila</i>		•		•		
Eastern redbud	<i>Cercis canadensis</i>			•	•		
Fringetree	<i>Chionanthus virginicus</i>			•			
Pagoda dogwood	<i>Cornus alternifolia</i>		•		•		
Flowering dogwood	<i>Cornus florida</i>		•	•	•		



# Lake Lure TREE MANAGEMENT Handbook

Common Name	Scientific Name	Color	Uses			Light	Water
			W	H	C		
<b>Small Trees (Cont.)</b>							
Persimmon	<i>Diospyros virginiana</i>		●	●	●	☀→☾	▲→□
Carolina silverbell	<i>Halesia carolina</i>	○		●	●	☀→☾	▲→□
Witch-hazel	<i>Hamamelis virginiana</i>	●		●	●	☀→☾	▲→□
American holly	<i>Ilex opaca</i>	E/○/▲	●	●	●	☀→☾	▲→□
Red cedar	<i>Juniperus virginiana</i>	E	●	●	●	☀→☾	□→○
Hop-hornbeam	<i>Ostrya virginiana</i>			●		☾→☾	▲→□
Sourwood	<i>Oxydendrum arboreum</i>	○/■		●		☀→☾	□→○
Sassafras	<i>Sassafras albidum</i>	●/■/■/■	●	●		☀→☾	▲→□
<b>Shrubs</b>							
Tag alder	<i>Alnus serrulata</i>	●	●	●	●	☀→☾	■→▲
Red chokeberry	<i>Aronia arbutifolia</i>	○		●	●	☀→☾	■→□
Black chokeberry	<i>Aronia melanocarpa</i>	○		●	●	☀→☾	■→○
American beautyberry	<i>Callicarpa americana</i>	○/▲	●	●		☾→☾	▲→○
Sweetshrub	<i>Calycanthus floridus</i>	●	●	●	●	☾→☾	■→□
New Jersey tea	<i>Ceanothus americanus</i>	○		●	●	☾→☾	▲→○
Buttonbush	<i>Cephalanthus occidentalis</i>	○		●	●	☀→☾	■→▲
Cinnamonbark	<i>Clethra acuminata</i>	○	●	●	●	☀→☾	□→○
Sweetfern	<i>Comptonia peregrina</i>	○				☀→☾	□→○
Silky dogwood	<i>Cornus amomum</i>	○	●		●	☀→☾	■→□
Hazelnut	<i>Corylus americana</i>		●		●	☀→☾	▲→□
Hearts-a-bustin'	<i>Euonymus americanus</i>	●/▲	●	●	●	☾→☾	▲→□
Large witch-alder	<i>Fothergilla major</i>	○		●	●	☀→☾	▲→□
Wild Hydrangea	<i>Hydrangea arborescens</i>	○		●		☾→☾	▲→□
Dense Hypericum	<i>Hypericum densiflorum</i>	●		●	●	☀→☾	▲→○
Shrubby St. John's Wort	<i>Hypericum prolificum</i>	●		●	●	☀→☾	■→○
Mountain holly	<i>Ilex montana</i>	○/▲	●	●	●	☀→☾	▲→□
Common winterberry	<i>Ilex verticillata</i>	○/▲	●	●		☀→☾	■→▲
Virginia sweetspire	<i>Itea virginica</i>	○				☀→☾	■→□
Mountain laurel	<i>Kalmia latifolia</i>	E/○		●	●	☀→☾	□→○
Doghobble	<i>Leucothoe axillaris</i>	E/○		●	●	☾→☾	□→○
Fetterbush	<i>Leucothoe racemosa</i>	○		●	●	☀→☾	▲→□
Spicebush	<i>Lindera benzoin</i>	●	●	●	●	☾→☾	▲
Mock orange	<i>Philadelphus inodorus</i>	○		●	●	☀→☾	▲→□
Ninebark	<i>Physocarpus opulifolius</i>	○		●	●	☀→☾	▲→□
Sweet azalea	<i>Rhododendron arborescens</i>	○		●	●	☀→☾	■→▲
Flame azalea	<i>Rhododendron calendulaceum</i>	●		●	●	☾→☾	▲→□
Rosebay Rhododendron	<i>Rhododendron maximum</i>	E/○		●	●	☾→☾	▲→□
Carolina Rhododendron	<i>Rhododendron minus</i>	E/○		●	●	☾→☾	▲→□
Wild or Pinxter azalea	<i>Rhododendron periclymenoides</i>	●		●	●	☾→☾	■→□
Carolina rose	<i>Rosa carolina</i>	●	●	●	●	☀→☾	▲→□
Swamp rose	<i>Rosa palustris</i>	●	●	●	●	☀→☾	■→▲

# Lake Lure TREE MANAGEMENT Handbook

































































































































































































































































Common Name	Scientific Name	Color	Uses			Light	Water
			W	H	C		
<b>Shrubs (Cont.)</b>							
Smooth sumac	<i>Rhus glabra</i>	■/▲	●		●	☀→☾	▲→□
Silky willow	<i>Salix sericea</i>			●	●	☀→☾	■→□
Elderberry	<i>Sambucus canadensis</i>	○	●	●	●	☀→☾	▲→○
Meadowsweet	<i>Spiraea latifolia</i>	○	●	●	●	☀→☾	▲→○
Bladdernut	<i>Staphylea trifolia</i>	●		●	●	☾→☾	▲→□
Horsesugar	<i>Symplocos tinctoria</i>	●		●	●	☀→☾	□→○
Highbush blueberry	<i>Vaccinium corymbosum</i>	○	●	●	●	☀→☾	□→○
Lowbush blueberry	<i>Vaccinium pallidum</i>	○	●	●	●	☀→☾	▲→○
Deerberry	<i>Vaccinium stamineum</i>	○	●	●	●	☀→☾	▲→○
Maple-leaf Viburnum	<i>Viburnum acerifolium</i>	○	●	●	●	☀→☾	▲→○
Witherod	<i>Viburnum cassinoides</i>	○	●	●	●	☀→☾	▲→□
Arrowwood	<i>Viburnum dentatum</i>	○	●	●	●	☀→☾	▲→□
Yellowroot	<i>Xanthorhiza simplicissima</i>	●		●	●	☾→☾	■
<b>Vines</b>							
Crossvine	<i>Bignonia capreolata</i>	●●	●	●		☀→☾	■→□
Virgin's bower	<i>Clematis virginiana</i>	○		●		☀→☾	▲→○
Climbing Hydrangea	<i>Hydrangea barbara</i>	○		●		☀→☾	▲→□
Coral honeysuckle	<i>Lonicera sempervirens</i>	●		●		☀→☾	▲→□
Virginia creeper	<i>Parthenocissus quinquefolia</i>	■	●	●	●	☀→☾	▲→○
Passion flower	<i>Passiflora incarnata</i>	●/▲	●	●	●	☀→☾	▲→○
Fox grape	<i>Vitis labrusca</i>	●/▲	●		●	☀→☾	▲→□
<b>Ferns</b>							
Maidenhair fern	<i>Adiantum pedatum</i>			●		☾→☾	▲→□
Ebony spleenwort	<i>Asplenium platyneuron</i>			●		☀→☾	▲→○
Southern lady fern	<i>Athyrium asplenoides</i>			●	●	☾→☾	▲→□
Rattlesnake fern	<i>Botrychium virginianum</i>			●		☾→☾	▲→□
Hay-scented fern	<i>Dennstaedtia punctiloba</i>			●	●	☾→☾	▲→○
Marginal wood fern	<i>Dryopteris marginalis</i>			●		☾→☾	▲→□
Sensitive fern	<i>Onoclea sensibilis</i>			●	●	☀→☾	■→▲
Cinnamon fern	<i>Osmunda cinnamomea</i>			●	●	☾→☾	■→▲
Interrupted fern	<i>Osmunda claytoniana</i>			●	●	☾→☾	■→▲
Royal fern	<i>Osmunda regalis</i>			●	●	☾→☾	■→▲
Christmas fern	<i>Polystichum acrostichoides</i>			●	●	☾→☾	▲→□
New York fern	<i>Thelypteris noveboracensis</i>			●	●	☾→☾	▲→□
Chain fern	<i>Woodwardia areolata</i>			●		☾→☾	▲→□
Common woodsia	<i>Woodsia obtusa</i>			●		☾→☾	▲→□
<b>Grasses/Sedges</b>							
Big bluestem	<i>Andropogon gerardii</i>		●	●	●	☀→☾	▲→□
Broomsedge	<i>Andropogon virginicus</i>		●	●	●	☀→☾	□→○



# Lake Lure TREE MANAGEMENT Handbook

Common Name	Scientific Name	Color	Uses			Light	Water
			W	H	C		
<b>Grasses/Sedges (Cont.)</b>							
River cane	<i>Arundinaria gigantea</i>		●		●	☀ → ●	▲ → □
Pennsylvania sedge	<i>Carex pennsylvanica</i>			●	●	☾ → ●	▲ → □
Plantain-leaved sedge	<i>Carex plantaginea</i>			●	●	☾ → ●	▲ → □
River oats	<i>Chasmanthium latifolium</i>			●	●	☀ → ●	▲ → □
Oat grass	<i>Danthonia compressa</i>		●		●	☀ → ☾	□ → ○
Deer-tongue	<i>Dichanthelium clandestinum</i>		●		●	☀ → ☾	■ → ○
Bottlebrush grass	<i>Elymus hystrix</i>		●	●		☀ → ●	▲ → ○
Switch-grass	<i>Panicum virgatum</i>		●	●	●	☀ → ☾	■ → □
Little bluestem	<i>Schizachyrium scoparium</i>		●	●	●	☀ → ☾	▲ → □
Indian grass	<i>Sorghastrum nutans</i>		●	●	●	☀ → ☾	▲ → □
Eastern gamma grass	<i>Tripsacum dactyloides</i>		●	●	●	☀ → ☾	■ → □
<b>Herbaceous Plants</b>							
Bluestar	<i>Amsonia tabernaemontana</i>	●		●		☾ → ●	▲ → □
Thimbleweed	<i>Anemone virginiana</i>	○		●		☾ → ●	▲ → ○
Pussy toes	<i>Antennaria plantaginifolia</i>	○		●		☾ → ●	▲ → ○
Eastern columbine	<i>Aquilegia canadensis</i>	● ●	●	●		☾ → ●	▲ → ○
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>	●		●		☾ → ●	▲ → □
Goat's-beard	<i>Aruncus dioicus</i>	○		●		☾ → ●	▲ → □
Wild ginger	<i>Asarum canadense</i>	●		●	●	☾ → ●	▲ → □
Swamp milkweed	<i>Asclepias incarnata</i>	●	●	●	●	☀ → ☾	■ → ▲
Butterfly-weed	<i>Asclepias tuberosa</i>	●	●	●	●	☀ → ☾	□ → ○
Curtis' aster	<i>Aster curtisii</i>	●		●	●	☀ → ●	▲ → ○
White wood aster	<i>Aster divaricatus</i>	○		●	●	☀ → ●	▲ → ○
Late purple aster	<i>Aster patens</i>	●		●	●	☀ → ●	▲ → ○
False goat's-beard	<i>Astilbe biternata</i>	○		●		☾ → ●	▲ → □
Wild indigo	<i>Baptisia tinctoria</i>	●		●		☀ → ●	▲ → □
Blue cohosh	<i>Caulophyllum thalictroides</i>	● / ▲	●	●	●	☾ → ●	▲ → □
Partridge pea	<i>Chamaecrista fasciculata</i>	●			●	☀ → ☾	□ → ○
White turtlehead	<i>Chelone glabra</i>	○		●	●	☾ → ●	▲ → □
Pink turtlehead	<i>Chelone lyonii</i>	●		●	●	☾ → ●	▲ → □
Green-and-gold	<i>Chrysogonum virginianum</i>	●		●	●	☾ → ●	□ → ○
Black cohosh	<i>Cimicifuga racemosa</i>	○		●		☾ → ●	▲ → □
Tall coreopsis	<i>Coreopsis major</i>	●		●		☀ → ●	□ → ○
Star coreopsis	<i>Coreopsis pubescens</i>	●		●		☀ → ●	□ → ○
Dutchman's breeches	<i>Dicentra cucullaria</i>	○		●		☾ → ●	▲ → □
Wild bleeding heart	<i>Dicentra eximia</i>	●		●		☾ → ●	▲ → □
Joe-Pye weed	<i>Eupatorium fistulosum</i>	●	●	●	●	☀ → ●	▲ → ○
Boneset	<i>Eupatorium perfoliatum</i>	○			●	☀ → ☾	■ → ▲
White snakeroot	<i>Eupatorium rugosum</i>	○		●	●	☾ → ●	▲ → □
Trout Lily	<i>Erythronium americanum</i>	●		●		☾ → ●	▲ → □
Wild strawberry	<i>Fragaria virginiana</i>	○	●		●	☀ → ☾	▲ → ○

# Lake Lure TREE MANAGEMENT Handbook

Common Name	Scientific Name	Color	Uses			Light	Water
			W	H	C		
<b>Herbaceous Plants (Cont.)</b>						  	  
Wild geranium	<i>Geranium maculatum</i>					 	 
Sunflower	<i>Helianthus resinosus</i>					 	 
Sharp-lobed hepatica	<i>Hepatica acutiloba</i>					 	 
Alumroot	<i>Heuchera americana</i>					 	 
Little Brown Jugs	<i>Hexastylis arifolia</i>	 				 	 
Jewelweed	<i>Impatiens capensis</i>					 	 
Dwarf crested iris	<i>Iris cristata</i>	 				 	 
Dwarf spring iris	<i>Iris verna</i>	 				 	 
Blazingstar	<i>Liatris spicata</i>					 	 
Turks-cap lily	<i>Lilium superbum</i>					 	 
Cardinal flower	<i>Lobelia cardinalis</i>					 	 
Lobelia	<i>Lobelia puberula</i>					 	 
Great blue lobelia	<i>Lobelia siphilitica</i>					 	 
Monkeyflower	<i>Mimulus ringens</i>					 	 
Partridge berry	<i>Mitchella repens</i>					 	 
Bee balm	<i>Monarda didyma</i>					 	 
Purple phacelia	<i>Phacelia bipinnatifidum</i>					 	 
Carolina phlox	<i>Phlox carolina</i>					 	 
Woodland phlox	<i>Phlox divaricata</i>					 	 
Garden phlox	<i>Phlox paniculata</i>					 	 
Creeping phlox	<i>Phlox stolonifera</i>					 	 
Mayapple	<i>Podophyllum peltatum</i>					 	 
Solomon's seal	<i>Polygonatum biflorum</i>					 	 
Hoary mountain mint	<i>Pycnanthemum incanum</i>					 	 
Blackeyed susan	<i>Rudbeckia hirta</i>					 	 
Green coneflower	<i>Rudbeckia laciniata</i>					 	 
Bloodroot	<i>Sanguinaria canadensis</i>					 	 
Golden ragwort	<i>Senecio aureus</i>					 	 
Fire pink	<i>Silene virginica</i>					 	 
Solomon's plume	<i>Smilacina racemosa</i>					 	 
Rough-stemmed goldenrod	<i>Solidago rugosa</i>					 	 
Blue-eyed grass	<i>Sisyrinchium angustifolium</i>					 	 
Bush pea	<i>Thermopsis villosa</i>					 	 
Foamflower	<i>Tiarella cordifolia</i>					 	 
New York ironweed	<i>Vernonia noveboracensis</i>					 	 



### **Key:**

#### **Color**

- Indicates flower color (may be multi-colored).
- △ Indicates fruit color (provides an ornamental quality).
- Indicates foliage color in autumn (may be multi-colored).
- E Plant is evergreen.

#### **Uses**

- W Important to wildlife.
- H Useful for horticulture and landscaping.
- C Useful for conservation and restoration.

#### **Light**

- ☀ Full sun
- ◑ Partial sun
- Shade

#### **Moisture Requirements (Water)**

- Hydric soils; plants are periodically or often inundated by water.
- Sub-xeric soils; moist to dry soils, depending on season and periods of drought.
- ▲ Mesic soils; adequate soil moisture is retained throughout the year.
- Xeric soils; soils retain little moisture and are excessively drained; plants are typically drought resistant.

## **Sources for Native Plants**

### **Carolina Greenery**

375 Carthage Rd.  
West End, NC 27376  
(910)947-3150  
<http://www.carolinagreenery.com>

### **Gardens of the Blue Ridge**

P.O. Box 10  
Pineola, NC 28622  
(828)733-2417  
<http://www.gardensoftheblueridge.com>

### **Carolina Native Nursery**

1126 Prices Creek Rd.  
Burnsville, NC 28714  
(828)682-1471  
<http://www.carolinanativenursery.com>

### **Meadowbrook Nursery and We-Du Natives**

2055 Polly Spout Rd.  
Marion, NC 28752  
(828)738-8300  
<http://www.we-du.com>

### **Elk Mountain Nursery**

P.O. Box 599  
Asheville, NC 28802  
(828)683-9330  
<http://www.elk-mountain.com>

### **Native Gardens**

5737 Fisher Lane  
Greenback, TN 37742  
(865)856-0220  
<http://www.native-gardens.com>

### **Ernst Conservation Seeds**

9006 Mercer Pike  
Meadville, PA 16335  
1-800-873-3321  
<http://www.ernstseed.com>

### **North Carolina Botanical Garden**

Daily Plant Sale—April through October  
UNC at Chapel Hill  
(919)962-0522  
<http://www.ncbg.unc.edu>

## References

- Hall, Karen, "Recommended Native Plant Species for Stream Restoration in North Carolina," NC Stream Restoration Institute: NCSU, 2003.
- Great Smoky Mountains National Park, et al, "Landscaping With Native Plants," Southern Appalachian Man and the Biosphere, et al, 1999.
- North Carolina Wildflower Preservation Society, "Landscaping With Native Plants: Native Plant Recommendations," [www.ncwildflower.org](http://www.ncwildflower.org).
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- Virginia Natural Heritage Program, "Native Riparian Plants for Conservation and Landscaping," [www.dcr.state.va.us](http://www.dcr.state.va.us).
- Weakley, Alan, Flora of the Carolinas, Virginia, and Georgia, Working draft: 2004.

