

Chapter 8. TREE PROTECTION & LANDSCAPING

8.1 Purpose and Intent

The protection of existing trees and the provision of landscaping are essential components of the built urban form of the Town. The purpose of this section is to regulate the protection, preservation, installation, and long-term management of vegetation within the Town of Knightdale. Landscaping requirements are intended to:

- minimize potential nuisances such as visual impacts from adjacent properties;
- minimize transmission, noise, dust, odor, litter, and glare of lights;
- provide for a separation of space and establish a sense of privacy;
- promote the preservation of open space; and
- mitigate adverse grade changes between adjacent properties.

The appropriate use of existing and supplemental landscaping improves the aesthetic appearance of new development, thereby enhancing the local business economy while preserving and protecting the identity and character of Knightdale. Furthermore, the use of native evergreen and deciduous plant materials blend new construction with the existing natural and built environments while maintaining the aesthetic character of the Town, and the installation of drought tolerant plant materials promotes good soil management and water conservation.

8.2 Applicability

- A. Expansions and Changes of Use:** These regulations shall apply to all newly developed properties as well as changes of use, expansions which increase the gross heated square footage of an existing building by more than 25%, and expansions of vehicle accommodation areas by more than 25% (Section 13.8).
- B. Modification of Standards:** Where necessary to accommodate creativity in site design, or where topographic or physical site conditions are not feasible, the Administrator may modify these requirements, provided that the type and amount of landscaping or other features are equivalent in effectiveness.
- C. Emergencies:** In the case of emergencies such as windstorms, ice storms, fire, or other disasters, the requirements of this Ordinance may be waived by the Town during the emergency period so that the requirements of this Ordinance will in no way hamper private or public work to restore order in the Town. This shall not be interpreted to be a general waiver of the intent of this Ordinance.
- D. Exemptions**
1. **Lots Less Than Two (2) Acres:** Any lot less than two (2) acres shall be exempt from the tree protection provisions of this chapter. *Subdivision of property to circumvent these requirements is not permitted.*
 2. **Timbering and Silviculture:** Normal forestry activity on forestland that is taxed on the basis of its present-use value as forestland under Article 12 of Chapter 105 of the General Statutes or that is conducted in accordance with a forest management plan that is prepared or approved by a forester registered in accordance with Chapter 89B of the General Statutes shall be exempt from the tree protection provisions of this Chapter (Section 8.5).

If a forest landowner harvests timber and they will be developing the lot within the next three (3) to five (5) years, it is particularly important to maintain any

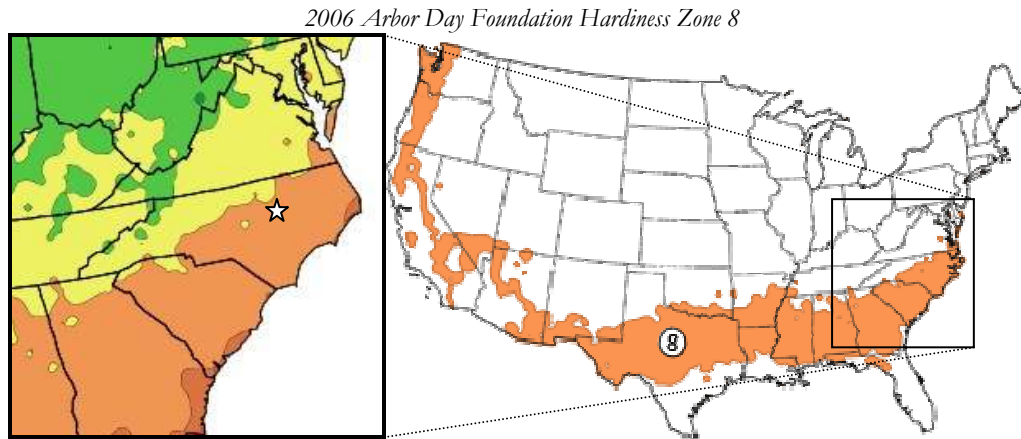
buffers that might be required under current zoning. The landowner should also be reminded in such instances that protected trees as listed in Section 8.5(A) or any canopy required under Section 8.11 will have to be accounted for. Timbering and silviculture may not be used to circumvent the requirements of this chapter for development. Forest land owners should keep a record of when the tract was harvested since that date may come into question should a development plan be submitted to the Town in the future.

