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## Model Tree Canopy Cover Management Regulation

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*K. Date*

CSU Center for Community Planning and Development  
Levin College of Urban Affairs  
Co-sponsored by the Ohio Balanced Growth Program

## **MODEL TREE CANOPY COVER MANAGEMENT REGULATION**

**Public Discussion Document 11-14-16**

# MODEL TREE CANOPY COVER MANAGEMENT REGULATION

Public Discussion Document 11-1-16

## INTRODUCTION TO THE DISCUSSION DOCUMENT

This version of a model regulation for Tree Canopy Cover Management has been developed for the purposes of discussion with community leaders, arborists, technical experts, and the development community in Ohio. It has not yet received full legal review and/or endorsement or adoption by any entity.

**This model represents a strong departure from traditional tree protection regulations. It does not require protection of any class of trees. Instead it focuses on the stormwater, health and safety benefits of trees in communities over the long term. Quality of the tree living environment is prioritized over tree size and retention. Specific decisions about the balance of preserved and new trees on development sites, and which trees are preserved, are largely left to the discretion of the applicant, within overall 30-year performance standards. Negotiation and evaluation of tradeoffs, particularly cost, are encouraged.**

Recognizing the extensive health and safety, economic and property benefits that result from established urban forests, this draft was prepared with input from professional public and private industry arborists, watershed and stormwater experts, and municipal leaders. A list of participating advisors is given below.

It is hoped that further discussion will help to refine the elements of a tree canopy cover management regulation that can maximize the benefits to communities, families, businesses, and property owners.

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## MODEL TREE CANOPY COVER MANAGEMENT REGULATION

### Public Discussion Document 11-14-16

#### **Commentary:**

**Use of the Model Regulation.** Please note that this is a model regulation, which includes both regulation language, and commentary explaining the approach, providing resources and links, and outlining options available at various points. Regulation Language is provided in Roman Type. Commentary is provided in italics, and is not intended to be included in the final regulation language.

*This regulation is drafted with a focus on municipalities in Ohio. Applicability to Ohio townships, and any adaptation that is appropriate, will be explored during this discussion period.*

*This regulation language is a model and contains many blanks. Decision points are highlighted by commentary in italics. This model language MUST be tailored to meet the needs, legal requirements, and interests of each individual community, in concert with their legal and planning advisors.*

**Value of trees in communities.** Trees have been proven to provide significant economic, environmental, and social benefits to the communities where they are located. Overall percentage of healthy tree cover, in particular, is shown to make a clear difference in stormwater management, human health and living environment, and property values. It is becoming more and more evident that a healthy and long-term viable urban tree canopy supplies many health, safety and economic benefits to community residents and businesses. For more information, see:

<http://www.americanforests.org/our-programs/urbanforests/whywecare/>  
<http://forestsforwatersheds.org/>

**Types of tree protection regulations.** There are four different ways that communities can address the viability of trees in the landscape: 1) street and public tree ordinances, 2) woodlot/forest cover protection ordinances, 3) tree management on private and public development and redevelopment sites, and 4) protection of solar access and views. This model regulation addresses **management of trees on private and public development and redevelopment sites**, and is intended to be inserted into a community's development regulations (planning, zoning and subdivision regulations).

**Overall simplified performance approach.** Traditional tree protection regulations focus on blanket requirements for inventory and protection of all trees over a certain size or trunk diameter, without attention to species, health, or development goals. This new model takes a very different approach, stating performance goals for overall tree cover depending on type of development, and leaving decisions about individual tree protection or new planting to the developer and designer, informed by analysis of tree species and health, location, construction tolerance, structural integrity, and development goals. Specific goals for individual tree protection are limited to very large and significant trees, called Significant Canopy Trees,

which are identified early; all tree resources are subject to a cost-benefit analysis comparing protection vs removal and replacement. The intent is not to save every tree on a particular property, but to provide for the health, safety and economic benefits provided by trees for the long term across a community.

**Recommended community urban forest management plan.** It is recommended that each community conduct an overview of the existing and past tree canopy cover in their community, and gain an understanding of the existing character and health of their tree canopy cover, its role in storm water management, changes over time, role in property values and energy conservation, and contribution to community character. There are many software options available to assist with such an analysis. Such an evaluation can be used as a basis for development of tree canopy cover strategies related to development, parks, and street trees communitywide, and which can then be incorporated into this regulation. For more information, see:

<http://www.americanforests.org/bigtrees/forestry-measurement-tools/>

<http://www.americanforests.org/wp-content/uploads/2013/06/Click-here-to-download-the-Urban-Forest-Assessments-Resource-Guide-as-a-PDF-3.pdf>

[http://www.itreetools.org/resources/content/guide\\_to\\_assessing\\_urban\\_forests\\_nrs\\_inf\\_24\\_13.pdf](http://www.itreetools.org/resources/content/guide_to_assessing_urban_forests_nrs_inf_24_13.pdf)

**Efficient design of wooded sites.** It should be noted that on wooded residential, commercial and or industrial subdivision sites, a very efficient way of meeting canopy cover requirements would be to implement a conservation development type of Planned Unit Development code, which allows for consolidation of development on one part of a site in order to set aside blocks of untouched open space in other parts of the site. 40% or more of a site can be preserved in this way, including its canopy cover, for very low cost and increased efficiency of development layout. In such cases, the procedures in this regulation will be helpful in identifying priority areas for protection, and for ensuring the longevity of the trees protected during and after construction, as well as the longevity of newly planted trees.

**Parts of the regulation.** This regulation includes four basic components, corresponding to the conceptual, preliminary, construction document, and construction monitoring phases of development:

- 1) Conceptual stage.** A Tree Resource Evaluation Report, which can be brief depending on development goals and the site, is prepared by a qualified professional arborist to assess trees on the site and make recommendations regarding protection and new tree planting.
- 2) Preliminary Plan stage.** A draft Tree Management Plan is developed, showing trees to be protected, and new trees to be planted, and projecting future tree canopy cover at 30 years of age
- 3) Final Construction Plans stage.** The Tree Management Plan is finalized, and specifications provided for tree protection and barriers, soil amendment, and new tree planting
- 4) Construction stage.** Tree protection barriers, as applicable, are placed, and monitoring is provided during construction.