## *Chapter 4*

### **Significant Trees: Common Tree Species of Lake Lure and Recommended Diameters**

By Clint Calhoun.

**Note: For information on the fire-hardiness of native species,  
see Chapter 7.4 of this handbook.**

**Significant Trees:**  
**Common Tree Species of Lake Lure and Recommended Diameters**

<b>Tree Species</b>	<b>Average Diameter at Breast Height (dbh)</b>	<b>Significant dbh</b>	<b>Maximum Caliper for replanting</b>
White Oak	2-3'	12"	3"
Northern Red Oak	3-4'	15"	3"
Scarlet Oak	1-2'	6"	3"
Chestnut Oak	3-4'	15"	3"
Blackjack Oak	1-2'	6"	3"
White Ash	1-2'	6"	3"
Red Maple	1-2'	6"	3"
Flowering Dogwood	12 -18"	4"	3"
Black Locust	2-3'	12"	3"
Black Walnut	2-4'	12"	3"
Bitternut Hickory	18-24"	10"	3"
Pignut Hickory	2-3'	12"	3"
Mockernut Hickory	18-24"	10"	3"
Yellow Poplar	2-6'	12"	3"
Sycamore	3-4'	15"	3"
Basswood*	2-3'	12"	3"
Beech	2-3'	12"	3"
Slippery Elm*	1-2'	6"	3"
Sweet Birch	2-3'	12"	3"
Black Cherry	2-3'	12"	3"
American Holly	6-24"	6"	3"
Sourwood	18-20"	6"	3"
Carolina Silverbell	6-12"	6"	3"
Persimmon	10-12"	6"	3"
Blackgum	1-2'	6"	3"
Cucumber Magnolia*	1-2'	6"	3"
Fraser Magnolia	10-12"	6"	3"
Redbud	10-12"	6"	3"
Yellow Buckeye*	To 3'	12"	3"
Eastern Hemlock	2-3'	12"***	3"
Carolina Hemlock	2-3'	12"***	3"
Shortleaf Pine	3-4'	6"	3"
Virginia Pine	1-2'	6"	3"
Pitch Pine	1-2'	6"	3"
White Pine	2-3'	12"	3"

\* Species that may or may not occur in Lake Lure but do occur in the region.

\*\* It may become necessary to preserve all these trees, regardless of dbh, due to potential loss of the species due to mortality from invasive species.

## *Chapter 5*

### **Lake Lure Forest Coverage Table Significant Tree Density and Canopy Coverage**

By Chris Braund, Clint Calhoun, and Paula Jordan

#### **Including the following estimation methods:**

- **Significant Tree Density**  
Developed by Chris Braund  
Revised by the Town of Lake Lure Zoning and Planning Board
- **Canopy Coverage**  
Developed by Clint Calhoun

**Note: This discussion assumes the approach to these estimation tools based on the requirements of the Lake Lure Zoning Regulations. Where the Subdivision Regulations differ for these tools, those differences are noted. However, before undertaking use of these tools for purposes of Subdivision Development, please refer to the complete discussion in Attachment C of the Subdivision Regulations.**

## **The Lake Lure Forest Coverage Table — Significant Tree Density and Canopy Coverage**

The forest coverage of a piece of property refers to the extent of forestation on the property. It can be estimated in several ways depending on the size and topography of the property, the number of trees on the property, and the availability of suitable aerial photographs. The table below is used to determine the minimum forest coverage that must be retained during land clearing land disturbance, and/or development or achieved through replanting with trees and shrubs recommended in Chapter 3 of this Handbook. Copies of all materials used to arrive at tree density or canopy coverage estimates must be presented with the site plan or plat.

- a) *The Ground Survey – significant tree density:* A small property or one with relatively few trees could be evaluated by a ground survey. With this method, a qualified licensed professional visits the area on foot (at the owner's expense), counts or (if necessary) estimates the number of significant trees present before clearing, and reports the significant tree density. Significant trees, and/or forest areas, are then marked for protection or removal on the site plan as described in § 92.119 of the Zoning Regulations, or on the plat as described in §91.59.5 of the Subdivision regulations. Estimates of significant tree densities that will remain after land clearing, land disturbance, and/or development are then produced based on the number of significant trees to be removed. Where this density falls below that required on the Forest Coverage Table, the tree protection officer directs the replanting of trees to make up the deficit.
- b) *The Aerial Survey – canopy coverage:* A larger property, particularly one with steep topography, or a property with significant forest coverage, might best be managed by a canopy coverage estimate involving analysis of existing aerial photographs. This analysis is carried out by a qualified licensed professional, at the owner's expense, by the method described under **Aerial Survey – Canopy Coverage Method** at the end of this Chapter.
- c) *The combined Ground and Aerial Survey:* When a large area to be evaluated by aerial survey also includes pockets of forest that are to be left for open space or common areas, or small undisturbed forest areas (less than 1 acre and less than 50% canopy coverage) that will be disconnected from larger undisturbed forest areas, these isolated areas are evaluated by a ground survey, with the Significant Tree Density figure to be shown on the plat or site plan for each such isolated area. This method will improve accuracy in calculating overall forest coverage, particularly where common areas and open space are so designated. The Significant Tree Density method is also used when planning tree thinning on a portion of the property or for other special purposes needing particular accuracy.
- d) *Other methods:* Property owners wishing to compute the pre-land clearing/land disturbance/development forest coverage estimate by their own methods must provide their calculations to the Tree Protection Officer with sufficient clarity and accuracy that the tree protection officer can duplicate and validate their results.



## Lake Lure TREE MANAGEMENT Handbook

- e) *The Forest Coverage Table:* This table computes the minimum Significant Tree Density or Canopy Coverage that is to remain on a property after land clearing, land disturbance and/or development, based on the Significant Tree Density or Canopy Coverage on the property prior to land clearing, land disturbance and/or development. Where the post-land clearing, land disturbance and/or development values fall below those required on the Forest Coverage Table, the tree protection officer directs the replanting of trees to make up the deficit.

**Significant Tree Density/Canopy Coverage Table**

<b>Pre-Land Clearing/Land Disturbance/Development Significant Tree Density (significant trees per acre)</b>	<b>Pre- Land Clearing/Land Disturbance/Development Canopy Coverage (percentage of total property area)</b>	<b>Post- Land Clearing/Land Disturbance/Development Significant Tree Density or Canopy Coverage</b>
0 to 10	0% to 10%	1.0 x initial value
11 to 20	11% to 20%	.90 x initial value
21 to 50	21% to 50%	.80 x initial value
50 or more	50% or more	.70 x initial value

### Examples for General Zoning Regulation Purposes

*Tree Density Example 1:* For a 2 acre lot with an average initial significant tree density of 25 significant trees per acre, the final significant tree density shall average 20 significant trees per acre ( $.80 \times 25$ ).

*Tree Density Example 2:* For a 1-acre lot with an initial significant tree density of 15 per acre, a minimum of 13.5 significant trees must remain after construction ( $.90 \times 15$ ). If construction renders greater tree removal unavoidable, then a replanting plan is submitted as part of the site plan to achieve the minimum final density.

*Tree Density Example 3:* For a 0.5-acre lot with just 10 significant trees (initial significant tree density of 20), 9 of them must remain (or be replaced) after construction.

*Canopy Coverage Example 1:* For a 2 acre lot with an initial canopy coverage of 25%, the minimum final canopy coverage must be 20% of the 2 acre lot ( $.80 \times .25$ ).

*Canopy Coverage Example 2:* For a 1-acre lot with an initial canopy coverage of 80%, a minimum final coverage of 56% of the 1-acre lot must remain after construction ( $.70 \times .80$ ). If construction renders greater tree removal unavoidable, then a replanting plan is submitted as part of the site plan to achieve the minimum final coverage.

*Canopy Coverage Example 3:* For a 0.5-acre lot with an initial canopy coverage of just 10%, all the trees must remain (or be replaced) after construction ( $.10 \times 1$ ).

**Examples for Subdivision Development Purposes**

*Tree Density Example:* For a 200 acre subdivision development with an average initial significant tree density of 25 significant trees per acre, the final significant tree density (after accounting for roads, facilities, homes and driveways) must average 20 significant trees per acre ( $.80 \times 25$ ).

*Canopy Coverage Example:* For a 200 acre subdivision development with an initial canopy coverage of 25%, the minimum final canopy coverage (after accounting for roads, facilities, homes and driveways) must be 20% of the 200 acre development ( $.80 \times .25$ ).

**Aerial Survey – Canopy Coverage Method**

**STEP 1:** Using a clear, 2005 or later aerial photo of the property, draw a grid overlaying the property. The grid lines must be spaced at  $\frac{1}{2}$  inch intervals. Count the total number of squares in the grid, then study the squares and estimate each square's coverage level – the percentage (100%, 75%, 50%, 25%, or 0%) of each square that is covered by forest canopy.

For squares with 100% canopy coverage a value of 1 is assigned.

For squares with 75% canopy coverage a value of .75 is assigned.

For squares with 50% canopy coverage a value of .5 is assigned.

For squares with 25% canopy coverage a value of .25 is assigned.

For squares with 0% canopy coverage a value of 0 is assigned.

**STEP 2** Count the number of squares with 100% coverage and multiply by 1. To calculate the percentage of the total property area that the 100% coverage squares represent, divide the number of 100% squares by the total number of squares in the grid. Use the following formula to do the division and convert the results into a percentage:

$x$  = total # of squares covering the whole property.

$a$  = total # of squares with a 100% canopy coverage level

$$\frac{(a \times 1)}{x} \times 100 = (?)\%$$

Then count the number of squares with 75% coverage and multiply by .75. Use the same formula to do the division and convert the results into percentages:

$x$  = total # of squares covering the whole property.

$b$  = total # of squares with a 75 % canopy coverage level

$$\frac{(b \times .75)}{x} \times 100 = (?)\%$$

Follow the same steps for the other levels of canopy coverage using the following values.

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### For the 50% canopy coverage:

$x$  = total # of squares covering the whole property.

$c$  = total # of squares with a 50% canopy coverage level

$$\frac{(c \times .5)}{x} \times 100 = (?)\%$$

### For the 25% canopy coverage:

$x$  = total # of squares covering the whole property.

$d$  = total # of squares with a 25% canopy coverage level

$$\frac{(d \times .25)}{x} \times 100 = (?)\%$$

### For the 0% canopy coverage:

$x$  = total # of squares covering the whole property.

$e$  = total # of squares with a 0% canopy coverage level

$$\frac{(e \times 0)}{x} \times 100 = (?)\%$$

When the area percentage for each coverage level is known, add the percentages together for the total estimated canopy coverage as a percentage of the total property acreage.

Example Problem: A grid is laid over a 2 acre tract. The property has been previously disturbed and shows mixed patches of forest and cleared areas. The total number of squares covering the parcel is 140. 100 squares are completely vegetated; 10 squares are 75% vegetated; 15 squares are 50% vegetated; 10 squares are 25% vegetated; and 5 squares no longer contain any vegetation. Using the above equation, calculate the estimated canopy coverage for the site.

$$x = 140$$

$$a = 100$$

$$b = 10$$

$$c = 15$$

$$d = 10$$

$$e = 5$$

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$$\frac{(a \times 1)}{x} \times 100 = (?)\%$$

$$\frac{(b \times .75)}{x} \times 100 = (?)\%$$

$$\frac{(c \times .5)}{x} \times 100 = (?)\%$$

$$\frac{(100 \times 1)}{140} \times 100 = (?)\%$$

$$\frac{(10 \times .75)}{140} \times 100 = (?)\%$$

$$\frac{(15 \times .5)}{140} \times 100 = (?)\%$$

$$\frac{100}{140} \times 100 = (?)\%$$

$$\frac{7.5}{140} \times 100 = (?)\%$$

$$\frac{7.5}{140} \times 100 = (?)\%$$

$$.71 \times 100 = \mathbf{71\%}$$

$$.053 \times 100 = \mathbf{5.3\%}$$

$$.053 \times 100 = \mathbf{5.3\%}$$

$$\frac{(d \times .25)}{x} \times 100 = (?)\%$$

$$\frac{(e \times 0)}{x} \times 100 = (?)\%$$

$$71.0\%$$

$$5.3\%$$

$$5.3\%$$

$$\frac{(10 \times .25)}{140} \times 100 = (?)\%$$

$$\frac{(5 \times 0)}{140} \times 100 = (?)\%$$

$$1.8\%$$

$$+ 0.0\%$$

**83.4% Total Canopy**

$$\frac{2.5}{140} \times 100 = (?)\%$$

$$\frac{0}{140} \times 100 = (?)\%$$

$$.0179 \times 100 = \mathbf{1.8\%}$$

$$0 \times 100 = \mathbf{0\%}$$

The estimated canopy coverage is **83.4%**.

## *Chapter 6*

### **Summary of Town Regulations on Mountain and Hillside Development**

By Amos Gilliam and Paula S. Jordan

## **Effects of the Mountain and Hillside Development Ordinance**

By Amos Gilliam and Paula S. Jordan

The concern over increased construction on steep hillsides in the area has to do with the reduced stability of altered slopes and the growing frequency of major landslides across WNC. While Lake Lure has so far avoided severe landslides, several construction-related slides have damaged slopes and filled creeks, coves, roads, and even a restaurant with mud.

The aim of the Mountain and Hillside Development ordinance is to help ensure hillside safety by minimizing land disturbance and tree removal on lands with an average slope of 30% or greater and using geotechnically sound construction practices in development on such slopes.

Average slope is determined from the natural slope of the property prior to any land disturbing activity. It is based on two separate measurements along the natural drainages of the property using topographic data. The Town's GIS will provide the initial calculation of the average slope of a property, but owners who disagree with that determination may submit topographic surveys for the Town's review. An owner of a large tract may also set steeper areas aside in permanent conservation easements, thus reducing the average slope calculated for the remaining property.

There are somewhat differing regulations under this ordinance for development of private lots and subdivisions.

Undeveloped private lots of record registered on or before 11/18/08 are likely to be smaller than the lot sizes required in the new ordinance for lands with average slopes of 30% or more. In fairness to the owners, such lots are "grandfathered" to allow the construction of a single-family dwelling (with certain land disturbance limits) provided that all Health Department requirements are met and any required development and/or building permits are obtained. However, if such a lot of record has soil types suggesting possible instability and/or a building and grading envelope with an average slope of 40% or greater, a second level of technical requirements will apply.

A building and grading envelope (BGE) is the maximum area of land disturbance allowed on a lot. It may be one area or several smaller areas connected by walks or drives. All structures and any land disturbance associated with construction activity on such lots must be confined within this envelope. No more than 50% of such lots may be disturbed, with two exceptions: the disturbance area will not be reduced below 7,500 square feet regardless of the size of the lot, nor may the disturbance area on any lot exceed 15,000 square feet. Also, no lot may contain more than 6,000 square feet of roofed, paved, graveled or other impervious surface.

Lots created after 11/18/08 will comply with the larger lot sizes required for construction on steeper slopes, as described in the new ordinance, so development on those lots must comply with all applicable regulations contained in the ordinance and elsewhere in the Town's regulations.

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Regarding subdivision development, the regulations require that all new lots have an average slope of less than 30% or contain a building and grading envelope with an average slope of less than 30%. Applications to subdivide lands with an overall average slope of 30% or greater must conduct a wide range of technical studies to evaluate the impacts of the proposed construction, then meet additional design and construction requirements – including significantly larger lot sizes with smaller percentages of disturbed and impervious areas – to minimize those impacts.

The ordinance also provides additional setback, vegetative screening, tree protection and roof line design regulations on certain highly visible mountain ridges. These ridges – all of which stand at least 1,200 feet above mean sea level – can be seen on the Protected Mountain Ridge Overlay Zone map at Town Hall.

Full details on all these issues may be seen in Section 92.200 of the Town Zoning Regulations, available on the Town web site at [www.townoflakelure.com](http://www.townoflakelure.com). Town staff may be consulted at 828-625-9983.

## *Chapter 7*

### **Goals and Principles for a Mountain Town in a Forest**

#### **7.1 How to Prune Trees**

##### **7.1.a Topping Must Stop**

By Danny Lauderdale, Horticulture Agent  
North Carolina Cooperative Extension Service

##### **7.1.b How To Prune Trees**

By Peter J. Bedker, Joseph G. O'Brien,  
and Manfred M. Mielke,  
Illustrations by Julie Martinez, Afton, MN  
USDA Forest Service

#### **7.2 Avoiding Tree Damage During Construction**

By the International Society of Arboriculture

#### **7.3 Frequently Asked Questions About Trout Buffers**

By the North Carolina Department of  
Environment and Natural Resources

#### **7.4 Developing Views Without Cutting Too Many Trees!**

By Clint Calhoun

#### **7.5 Firewise Landscaping In North Carolina**

By NC State University



## *Chapter 7.1.a*

### **Topping Must Stop**

By Danny Lauderdale, Horticulture Agent  
North Carolina Cooperative Extension Service

**Note that tree-topping is considered an unethical practice for licensed tree services providers and could result in license revocation.**

Gardening Article , 12/14/2002  
Danny Lauderdale ,  
Horticulture Agent  
North Carolina Cooperative Extension Service  
Pitt County

## **Topping Must Stop**

As a horticulturist and International Society of Arboriculture Certified Arborist, tree topping makes me sick.

Unfortunately I just witnessed another tragic case in Farmville this weekend. The victims, a beautiful grove of pecan trees, turned into giant hat racks. What a shame. Did the homeowner request this butchering, not knowing the damage it would do, or did they ask for pruning and got topping? I don't know? In either case, the tree service should have known better. Professionally, businesses that perform topping should not exist. This is one case where we need more regulation. Anyone performing individual tree care services should be an International Society of Arboriculture Certified Arborist. What the property owners probably don't know is that they have devalued their property by thousands of dollars. Now that you know how I feel about tree topping let me give you the reasons why it is wrong.