In cases where the harvest results in the removal of all or substantially all of the trees that fall within required buffers, or fails to account for protected trees under Town regulations governing development of the tract of land, the Administrator may deny a building permit or refuse to approve a site or subdivision plan for either a period of up to three (3) years if it was not a willful violation of the Town's regulations, or up to five (5) years if it was a willful violation of the Town's regulations.

8.3 Plant Classifications

All measures of plant maturity shall be defined by the "Plant Profiles" promulgated by the NC Cooperative Extension Service (<http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/>).

- A. **Canopy Tree:** Any tree listed on the *Town of Knightdale Approved Canopy Tree List* or other species approved by the Administrator that is hardy to "Zone 8", has an expected mature height of 35 feet or higher and has an expected mature width of at least 30 feet or greater.
- B. **Understory Tree:** Any tree listed on the *Town of Knightdale Approved Understory Tree List* or other species approved by the Administrator that is hardy to "Zone 8" and has an expected mature height of 10 to 15 feet or higher.
- C. **Shrub:** Any shrub listed on the *Town of Knightdale Approved Shrub List* or other species approved by the Administrator that is hardy to "Zone 8" and has an expected mature height of two and a half (2½) feet or higher.
- D. **Groundcover:** Mature groundcover plants are any shrub or grass species approved by the Administrator that is hardy to "Zone 8" and range from a few inches to no more than two and a half (2½) feet in height.



8.4 General Provisions

- A. **Landscape Plan:** Prior to any site disturbance, a Landscape Plan meeting the requirements of Section 16.8 shall be submitted and approved.
- B. **Pre-Construction Conference:** Prior to the commencement of any activities requiring a building or zoning permit, an on-site pre-construction conference shall take place with the developer and the Administrator to review procedures for the protection and management of all landscape elements that are to remain as identified on the Landscape Plan (see Section 16.8).
- C. **Combustible Landscaping Materials Prohibited:** No pine straw or any other material with a fire rate of spread more than 24 inches per minute as determined by the most recent study of the National Institute of Standards and Technology shall be placed, kept or stored within ten feet of buildings with any portion of the exterior wall covered with combustible material. Single-family residential homes are exempt from this prohibition.



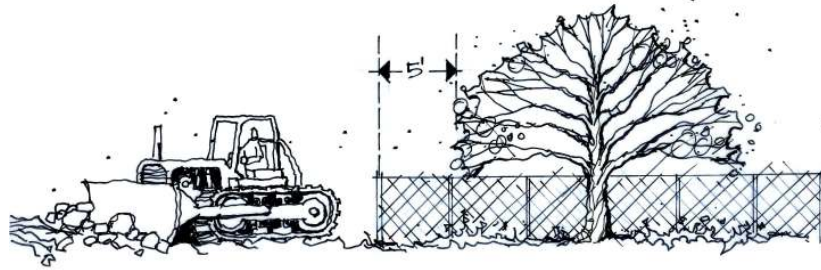
D. Existing Landscaping

1. Vegetation

- a. **Use:** The use of existing trees or shrubs to satisfy the landscaping requirements of this Chapter is strongly encouraged. Existing significant vegetation within a landscaped area required by this Chapter shall be preserved, unless otherwise approved by the Town of Knightdale at the time of Master Plan approval, and shall be credited toward the applicable standard.
- b. **Protection**
 - i. **Planning and Surveying:** Through the protection of trees and existing vegetation, the Town encourages new development to be creative in design and placement of buildings, structures, parking and other impervious surfaces as to preserve natural features and to complement the existing topography when practical. No tree greater than twelve (12) inches in diameter at breast height (DBH: *measured at 4.5 feet above grade*) located on public property or within a required tree protection area (Section 8.5) shall be removed for the purpose of surveying without an approval from the Administrator.
 - ii. **During Construction:** Protective barricades shall be placed around all protected trees designated to be saved prior to the start of development activities or grading in accordance with Standard 2.10 of the Town of Knightdale *Standard Specifications and Details Manual*. Protective barricades shall remain in place until development activities are completed. To prevent unintended compaction of soil, the area within the protective barricade shall remain free of all building materials, dirt or other construction debris, construction traffic, storage of vehicles and materials, and mass grading.