*Monitoring is also provided for a maintenance period after construction is complete. The regulation rests on performance standards for tree canopy cover on the site in 30 years. In addition, provisions are included for variances and enforcement of the regulation.*

**5) *Post-construction monitoring.*** *Provisions are described for monitoring for a standard period after construction completion, similar to management of landscape installations.*

*In addition, provisions are included for variances and enforcement of the regulation.*

**RESOLUTION \_\_\_\_\_**  
**Date \_\_\_\_\_**

WHEREAS, The International Society of Arboriculture Guidelines for Developing and Evaluating Tree Ordinances recommends that jurisdictions regulate tree canopy coverage rather than individual trees; and

WHEREAS, The City/Village of \_\_\_\_\_ recognizes the multiple functions of tree canopy on development areas in the urban environment, including measures of health and safety providing filtration of on-site surface water and groundwater prior to re-entry into the City/Village's waterways, reducing soil erosion by providing vegetated areas to reduce stormwater runoff, improving air quality, reducing building energy needs, providing a buffer for noise, reducing urban heat island effects; as well as providing a reservoir for carbon sequestration, providing habitat for urban wildlife, and improving the community's aesthetic environment; and

WHEREAS, current scientific research and national standards in the United States provide information on tree species construction tolerance, tree longevity under varying conditions, tree canopy size at maturity, and using a mix of different tree species when placing trees into landscaping in order to increase the tree canopy's resistance to pest infestations, disease and varying hydrology and climate conditions; on which regulations and requirements can be based; and

WHEREAS, scientific research and national standards in the United States support the necessity of proper soil protection, preparation and amendment in order to provide for health and longevity of existing and newly planted trees on development sites, thereby protecting the development investment; and

WHEREAS, the \_\_\_\_\_ Soil and Water District; the \_\_\_\_\_ Watershed Partnership; the Ohio Department of Natural Resources; the Ohio EPA; the USEPA; and \_\_\_\_\_ recommend protection and enhancement of tree canopy for the long term as an important part of a comprehensive watershed protection strategy to absorb and moderate stormwater flows, filter storm water, reduce heat island effects, and enhance property values and community quality of life; and

WHEREAS, the Council of the City/Village of \_\_\_\_\_ has reviewed and adopted the recommendations of the above government agencies, and the Council finds that in order to reduce and manage storm water runoff and the need for costly engineering solutions to protect structures and reduce property damage and threats to the safety of watershed residents; to provide for energy cost management, and reduced heat island effect on City/Village homes and businesses; to protect and enhance the scenic beauty of the City/Village; and to preserve the character of the City/Village, the quality of life of the residents of the City/Village, and corresponding property values, it is necessary and appropriate to ensure protection and enhancement of tree canopy cover in the City/Village;

WHEREAS, Article XVIII, Section 3 of the Ohio Constitution grants municipalities the legal authority to adopt land use and control measures for promoting the peace, health, safety, and general welfare of its citizens; and,

WHEREAS, 40 C.F.R. Parts 9, 122, 123, and 124, referred to as NPDES Storm Water Phase II, require designated communities, including the City/Village of \_\_\_\_\_, to develop a Storm Water Management Program to address the quality of storm water runoff during and after soil disturbing activities.

NOW, THEREFORE, BE IT ORDAINED by the Council of the City/Village of \_\_\_\_\_, County of \_\_\_\_\_, State of Ohio, that:

Codified ordinance Chapter XX, Tree Canopy Cover Management, is hereby adopted to read in total as follows:

## **XX.00 TREE CANOPY COVER MANAGEMENT**

### **XX.10 PURPOSE**

**XX.11 Overall objective.** This ordinance seeks to maintain an overall \_\_\_\_% canopy coverage communitywide, through retention of existing tree canopy and major trees, ensuring adequate soil resources to support tree longevity, and supplemental plantings if needed, on all development and redevelopment sites, while providing flexibility for developers to meet site development goals.

#### ***Commentary:***

*This overall canopy cover percentage is broken down by zoning district later in the regulation. Here the overall desirable cover is given as a purpose of the regulation. Percentages that are appropriate for a particular area of a community, and the community overall, can vary widely depending on the community location and climate; density of development; soil conditions; and other factors. Percentages may range from 10 to 40%. It is highly recommended that at the least, a community analyze existing canopy cover in each zoning district, and possible tree canopy cover, and determine reasonable goals for canopy cover to be achieved for each area, and overall. See further commentary under performance standards below.*

**XX.12 Specific purposes.** The purposes of this regulation are to:

- 1) Save, maintain and establish tree canopy for the benefit of present and future residents of the City/Village, recognizing the long term health and safety, property protection, economic, environmental and community benefits provided by tree canopy cover;
- 2) Maximize tree canopy retention and establishment;
- 3) Establish procedures, standards and requirements to minimize the loss and disturbance of overall tree canopy as a result of development; and
- 4) Support the City/Village's efforts in compliance with the requirements of the EPA Phase II rules, as enforced by the Ohio EPA.



## XX.20 DEFINITIONS

### **Commentary**

*These definitions align with those of the American National Standards Institute (ANSI) Specification A300 for Tree Care Operations, Parts 1 through 9. (International Society of Arboriculture, n.d.-a) See the references for citation.*

*It is recommended that these definitions be integrated into the definitions section of the overall code, verifying and correcting any duplication and/or conflict with other definitions.*

*Note that there are two zone areas defined in this section: The Critical Root Zone is designated in the Tree Resource Evaluation Report in order to support decision making for tree canopy management. It is determined by the Arborist based on tree species and characteristics, and may be up to 3 times the drip line diameter of the tree. The Tree Protection Zone is a barrier-protected area on the construction site that receives special construction considerations in order to protect the Critical Root Zone and any adaptation of the root protection area as designated by the Arborist.*

The following terms have the meanings as defined.

**XX.201 Approved.** Any action which has the written approval and agreement of the City/Village or the City/Village's designated representative.

**XX.202 Arborist.** An individual engaged in the profession of arboriculture who, through experience, education and related training, possesses the competence to provide for, or supervise the management of, trees and other woody plants.

**XX.203 City/Village Representative.** The City/Village Engineer, Planning Director, Zoning Inspector, or other person authorized to act on behalf of the City/Village for the purposes of administration of this regulation.

**XX.204 City/Village Reviewing Body.** The City/Village Council, Planning Commission, Zoning Commission, Zoning Board of Appeals, City Shade Tree Commission, or other administrative or decision making body, as designated by the City/Village Council for the purposes of administration of this regulation.

**XX.205 Contributing Canopy Tree.** Any tree that is smaller than a Significant Canopy Tree as measured by circumference at dbh, but larger than 18" dbh.

**XX.206 Contributing Canopy Tree Groupings.** General areas of contributing trees of similar character (similar in size, age, species, health, and/or construction tolerance) on the site.

**XX.207 Critical Root Zone (CRZ).** The minimum volume of roots necessary to have for tree health and stability, as identified for each species in the Tree Resource Evaluation Report and the Tree Canopy Management Plan.

**XX.208 Diameter Breast Height (DBH).** Measurement of trunk diameter taken at 4.5 feet (1.4 meters) off the ground.

**XX.209 Dripline.** The soil surface delineated by the branch spread of a single plant or group of plants.

**XX.210 Invasive Species.** Species that are both non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm, or harm to human health.