Tree topping is one of the most damaging tree pruning practices that exist. Even though the harmful effects of tree topping have been known for 25 years, the butchering continues. Just in case you don't know, topping is the indiscriminate cutting back of tree branches to stubs. Topping is also called heading, tipping, hat racking, or rounding over. Topping is often done to reduce the size of a tree. Homeowners often feel their trees are too tall and may be hazardous. Topping is not a viable method of height reduction, and does not reduce any hazards if they exist. Actually, topping makes trees more hazardous.

Topping usually removes 50 to 100% of the leaf surface of a tree. Since leaves make tree food, this can cause tree starvation. Topping also triggers a survival mechanism in trees. When such a large portion of branches are removed, trees activate dormant buds that force rapid growth of multiple shoots below each cut if they have enough stored energy. If a tree does not have stored energy to do this, it can be seriously weakened and die. Stressed trees are also vulnerable to insect and disease attacks. Large wounds created by topping open trees for attack.

These large wounds left as stubs are not made at the proper location just beyond the branch collar at the branch's point of attachment. Trees can not close these type of wounds and wood tissues begin to decay.

When leaves are removed by topping there is nothing to block the heat and light from the summer sun. The result is often burning of the plant tissues beneath the bark. This damage leads to cankers, bark splitting, and death of some branches.

The multiple shoots that are created when a tree is topped are weak. Unlike normal branches that develop with a strong attachment, these many shoots are only attached to the outermost layers of the parent branch. These new shoots also grow up to 20 feet in a year. This weak attachment and rapid growth make them prone to break in windy and icy conditions. The bitter irony is that the goal of tree topping is often to make trees safer, however topped trees are more hazardous than before.

Besides the health and safety hazards of topping, topping makes trees ugly. The natural branching structure of trees is beautiful. Topping removes the ends of the branches and leaves ugly stubs. Topping mutilates the natural form trees. One of the most disgusting sites to see is a topped deciduous tree during the winter. Without leaves for six months, these trees look, disfigured, mutilated, and if they had feelings humiliated.

Many people believe that topping is cheap and it is up front. However, topping is expensive in the long run. The cost does not just include the money paid to the unprofessional tree butcher, but if the trees survive, they will require pruning again in a few years. Storm damage will certainly have to be cleaned up in the future. If the trees die, they will have to be removed. The hidden is reduction of property value. Healthy well maintained trees can add 10 to 20 percent to the value of a property. Likewise, topping all the trees on a property can reduce the value by 10 to 20%. A property valued at \$200,000 could easily be reduced by \$40,000 by topping all the trees.

There are some alternatives to topping. There are some times when a tree must be reduced in height or spread. Providing clearance for utility lines is an example. There are recommended techniques for doing that. Unfortunately, utility pruning is often done wrong also. If a branch must be shortened, it should be cut back to a lateral at least one third the diameter of the limb being removed and have no greater than a 30 degree angle from the limb being removed. This pruning method preserves natural tree form. This often still leaves large wounds that may not be able to close. Sometimes the best solution is to remove a tree that is too large and replace it with one more appropriate for the site.

Pruning large trees is dangerous work. Hire a professional to do work that requires working above the ground or using power equipment. A knowledgeable, experience arborist can determine the type of pruning needed to maintain the health, appearance, and safety of trees. Consider these things when selecting an arborist:

- Membership in a professional organization such as the International Society of Arboriculture (ISA), the National Arborist Association(NAA) or the American Society of Consulting Arborists (ASCA).

- Certification through the ISA Certified Arborist program.

- Proof of insurance.

- A list of references (Check them.)

Avoid using the services of a tree company advertising topping as a service. Knowledgeable arborists know that topping is harmful to trees and unacceptable. Avoid companies that use tree climbing spikes to climb trees that are being pruned. Climbing spikes damage trees and should only be used on trees to be removed.

If you have questions about proper tree pruning give the Cooperative Extension office a call at 757-2801 Extension 40. If you would like to find a list of International Society of Arboriculture Certified Arborists in your area, go to [www.isa-arbor.com/arborists/arbsearch.html](http://www.isa-arbor.com/arborists/arbsearch.html)

When a large tree needs to be pruned, it's best to hire an arborist. That's a person trained to prune trees safely. They also have special equipment to minimize the hazards as much as possible. They know how to prune trees properly to maintain and improve tree health. However, not all people who prune trees commercially are trained arborists. If you're looking for an arborist who can prune your trees and not leave them looking like victims of a chainsaw massacre, here are some pointers.

1. Look for someone who is a member of a professional arborists association. It's even better to get a person who is a "certified ISA arborist" because they have passed an extensive examination covering pruning and other aspects of tree care.
2. Always ask for proof of insurance. If they don't have current insurance, you could be held responsible for any damage they cause or any injuries that occur as a result of their job... even injuries that occur to their employees pruning your trees!
3. Ask for references and don't hesitate to check them. Contact the Better Business Bureau about the companies in which you're interested.
4. Get a written estimate that details the work to be done and the time frame for the work to be completed. Compare estimates and make your decision with care. The lowest estimate may not always give you the quality of pruning that you want. Be sure the estimate and contract specify who will be responsible for clean-up; what the total price will be; and what's the hourly rate if you want more work done.
5. Good tree pruning can be a substantial investment. Having your tree pruned isn't like getting a bad haircut. Your hair will grow back. If the pruning is done poorly, you're pretty much stuck with it. Poor pruning can decrease the overall value of your property and create an unsightly, hazardous tree.

## Why Prune Our Trees?

Marianne C. Ophardt  
Washington State University Cooperative Extension  
Area Extension Agent

If someone knocks on your door and tells you you're trees needs pruning, beware! This person may be a qualified arborist looking for work or they simply may be a chainsaw owner looking for some good firewood. First let's examine the reasons why a tree might need pruning.

Dead limbs or branches with a core of decayed wood are hazardous. They should be removed whenever they become evident. Also, broken limbs and branches should be properly pruned as soon as possible after the damage has occurred.

Limbs and branches that interfere with utility wires, gutters, roofs, and chimneys should be removed. Branches that create a safety hazard by obstructing a view of the street or sidewalk should be removed using proper pruning techniques. Branches that intersect and rub should be pruned to eliminate the problem.

Tree pruning is sometimes employed to lessen crown density in order to reduce wind resistance, to shape the tree, or to allow for greater light penetration. Beware if someone says your tree needs pruning because it's "too big." Keep in mind that healthy trees with adequate root systems seldom "NEED" pruning just because they are big. That just isn't true.

In some cases, tree removal may be a better option than pruning. Trees warrant removal if they are obviously dead or dying. Trees definitely should be removed if they pose a serious hazard because of internal decay or the destruction of a large portion of their anchoring roots. If pruning can't remedy the situation, trees growing too close to a building or crowding other trees should be removed.

Good landscaping can add 15 to 20 per cent to the value of your home. Healthy, attractive trees are an asset to your landscape's design. Unhealthy, poorly pruned trees are a liability. When you hire someone to prune your tree or to help you decide on removal, you should look for a qualified, trained certified arborist, not just anyone who knocks on your door.

## *Chapter 7.1.b*

### **How To Prune Trees**

By Peter J. Bedker, Joseph G. O'Brien, and Manfred M. Mielke,  
Illustrations by Julie Martinez, Afton, MN  
USDA Forest Service

**Note that tree-topping is considered an unethical practice for licensed tree services providers and could result in license revocation.**



# USDA Forest Service

NA-FR-01-95

Northeastern Area State and Private Forestry

## HOW to Prune Trees

*Peter J. Bedker, Joseph G. O'Brien, and Manfred M. Mielke*

Illustrations by Julie Martinez, Afton, MN

### Introduction

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

### Why Prune

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

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

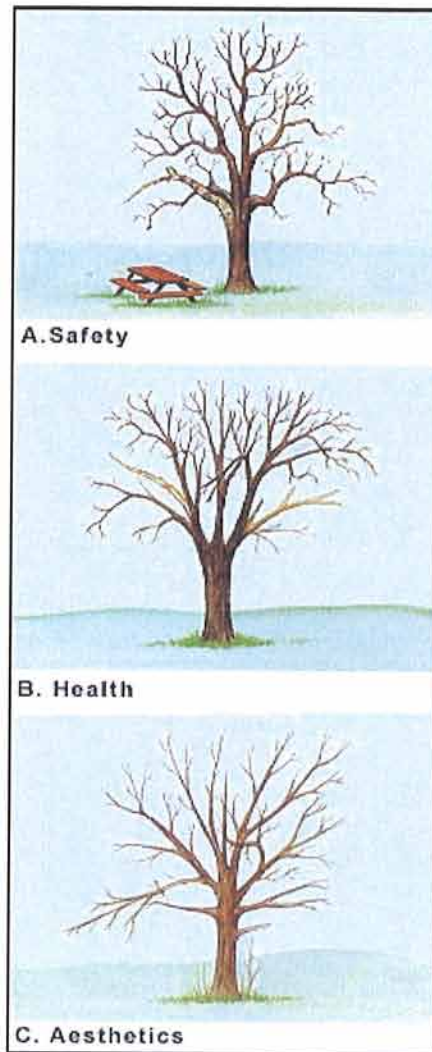


Figure 1. Reasons for pruning.



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

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

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

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

To reduce the need for pruning it is best to consider a tree's natural form. It is very difficult

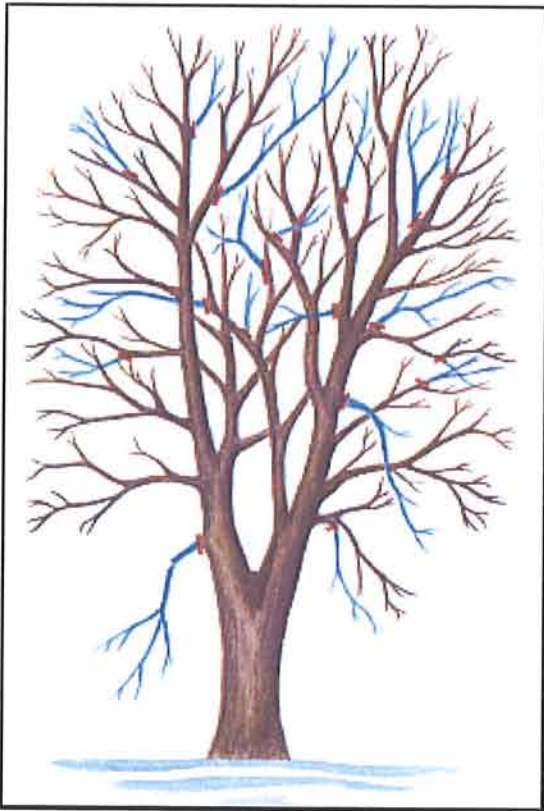
to impose an unnatural form on a tree without a commitment to constant maintenance.

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

## Pruning Approaches

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

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

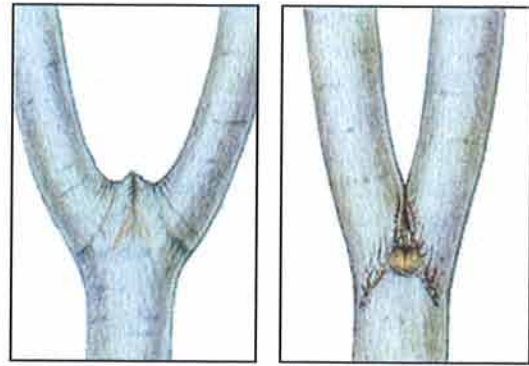


**Figure 2.** Crown thinning - branches to be removed are shaded in blue; pruning cuts should be made at the red lines. No more than one-fourth of the living branches should be removed at one time.

The most common types of pruning are:

#### 1. *Crown Thinning* (Fig. 2)

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

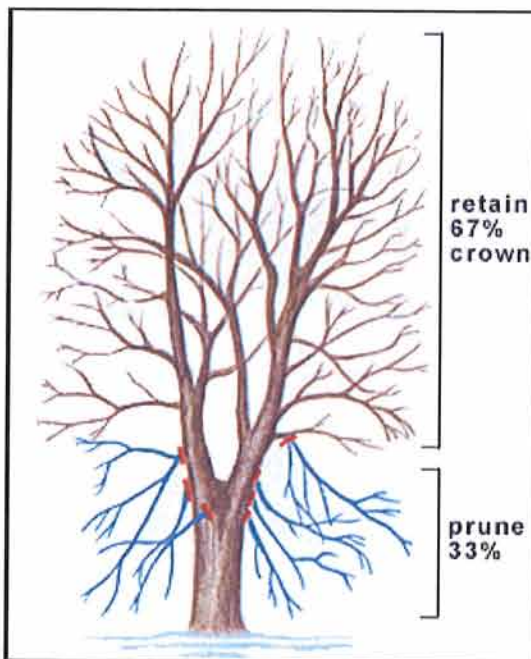


**A. U-shaped strong union**      **B. V-shaped weak union**

**Figure 3.** Types of branch unions.

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

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



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

another branch should be removed.

Conifers that have branches in whorls and pyramidal crowns rarely need crown thinning except to restore a dominant leader.

Occasionally, the leader of a tree may be damaged and multiple branches may become codominant. Select the strongest leader and remove competing branches to prevent the development of codominant stems.

## 2. Crown Raising (Fig. 4)

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

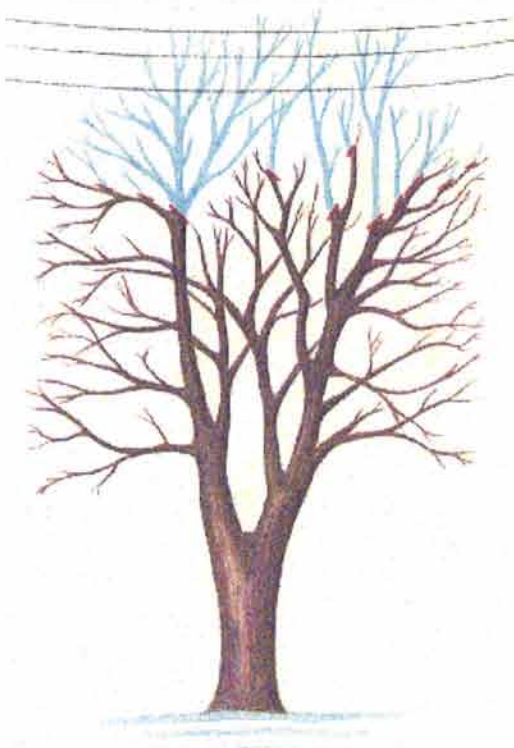
On young trees "temporary" branches may be retained along the stem to encourage taper and protect trees from vandalism and sun scald. Less vigorous shoots should be selected as temporary branches and should be about 10 to 15 cm apart along the stem. They should be pruned annually to slow their growth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

## 3. Crown Reduction (Fig. 5)

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

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





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

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

## Pruning Cuts

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

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

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

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

The quality of pruning cuts can be evaluated by examining pruning wounds after one growing season. A concentric ring of woundwood will form from proper pruning cuts (Fig. 6B).

**Flush cuts** made inside the branch bark ridge or branch collar, result in pronounced development of woundwood on the sides of the pruning wounds with very little woundwood forming on the top or bottom (Fig. 7D). As described above, stub cuts result in the death of the remaining branch and woundwood forms around the base from stem tissues.

When pruning small branches with hand pruners, make sure the tools are sharp enough

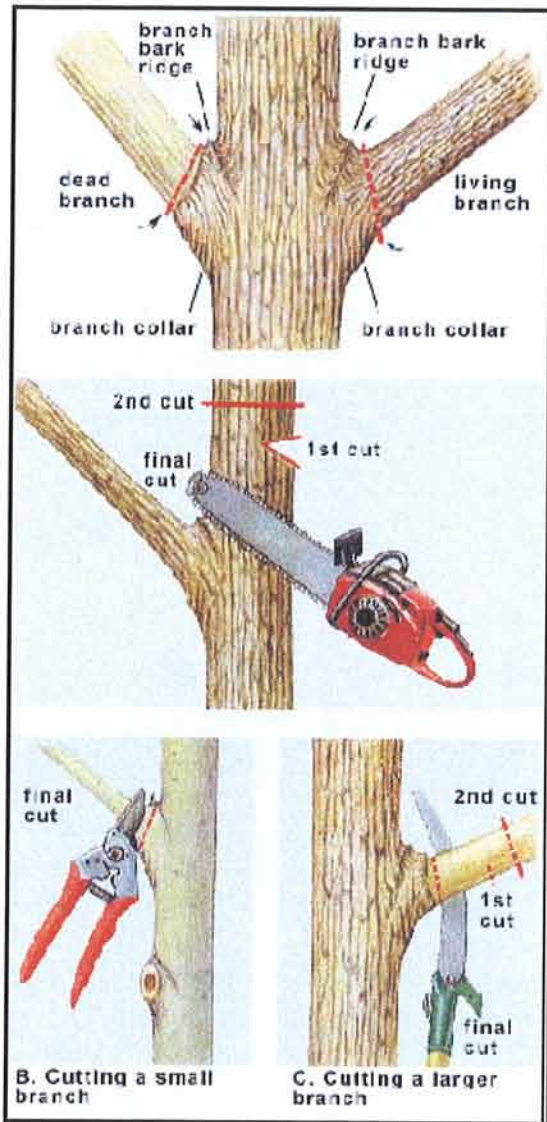


Figure 6. Pruning cuts

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

1. The first cut is a shallow notch made on the underside of the branch, outside the

branch collar. This cut will prevent a falling branch from tearing the stem tissue as it pulls away from the tree.

2. The second cut should be outside the first cut, all the way through the branch, leaving a short stub.
3. The stub is then cut just outside the branch bark ridge/branch collar, completing the operation.

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

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

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

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

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



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

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

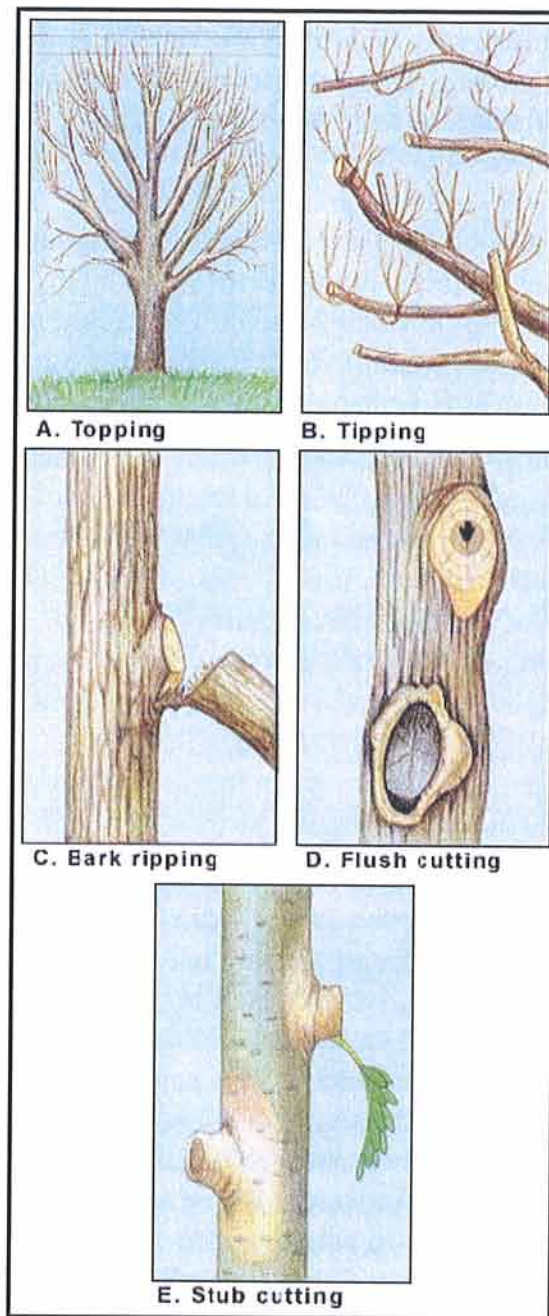
### Pruning Practices That Harm Trees

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

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

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

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



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

## When to Prune

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

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

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

- ▼ Trees and shrubs that flower in early spring (redbud, dogwood, etc.) should be pruned immediately after flowering (flower buds arise the year before they flush, and will form on the new growth).
- ▼ Many flowering trees are susceptible to fireblight, a bacterial disease that can be spread by pruning. These trees,

including many varieties of crabapple, hawthorn, pear, mountain ash, flowering quince and pyracantha, should be pruned during the dormant season. Check with your county extension agent or a horticulturist for additional information.

- ▼ Trees and shrubs that flower in the summer or fall always should be pruned during the dormant season (flower buds will form on new twigs during the next growing season, and the flowers will flush normally).

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

## Pruning Tools

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

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

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

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

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

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

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

To ensure that satisfactory cuts are made and to reduce fatigue, keep your pruning tools sharp and in good working condition. Hand pruners,

lopping shears, and pole pruners should be periodically sharpened with a sharpening stone. Replacement blades are available for many styles. Pruning saws should be professionally sharpened or periodically replaced. To reduce cost, many styles have replaceable blades.

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

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



## Treating wounds

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

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

## Pruning Guidelines

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

### *General*

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

### *Crown Thinning*

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

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

#### *Crown Raising*

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

#### *Crown Reduction*

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

### **Glossary**

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

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

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

**Crown Raising:** a method of pruning to

provide clearance for pedestrians, vehicles, buildings, lines of sight, and vistas by removing lower branches.

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

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

**Callus:** see woundwood.

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

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

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

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

**Included Bark:** bark enclosed between

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

**Pollarding:** the annual removal of all of the previous year's growth, resulting in a flush of slender shoots and branches each spring.

**Stub Cuts:** pruning cuts made too far outside the branch bark ridge or branch collar, that leave branch tissue attached to the stem.

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

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

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

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

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

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## *Chapter 7.2*

### **Avoiding Tree Damage During Construction**

By the International Society of Arboriculture

**Note: See Chapter 2 of this Handbook and relevant Town Regulations for details on required protections for trees and native shrubbery during construction.**

## **Avoiding Tree Damage During Construction**

As cities and suburbs expand, wooded lands are being developed into commercial and residential sites. Homes are constructed in the midst of trees to take advantage of the aesthetic and environmental value of the wooded lots. Wooded properties can be worth as much as 20% more than those without trees, and people value the opportunity to live among trees.

Unfortunately, the processes involved with construction can be deadly to the nearby trees. Further, unless the damage is extreme, the trees may not die immediately but could decline over several years. With this delay in symptom development, you may not associate the loss of the tree with the construction.

It is possible to preserve trees on building sites if the right measures are taken. The most important step is to hire a professional arborist during the planning stage. An arborist can help you decide which trees can be saved, and can work with the builder to protect the trees throughout each construction phase.

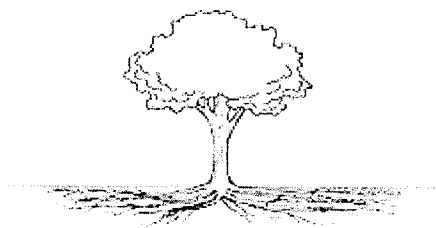
## **How Trees Are Damaged During Construction**

### **Physical injury to the trunk and crown**

Construction equipment can injure the above-ground portion of a tree by breaking branches, tearing the bark, and wounding the trunk. These injuries are permanent, and if extensive, can be fatal.

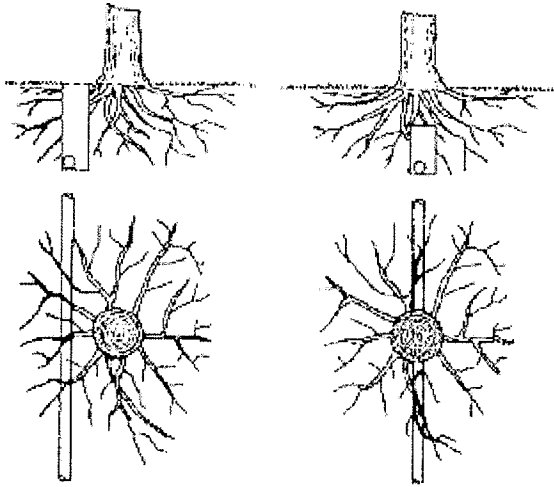
### **Cutting of roots**

The digging and trenching that are necessary to construct a house and install underground utilities will likely sever a portion of the roots of many trees in the area. It is easy to appreciate the potential for damage if you understand where roots grow. The roots of a mature tree extend far from the trunk of the tree. In fact, roots typically will be found growing a distance of 1-3 times the height of the tree. The amount of damage a tree can suffer from root loss depends, in part, upon how close to the tree the cut is made. Severing one major root can cause the loss of 5-20% of the root system.



The roots of a tree will extend far from the trunk and will be found mostly in the upper 6 to 10 inches of the soil.

Another problem that may result from root loss due to digging and trenching is that the potential for the trees to fall over is increased. The roots play a critical role in anchoring a tree. If the major support roots are cut on one side of a tree, the tree may fall or blow over.



Less damage is done to tree roots if utilities are tunneled under a tree rather than across the roots.

### **Soil compaction**

An ideal soil for root growth and development is about 50% pore space. These pores, the spaces between soil particles, are filled with water and air. The heavy equipment used in construction compacts the soil and can dramatically reduce the amount of pore space. This not only inhibits root growth and penetration but also decreases oxygen in the soil that is essential to the growth and function of the roots.

### **Smothering roots by adding soil**

Most people are surprised to learn that 90% of the fine roots that absorb water and minerals are in the upper 6-12 inches of soil. Roots require space, air, and water. Roots will grow best where these requirements are met, which is usually very near the soil surface. Piling soil over the root system or increasing the grade will smother the roots. It only takes a few inches of added soil to kill a sensitive mature tree.

### **Exposure to the elements**

Trees in a forest situation grow as a community, protecting each other from the elements. The trees grow tall with long, straight trunks and high canopies. Removal of neighboring trees or opening the shared canopies of trees will expose the remaining trees to sunlight and wind. The higher levels of sunlight may cause sunscald on the trunks and branches. Also, the remaining trees will be more prone to breaking from wind or ice loading.

### **Getting Advice**

Hire a professional arborist in the early planning stage. Many of the trees on your property may be saved if the proper steps are taken. Allow the arborist to meet with you and your building contractor. Your arborist can assess the trees on your property, determine which are healthy and structurally sound, and suggest measures to preserve and protect them.

One of the first decisions is determining which trees are to be preserved, and which should be removed. You must consider the species, size and maturity, location, and the condition of each tree. The largest, most mature trees are not always the best choices to preserve. Younger, more vigorous trees can usually survive and adapt to the stresses of construction better. Try to maintain diversity of species and ages. Your arborist can advise you about which trees are more sensitive to compaction, grade changes, and root damage.

### **Planning**

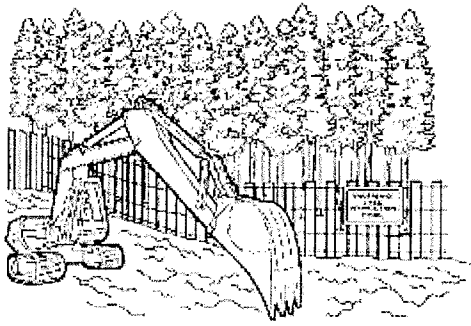
Your arborist and builder should work together in planning the construction. The builder may need to be educated regarding the value of the trees on your property and the importance of saving them. Few builders are aware of the way trees' roots grow and what is needed to protect them.

Sometimes small changes in the placement or design of your house can make a great difference in whether a critical tree will survive. An alternative plan may be more friendly to the root system. For example, bridging over the roots may substitute for a conventional walkway. Or, instead of trenching beside a tree for utility installation, tunneling under the root system is much less damaging.

### **Erecting Barriers**

Because our ability to repair construction damage to trees is limited, it is vital that the trees be protected from injury. The single most important action you can take is to set up construction fences around all of the trees that are to remain. The fences should be placed as far out from the trunks of the trees as possible. As a general guideline, allow one foot of space from the trunk for each inch of trunk diameter. The intent is not merely to protect the above-ground portions of the trees but also the root systems. Remember that the root systems extend much farther than the drip lines of the trees.

Instruct the construction personnel to keep the fenced area clear of building materials, waste, and excess soil. No digging, trenching, or other soil disturbance should be allowed in the fenced area.



Protective fences should be erected as far out from the trunks as possible in order to protect the root system.

### **Limiting Access**

If at all possible, it is best to allow only one access route on and off the property. All contractors must be instructed where they are permitted to drive and park their vehicles. Often this same access drive will later serve as the route for utility wires, water lines, or the driveway.

Specify storage areas for equipment, soil, and construction materials. Limit areas for burning (if permitted), cement wash-out pits, and construction work zones. These areas should be away from protected trees.

### **Specifications**

Get it in writing. All of the measures intended to protect your trees must be written into the construction specifications. The written specifications should detail exactly what can and cannot be done to and around the trees. Each sub-contractor has to be made aware of the barriers, limitations, and specified work zones. It is a good idea to post signs as a reminder.

Fines and penalties for violations should be built into the specifications. Not too surprisingly, sub-contractors are much more likely to adhere to the tree preservation clauses if their profit is at stake. The severity of the fines should be proportional to the potential damage to the trees, and should increase for multiple infractions.

### **Maintaining Good Communications**

It is important to work together as a team. You may share clear objectives with your arborist and your builder, but one sub-contractor can destroy your prudent efforts. Construction damage to trees is often irreversible.

Visit the site at least once a day if possible. Your vigilance will pay off as workers learn to take your wishes seriously. Take photos at every stage of construction. If any infraction of the specifications does occur, it will be important to prove liability.



## **Final Stages**

It is not unusual to go to great lengths to preserve trees during construction, only to have them injured during landscaping. Installing irrigation systems and rototilling planting beds are two ways the root systems of trees can be damaged. Remember also that small increases in grade, as little as 2-6 inches, which place additional soil over the roots can be devastating to your trees. Careful planning and communicating with landscape designers and contractors is just as important as avoiding tree damage during construction.

## **Post-Construction Tree Maintenance**

Your trees will require several years to adjust to the injury and environmental changes that occur during construction. Stressed trees are more prone to health problems such as disease and insect infestations. Talk to your arborist about continued maintenance for your trees. Continue to monitor your trees, and have them periodically evaluated for declining health or safety hazards.

Despite the best intentions and most stringent tree preservation measures, your trees may still be injured from the construction process. There are remedial treatments that your arborist can suggest to help reduce stress and improve the growing conditions around your trees. In addition, the International Society of Arboriculture offers a companion to this brochure titled Treatment of Trees Damaged by Construction

## **For Additional Information**

This brochure is one in a series published by the International Society of Arboriculture as part of its Consumer Information Program. You may have additional interest in the following titles currently in the series:

- Why Hire an Arborist?
- Benefits of Trees
- Value of Trees
- Tree Selection
- Buying High-Quality Trees
- Avoiding Tree and Utility Conflicts
- New Tree Planting
- Mature Tree Care
- Plant Health Care
- Trees and Turf
- Proper Mulching Techniques
- Pruning Young Trees
- Pruning Mature Trees
- Why Topping Hurts Trees

- Insect and Disease Problems
- Recognizing Tree Hazards
- Avoiding Tree Damage During Construction
- Treatment of Trees Damaged by Construction

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

ISA, P.O. Box 3129, Champaign, IL 61826-3129, USA.  
E-mail inquires: [isa@isa-arbor.com](mailto:isa@isa-arbor.com)

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UPDATED JULY 2003

## *Chapter 7.3*

### **Frequently Asked Questions About Trout Buffers**

By the North Carolina Department of  
Environment and Natural Resources



# Protecting TROUT WATERS

## of North Carolina

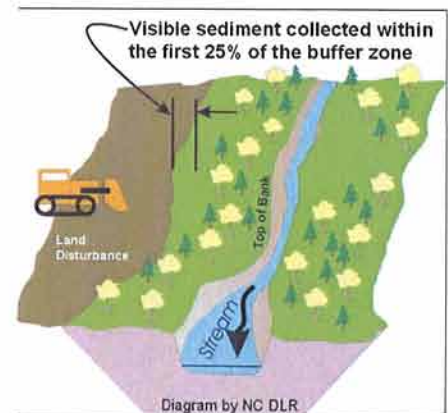
### Trout Waters (Tr) Classification

Trout waters are defined in the Environmental Management Commission Rule (15A NCAC 2B .0202) as "waters which have conditions which shall sustain and allow for trout propagation and survival of stocked trout on a year-round basis". All named and unnamed tributaries to trout waters usually carry the trout waters classification. This classification does not and is not intended to provide public access to streams for fishing on private and public lands and does not regulate, in any way, fishing activities (seasons, size limits, creel limits, and bait and lure restrictions) handled by the NC Wildlife Resources Commission.

### Trout Buffer Law

The Sedimentation Pollution Control Act of 1973 requires buffer zones along trout waters. G.S. 113A-57(1) of this Act says:

"Waters that have been classified as trout waters by the Environmental Management Commission shall have an undisturbed buffer zone 25 feet wide or of sufficient width to confine visible siltation within the twenty-five percent (25%) of the buffer zone nearest the land-disturbing activity, whichever is greater. Provided, however, that the Sedimentation Control Commission may approve plans which include land-disturbing activity along trout waters when the duration of said disturbance is temporary and the extent of said disturbance would be minimal."



### Why a Trout Buffer?

By law, buffers are required on trout waters regardless of the size of land disturbance. Trees, left undisturbed, provide protection for waters that support trout populations. Buffers have many benefits, including:

- Capturing pollutants in runoff to keep the water clean.
- Capturing sediment to keep mud out of the water.
- Providing shade to keep waters cool.
- Providing leaves and sticks for aquatic insects, which serve as a food source for fish and other aquatic life.
- Providing logs and branches that serve as habitat and feeding areas for trout and aquatic insects.
- Keeping stream banks stable.
- Preventing erosion.

### Trout Buffer Requirements

Division of Land Resources ("DLR") Rule 15A NCAC 04B .0125 specifies the following requirements for buffer zones for trout waters that must be met:

- The (minimum) 25-foot buffer must be measured horizontally from the top of the bank.
- A land-disturbing activity in the buffer zone adjacent to trout water can be permitted if the duration of the disturbance is temporary and the extent of the disturbance is minimal. Permission must be received from DLR (contact on back).
- To be considered minimal, a land-disturbing activity must meet two conditions. (1) The land-disturbance must be limited to a maximum of ten percent of the total length of the buffer zone on your property. (2) There must not be more than 100 linear feet of disturbance in each 1000 linear feet of buffer zone. For example, if there is 750 linear feet of buffer zone on your property, up to 75 linear feet of that buffer can be disturbed. If there is 1500 linear feet of buffer zone on your property, you are still limited to 100 linear feet of disturbance in any 1000 linear foot section along the stream. Please check with the appropriate Regional Office (contact information on back) to verify that the proposed activity is minimal.
- If the disturbance will exceed 10 percent or 100 linear feet in every 1000 linear feet, approval for the disturbance must be obtained from the Director of the DLR. Please submit your trout buffer variance request through the DLR Central Office. (Contact information on back).
- A land-disturbing activity within a buffer zone adjacent to trout water that will cause adverse stream temperature fluctuations, as set forth in 15A NCAC 2B .0211, is prohibited.

**One should check with local governments to ensure the land-disturbing activity in the buffer zone is in compliance with all local requirements.**

## **Frequently Asked Questions About Trout Buffers**

**Q: Does the Trout water (Tr) classification give the public permission to access private property for fishing or boating?**

A: No. Property rights do not change when a stream is classified as trout. This trout classification only protects water quality for trout to live and survive, and does not provide any access for any reason.

**Q: What is a land-disturbing activity?**

A: "A land-disturbing activity means any use of the land by any person in residential, industrial, educational, institutional or commercial development, highway and road construction and maintenance that results in a change in the natural cover or topography and that may cause or contribute to sedimentation." (G.S. 113A-52(6))

**Q: If my land has a trout stream on it, can I continue to mow the grass up to the stream bank, even though it is within the trout buffer?**

A: In most cases, Yes. For an activity to be considered land-disturbance, it must have the potential to increase soil erosion and sedimentation. If mowing does not damage the ability of the ground cover to prevent soil erosion, then it is not a land-disturbing activity. Weed-eating or bush-hogging may result in "scalping" that would result in soil erosion. Minimal land disturbance may take place as described above in the "Trout Buffer Requirements" section.