***Commentary:** This definition is based on the National Invasive Species council definition. Refer to <http://ohiodnr.gov/invasivespecies> for more information on invasive species in Ohio. For further information on invasives including insects, also see The Ohio Department of Agriculture plant health webpage <http://www.agri.ohio.gov/plant/?div=plantpest.htm>*

**XX.211 Land Disturbing Activity.** Any earth movement, change in site hydrology, or land change which may result in soil erosion from water or wind, or the movement of sediment into the waters of the State, or onto offsite lands, including tilling, clearing, grading, excavating, stripping, stockpiling, filling, and related activities, and covering land with pavement or other construction.

**XX.212 Limits of disturbance.** A clearly designated area within which land disturbance is planned to occur.

**XX.213 Protection Zone Barriers.** Substantial devices such as fencing or berms with signage to define and limit access to tree protection zones, or soil protection zones, as appropriate to accomplish the goals of the Tree Canopy Management Plan.

**XX.214 Significant Canopy Tree.** A tree designated as an Ohio Champion Tree by the Ohio Department of Natural Resources, or any tree 35% or more of the circumference at dbh of the Ohio Champion Tree for its species.

***Commentary:***

*An Ohio Champion Tree is the single largest tree of its species known to exist in Ohio. By choosing a standard that is 35% of this tree's size for each species, a species-adjusted standard is given that addresses the outstanding specimens likely to appear on development sites. A community may want to evaluate the best standard for typical tree specimens in their jurisdiction, and adjust this number. The goal is to set a special standard of review for the few outstanding trees on a site, while allowing for a reasonable cost-benefit analysis of the best way to meet overall tree canopy goals sitewide. Ideally these goals would be set in a Community Urban Forest Management Plan, based on known tree characteristics in the community. The Ohio DNR site for Ohio Champion Trees is located at: <http://forestry.ohiodnr.gov/Portals/forestry/pdfs/BigTrees/NativeOhioChamps.pdf>*

**XX.214 Tree.** A woody plant usually having a dominant trunk or trunks and a mature height greater than 15 feet (4.5 meters).

**XX.215 Tree canopy cover.** The combined area of the crowns of all trees on the site, including trees in forested areas.

**XX.216 Tree Crown.** Upper part of a tree, upward of the lowest branch, including all branches and foliage.

**XX.217 Tree Protection Zone (TPZ).** The area surrounding a tree defined by a specified distance, in which excavation and other construction-related activities shall be avoided. The TPZ is variable depending on species, factors, age and health of the plant, soil conditions, and proposed construction, and as designated in the site Tree Canopy Management Plan. The zone shall be demarcated by physical Protection Zone Barriers.

## **XX.30 APPLICABILITY**

**XX.31 General Applicability.** Unless noted under exemptions below, this regulation applies to all development projects involving site land disturbance over one (1) or more acres of total land, or less than one (1) acre if part of a larger common plan of development or sale disturbing one (1) or more acres of total land, or whenever land disturbance as part of development requiring a Comprehensive Stormwater Management Plan occurs. The [community representative] may require tree canopy cover management on sites disturbing less than 1 acre.

This regulation applies to all zoning districts in the City/Village. No approvals or permits will be granted by the City/Village without full compliance with the terms of this regulation.

### ***Commentary:***

*The 1-acre requirement parallels the applicability requirement of model stormwater regulations in use across Ohio, and aligns with the stormwater management requirements of the Ohio EPA, and the anticipated stormwater benefits that are provided by tree cover within the community and on individual sites.*

**XX.32 Exceptions.** This regulation does not apply to:

- 1) Any tree nursery, silvicultural activity or agricultural activity, defined as “agriculture” by the Ohio Revised Code.
- 2) Cutting or clearing trees in a utility or road right-of-way. However, all such operations shall be done in order to minimize loss of tree cover.
- 3) Routine or emergency maintenance of an existing stormwater management facility, including an existing access road, or other emergency as designated by the City/Village representative.

**Commentary:**

*The Tree Cover Management Plan may outline further detail on emergency management of tree resources, and other exceptions.*

*Agriculture definitions in the Ohio Revised Code fall in sections 1.61, 303.01, and 519.01.*

**XX.40 CONFLICTS AND SEVERABILITY**

**Commentary:**

*This section should be reviewed by the City/Village's legal representation to ensure that it is consistent with other provisions of the City/Village's code, and refers to the appropriate sections and provisions in the codes and regulations.*

**XX.41 Conflicts.** Where this regulation imposes a greater restriction upon land than is imposed or required by any other provision of law, regulation, contract, or deed, the provisions of this regulation shall control. This regulation shall not limit or restrict the application of other provisions of law, regulation, contract, or deed, or the legal remedies available thereunder, except as provided in Section \_\_\_\_ of this regulation.

**XX.42 Severability.** If any clause, section, or provision of this regulation is declared invalid or unconstitutional by a court of competent jurisdiction, validity of the remainder shall not be affected thereby.

**XX.50 PERFORMANCE STANDARDS FOR TREE CANOPY COVER MANAGEMENT**

**Commentary.**

*The following references provide information of use to the professional, designer and reviewer:*

- 1) *Relative Tolerance of Selected Species to Development Impacts, International Society of Arboriculture, Best Management Practices: Managing Trees During Construction, Appendix A (International Society of Arboriculture, n.d.-b)*
  - 2) *Companion Best Practices publications to the ANSI standards A300, parts 1 through 9.(International Society of Arboriculture, n.d.-b)*
  - 3) *Recommendations for tree species selection can be found at Holden Arboretum (for Northeast Ohio) <http://www.holdenarb.org/resources/default.asp>, under Community Forestry, and the Ohio Department of Natural Resources' Ohio Master Planting Design Tree Lists are available from ODNR's Urban Forestry Toolbox: <http://forestry.ohiodnr.gov/urban>. Direct link: [http://forestry.ohiodnr.gov/portals/forestry/urbantoolbox/ohiomasterplantingdesign/4\\_mpd\\_Treelists.xls](http://forestry.ohiodnr.gov/portals/forestry/urbantoolbox/ohiomasterplantingdesign/4_mpd_Treelists.xls)*
- Holden Arboretum's current tree selection guide for Northeast Ohio is included at the end of this model.*

## XX.51 Reference Standards for Tree Care and Management

The following national standards and references are hereby incorporated by reference: ANSI 300A for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices, Parts 1 (Pruning), 2 (Soil Management), 3 (support and Guying Systems), 4 (Lightning Protection), 5 (Management of Trees and Shrubs During Site Planning, Site Development, and Construction), 6 (Planting and Transplanting), 7 (Vegetation Management), 8 (Root Management) and 9 (Tree Risk Assessment), and the current version of ANSI standard, American Standard for Nursery Stock.

All work for tree protection, soil management, root management, and new planting shall be done in accordance with the reference standards. Where more specific requirements are given in this regulation and/or in the project approved plans and specifications, this regulation and project plans and specifications shall govern.

### **Commentary:**

*Note that at the time of this draft, Marcy 2016, two additional ANSI sections are under public review. Part 10 will address pest management, and Part 11 will address the use of urban forest products in tree management. When they become available, they should be added to this standard. See <http://www.tcia.org> for up to date information.*

## XX.52 Percentage tree cover required per development type

The following tree canopy cover percentages are required to be achieved on every development site through tree preservation, new tree planting, or a combination of the two. Tree canopy cover percentage shall be as follows, as projected for the site in 30 years or at maturity of the trees:

<b>LAND USE OR ZONING DISTRICT</b>	<b>REQUIRED TREE CANOPY PERCENTAGE</b>
Residential, lots over ½ acre	
Residential, lots 1/8-1/2 acre	
Residential, multi-family	
Commercial, retail	
Commercial, office	
Mixed use urban	
Industrial, light industry	
Industrial, heavy	
OVERALL COMMUNITY GOAL	



**Commentary:**

*Each community should set its own personalized goals based on its existing tree canopy, projected needs for storm water management and energy conservation, development densities and buildout status, realistic objectives for canopy attainment over time, and other local conditions. Most communities set goals that are 5-50% higher than their current status, with community-wide objectives that target the amount of increase that can be provided by street trees, park and public area trees, and trees on private property. Ideally these goals would be set as part of a community wide urban forest management plan. For examples of tree canopy cover percentages in different development land use areas, see <http://forestsforwatersheds.org/urban-tree-canopy/>*

*Some overall development type standards for tree canopy cover that are commonly recommended by industry professionals:*

*Central Business District 15%*

*Urban Residential Districts 25%*

*Suburban Residential 50%*

*Overall community goal 40%*

*These recommendations originated in an early decision-making GIS software tool created by American Forests, known as CITYgreen, which was based on 1997 research into typical canopy cover scenarios. While useful, it is recommended that communities develop their own standards based on local conditions and experience.*

**XX.53 Standards for estimated tree canopy at maturity by species**

The Tree Cover Management Plan will show the tree canopy cover at maturity for existing trees on the site and trees to be planted. Estimated tree canopy for each tree species shall be in accordance with recommended estimates by \_\_\_\_\_. Where a range of tree crown diameter is given, the average of the range shall be used.

**Commentary:** *The following resources support future tree size estimation. Several resources are given; it is recommended that the community choose one that is most relevant to its location and conditions. The community may choose to assume a lower or higher projected size for each tree, or a percentage adjustment, depending on local conditions. Ideally this standard would be chosen and discussed as part of the development of a community Urban Forest Management Plan. It should be obvious that while estimates are helpful, the actual size of any tree at maturity will depend on its environment, soil, climate, water and nutrient availability, wind or other harsh conditions, the presence of other trees, and the presence of pests and other threats.*

*Holden Arboretum Urban Tree Selection Guide (attached as Appendix A to this model)*

*<http://www.holdenarb.org/resources/communityforestry.asp>*

*Penn State Landscape Tree Fact Sheets: available from:*

*<http://www.pacomunityforests.com/publicationsresources/forsalepublications/index.htm>*

Virginia Technical University  
<http://dendro.cnre.vt.edu/predictions/canopy.cfm>

Arbor Day Foundation  
<https://www.arborday.org/trees/treeguide/TreeDetail.cfm?ItemID=879>

#### **XX.54 Standards for species choice and diversity**

Tree species shall be recommended by the Arborist in the Tree Resource Evaluation report and Tree Canopy Cover Management Plan. No invasive species may be planted.

No more than 30% of newly planted trees on the site, in both public and private areas, may be represented by any one tree family, 20% in any one tree genus, and 10% in a species. Designers are encouraged to provide species diversity in choice of trees.

***Commentary:** These percentages are a commonly accepted standard among our arborist advisors. The community Urban Forest Management Plan would ideally set these standards as appropriate to the community's goals.*

#### **XX.54 Standards for site design and layout**

Site design and layout shall be accomplished to avoid construction of any type, including utility lines and trenches, within the Tree Protection Zone. Site grading and drainage shall be designed to avoid changes in hydrology (water flow) in and out of Tree Protection Zones from existing conditions.

#### **XX.56 Standards for new landscape soil amendment**

Upon completion of construction and start of the landscape construction phase, the entire landscaped area shall be loosened and amended in accordance with ANSI Standard A300, part 2, Soil Management. Soil amendment shall be in accordance with recommendations in the Tree Resource Evaluation Report, and shall be based on site soil assessment.

Existing topsoil shall be retained in place without compaction or alteration to the extent possible. Existing topsoil in site construction areas only shall be stockpiled prior to construction and re-applied during landscape soil amendment, as recommended in the Tree Canopy Resource Evaluation Report.

Tree pit soil amendment shall also be provided, as noted in the reference standards.

#### **XX.57 Incentives for tree protection**

Credits in tree canopy calculations shall be provided as follows:

- 1) Significant Canopy trees to be preserved shall be counted at 120% of actual canopy

- 2) Contributing Tree Groupings of more than five trees shall be counted at 125% of total tree canopy for the grouping
- 3) Groupings of more than five Significant Canopy Trees shall be counted at 150% of total tree canopy

***Commentary:***

*Incentives can help to encourage site developers to protect trees rather than replacing them. Some communities may choose to provide reductions in other requirements, such as required open space and recreational amenities, or provide modest density bonuses, in exchange for increased canopy percentages, or preservation of existing trees.*

## **XX.60 REQUIRED PROCEDURES**

### **XX. 61 Tree Resource Evaluation Report**

***Commentary:***

*The intent of the tree resource evaluation report is to replace the old standard for tree protection, documentation of every tree on the site, with a performance-oriented map and brief description of key issues affecting tree viability for the long term. Applicants should be encouraged to keep this report brief and to the point.*

At the time of pre-application review, submit a Tree Canopy Resource Evaluation Report which shall be prepared by an Arborist. The report shall include:

- 1) Map to scale of the site and immediate adjacent property with existing tree canopy delineation, location and dripline of Significant Canopy Trees, and demarcation of Contributing Canopy Tree groupings. Include Significant Canopy Trees on immediate adjacent property whose critical root zones are within 50 feet of site limits of disturbance.
- 2) Brief summary of key information:
  - a. Significant Canopy Trees, if present: Identification of species, health, diameter at breast height, structural stability and risk assessment, and construction tolerance.
  - b. Contributing Canopy Tree Groupings, if present: Description of general species mix, typical age, size, health, structural stability and risk assessment, and construction tolerance.
  - c. Description of site soil and hydrology characteristics, and implications for development, tree tolerance and survival.
  - d. Results of a site soil fertility assessment with recommendations for landscape soil management before, during and after construction, in accordance with ANSI standard.
  - e. Assessment of potential canopy cover for the site, and/or areas of the site, based on site soil, climate, construction, and other characteristics, and recommendations in the City/Village's Urban Forest Management Plan.