**Q: Can I trim the vegetation within the trout buffer if it is adjacent to an existing use (house, road, garage)?**

A: In most cases, Yes. Trimming of limbs or other vegetation is generally not a land-disturbing activity and therefore is allowed in the trout buffer. However, removing shade that results in adverse stream temperature fluctuations is prohibited. Minimal land disturbance may take place as described above in the "Trout Buffer Requirements" section.

**Q: Can I cut down existing brush or trees within the trout buffer not associated with any existing structure?**

A: Clearing of brush or trees must be limited to the amount that is considered minimal. Minimal land disturbance may take place as described above in the "Trout Buffer Requirements" section. Ground cover must be maintained to prevent soil erosion.

**Q: Can I harvest the timber next to a trout stream on my property?**

A: Yes, but forestry activities must adhere to the statewide Forest Practices Guidelines Related to Water Quality noted in Answer #2 of the question below.

**Q: Are there any land disturbing activities that are exempt from the trout buffer requirements?**

A: Yes. The Sedimentation Pollution Control Act, which protects trout buffer zones, does not apply to the following types of land-disturbing activity (G.S. 113A-52.01):

1. An activity, including breeding and grazing of livestock, undertaken on agricultural land for the production of plants and animals useful to man, including but not limited to: forage and sod crops, grains and feed crops, tobacco, cotton, and peanuts; dairy animals and dairy products; poultry and poultry products; livestock, including beef cattle, llamas, sheep, swine, horses, ponies, mules, and goats; bees and apiary products; fur producing products.
2. An activity undertaken on forestland for the production and harvesting of timber and timber products and conducted in accordance with best management practices set out in Forest Practices Guidelines Related to Water Quality, defined in 15A NCAC 11 .0100-.0209, as adopted by the North Carolina Department of Environment and Natural Resources. For more details and guidance please visit the NC Division of Forest Resources website at [www.dfr.nc.gov/water\\_quality/water\\_quality.htm](http://www.dfr.nc.gov/water_quality/water_quality.htm) or call your local County Ranger.
3. An activity for which a permit is required under the Mining Act of 1971, Article 7 of Chapter 74 of the North Carolina General Statutes.
4. An activity essential to protect human life during an emergency.

**Q: If a tree falls into the trout buffer on my property, can I remove it?**

A: Yes, with minimal disturbance to the trout buffer.

**Q: Can I make repairs to my septic system, paint my house and do other maintenance activities to an existing structure within the trout buffer?**

A: Yes. You can still maintain your house, deck or any other existing structures. In the case of repairs to a septic system, approval by the local health department is required.

**Q: Can I make repairs to roads, driveways or culverts if it is within the trout buffer?**

A: Yes, provided that any land-disturbance is temporary and minimal, and does not result in stream sedimentation.

**Q: Can I build a new garage or shed in the trout buffer zone?**

A: Yes, with a variance approval if necessary. Any land-disturbing activity that is not minimal must obtain a variance from the Central Office of DLR.

**Q: If there is already a 30 foot vegetated buffer requirement in place, does the undisturbed trout buffer add another 25 feet to the existing buffer requirement?**

A: No, the widths do not compound. The most restrictive buffer requirement takes precedent, in this example, 30 feet. However, note that a vegetated buffer requirement is not always the same as the undisturbed trout buffer requirement.

**Q: Is it possible to culvert over the creek that runs through my property?**

A: Any work done within a stream, regardless of a trout buffer, first requires approval from DWQ and the US Army Corps of Engineers.

### **For More Information about Trout Buffers**

*Citizens and state agencies working together to protect North Carolina trout waters*

Division of Land Resources (DLR)  
(919) 733-3833  
<http://www.dlr.enr.state.nc.us>

Division of Water Quality (DWQ)  
(919) 807-6300  
<http://h2o.enr.state.nc.us>

Regional Offices  
Asheville: (828) 296-4500  
Winston-Salem: (336) 771-5000  
Mooresville: (704) 663-1699

## *Chapter 7.4*

### **Developing Views Without Cutting Too Many Trees!**

By Clint Calhoun and Paula Jordan

**Note that by Town regulations, tree thinning and other methods of developing views must be included in the approved plat or site plan.**

## **Developing Views Without Cutting too Many Trees!**

We all know the value of views in Lake Lure: providing enjoyment for property owners while enhancing the quality and value of their lots. Property owners may feel that removing a few – even many – trees is well worth the benefits of the resulting views. What they're forgetting is that those beautiful views are made up, in large part, by healthy forested slopes. Lake Lure's ordinances tread the middle path between meeting the demand for views and protection of the tree lined slopes being viewed.

### ***Background***

During Lake Lure's early development many subdivisions were planned to offer great views while maintaining a forested landscape. It was easier then, with plenty of fairly level land still available in accessible areas. Also, many parts of Lake Lure had recently been logged and the second-growth trees were still small, allowing good views without the removal of too many more trees. That is how Lake Lure has managed to keep so much of its forest.

Now, however, with more and more people coming here, most of the lower, more level land has been developed, leaving only the steeper, more difficult lots for new development. In older neighborhoods, where slopes may not be an issue, long term residents may find that large trees have grown into their view since they bought their property. So, faced either with the high cost of building on steep lots, or high property taxes levied on a view they no longer have, many property owners feel justified in pruning, topping, or even removing their trees in order to enjoy the view. This not only damages the viewshed and distorts the smooth slope of the land – producing the saw-tooth appearance of so many of our ridgelines today – but may well cause erosion and soil stability problems that the property owners never thought of.

Fortunately, a high percentage of property owners do recognize the benefits of trees, both as part of their view and as part of the natural environment. When Lake Lure surveyed all landowners during development of the Comprehensive Plan, an overwhelming majority of respondents identified trees as an important part of this community. They made it clear that Lake Lure values its forests and trees not only for environmental reasons, but also for the character, sense of place, and overall quality of life they bring to the town. This led the Town Council to adopt regulations to limit tree removal and land clearing. Provisions for developing views were also provided as part of those regulations.

### ***Tree Protection Regulations***

In the **Subdivision Regulations**, cutting for views is prohibited during early phases of development except in common areas where trails, bicycle paths, small picnic areas and other such amenities may be developed for the use of all residents. Clearing for views on individual lots for speculative purposes is expressly prohibited at this early stage of development (**See Section 91.59.5 of the Subdivision Regulations**), but thinning for views can be planned and permitted under the Zoning Regulations during home construction.

## Lake Lure TREE MANAGEMENT Handbook

In the **Zoning Regulations**, tree thinning for views is allowed anywhere except within trout buffers, provided that the extent of the thinning, and the technique used, are authorized under the regulations (**see Section 92.119 and 92.120(E) of the Zoning Regulations**). However, this exception to the regulations does not authorize excessive removal of trees (the removal of all or substantially all the trees and/or woody shrubs from one acre or 25 percent of the acreage of a lot or tract of land, whichever is greater). The Town of Lake Lure discourages inappropriate pruning practices such as topping, tipping, or pollarding, which can leave trees unhealthy and unsightly, and in some cases can create unnecessary hazards. Other pruning practices may be used to achieve the same goals with less damage to the trees, as provided below.

### *So what can I do to improve my views?*

That depends on what you want to accomplish. People have different ideas on what they want in a view. Some want views while maintaining some privacy. Others may want to develop the full potential of their location with less concern for privacy. Still others may have less interest in the actual views than in creating an attractive showcase for their house. These differing goals require fundamentally different techniques for developing the views, and may impact the ability to maintain the views after the trees have been pruned. So it is important to consider all the options and possible hazards before deciding on a course of action.

### *The Benefits of Trees*

Trees are more than just pretty features in the landscape. They play an important biological role in almost every ecological (plant and animal) community where they are found, providing food, shelter, and shade for many other species. For us humans, they provide a cooling effect by shading the earth. They have a real, measurable affect on the temperature in your home, producing real savings on summer air conditioning bills if your house faces to the west or south. Trees also serve as buffers against wind and lessen damage to property. Their foliage softens the impact of heavy rains on steep slopes, and their roots are the best means of stabilizing the soil, thereby preventing erosion and sedimentation.

And trees – especially trees that are well maintained – really do add value to your property. In fact, every tree on your property has some type of economical value. A tree that has been properly pruned and cared for is more valuable than one that has been topped or unnecessarily butchered and showing signs of failing health. Good tree management should also consider that the forest is always changing. Much like children, young trees must be nurtured and protected so that they can reach their full potential, and replace the old trees when they are gone. All these issues should be considered when selecting the trees to be altered when developing views.

### *Considerations on a course of action*

**“What do I want to see?”** This is the first questions to ask when developing views. There’s no sense cutting or pruning trees if you don’t know the answer to this one.



**“What is preventing me from seeing what I want to see?”** Is it one tree? Is it ten trees? Is it a limb that sticks out at a weird angle?

**“What is the least amount of thinning that will accomplish my goal?”** I find that a minimalist approach is more likely to produce a result that you will like than if you start out cutting every tree in sight. At least, if the first cut does not accomplish what you want, the minimalist approach lets you re-plan and cut a little more. If you remove everything and don't like the result, the damage is done. Expensive replanting and a period of slow re-growth may be the only way to fix it.

**“What will the impacts be if I cut these particular trees?”** Will it expose my house to high winds, or make my house hotter in the summer? Will cutting result in erosion and sedimentation issues that I'll have to deal with later?”

And there are other considerations. Like many of you, I hold for the most part that what I do on my property is my business and no one else's. On the other hand, natural resources are shared by all. Will your excess tree removal impact your neighbor or your neighbor's view? Will it remove their shade? It may be your tree, but by preserving the benefit that it provides to them, you could create the foundation for genuine neighborliness between you. And wouldn't you expect the same consideration from them?

Careful consideration of such questions as these will help you toward a course of action that will be beneficial to you, your neighbors, and the trees themselves.

### *Considerations on technique*

Once you have decided what needs to be done to improve the view, it's time to consider techniques for doing it. Complete removal of a tree should be a last resort, especially when there may be very beneficial alternatives. It is possible to prune a tree in such a way as to create “windows” for views without disfiguring the tree. Strategic crown thinning can accomplish several desirable things – removing dead and damaged limbs and reducing weight that can make a tree more vulnerable to wind damage – while at the same time creating a desirable view. Very often this will entirely save the tree while giving everyone what they want.

Tree thinning refers to the removal of select limbs and branches in order to accomplish the desired goal, but doing so in a way that ensures the health of the tree. As discussed in Chapter 7.1.b, there is a right way and a wrong way to prune trees. Proper cutting techniques applied at branch junctions or nodes allow the cut wound to heal properly and prevent attempted re-growth at the cut site.

When branches are cut between nodes, as is done in topping, pollarding, and tipping, the tree takes this as an unnatural condition and does what it can to correct the damage. The result is stimulated growth at the wound site, leading to a great many small branches with weak junctions to the main tree. These branches will be very prone to breakage as they grow heavier with time, and can easily become hazardous due to falling limbs. Such a practice eventually leads to an overall decline in the health of the tree.

## Lake Lure TREE MANAGEMENT Handbook

If a tree cannot be properly thinned by removing the undesirable limbs without making cuts at branch junctions, then consideration should be given to removing the tree. Very often, the reason that trees block views and become hazardous is that they have been improperly maintained from the beginning. Perhaps a tree was damaged during an ice storm or a wind storm when it was young and was never repaired. Or it may have been topped as a way of shaping it early on, creating an unnaturally thick clump of foliage between you and your view. These are factors that must be considered when planning the management of the tree.

Another thing to consider in any “clean-up” is the regeneration factor. Very often people will underbrush and remove substantial amounts of woody material, including trees such as poplars, locust, pine, and sycamores that they don’t deem significant. The problem is that the extra sunlight thus provided at the roots of remaining plants throws the regeneration factor into overdrive, causing mass re-growth of cut stumps and germination of the seed bed that has lain dormant waiting for the canopy trees to grow old and fall. This rapid re-growth adds to the work required to maintain the view. If the property owner had been selective – removing only what was necessary, maintaining some overstory, creating windows through branch thinning, and treating cut stumps with herbicide – regeneration would be far more manageable.

### ***The Bottom Line***

It does seem reasonable that a person should be able to do what they want on their property, especially if they are paying taxes on it. Developing views is no exception. However, in a town where citizens value the forested character and natural beauty of the community, consideration should be given to doing no more than absolutely necessary to achieve the desired goal. Your trees and your views – and the whole community – will all be the better for it.

## *Chapter 7.5*

### **Firewise Landscaping In North Carolina**

By NC State University



# FIREWISE

## Firewise Landscaping in North Carolina

*Do you live in a home or community that is tucked into the woods or surrounded by marsh or shrubs? Then your home may be at risk of exposure to wildfire. You can use firewise landscaping practices to create a survivable space around your home and reduce your risk of damage from a wildfire.*

### What Is Firewise Landscaping?

Firewise landscaping involves creating survivable space by selecting, placing, and maintaining plants around your home that will make it less vulnerable to wildfire. Survivable space is the area extending outward from your home 30 feet or more that is designed to serve as a buffer to slow or stop a wildfire. Survivable space doesn't mean you cannot have trees in your yard. Nor does survivable space mean that your landscape will be bare or that it won't attract wildlife. Instead, firewise concepts allow you to make decisions about what you value while taking steps to reduce your risk. By using firewise landscaping, you can decrease the risk of damage to your property from a wildfire.

This publication summarizes some basic firewise concepts to use when creating a landscape around your home. It also provides lists of native plants by their flammability ratings so homeowners can make informed decisions when selecting and maintaining plants. Many of North Carolina's native plants are well-suited to firewise landscaping—they have evolved

to thrive in the state's soils and climate, are non-invasive, and are best suited to provide food, shelter, and nesting sites for North Carolina's wildlife.

### Basic Concepts

All vegetation is potential fuel for a fire. There are no "fireproof" plants. But the type, amount, and placement of vegetation can have a dramatic effect on fire behavior. In fact, plant choice, spacing, and maintenance are critical to firewise landscaping.

Survivable space is the area extending outward from the boundaries of your home or structure (Figure 1). The recommended distance for survivable space varies based on the kinds of vegetation around your home and the steepness of the terrain. For homes and other structures on terrain that slopes less than 20 percent, a minimum of 30 feet is recommended for survivable space. For steeper terrain, survivable space may need to extend from the structure as much as 200 feet. To determine how much survivable space is needed for your home, contact your local fire officials, the N.C. Division of Forest Resources, or your local Cooperative Extension center.

## Plant Choice

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Select plants with a low flammability rating for the areas nearest your house. By selecting plants with certain characteristics, you can reduce the flammability potential of your landscape and provide habitat for wildlife. Plants that are resistant to wildfire have one or more of the following characteristics:

- They grow without accumulating large amounts of combustible dead branches, needles, or leaves (example: *Cornus florida*, flowering dogwood).
- They have open, loose branches with a low volume of total vegetation (example: *Euonymus americana*, strawberry bush).
- They have low sap or resin content (example: many deciduous species).
- They have high moisture content (example: *Impatiens capensis*, jewelweed).
- They grow slowly and need little maintenance, such as pruning (example: *Carpinus caroliniana*, ironwood).
- They are short and grow close to the ground (example: *Viola pedata*, bird-foot violet).
- They can resprout following fire and thereby reduce the costs of replanting a landscape after a fire (example: *Rhus glabra*, smooth sumac).

Plant a variety of types and species. Besides being aesthetically pleasing and more attractive to a wide range of wildlife, a variety of plants will help to ensure a healthier landscape by reducing insect and disease problems. Insects and diseases tend to increase in areas where a host plant dominates the landscape. Plants that are stressed from insects and diseases are more flammable because of the loss of vigor and increased amount of dead, dry plant material.

## Plant Placement

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Keep plants widely spaced. Fire can race rapidly from one plant to another when there is no space between plants. Maintain ample space between plants by placing them in small irregular clusters and islands. This will reduce the threat from wildfire by decreasing the volume of fuel available to a wildfire in your landscape.

Do not plant vines or ornamental grasses within the zone of survivable space. Vines and ornamental grasses, such as switchgrass (*Panicum virgatum*), are extremely flammable plants that can cause a wildfire to spread rapidly. This is especially so if dead growth has not been removed.