**Commentary:** *If an Urban Forest Management Plan exists for the City/Village, it can be referenced here.*

- 7) Recommendations for tree protection and replacement for the site, based on standards of this regulation, including recommended Tree Protection Zone locations and boundaries.
- 8) Cost benefit analysis of protection vs replacement for Significant Canopy Trees, Contributing Canopy Tree groupings, in order to achieve required tree canopy cover goals.

The Tree Canopy Resource Evaluation Report shall be used as a basis for decisions about tree protection, removal, and replacement in project design.

**Commentary:**

*Note that a tree resource evaluation report is required whether or not there are existing trees on the site. Where there are no trees, a statement of soil and hydrology characteristics, soil assessment, and assessment of potential canopy cover, are still required, in order to plan for an adequate growing environment for future tree canopy cover on the site.*

*Cost benefit analysis would ideally be done by the developer on every project, in order to optimize tree resource removal, balanced with new planting, to meet canopy and development goals simultaneously. The value of sharing this analysis with the community would be to educate community members about the costs involved in resource protection and proper installation of landscape.*

## **XX.62 Preliminary Tree Canopy Management Plan**

**Commentary:**

*The Preliminary Tree Canopy Management Plan comprises the draft tree protection and new tree planting plan, and can be incorporated into the landscape design documents for the site.*

At the time of preliminary plan review, prepare and submit a preliminary Tree Canopy Management Plan which shall include the following:

- 1) A map to scale of the proposed development layout, showing:
  - a) proposed building, pavement and structure footprints, property lines, and limits of disturbance
  - b) delineation of proposed areas of Significant Trees and Contributing Tree grouping protection, if planned
  - c) locations of critical root zones and tree protection zones for Contributing Canopy Tree Groupings and individual Significant Canopy Trees that are to be preserved if applicable.
  - d) Significant Canopy Trees on immediate adjacent property, with critical root zones and tree protection zones shown, if present.
  - e) delineation of tree removal areas, with acreage and percent canopy cover to be removed
  - f) proposed new landscape and tree planting areas.

g) delineation of proposed tree cover at 30 years, and calculation of percent cover for the site at 30 years, with evidence showing basis for percent cover calculation.

***Commentary:***

*See notes under performance standards regarding proposed cover requirements.*

2) Brief narrative description of overall strategy for tree canopy provisions on the site, including proposed tree protection strategy during construction, in light of findings and recommendations in the Tree Canopy Resource Evaluation Report.

### **XX.63 Final Tree Canopy Management Plan**

***Commentary:***

*The Final Tree Canopy Management Plan comprises the construction documents for tree protection and new tree planting, and can be incorporated into the landscape construction documents for the site.*

At the time of construction document review, submit final Tree Canopy Management Plan including the following:

- 1) Final map to scale showing development layout, designation of tree protection areas with tree protection zones, and new planting landscape plan
- 2) Summary of final tree protection, and planting strategy including calculation of final tree canopy cover percentage
- 3) Construction details and specifications for tree protection barriers, construction protection and monitoring procedures, soil preparation, new tree planting, and post-construction monitoring and maintenance.

***Commentary:***

*Soil volume provided per tree is directly related to the eventual potential size of the tree, particularly in urban areas where tree pits are in use. Every effort should be made in design to maximize the soil volume available to trees. Recommendations for soil volume are included in the Reference Standards cited in this model.*

### **XX.64 Pre-Construction Tree Protection Zone Delineation and Barriers**

Prior to start of construction, approved tree protection zones, as shown on the approved site plans, shall be clearly identified by the applicant on site and approved by the City/Village's representative. The TPZ shall be demarcated with approved Protection Zone Barriers as shown on the site plans and specifications. Such barrier installation shall be completed prior to the initiation of any land disturbing activities and shall be maintained throughout the construction period. No permits or approvals shall be issued by the City/Village until the Protection Zone Barriers are complete and in place.



## **XX.65 Tree Protection During Construction**

The following activities are prohibited within delineated Protection Zone Barriers:

- 1) soil compaction
- 2) location of vehicles, equipment, materials, debris, or other construction-related items
- 3) walking, standing, sitting, or otherwise using of soil area by personnel for any activity, unless specifically related to tree protection activities as specified
- 4) alteration of hydrology, drainage, grade or soil level
- 5) application of mulch, gravel, soil, fertilizer, or other material or liquids, unless specifically called for in the plans and specifications, or as recommended by a qualified professional onsite and approved by the City/Village's representative.

Any pruning, cutting, trimming, or other alteration of any tree branches and foliage of any tree to be preserved, inside or outside the TPZ, is prohibited, unless specifically called for in the plans and specifications, or as recommended and overseen by an Arborist onsite and approved by the City/Village's representative.

## **XX.67 Post Construction Monitoring**

A post-construction maintenance period of 1 year shall be provided to ensure tree viability as planted. Inspection shall be provided upon completion of the one-year period, and any nonviable trees replaced.

### ***Commentary:***

*Depending on standard practice in the community, the post-construction maintenance period may be increased up to 3 years. Some professionals argue for longer maintenance periods for new trees that are planted in larger caliper sized.*

*It is recommended that communities adopt a periodic (biennial or triennial) review community-wide of tree canopy achievements in relation to community-wide canopy goals. This is especially important where tree removal is occurring due to pests and diseases and regional tree removal policies. Adaptation in the community's strategies may be needed to offset loss of trees over time.*

## **XX.70 INSPECTION OF PROTECTION ZONES**

***Commentary:*** *The City/Village may choose to designate an Arborist as representative for inspection of protection zones before, during and after construction.*

**XX.71 Inspection of tree protection zones (TPZ).** The identification of tree protection zones shall be inspected by the City/Village's representative prior to land disturbing activities authorized under this regulation. The applicant shall provide the City/Village's representative with at least two (2) working days written notice prior to starting such land disturbing activities.

**XX.72 Inspection during project development.** The tree protection zones and tree planting, which together will meet standards for tree canopy cover on the site, will be inspected at any time evidence is brought to the attention of the City/Village that uses or structures are occurring that may reasonably be expected to violate the provisions of this regulation.

**XX.73 Inspection after project completion.** New and preserved tree protection areas will be inspected upon completion of the construction and the start of the maintenance period, and at one year post-construction, by the City/Village's representative. Any recommendations or requirements for correction of problems will be implemented prior to issuance of a certificate of completion and release of any construction performance bonds.