## Plant Maintenance

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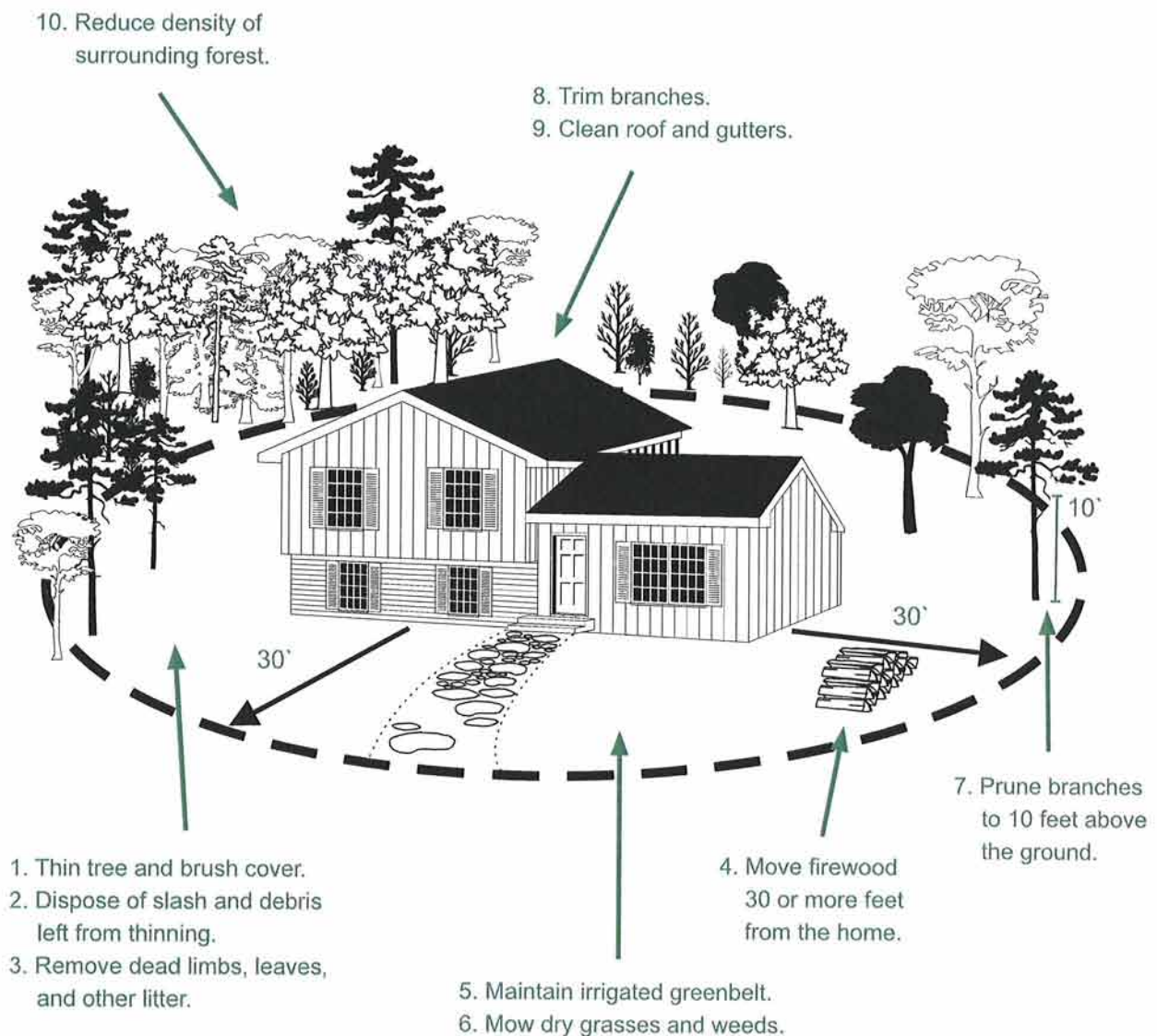
*Do not forget maintenance.* A landscape is a dynamic system that is constantly changing. Trees, shrubs, and herbaceous plants that have a low flammability rating and low fuel volumes can lose these characteristics over time if they are not maintained properly. Conducting seasonal maintenance activities, such as pruning, will help you to maintain the plants' firewise properties by keeping them green and healthy. When conducting maintenance, keep the following tips in mind:

- Cut and remove the dried foliage of annual and perennial herbaceous plants.
- Rake up and dispose of plant litter as it builds up over the season.
- Mow or trim turfgrass to a low height within the survivable space.
- Remove all dead branches, twigs, and leaves attached to living trees to a height of 10 feet above the ground.
- Remove all dead shrubs from within the survivable space.
- Remove vegetation encroaching on power lines.
- Remove branches within 15 feet of the chimney and roof.
- Remove vegetation touching the house or structure.
- Conduct pruning before the nesting season (April 15 through September 15) to encourage wildlife.
- Schedule and conduct maintenance with the North Carolina fire seasons (spring and fall) in mind.

## Summary

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Wildfire can significantly reduce the resources and services produced by North Carolina's wildlands, including wildlife habitat, recreation, clean water, timber, and scenic beauty. More than 41 percent of North Carolina's homes are located within the wildland-urban interface, the zone where human development meets or intermixes with wildland vegetation. As the state's population grows and residential development increases, the risk increases that a wildfire will encroach upon someone's home and have a significant impact on their lives. Some homeowners may have to deal only with smoke and evacuation. For others, fire often results in destruction of their homes and property. By using firewise landscaping strategies, homeowners can create landscapes with less potential fuel for a fire and minimize the risk of a wildfire spreading to their home.



**Figure 1.**

An example of survivable space around a home. A firewise home has at least 30 feet of space around it that is clear of dead vegetation and flammable debris. Trees and shrubs are pruned, and the landscape consists of healthy, irrigated, fire-resistant vegetation.



Table 1. Plant Species Native to North Carolina with a Low Flammability Rating

Latin Name	Common Name	Soil Moisture			Light Needs			Native Region			Wildlife Value					
		Wet	Moist	Dry	Full sun	Partial shade	Shade	Mountains	Piedmont	Coastal plain	Winter cover	Fleshy fruit	Seed, mast, or catkin	Hummingbird nectar	Butterfly/insect nectar	Butterfly larvae host
Tall Trees (taller than 30 feet)																
<i>Acer barbatum</i>	Southern sugar maple		•		•	•	•		•	•			•			
<i>Acer rubrum</i>	Red maple	•	•	•	•	•	•	•	•	•			•			
<i>Acer saccharum</i>	Sugar maple		•		•	•	•	•					•			
<i>Aesculus flava</i>	Yellow buckeye		•			•	•	•						•		
<i>Betula lenta</i>	Sweet birch		•	•	•	•	•	•					•			•
<i>Betula nigra</i>	River birch		•		•				•	•			•			•
<i>Carya glabra</i>	Pignut hickory		•	•	•	•		•	•	•			•			•
<i>Carya ovata</i>	Shagbark hickory		•	•	•	•	•	•	•	•			•			•
<i>Carya tomentosa</i>	Mockernut hickory		•	•	•	•		•	•	•			•			•
<i>Celtis laevigata</i>	Sugarberry		•		•	•	•		•	•		•				•
<i>Diospyros virginiana</i>	Persimmon		•	•	•	•		•	•	•		•				
<i>Fraxinus americana</i>	White ash		•		•	•	•	•	•				•			•
<i>Fraxinus pennsylvanica</i>	Green ash	•	•	•	•	•		•	•	•			•			•
<i>Liquidambar styraciflua</i>	Sweetgum		•		•	•		•	•	•			•			
<i>Liriodendron tulipifera</i>	Yellow poplar		•		•	•		•	•	•			•	•	•	•
<i>Magnolia acuminata</i>	Cucumber tree		•		•	•		•	•				•			
<i>Magnolia virginiana</i>	Sweetbay	•	•		•	•			•	•			•			•
<i>Nyssa sylvatica</i>	Blackgum		•	•	•	•		•	•	•		•				
<i>Oxydendrum arboreum</i>	Sourwood		•	•	•	•	•	•	•	•					•	
<i>Prunus serotina</i>	Black cherry		•	•	•			•	•	•		•			•	•
<i>Quercus alba</i>	White oak		•	•	•	•		•	•	•			•			•
<i>Quercus coccinea</i>	Scarlet oak			•	•	•		•	•				•			•
<i>Quercus falcata</i>	Southern red oak		•	•	•	•		•	•	•			•			•
<i>Quercus michauxii</i>	Swamp chestnut oak		•		•	•			•	•			•			•
<i>Quercus nigra</i>	Water oak		•		•	•			•	•			•			•
<i>Quercus pagoda</i>	Cherrybark oak		•		•	•			•	•			•			•
<i>Quercus phellos</i>	Willow oak		•		•	•			•	•			•			•
<i>Quercus rubra</i>	Northern red oak		•		•	•		•	•				•			•
<i>Quercus shumardii</i>	Shumard oak		•		•	•			•	•			•			•
<i>Quercus stellata</i>	Post oak		•	•	•			•	•	•			•			•
<i>Quercus velutina</i>	Black oak		•	•	•	•		•	•	•			•			•
<i>Robinia pseudoacacia</i>	Black locust		•	•	•	•		•	•				•			•
<i>Salix nigra</i>	Black willow	•	•		•	•	•	•	•	•						•
<i>Sassafras albidum</i>	Sassafras		•	•	•	•		•	•	•		•				•
<i>Taxodium distichum</i>	Baldcypress	•	•		•	•				•			•			
<i>Tilia americana</i>	Basswood		•		•	•		•	•	•			•		•	•
<i>Ulmus alata</i>	Winged elm		•	•	•	•		•	•	•			•			•
<i>Ulmus americana</i>	American elm		•		•	•		•	•	•			•			•



Table 1. Plant Species Native to North Carolina with a Low Flammability Rating (continued)

Latin Name	Common Name	Soil Moisture			Light Needs			Native Region			Wildlife Value					
		Wet	Moist	Dry	Full sun	Partial shade	Shade	Mountains	Piedmont	Coastal plain	Winter cover	Fleshy fruit	Seed, mast, or catkin	Hummingbird nectar	Butterfly/insect nectar	Butterfly larvae host
Small Trees and Shrubs (10 to 30 feet tall)																
<i>Aesculus pavia</i>	Red buckeye		•			•				•				•	•	
<i>Aesculus sylvatica</i>	Painted buckeye		•			•			•					•		
<i>Alnus serrulata</i>	Alder	•	•		•	•		•	•	•			•			•
<i>Amelanchier arborea</i>	Serviceberry		•		•	•	•	•	•			•			•	•
<i>Amelanchier canadensis</i>	Juneberry		•		•	•			•	•		•			•	•
<i>Amelanchier laevis</i>	Allegheny serviceberry		•	•	•	•	•	•				•			•	•
<i>Aralia spinosa</i>	Devil's walking stick		•		•	•			•	•	•	•			•	
<i>Asimina triloba</i>	Pawpaw		•		•	•	•	•	•	•		•				•
<i>Carpinus caroliniana</i>	Ironwood		•			•	•	•	•	•			•			•
<i>Celtis tenuifolia</i>	Dwarf hackberry			•	•	•			•			•				•
<i>Cercis canadensis</i>	Eastern redbud		•	•	•	•			•	•			•		•	•
<i>Chionanthus virginicus</i>	Fringetree		•	•	•	•			•	•		•				
<i>Cornus florida</i>	Flowering dogwood		•	•	•	•			•	•	•	•			•	•
<i>Crataegus</i> spp.	Hawthorn		•		•	•	•	•	•	•		•		•	•	•
<i>Halesia carolina</i>	Carolina silverbell		•			•	•	•	•						•	
<i>Hamamelis virginiana</i>	Witch hazel		•		•	•	•	•	•	•			•			
<i>Ilex decidua</i>	Possumhaw	•	•	•	•	•	•		•	•		•			•	•
<i>Ilex verticillata</i>	Winterberry	•	•		•	•	•	•	•	•		•			•	•
<i>Morus rubra</i>	Red mulberry		•	•	•	•	•	•	•	•		•				•
<i>Ostrya virginiana</i>	Hophornbeam		•	•	•	•	•	•	•			•				•
<i>Prunus americana</i>	Wild plum		•	•	•			•	•			•			•	•
<i>Prunus angustifolia</i>	Chickasaw plum		•	•	•				•	•		•			•	•
<i>Prunus pensylvanica</i>	Fire cherry		•	•	•			•				•			•	•
<i>Rhus copallinum</i>	Winged sumac		•	•	•	•		•	•	•		•			•	•
<i>Rhus glabra</i>	Smooth sumac		•	•	•	•		•	•	•		•			•	•
<i>Salix caroliniana</i>	Carolina willow	•	•		•	•			•	•						•
<i>Sambucus canadensis</i>	Elderberry	•	•		•	•		•	•	•		•				
<i>Sorbus americana</i>	Mountain ash		•		•	•		•				•				
<i>Viburnum prunifolium</i>	Blackhaw		•		•	•	•	•	•	•		•				•
<i>Viburnum rufidulum</i>	Rusty blackhaw		•	•	•	•	•		•	•		•				•
Small Shrubs (less than 10 feet tall)																
<i>Callicarpa americana</i>	American beautyberry		•	•	•	•	•		•	•		•				
<i>Calycanthus floridus</i>	Sweetshrub		•			•	•	•	•						•	
<i>Ceanothus americanus</i>	New Jersey tea		•	•		•	•	•	•	•			•		•	•
<i>Cephalanthus occidentalis</i>	Buttonbush	•	•		•	•		•	•	•			•	•	•	
<i>Clethra alnifolia</i>	Sweet pepperbush	•	•		•	•			•	•		•		•	•	
<i>Corylus americana</i>	Hazelnut		•		•	•		•	•				•			
<i>Euonymus americana</i>	Strawberrybush		•			•	•	•	•	•			•			



Table 1. Plant Species Native to North Carolina with a Low Flammability Rating (continued)

Latin Name	Common Name	Soil Moisture			Light Needs			Native Region			Wildlife Value					
		Wet	Moist	Dry	Full sun	Partial shade	Shade	Mountains	Piedmont	Coastal plain	Winter cover	Fleshy fruit	Seed, mast, or catkin	Hummingbird nectar	Butterfly/insect nectar	Butterfly larvae host
Small Shrubs (less than 10 feet tall) (continued)																
<i>Gaylussacia frondosa</i>	Blue huckleberry		•	•	•	•	•		•	•		•			•	•
<i>Hydrangea arborescens</i>	Wild hydrangea		•			•	•	•	•				•		•	
<i>Itea virginica</i>	Virginia willow	•	•			•	•	•	•	•			•		•	
<i>Lindera benzoin</i>	Spicebush		•	•	•	•	•	•	•	•		•				•
<i>Photinia pyrifolia</i>	Red chokeberry		•		•	•		•	•	•		•				•
<i>Vaccinium corymbosum</i>	Highbush blueberry		•		•	•			•	•		•			•	•
<i>Vaccinium stamineum</i>	Deerberry		•	•	•	•		•	•	•		•			•	•
<i>Vaccinium pallidum</i>	Lowbush blueberry			•	•	•		•	•	•		•			•	•
<i>Viburnum acerifolium</i>	Mapleleaf viburnum		•	•		•	•	•	•			•				•
<i>Viburnum dentatum</i>	Arrowwood		•	•	•	•	•	•	•	•		•				•
<i>Viburnum nudum</i>	Wild raisin	•	•		•	•	•	•	•	•		•				•
Ferns																
<i>Polystichum acrostichoides</i>	Christmas fern		•			•	•	•	•	•	•					
Herbs and Wildflowers																
<i>Apocynum cannabinum</i>	Hemp dogbane		•	•	•	•		•	•	•					•	
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit		•			•	•	•	•	•		•				
<i>Aristolochia serpentaria</i>	Virginia snakeroot		•	•		•	•	•	•	•						•
<i>Chrysogonum virginianum</i>	Green-and-gold		•				•		•	•			•		•	
<i>Desmodium</i> spp.	Beggarlice		•	•	•	•		•	•	•			•			•
<i>Eupatorium coelestinum</i>	Mistflower		•		•	•		•	•	•			•		•	
<i>Eupatorium fistulosum</i>	Joe-pye-weed		•		•			•	•	•			•	•		•
<i>Geranium maculatum</i>	Wild geranium		•	•	•	•		•	•				•		•	
<i>Houstonia caerulea</i>	Bluets		•	•	•	•	•	•	•	•					•	
<i>Impatiens capensis</i>	Jewelweed		•			•	•	•	•	•				•	•	
<i>Iris cristata</i>	Crested iris		•			•	•	•	•					•		
<i>Phlox carolina</i>	Carolina phlox		•	•	•	•		•	•	•					•	
<i>Phlox divaricata</i>	Blue phlox		•			•	•	•	•	•					•	
<i>Phlox paniculata</i>	Summer phlox		•		•	•		•	•	•					•	
<i>Phlox pilosa</i>	Prairie phlox		•	•	•	•			•	•					•	
<i>Phlox subulata</i>	Moss pink		•	•	•			•	•						•	
<i>Silene virginica</i>	Fire pink		•	•		•	•	•	•	•			•	•	•	
<i>Spigelia marilandica</i>	Indian pink		•			•	•	•	•	•				•		
<i>Viola pedata</i>	Bird-foot violet		•	•	•	•		•	•	•						•

Table 2. Plant Species Native to North Carolina with a *Medium* Flammability Rating

Latin Name	Common Name	Soil Moisture			Light Needs			Native Region			Wildlife Value					
		Wet	Moist	Dry	Full Sun	Partial Shade	Shade	Mountains	Piedmont	Coastal plain	Winter cover	Fleshy fruit	Seed, mast, or catkin	Hummingbird nectar	Butterfly/insect nectar	Butterfly larvae host
Tall Trees (taller than 30 feet)																
<i>Fagus grandifolia</i>	American beech		•			•	•	•	•	•			•			
<i>Gordonia lasianthus</i>	Loblolly bay	•	•		•	•				•	•					
<i>Magnolia grandiflora</i>	Southern magnolia		•			•	•		•	•	•		•			
<i>Persea borbonia</i>	Redbay	•	•		•	•	•			•	•	•				•
<i>Platanus occidentalis</i>	Sycamore		•		•	•		•	•	•			•			
Small Trees and Shrubs (10 to 30 feet tall)																
<i>Castanea pumila</i>	Chinquapin		•	•	•	•		•	•	•			•			
<i>Cornus amomum</i>	Silky dogwood	•	•		•	•		•	•	•		•			•	•
<i>Cyrilla racemiflora</i>	Titi	•	•		•	•	•		•	•	•				•	
<i>Osmanthus americanus</i>	Wild olive, devilwood		•	•	•	•				•	•	•				
<i>Prunus caroliniana</i>	Carolina laurel cherry		•	•	•	•				•	•	•			•	•
<i>Symplocos tinctoria</i>	Sweetleaf		•	•	•	•	•	•	•	•			•		•	•
Small Shrubs (less than 10 feet tall)																
<i>Gaylussacia dumosa</i>	Dwarf huckleberry		•	•	•	•		•	•	•		•			•	•
<i>Lyonia lucida</i>	Fetterbush		•			•	•		•	•	•				•	
<i>Rhododendron atlanticum</i>	Dwarf azalea		•	•	•	•	•		•	•				•	•	
<i>Rhododendron calendulaceum</i>	Flame azalea		•	•		•	•	•						•	•	
<i>Rhododendron maximum</i>	Rosebay rhododendron		•			•	•	•	•		•			•	•	
<i>Rhododendron periclymenoides</i>	Wild azalea		•		•	•	•	•	•	•				•	•	
<i>Vaccinium arboreum</i>	Sparkleberry		•	•	•	•	•		•	•	•	•			•	•
Herbs and Wildflowers																
<i>Aquilegia canadensis</i>	Columbine		•	•		•	•	•	•	•			•	•	•	
<i>Aruncus dioicus</i>	Goat's beard		•			•	•	•	•							•
<i>Asclepias incarnata</i>	Swamp milkweed	•	•		•	•		•	•	•					•	•
<i>Asclepias tuberosa</i>	Butterfly weed			•	•	•		•	•	•					•	•
<i>Asclepias variegata</i>	White milkweed		•	•	•	•		•	•	•					•	•
<i>Aster curtisii</i>	Aster		•	•	•	•		•					•		•	•
<i>Aster divaricatus</i>	Heart-leaved aster		•	•		•	•	•	•				•		•	•
<i>Aster novae-angliae</i>	New England aster		•	•	•	•		•					•		•	•
<i>Aster novi-belgii</i>	New York aster		•		•	•				•			•		•	•
<i>Aster pilosus</i>	White heath aster			•	•			•	•	•			•		•	•
<i>Baptisia australis</i>	Blue false indigo		•		•	•		•	•						•	•
<i>Baptisia tinctoria</i>	Yellow wild indigo			•	•	•		•	•	•					•	•
<i>Bidens aristosa</i>	Sticktight	•	•	•	•	•			•	•			•		•	
<i>Chamaecrista fasciculata</i>	Partridge pea		•	•	•			•	•	•			•			•
<i>Cimicifuga racemosa</i>	Black cohosh		•				•	•	•							•



Table 2. Plant Species Native to North Carolina with a *Medium* Flammability Rating (continued)

Latin Name	Common Name	Soil Moisture			Light Needs			Native Region			Wildlife Value					
		Wet	Moist	Dry	Full Sun	Partial Shade	Shade	Mountains	Piedmont	Coastal plain	Winter cover	Fleshy fruit	Seed, mast, or catkin	Hummingbird nectar	Butterfly/insect nectar	Butterfly larvae host
Herbs and Wildflowers (continued)																
<i>Coreopsis angustifolia</i>	Narrow-leaved coreopsis		•		•	•				•			•		•	
<i>Coreopsis auriculata</i>	Eared coreopsis		•		•	•		•	•	•			•		•	
<i>Coreopsis falcata</i>	Sickle tickseed	•	•		•	•			•	•			•		•	
<i>Coreopsis lanceolata</i>	Lance-leaved coreopsis		•	•	•			•	•	•			•		•	
<i>Coreopsis major</i>	Greater tickseed		•	•	•	•		•	•				•		•	
<i>Coreopsis verticillata</i>	Threadleaf coreopsis		•	•	•	•		•	•	•			•		•	
<i>Echinacea purpurea</i>	Purple coneflower		•	•	•			•	•				•		•	
<i>Helianthus angustifolius</i>	Swamp sunflower	•	•		•	•		•	•	•			•		•	
<i>Helianthus atrorubens</i>	Sunflower		•	•	•			•	•	•			•		•	•
<i>Helianthus divaricatus</i>	Woodland sunflower		•	•		•		•	•	•			•		•	
<i>Heliopsis helianthoides</i>	Ox-eye		•	•	•	•		•	•	•			•		•	
<i>Hibiscus moscheutos</i>	Rose mallow		•		•	•		•	•	•				•	•	
<i>Liatris spicata</i>	Blazing star		•		•	•		•	•						•	
<i>Lobelia cardinalis</i>	Cardinal flower	•	•		•	•	•	•	•	•				•	•	
<i>Lobelia puberula</i>	Downy lobelia	•	•	•	•	•		•	•	•				•	•	
<i>Lobelia siphilitica</i>	Great blue lobelia	•	•			•	•	•						•	•	
<i>Mitchella repens</i>	Partridgeberry		•		•	•	•	•	•	•		•				
<i>Monarda didyma</i>	Beebalm		•			•	•	•						•	•	
<i>Monarda fistulosa</i>	Wild bergamot		•	•	•	•		•	•					•	•	
<i>Monarda punctata</i>	Horsemint		•	•	•	•			•	•				•	•	
<i>Oenothera fruticosa</i>	Sundrops		•	•	•	•		•	•	•			•	•		
<i>Penstemon canescens</i>	Hairy beardtongue		•	•	•	•		•	•					•	•	•
<i>Penstemon laevigatus</i>	Smooth beardtongue		•		•	•	•	•	•	•				•	•	•
<i>Phytolacca americana</i>	Pokeweed		•	•	•			•	•	•		•	•			
<i>Pycnanthemum incanum</i>	Hoary mountainmint		•	•	•	•		•	•	•					•	
<i>Rudbeckia fulgida</i>	Orange coneflower		•		•			•	•	•			•		•	
<i>Salvia lyrata</i>	Lyreleaf sage		•	•	•	•	•	•	•	•				•	•	
<i>Solidago</i> spp.	Goldenrod		•	•	•	•		•	•	•			•		•	
<i>Vernonia noveboracensis</i>	Ironweed		•		•	•		•	•	•					•	

**Table 3. Plant Species Native to North Carolina with a *High* Flammability Rating**

Latin Name	Common Name	Soil Moisture			Light Needs			Native Region			Wildlife Value						
		Wet	Moist	Dry	Full Sun	Partial Shade	Shade	Mountains	Piedmont	Coastal plain	Winter cover	Fleshy fruit	Seed, mast, or catkin	Hummingbird nectar	Butterfly/insect nectar	Butterfly larvae host	
Tall Trees (taller than 30 feet)																	
<i>Chamaecyparis thyoides</i>	Atlantic whitecedar	•	•		•	•				•	•					•	
<i>Ilex opaca</i>	American holly		•	•	•	•	•	•	•	•	•	•			•	•	
<i>Juniperus virginiana</i>	Eastern redcedar		•	•	•	•		•	•	•	•	•				•	
<i>Pinus echinata</i>	Shortleaf pine		•	•	•	•		•	•	•	•		•			•	
<i>Pinus palustris</i>	Longleaf pine		•	•	•				•	•	•		•				
<i>Pinus strobus</i>	Eastern white pine		•	•	•			•	•		•		•				
<i>Pinus taeda</i>	Loblolly pine		•	•	•			•	•	•	•		•			•	
<i>Quercus virginiana</i>	Live oak		•	•	•					•	•		•			•	
<i>Tsuga canadensis</i>	Eastern hemlock		•			•	•	•	•		•		•				
Small Trees and Shrubs (10 to 30 feet tall)																	
<i>Ilex vomitoria</i>	Yaupon		•	•	•	•				•	•	•			•	•	
<i>Morella cerifera</i>	Wax myrtle		•	•	•	•			•	•	•	•				•	
Small Shrubs (less than 10 feet tall)																	
<i>Ilex glabra</i>	Inkberry		•		•	•				•	•	•	•			•	•
<i>Kalmia carolina</i>	Carolina laurel		•	•	•	•	•				•	•			•	•	
<i>Kalmia latifolia</i>	Mountain laurel		•	•	•	•	•	•	•		•				•	•	
<i>Leucothoe axillaris</i>	Doghobble	•	•		•	•		•	•	•	•					•	
<i>Rhododendron catawbiense</i>	Catawba rhododendron		•			•	•	•	•		•				•	•	



**Table 4. Plant Species Native to North Carolina with an *Extreme* Flammability Rating**  
(These species should *not* be planted inside the zone of survivable space.)

Latin Name	Common Name	Soil Moisture			Light Needs			Native Region			Wildlife Value					
		Wet	Moist	Dry	Full Sun	Partial Shade	Shade	Mountains	Piedmont	Coastal plain	Winter cover	Fleshy fruit	Seed, mast, or catkin	Hummingbird nectar	Butterfly/insect nectar	Butterfly larvae host
Vines																
<i>Ampelopsis arborea</i>	Peppervine	•	•		•	•				•		•				
<i>Aristolochia macrophylla</i>	Dutchman's pipe		•	•		•	•	•								•
<i>Berchemia scandens</i>	Rattanvine, supplejack	•	•		•	•			•	•		•				
<i>Bignonia capreolata</i>	Crossvine		•	•	•	•			•	•				•		
<i>Campsis radicans</i>	Trumpet vine		•	•	•	•		•	•	•				•		
<i>Decumaria barbara</i>	Climbing hydrangea		•		•	•	•			•					•	
<i>Gelsemium sempervirens</i>	Carolina jasmine		•		•	•			•	•	•			•	•	
<i>Lonicera sempervirens</i>	Coral honeysuckle		•		•	•			•	•				•		
<i>Parthenocissus quinquefolia</i>	Virginia creeper		•	•	•	•	•	•	•	•		•				
<i>Passiflora incarnata</i>	Passionflower		•	•	•	•		•	•	•				•	•	•
<i>Smilax</i> spp.	Greenbrier	•	•	•	•	•		•	•	•	•	•				
<i>Vicia caroliniana</i>	Wood vetch			•	•	•		•	•	•			•			•
<i>Vitis</i> spp.	Grape	•	•	•	•	•		•	•	•		•				
Grasses																
<i>Andropogon glomeratus</i>	Bushy bluestem		•		•				•	•	•		•			•
<i>Andropogon temarius</i>	Splitbeard bluestem		•	•	•			•	•	•	•		•			•
<i>Aristida stricta</i>	Wiregrass		•	•	•	•			•	•	•		•			
<i>Arundinaria gigantea</i>	Switchcane	•	•	•	•	•	•	•	•	•	•		•			•
<i>Panicum virgatum</i>	Switchgrass	•	•		•	•		•	•	•	•		•			•
<i>Sorghastrum nutans</i>	Indiangrass		•	•	•			•	•	•	•		•			

## Additional Resources

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*18,000 copies of this public document were printed at a cost of \$8,378.90 or \$0.46 per copy.*

*Funding for this project was provided by the National Fire Plan through  
the U.S. Department of the Interior Fish and Wildlife Service.*

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## *Chapter 8*

### *Glossary*

**Definitions relevant to discussions in this Handbook  
taken from the following Regulations  
of the Town of Lake Lure:  
Section 91.06 of the Subdivision Regulations  
Section 92.004 of the Zoning Regulations**

**NOTE: Where the definition of a given term from one of the above sources differs significantly from the definition of the same term from the other source, both definitions are given, with the source of each indicated.**



## Lake Lure TREE MANAGEMENT Handbook

**Building:** Any structure constructed for the shelter, or enclosure of persons, animals, or property of any kind, including but not limited to sheds, carports, guest cottages, and other outbuildings, and also including any extension or extrusion of the structure such as balconies, decks, porches, roof overhangs, and foundations. The connection of two buildings by means of an open porch, breezeway, passageway, carport, or other such open structure, with or without a roof, shall not be deemed to make them one building.

**Building and grading envelope (BGE):** The limits of disturbance affected by the establishment of a building and grounds. All buildings, walls, lawns, driveways, site amenities, septic fields, and associated disturbance from construction activity shall be confined within this zone. The BGE may be sited in one mass or apportioned into several smaller compounds connected by walks or drives. Provided, however, alternative septic systems shall not be included within the BGE where it is demonstrated that any disturbance associated with them is minimal.

**Building Setback Line:** A line delineating the minimum allowable distance between the property line and a building on a lot, within which no building or other structure shall be placed except as otherwise provided. Whenever the front, side or rear portion of a lot abuts a street right-of-way, setback lines shall be measured perpendicularly from said right-of-way line, or where no right-of-way exists, from a point 16 feet from the center line of the street.

**Board of Adjustment:** A committee of citizens appointed by the Town Council to hear quasi-judicial zoning matters such as variance and conditional use permit petitions, as well as appeals from a decision of the zoning administrator, or his duly authorized representative, during a evidentiary hearing.

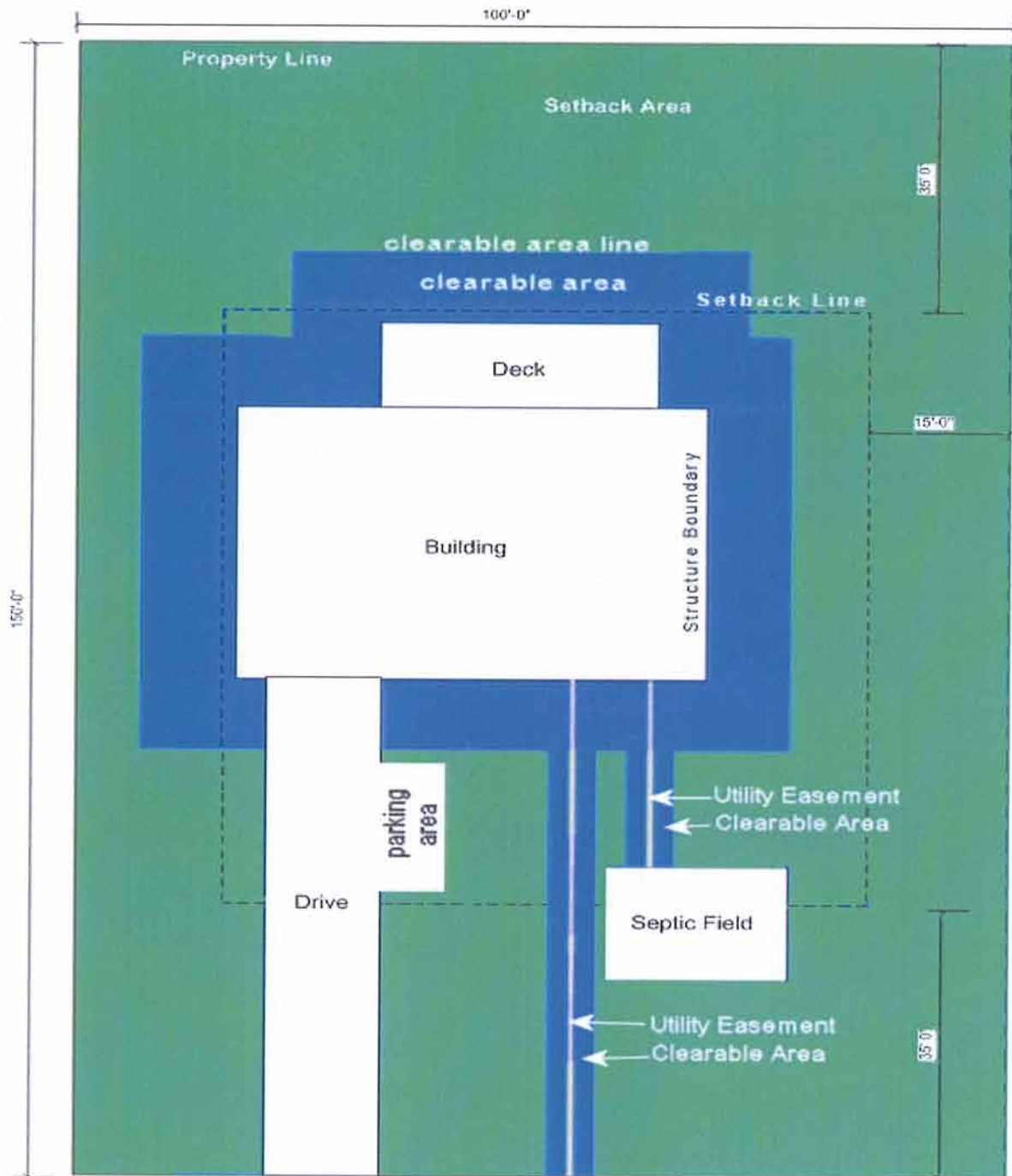
**Buffer Strip:** An area of land, whether landscaped or in its natural state, consisting of evergreen trees and shrubs used to physically separate or screen one use, structure, or property from another so as to visually shield or block noise, light, or other nuisances. Any width that may be specified for such a buffer strip shall be measured in the horizontal plane.

**Caliper:** Caliper is the term used for the diameter measurement of small tree trunks, taken at 6 inches above the average ground level.

**Canopy Coverage:** The area of the subject property that is covered by the foliage of trees.

**Clearable Area:** An area representing the maximum extent of disturbance resulting from construction including the following: (1) A zone that extends a maximum of ~~ten~~ fifteen feet from the boundary of any structures (buildings, deck, etc.), defined by an outer clearable area line. (2) A utility easement zone no more than 8 feet in width and no longer than the required length of the easement, defined by an outer clearable area line. Clearable areas may extend into setback areas. See Figure 1.

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**Figure 1**  
Simplified lot layout for illustration and guidance only. (Not to scale)

**FIGURE 1: Individual Lot Parameters**

Common Amenities (In Subdivision Regulations): Clubhouses, gazebos, tennis courts, swimming pools, amphitheater parks, or other facilities or structures accessory to one or more residential developments, intended to provide recreational, cultural or social enrichment to people residing in a residential subdivision and / or the general public.

## Lake Lure TREE MANAGEMENT Handbook

Common Amenities (in Zoning Regulations): Clubhouses (not to include lodging facilities), gazebos, tennis courts, swimming pools, amphitheaters, parks, or other facilities or structures accessory to one or more residential developments, intended to provide recreational, cultural or social enrichment solely to persons residing within the residential development(s) and their guests and not to the general public.

Community Development Director. The person charged with administration of this chapter. Also, sometimes referred to herein as “Director”. Unless specified otherwise, the terms “Community Development Director” and “Director” include the designee thereof.

Dbh: Dbh stands for the diameter of a tree trunk measured at breast height, four and one-half feet above the average ground level.

Development: Development is the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any mining, excavation, landfill; or any use or extension of the use of land.

Development Review Committee (DRC): A group consisting of town staff and professional consultants, such as an engineer or landscape architect, selected by the Community Development Director on an as needed basis to review and make recommendations regarding developments such as commercial developments, commercial planned unit developments, residential planned unit developments, subdivisions, land clearing, land disturbance, and/or development of any kind on steep slopes.

Diseased Tree: A tree in which fungi, bacteria, mycoplasmas, and/or viruses have invaded and infected causing poor growth and weak appearance, disruption of plant processes, distortion of certain tree parts and strain or death of the tree.

Erosion Control Measures: Any measures designed to prevent, retard, or mitigate accelerated erosion and subsequent sedimentation of streams, lakes, and other natural watercourses.

Excavation: A land-disturbing activity involving the mechanical removal of earth material.