## **XX.80 VARIANCES AND APPEALS PROCEDURES**

### ***Commentary:***

*Variances and appeals are necessary to providing fair alternatives when code provisions create a hardship, as legally defined. The City/Village's legal representatives should review these provisions to ensure they are consistent with City/Village procedures elsewhere.*

**XX.81 Variances.** The City/Village Council, or their designated review body, may grant a variance to this regulation as provided herein. In granting a variance, the following conditions shall apply:

- 1.) In determining whether there is unnecessary hardship with respect to the use of a property or practical difficulty with respect to compliance with tree canopy cover requirements as established in this regulation, such as to justify the granting of a variance, the reviewing body shall consider the potential harm or reduction in watershed functions that may be caused by a proposed structure or use.
- 2.) The City/Village's reviewing body may not authorize any structure or use in a Zoning District other than those authorized in the Zoning Code.
- 3.) Variances shall be void if not implemented within one (1) year of the date of issuance.

**XX.82 Variance considerations.** In making a variance determination under this regulation, the City/Village's reviewing body may consider the following:

1. The natural vegetation of the property as well as the percentage of the parcel that is in a 100-year floodplain of a stream or river. The criteria of the City/Village's Chapter \_\_\_\_\_ Flood Damage Prevention may be used as guidance when granting variances in the 100-year floodplain.
2. The extent to which the requested variance impairs the flood control, erosion control, water quality protection, or other functions of the tree canopy cover. This determination shall be based on sufficient technical and scientific data.
3. The degree of hardship, with respect to the use of a property or the degree of practical difficulty with respect to maintaining and establishing tree canopy cover as required in this regulation, placed on the landowner by this regulation and the availability of alternatives to the proposed alternative or use. Cost considerations alone are not adequate to demonstrate hardship.

4. Whether a property, otherwise buildable under the ordinances of the City/Village, will be made unbuildable because of this regulation.

**XX.83 Variance mitigation.** In granting a variance under this regulation, the City/Village's reviewing body, for good cause, may impose such conditions that it deems appropriate to maintain the purposes of this regulation and to mitigate any necessary impacts in the riparian setbacks permitted by variance. In determining appropriate mitigation, the City's reviewing body may consult with the City/Village Engineer or other agencies including [county] SWCD.

**XX.84 Variance and Appeal Procedures.** Any applicant seeking a variance to the conditions imposed under this regulation or an appeal to an administrative decision made under this regulation, other than a decision by the City/Village's reviewing body, may apply to or appeal to the City/Village's reviewing body. The following conditions shall apply:

1). When filing an application for an appeal to an administrative decision, the applicant shall file a notice of appeal specifying the grounds therefor with the administrative official within 20 days of the administrative official's decision. Upon determining that the application is complete and upon receipt of the required fee of \$100, the administrative official shall transmit to the City/Village's reviewing body the application and a transcript constituting the record from which the administrative decision subject to appeal was based. This transmission shall occur no less than fourteen (14) days prior to a regularly scheduled meeting of the City/Village's reviewing body in order to be placed on the agenda for that meeting.

2.) When applying for a variance, the applicant shall file a variance request with the City/Village's reviewing body.

3.) Applications for appeals or variances made under this regulation shall contain the following information:

- a. The name, address, and telephone number of the applicant;
- b. Proof of ownership or authorization to represent the property owner.
- c. The location of the property, including street address and permanent parcel number.
- d. The current zoning of the property.
- e. A description of the project for which the appeal or variance is sought.
- f. A description of the administrative decision being appealed or the conditions of the regulation from which a variance is sought.
- g. Names and addresses of each property owner within 500 feet as shown in the current records of the \_\_\_\_\_ County Auditor typed on gummed labels.

4.) Applications for variances or appeals of administrative decisions shall not be resubmitted to the City/Village's reviewing body within one (1) year of the date of a final decision by the Planning and Zoning Commission on the original application, unless the applicant shows the Planning and Zoning Commission either of the following:

- a. Newly discovered evidence that could not have been presented with the original submission, or
- b. Evidence of a substantial change in circumstances since the time of the original submission.

**XX.85 Variance Decision.** A decision by the City/Village's reviewing body in response to an application for a variance request or an appeal of an administrative decision filed pursuant to this regulation shall be final.

## **XX.90 PENALTIES AND ENFORCEMENT**

***Commentary:***

*The City/Village will need to consider penalties and/or stop notices in light of their provisions for violations of other development regulations. It is important that penalties and enforcement be consistent with City procedures and policies. The model language below is a suggestion only.*

**XX.91 Mitigation.** Upon becoming aware of violations of any of the provisions of this section, the City/Village shall provide the contractor with written notice of the violation, and requirements for mitigation and/or correction of the problem, along with a time frame for corrections to occur. If corrections are not in place by the specified time, the City/Village reserves the right to take corrective action, at cost to the contractor.

**XX.92 Penalties.** Any person who shall violate any section of this regulation shall be guilty of a misdemeanor of first degree and, upon conviction thereof, shall be subject to punishment as provided in Chapter XXXX and shall be required to implement planting and soil remediation mitigation as approved by the City/Village's representative and a qualified professional. The imposition of any other penalties provided herein shall not preclude the City/Village from instituting an appropriate action or proceeding in a Court of proper jurisdiction to prevent an unlawful development, or to restrain, correct, or abate a violation, or to require compliance with the provisions of this regulation or other applicable laws, ordinances, rules, or regulations, or the orders of the City/Village's representative.

**XX.92 Stop Work Notices.** The City/Village's representative shall be authorized to stop all or part of the work on the project until any violations of the requirements of this regulation are rectified and/or mitigated, as approved by the City/Village's representative and recommended by an Arborist.

***Commentary.*** *Stop Work Notices are a last resort, to be used only when all other options fail. A stop work notice has significant cost, schedule, and project feasibility implications for the contractor and/or developer. Many communities choose not to include this option at all; others keep it as a component of their development enforcement suite of tools. Usually, stop work notice authority is given to a key community official (such as the Community Engineer) only, and only with well-justified reasons. It is included here for those communities who want to maintain consistency with other aspects of their development regulation enforcement procedures.*

## Appendix A: TREE CANOPY SIZE AT MATURITY

The following table of tree species for Northeast Ohio includes estimates of tree size at maturity for each tree species at maturity, or about age 30 years. These are typical sizes based on the experience of forestry experts at the Holden Arboretum, and are based on a detailed data development project that was done as part of the City of Cleveland Tree Plan. (City of Cleveland, Western Reserve Land Conservancy, Holden Arboretum, LAND Studio, & Cleveland Neighborhood Progress, 2015)

Editors of Penn State University's *Landscape Tree Fact Sheet* series, dated 2001, also developed estimates of tree canopy at maturity, which underwent critical review by an extensive group of experts in Pennsylvania, Ohio, New York, New Jersey, Maryland, Wisconsin, Kansas, North Carolina, Illinois, Oregon, District of Columbia, and Minnesota. (Gerhold, Lacasse, & Wandell, 2001)