Excessive Removal of Trees: The removal, by any means, of all or substantially all the trees and/or woody shrubs from one acre or 25 percent of the acreage of a lot or tract of land whichever is greater.

Filling: A land-disturbing activity involving the placement of fill material, including the temporary stockpiling of fill material.

Fire Hazard: A condition or set of conditions conducive to the unintended initiation and/or rapid spread of fires. On forested and/or brushy land such conditions include, but are not limited to, the accumulation of woody and other inflammable debris and overgrown underbrush.

Flammable Species: Any species of tree identified as such in Chapter 7.5 of this Handbook.

## Lake Lure TREE MANAGEMENT Handbook

Forest Area: A forest area is a green area consisting of existing forest shown on a site plan and designated either for protection, for thinning, or for removal. When such a forest area is designated on any site plan as protected, all significant trees within it are considered protected trees.

Forest Coverage: The forest coverage of a piece of property refers to the extent of forestation on the property. This coverage may be quantified by any of the following means: (1) by analysis of the canopy coverage as seen in aerial photography; (2) by calculation of the significant tree density on the property; or (3) by other means deemed suitable by the Tree Protection Officer. See Chapter 5 of this Handbook.

Forestry Activity: Logging, timbering, and related forest maintenance activities undertaken on property that is taxed on the basis of its present-use value as forestland under Article 12 of Chapter 105 of the General Statutes. This term also refers to activity that is conducted in accordance with a forestry plan prepared or approved by a registered forester.

Forestry Lands: Lands that have been taxed previously on the basis of present-use value as forestry land under Article 12 of Chapter 105 of the General Statutes or that have been logged under a forestry plan prepared or approved by a registered forester.

General Development Plan: A plan showing general land use, all individual uses and associated structures, building sites, land clearing, land disturbance, impacts of uses and structures, vehicular and pedestrian circulation, open space, green area, common areas, stormwater management devices and practices, natural features, community facilities and utilities, and phasing for the tract of land to be developed as a planned unit development.

Girdle: To girdle a tree is to inflict a cut or other damage to the bark such that the wound encircles the tree to sufficient depth and extent that the likely result will be the death of that tree.

Grading: Any scraping, excavating or filling of the earth's surface or combination thereof.

Green Area: An area of land designated on a site plan for conservation, preservation, landscaping, or reforestation.

Hazardous Tree: A tree that meets one or more of the following criteria:

- (1) It has a structural defect which predisposes it to fall or drop limbs (e.g., it is a dead tree, has trunk decay, dead branches, or V-crotches), and it is located dangerously near a target such as a structure, road, walkway, campsite or other area where property exists or people reside.
- (2) Though structurally sound, it is of a species prone to flammability in dry weather, and is located within 30 feet of a flammable structure where property exists or people reside. See the *Lake Lure Tree Management Handbook*.

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- (3) Though structurally sound, it interferes with the routine activities of people, such as obstructing visibility for motorists or interfering with utilities.

Historic Structures: Structures listed on an official state or federal register recognizing the structure as historically significant.

Impervious Area: A portion of a lot covered with material that prevents absorption of storm water into the ground.

Impervious Material: Any material that prevents absorption of storm water into the ground.

Improvements: Any permanent structure that becomes part of or affixed to real estate, whether placed above or below land or water.

Independent Community Water System: A privately owned central water system constructed to town and state standards consisting of a source of potable water, a distribution system and, where needed, a water storage facility. Independent community water systems shall be operated and maintained by the owners of the area to be served or by a private entity with whom the owners shall contract for said service.

Individual Sewer System (in Zoning Regulations): Any septic tank, ground absorption system, privy or other facility serving a single source or connection and approved by the Rutherford County Health Department.

Individual Sewer System (in Subdivision Regulations): Any septic tank, privy or other facility serving a single source or connection and approved by the County Sanitarian.

Individual Water System: Any well, spring, stream, or other source used to supply a single connection.

Land Clearing: Land clearing is tree removal, underbrushing, grubbing, or any activity that removes live woody plants such as trees and shrubs.

Land Clearing Authorization: Authorization granted by the tree protection officer allowing a property owner to perform specified land clearing, grading, and/or other related activities which have neither been exempted from regulation nor previously approved under appropriate town regulations.

Land Disturbance: Any use of the land by any person in residential, industrial, educational, institutional, or commercial development, highway and road construction and maintenance or other construction or maintenance activity, including chemical applications or other techniques, that results in a change in the natural cover or topography and that may cause or contribute to sedimentation.

Land-disturbing Activity: Any grading of land, any clearing of vegetation, and any construction or rebuilding of a building or structure. This term shall not include activities

## Lake Lure TREE MANAGEMENT Handbook

such as ordinary maintenance and landscaping operations, individual home gardens, the upkeep of yard and grounds, repairs, and the cutting of firewood for personal use.

Lot (in Subdivision Regulations): A portion of a subdivision or any other parcel of land intended as a unit for transfer of ownership, for land clearing, for land disturbance, for development, or for all three. The word "lot" includes the words "plot" or "parcel."

Lot (in Zoning Regulations): A parcel of land whose boundaries have been established by some legal instrument such as a recorded deed or a recorded map and which is recognized as a separate entity for the transfer of title.)

Lot of Record: Any lot for which a plat has been recorded in the Register of Deeds Office of Rutherford County, or described by metes and bounds, the description of which meets the standards of the town's regulations.

Major Subdivision: Any subdivision of a tract of land greater than five acres in area into more than five lots, or any subdivision requiring the extension of public utilities and/or development or dedication of new streets.

Natural Ground Surface: The ground surface in its original state before any land-disturbing activity.

Natural Water Course: Any perennial or intermittent surface water approximately shown on either the most recent version of the soil survey map prepared by the Natural Resources Conservation Service of the United States Department of Agriculture or the most recent version of the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS). Notwithstanding the foregoing, the Subdivision Administrator may determine that a water body does or does not qualify as a natural water course depending upon the presence of surface waters in accordance with the provisions of 15A NCAC 2B.0233(3)(a) or other methods approved by the North Carolina Division of Water Quality. For purposes of these regulations, the term "natural watercourse" shall not include Lake Lure.

Open Space: Any area of land or water essentially unimproved and set aside, designated, or reserved for public or private use of owners, occupants, and their guests.

Parks: An area developed either for passive or active recreational activities including, without limitation, walkways, benches, preserved natural areas, open fields, multi-use courts, swimming and wading pools, amphitheaters, etc. The term "park" shall not include zoos, travel trailer parks, amusement parks, or vehicle, equestrian or dog racing facilities.

Protected Forest Area (In Subdivision Regulations): A protected forest area is a green area consisting of existing forest designated for protection on a subdivision plat and in the associated tree protection plan. All significant trees within such an area are protected trees.

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Protected Forest Area (In Zoning Regulations): A green area consisting of existing forest designated for protection on a site plan. All significant trees within such an area are protected trees.

Protected Tree (in Subdivision Regulations): A protected tree is any tree marked for protection, or any significant tree not expressly marked for removal, in a Tree Protection plan.

Protected Tree (in Zoning Regulations): Any tree marked for protection, or any significant tree not expressly marked for removal in a tree protection plan. **(Adopted 6-12-07)**

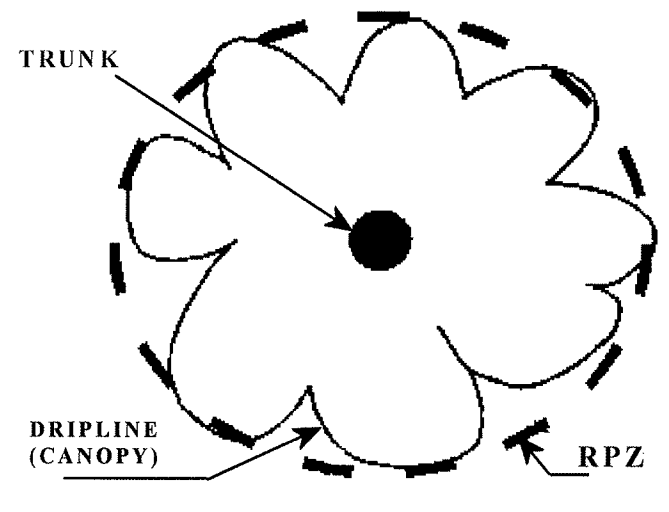
Protective Boundary: A protective boundary is a substantial visual screen, such as an orange barrier fence, sufficient to clearly identify and set apart a protected tree or protected forest area and the associated root protection zones.

Qualified Licensed Professional: A licensed professional in a discipline relevant to the task at hand, whose knowledge and capability to successfully carry out that task have been amply demonstrated through his or her certified practical experience in that discipline and in successful completion of previous tasks similar to the one at hand.

Retaining Wall: A structure erected between lands of different elevations to protect structures and/or to prevent erosion or land subsidence.

Rock outcropping: The part of a rock formation that appears above the surface of the surrounding land.

Root Protection Zone: The root protection zone (RPZ) is the area that encompasses the entire system of a tree's major and minor roots, 24 inches deep and extending from the trunk of the tree a radial distance equal to one foot for each inch of trunk diameter or to the drip line of the tree, whichever is greater.





## Lake Lure TREE MANAGEMENT Handbook

Scenic View: An area visible from a specified position that provides vistas over water, across expanses of land, or from mountain tops or ridges.

Sensitive Natural Area: Any area, which is sensitive or vulnerable to physical or biological alteration, as identified now or hereafter by the North Carolina Natural Heritage Program and which contains one or more of the following: (1) habitat, including nesting sites, occupied by rare or endangered species; (2) rare or exemplary natural communities; (3) significant landforms, hydroforms, or geological features; or (4) other areas so designated by the North Carolina Natural Heritage Program, which are sensitive or vulnerable to physical or biological alteration.

Setback: The minimum allowable distance measured on the horizontal plane between a property line, water's edge, right of way, or street centerline and specified improvements such as a building or parking area. No building or other structure may be placed within the setback area except as provided. (See definition of "Yard" below). Whenever the front, side, or rear portions of a lot abut a street right-of-way, setback lines shall be measured from said right-of-way, or where no right-of-way exists, from a point sixteen feet from the center line of the street.

Setback Area: The area between the property lines and the setback lines (front, back and sides, including all yards) designated by the lot's zoning classification. The setback area is intended to create a buffer zone of natural vegetation between properties. See Figure 1.

Shoreline: The line where the land and water meet which is the elevation of 990 feet mean sea level.

Shrub. A woody plant, commonly with multiple stems, whose mature growth is smaller than a tree, usually less than 4m (13.12 ft) tall and less than 10cm in diameter. See Chapter 3 in this Handbook.

Shrubbery. A collection of shrubs, of one or more species.

Significant Tree. Any stable, healthy tree with a dbh equal to or greater than the dbh noted as significant for that species in the table shown in Chapter 4 of this Handbook, or a tree of any other species with a dbh of 6 inches or greater.

Significant Tree Density: Significant tree density is the number of significant trees per acre. For example, a one acre lot with 10 significant trees has a significant tree density of 10; a 3-acre lot with 30 significant trees also has a significant tree density of 10. (See Chapter 5 of this Handbook.)

Initial Significant Tree Density: Initial significant tree density means significant tree density at the time of initial inspection and platting.

Final Significant Tree Density: Final significant tree density means significant tree density following land clearing, land disturbance, and/or development. In terms of subdivision development this means the significant tree density following completion of roads, utilities and common areas.

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Sketch Plan: A general concept site plan of a proposed development of sufficient accuracy to depict vicinity map; tract boundaries; total acreage; existing and proposed uses of land; building coverage areas for principal buildings and accessory buildings; street layout; water and sewer system location; bodies of water and waterways; drainage channels; areas of environmental concern; neighboring tracts and corresponding zoning classifications; parking areas; common areas, driveway entrances; sign location; name, address, telephone of owner.

Slope: An inclined earth surface, the inclination of which is expressed as the ratio of horizontal distance to vertical distance. In this Ordinance, slopes are generally expressed as a percentage; percentage of slope refers to a given rise in elevation over a given run in distance. A fifty (50) percent slope, for example, refers to a 100-foot rise in elevation over a distance of 200 feet. A fifty (50) percent slope is expressed in engineering terms as a 2:1 slope.

Steep Slope: A slope exceeding 40 percent, on average.

Steep Slope Plan: Information prepared as part of a site plan by a qualified licensed professional to a scale sufficient to clearly indicate the necessary details, including, without limitation, the following: topographical information on the steepness of the property and the slope providing access to the property; the means by which the property can best be developed for the proposed purposes, for proper management of the property during development, and for stabilizing the property once construction is complete; and any other information the Zoning Administrator may determine to be necessary in order to determine the specifics of the plan.

Stream Buffer: The strip of land in its natural state or restored to a suitably vegetated state, of specified width, lying adjacent to any stream, river, creek, brook, run, branch, wetland, or waterway, or any reservoir, lake, or pond, natural or impounded. (See also the discussion of Buffer Zones in Section §96.07A of the Soil Erosion and Sedimentation Control regulations.)

Structure: A combination of materials to form a permanent construction for use, occupancy or ornamentation whether installed on, above or below the surface of the land or water.

Subdivider: Any person, firm or corporation who subdivides or develops any land deemed to be a subdivision as herein defined.

Subdivision: A “subdivision” shall mean all divisions of a tract or parcel of land into two or more lots, building sites, or other divisions, for the purpose of sale or building development, whether immediate or future, and shall include all divisions of land involving the dedication of a new street or a change in existing streets; but the following shall not be included within this definition nor be subject to the regulations of this ordinance:

- (1) The combination or recombination of portions of previously subdivided and recorded lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards of the town as required by this chapter.

## Lake Lure TREE MANAGEMENT Handbook

- (2) The division of land into parcels greater than ten acres where no street right-of-way dedication is involved.
- (3) The public acquisition by purchase of strips of land for the widening or opening of streets.
- (4) The division of a tract of land in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-of-way dedication is involved, and where the resultant lots are equal to or exceed the standards of the town as required by this chapter.

Subdivision Administrator: The official responsible for the overall administration and enforcement of these regulations. Such individual shall be the Community Development Director and/or such other person specifically designated as Subdivision Administrator by the Community Development Director. The Subdivision Administrator may delegate duties under these regulations; however, the Subdivision Administrator shall remain responsible for their overall administration and enforcement.

Temporary Construction Road: A private access to a construction project or logging operation intended to be removed at the completion of the project or operation.

Tract: A term used interchangeably with the term “lot”.

Tree: A tree is a woody plant with a well-developed main trunk of at least 10 cm (almost 4 inches) dbh at maturity.

Tree Density: See “Significant Tree Density”.

Tree Protection Officer: A tree protection officer is a duly authorized town official whose function or scope of authority includes enforcing the tree protection provisions of this Handbook.

Tree Protection Plan: A tree protection plan is information provided as part of a sketch plan, preliminary plat, and/or final plat (in Subdivision Regulations) or a site plan (in Zoning Regulations) regarding protections provided to trees during land clearing, land disturbance, and/or development as well as the extent and condition of both the initial and final tree cover of the affected parcel.

Tree Services: The removal of portions or the entirety of trees or other woody vegetation by any means, including, without limitation, cutting, trimming, topping, pruning, grading, and the application of chemicals.

Tree Services Provider: Any person or entity who provides tree services for compensation.

Tree Thinning: The removal of a few selected trees and/or selected minor branches from selected trees for purposes of developing views and/or permitting more sunlight to reach the ground.

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Tree Topping: Topping a tree is the damaging practice of cutting back its main leader stem and / or limbs larger than three inches in diameter within the crown, to such a degree as to remove the normal canopy and disfigure the tree.

Trout Buffer: An undisturbed strip of land of specified width as measured in the horizontal plane and as defined and illustrated in the Town of Lake Lure Land Disturbance Regulations, that is required for the protection of waters that have been classified as trout waters by the Environmental Management Commission. Any removal of vegetation, including the removal of living branches, is prohibited within such areas.

Undisturbed: The natural ground surface remains in its natural state; no land disturbing activity occurs; no vegetation is removed except as exempted by this Ordinance; and no impervious surface is constructed thereon.

Unimproved Area: The portion of a lot without improvements.

View Protection: Requirements to assure that improvements do not interfere with scenic views.

Viewshed: Lake Lure's viewshed is the totality of near, medium, and long-distance views of lakes, streams, forests, ridgelines, mountains, or any combination thereof, as seen from the lakes, roadways, public areas, and homes, encompassing all the natural beauty of the area.

Yard: A space on the same lot with a principal building, open, unoccupied and unobstructed by buildings or structures from 30 inches above the general ground level of the graded lot upward; provided, however, that driveways; walkways; stairs; fences; walls and hedges, (subject to §92.116), poles; posts; children's play equipment; and other customary yard accessories, ornaments, statuary and furniture may be permitted in any yard subject to the provisions of §92.133.

Yard, Front: An open, unoccupied space on the same lot with a principal building, extending the full width of the lot, and situated between the street right-of-way line and the front line of the building, projected to the side lot lines of the lot. The lake side yard of a lake front lot shall be a front yard.

Yard, Lake Front: An open, unoccupied space on the same lot with a principal building extending the full width of the lot and situated between the shore of a lake and the line of the building projected to the side lines of the lot.

Yard, Rear: An open, unoccupied space on the same lot with a principal building, extending the full width of the lot and situated between the rear line of the lot and the rear line of the building projected to the side lines of the lot.

Yard, Side: An open, unoccupied space on the same lot with a principal building, situated between the building and the side lot line and extending from the rear line of the front yard to the front line of the rear yard.

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Zoning and Planning Board: A citizen committee appointed by the Town Council per Chapter 23 of the Town code to assist as an advisory body in the land use planning and zoning process.

Zoning Administrator (In Subdivision Regulations): An official or designated person of the town charged with administering the Subdivision Regulations. For purposes of this ordinance, the Office of the Zoning Administrator is designated a planning agency as referred to in G.S. § 160-373.

Zoning Administrator (In Zoning Regulations): An official or designated person of the Town of Lake Lure charged with enforcing and administering the zoning ordinance.

Zoning District: A specifically delineated area on the official zoning map of the town within which uniform regulations and requirements govern the use, placement, spacing and size of lots and structures.