It should be obvious that while estimates are helpful, the actual size of any tree at maturity will depend on its environment, soil, climate, water and nutrient availability, wind and other harsh conditions, the presence of other trees, and the presence of pests and other threats. As noted by the *Street Tree Fact Sheets* editors:

Estimates of the range in mature height and crown width apply to better-than-average suburban sites, e.g. a broad tree lawn in a residential neighborhood. Estimates are also given for age 30, which is a common practice in nursery catalogs (though not always explained). For more stressful urban sites, estimates can be reduced by perhaps 10 to 40 percent, as stature is greatly influenced by site quality. Estimates are based on figures in reference books and nursery catalogs, which contain significant inconsistencies. Despite such variability, sizes are useful for design purposes and for comparisons among species and cultivars. (Gerhold et al., 2001)

Estimates of tree size at maturity are also provided by Virginia Technical University at <http://dendro.cnre.vt.edu/predictions/canopy.cfm>, and by the Arbor Day Foundation at <https://www.arborday.org/trees/treeguide/TreeDetail.cfm?ItemID=879>.

It is recommended that the community work with an arborist to identify one of these resources, or some other reliable source, as the primary benchmark for planting and tree cover estimates on development sites in their location; recommendations for any reductions due to site conditions should also be considered and provided.

Tree canopy is only one characteristic of a tree species; selection of trees for any development site should take into account the full range of tree characteristics, including height, hardiness, drought tolerance, pollution tolerance, root zone requirements, soil and drainage preferences, disease and pest tolerance, special nutrient needs, maintenance requirements, and aesthetic characteristics.



## REFERENCES

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# HOLDEN ARBORETUM NORTHEAST OHIO URBAN TREE SELECTION LIST 11-2016

Note: This is a guide only. Tree selection for any project should be done in consultation with professional arborist or landscape architect advice to determine the appropriate tree for the location, soils, and site conditions.

Species	Common Name	Cultivars	Size	Spread	Form	Hardiness Zone	Growth Rate
<i>Abies concolor</i>	white fir	***	L	20'	conical	3 to 7	slow
<i>Abies nordmanniana</i>	Nordman fir	***	L	30'	pyramidal	4 to 6	slow
<i>Acer buergerianum</i>	trident maple	***	S	25'	oval	5 to 8	slow
<i>Acer campestre</i>	hedge maple	***	M	30'	rounded	5 to 8	slow
<i>Acer griseum</i>	paperbark maple	***	M	20'	rounded	5 to 7	slow
<i>Acer miyabei</i>	miyabe maple	Morton	M	25'	upright oval	4 to 6	slow
<i>Acer triflorum</i>	threeflower maple	***	M	30'	upright spreading	5 to 7	slow
<i>Acer x freemanii</i>	Freeman maple	Autumn Blaze	L	40'	broad oval	4 to 7	fast
<i>Aesculus flava</i>	yellow buckeye	***	L	50'	upright oval	4 to 8	moderate
<i>Aesculus glabra</i>	Ohio buckeye	***	M	40'	rounded	3 to 7	moderate
<i>Aesculus pavia</i>	red buckeye	***	S	20'	rounded (varies)	4 to 8	moderate
<i>Amelanchier laevis</i>	Allegheny serviceberry	***	M	40'	rounded	4 to 8	moderate
<i>Amelanchier x grandiflora</i>	apple serviceberry	***	M	30'	rounded	5 to 8	moderate
<i>Asimina triloba</i>	paw-paw	***	S	20'	pyramidal (multi-stem)	5 to 9	moderate
<i>Betula nigra</i>	river birch	***	L	50'	pyramidal (rounded)	4 to 9	fast
<i>Carpinus betulus</i>	European hornbeam	Emerald Avenue	M	30'	pyramidal (oval-rounded)	4 to 7	moderate
<i>Carpinus caroliniana</i>	American hornbeam	***	M	30'	round (irregular)	3 to 9	slow
<i>Celtis laevigata</i>	sugarberry	***	M	50'	broad-rounded	5 to 9	moderate
<i>Celtis x</i>	hybrid hackberry	Magnifica	M	40'	broad-oval	5 to 9	fast
<i>Cercidiphyllum japonicum</i>	katsuratree	***	L	50'	pyramidal (oval-rounded)	4 to 8	moderate
<i>Cercis canadensis</i>	redbud	***	S	25'	flat-topped (rounded)	4 to 9	moderate
<i>Chionanthus retusus</i>	Chinese fringetree	***	S	20'	broad-rounded	4 to 9	slow
<i>Cladrastis kentukea</i>	Kentucky yellowwood	***	M	40'	broad-rounded	4 to 8	moderate
<i>Cornus florida</i>	flowering dogwood	Appalachian Spring	M	20'	flat-topped (rounded)	5 to 9	slow
<i>Cornus kousa</i>	Asian flowering dogwood	***	M	30'	rounded (horizontal)	5 to 8	slow
<i>Crataegus viridis</i>	green hawthorn	Winter King	M	25'	vase (spreading)	4 to 7	slow
<i>Diospyros virginiana</i>	common persimmon	***	L	35'	pyramidal (oval-rounded)	4 to 9	moderate
<i>Fagus sylvatica</i>	European beech	***	L	50'	pyramidal (rounded)	5 to 7	moderate
<i>Ginkgo biloba</i>	ginkgo	see notes	L	40'	pyramidal (wide-spread)	4 to 7	slow
<i>Gleditsia triacanthos</i>	honeylocust	Imperial	L	40'	broad-spreading	4 to 7	fast
		'Shademaster'	L	40'	upright-spreading	4 to 7	fast
		Skyline	L	35'	pyramidal-spreading	4 to 7	fast
		StreetKeeper	L	20'	broad-columnar	4 to 7	fast
<i>Gymnocladus dioica</i>	Kentucky coffeetree	Espresso	L	35'	vase (irregular)	4 to 8	slow
		Prairie Titan	L	45'	oval (irregular)	4 to 8	slow
		Stately Manor	L	40'	obovate (irregular)	4 to 8	slow
<i>Halesia tetraptera</i>	Carolina silverbell	***	M	30'	round headed	5 to 8	moderate
<i>Juniperus chinensis</i>	Chinese juniper	Keteleeri	S	15'	pyramidal	3 to 9	moderate
<i>Juniperus virginiana</i>	eastern redcedar	'Canaertii'	M	20'	dense-pyramidal	4 to 9	moderate
		Emerald Sentinel	M	10'	pyramidal column	4 to 9	moderate
<i>Koeleruteria paniculata</i>	goldenrain tree	***	M	30'	rounded	5 to 8	moderate
<i>Liquidambar styraciflua</i>	sweetgum	'Moraine'	L	40'	pyramidal	5 to 9	fast
		'Variegata'	L	35'	pyramidal	5 to 9	moderate
<i>Liriodendron tulipifera</i>	tuliptree	***	L	40'	pyramidal (rounded)	4 to 9	fast
<i>Maackia amurensis</i>	amur maackia	MaackiaNifcent	M	25'	upright vase	4 to 7	slow
		'Starburst'	M	20'	vase (rounded)	4 to 7	slow
<i>Maclura pomifera</i>	osage organge	'White Shield'	M	35'	rounded	4 to 9	fast
<i>Magnolia acuminata</i>	cucumber tree magnolia	***	L	40'	pyramidal (rounded)	4 to 8	moderate
<i>Magnolia</i> spp.	magnolia	'Butterflies'	M	10'	upright pyramidal	4 to 8	moderate
		'Coral Lake'	M	20'	upright pyramidal	4 to 8	moderate
		'Daybreak'	M	20'	upright pyramidal	4 to 8	moderate
		'Elizabeth'	M	20'	upright pyramidal	4 to 8	moderate
		'Golden Gift'	S	5'	compact	5 to 7	moderate
		'Yellow Bird'	M	20'	upright pyramidal	4 to 8	moderate
<i>Magnolia stellata</i>	star magnolia	***	S	15'	dense-rounded	4 to 8	moderate
<i>Magnolia tripetala</i>	umbrella magnolia	***	M	15'	pyramidal	4 to 8	moderate
<i>Magnolia virginiana</i>	sweetbay magnolia	***	S	20'	oval (rounded)	5 to 9	moderate
<i>Magnolia x loebneri</i>	Loebner magnolia	***	S	15'	rounded (dense)	5 to 8	moderate
<i>Malus</i> spp.	crabapple	Bob White	S	20'	dense-rounded	4 to 7	moderate
		Prairiefire	S	20'	dense-rounded	4 to 7	moderate
		Red Jewel	S	15'	dense-rounded	4 to 7	moderate
		Sugar Tyme	S	15'	dense-rounded	4 to 7	moderate
<i>Metasequoia glyptostroboides</i>	dawn redwood	***	L	25'	pyramidal (conical)	5 to 8	fast
<i>Nyssa sylvatica</i>	blackgum	***	L	30'	pyramidal	4 to 9	moderate
<i>Ostrya virginiana</i>	American hop-hornbeam	***	L	30'	rounded (horizontal)	4 to 9	slow
<i>Parrotia persica</i>	Persian ironwood	'Vanessa'	M	15'	pyramidal	4 to 8	moderate
<i>Picea orientalis</i>	oriental spruce	***	L	20'	pyramidal	4 to 7	slow
<i>Pinus rigida</i>	pitch pine	***	L	40'	pyramidal (irregular)	4 to 7	moderate
<i>Pinus rigida x taeda</i>	pitch-job pine	***	L	40'	pyramidal	4 to 7	fast
<i>Pinus virginiana</i>	Virginia pine	***	M	30'	broad (pyramidal)	4 to 8	slow
<i>Platanus x acerifolia</i>	London planetree	Exclamation	L	40'	upright-pyramidal	4 to 8	moderate
<i>Quercus bicolor</i>	swamp white oak	***	L	50'	broad rounded	3 to 8	moderate
<i>Quercus imbricaria</i>	shingle oak	***	L	60'	broad rounded	4 to 7	slow
<i>Quercus macrocarpa</i>	bur oak	***	L	70'	broad rounded	2 to 8	slow
<i>Quercus muehlenbergii</i>	chinkapin oak	***	L	40'	rounded	4 to 7	moderate
<i>Quercus palustris</i>	pin oak	***	L	40'	pyramidal	4 to 7	fast
		Green Pillar	L	15'	narrow-columnar	4 to 7	fast

Species	Common Name	Cultivars	Size	Spread	Form	Hardiness Zone	Growth Rate
<i>Quercus prinoides</i>	dwarf chinquapin oak	***	S	10'	pyramidal	4 to 8	slow
<i>Quercus robur x bicolor</i>	hybrid English oak	'Nadler' Kindred Spirit Oak	M	10'	narrow-columnar	3 to 7	slow
		'Long' Regal Prince Oak	L	20'	narrow-columnar	4	slow
<i>Quercus rubra</i>	red oak	***	L	60'	rounded	4 to 7	fast
<i>Quercus shumardii</i>	Shumard oak	***	L	50'	rounded	5 to 9	moderate
<i>Styphnolobium japonicum (Sophora japonica)</i>	Japanese pagodatree	'Regent'	L	40'	oval (rounded)	4 to 7	fast
		'Pendulum'	S	15'	weeping	4 to 7	fast
<i>Syringa reticulata</i>	Japanese tree lilac	'Ivory Silk'	S	20'	rounded	3 to 7	moderate
<i>Taxodium distichum</i>	bald cypress	***	L	25'	pyramidal	4 to 9	moderate
<i>Thuja occidentalis</i>	eastern arborvitae	many exist	L	15'	pyramidal	2 to 7	slow
<i>Thuja x</i>	hybrid arborvitae	'Green Giant' or 'Spring Grove'	L	20'	broad-pyramidal	4 to 7	slow
<i>Tilia americana</i>	American linden	***	L	40'	oval rounded (arched)	2 to 8	moderate
<i>Tilia cordata</i>	littleleaf linden	Greenspire	L	30'	oval-rounded	4	moderate
		Summer Sprite	S	15'	rounded	4	moderate
<i>Tilia tomentosa</i>	silver linden	***	L	40'	pyramidal (oval-egg)	2 to 6	moderate
<i>Tilia x euchlora</i>	Crimean linden	***	L	25'	rounded	3 to 7	moderate
<i>Ulmus americana</i>	American elm	'Princeton'	L	50'	vase (spreading)	4	moderate
		'Jefferson'	L	50'	vase (arching)	4	moderate
		'New Harmony'	L	65'	vase (arching)	4	moderate
<i>Ulmus parvifolia</i>	Chinese elm	Allee	M	30'	vase (upright-rounded)	5 to 9	moderate
<i>Ulmus propinqua</i>	emerald sunshine elm	Emerald Sunshine	M	25'	vase (pyramidal)	5	fast
<i>Ulmus x</i>	hybrid elm	'Frontier'	M	30'	vase (oval)	5	fast
		'Patriot'	L	40'	vase (upright-narrow)	4	fast
		Triumph	L	45'	vase (upright-oval)	4	fast
		City Sprite	S	20'	vase (compact)	5	moderate
<i>Zelkova serrata</i>	Japanese zelkova	Green Vase	L	30'	vase (spreading)	5 to 8	moderate
		'Mushashino'	L	15'	narrow (upright)	5 to 8	moderate
		'Village Green'	L	40'	vase (rounded)	5 to 8	moderate