Except for driveway access points, sidewalks curb and gutter; no paving with concrete or other impervious materials within five (5) feet of a tree drip line shall be allowed unless otherwise approved. Where grading within a tree dripline cannot be avoided, cut and fill shall be limited to ¼ to ½ of the area within the dripline, and tree

roots must be pruned with clean cuts at the edge of the disturbed area. No fill shall be placed within the dripline of a tree without venting to allow air and water to reach the roots.



2. **Fences, Walls and Berms:** Existing walls or fences meeting the requirements of Section 4.7 and berms within a landscaped area required by this Chapter may be used to fulfill the standards for the type of buffer and screening required by Section 8.6, provided that these elements are healthy and/or in a condition of good repair.
3. **Other Features:** Other existing site features within a landscaped area required by this Chapter which do not otherwise function to meet the standards for the required landscaping shall be screened from the view of other properties or removed, as determined during review and approval of the Master Plan.

E. Grading and Development in Required Landscaped Areas

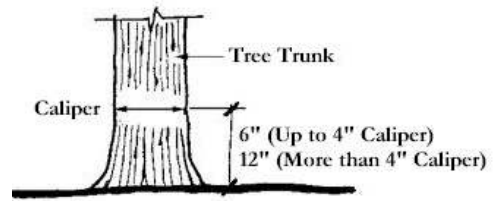
1. **All Areas:** Landscaped areas required by this Chapter shall not contain any development, impervious surfaces or site features that do not function to meet the applicable standards for that area or that require removal of existing significant vegetation.
2. **Buffer Yards:** No grading, development or land-disturbing activities shall occur within area buffer yard if forest canopy, specimen trees or significant vegetation exists within these areas, unless approved by the Administrator. If grading within a buffer yard is proposed, slopes of 1:3 or less are encouraged to ensure the proper transition of grades to the adjacent property and to facilitate landscaping and maintenance.

F. Use of Off-Site Landscape Easements: Permanent off-site landscape easements may be used to meet required buffer yards provided that the size or shape of the parcel significantly restricts the ability to reasonably use the property and meet the buffer yard requirements. These easements must be recorded prior to or in conjunction with the approval of the site or subdivision plan.

G. Installation and Maintenance Standards

1. **Installation of New Vegetation and Landscape Features:** In general, new plant material should complement existing vegetation native to the site. The use of drought tolerant, indigenous, native and/or regionally grown species of trees, shrubs and groundcovers is encouraged in order to make planted areas compatible with existing native habitats and to reduce dependency on irrigation. In addition to the following requirements, all installations shall be in accordance with Town of Knightdale *Standard Specifications & Detail Manual*.

- a. **Minimum Size:** Landscaping should be of sufficient size so that mature appearance will be achieved within three (3) years of installation for shrubs and within five (5) years of installation for trees. Where the following minimum size requirements overlap, the higher standard shall prevail:



- i. **Evergreen trees** of any classification shall not be less than six (6) feet in height with a minimum two (2) inch caliper.
- ii. **Multi-stemmed trees** of any classification shall have at least three (3) stalks and not be less than eight (8) feet in height.
- iii. **Canopy trees** shall not be less than eight (8) feet in height with a minimum two (2) inch caliper.
- iv. **Understory trees** shall be a minimum of one and a quarter (1¼) inch caliper and have a minimum height of six (6) feet.
- v. **Shrubs** shall be at least three (3) gallons in container size, have a minimum height of 18 inches and have a minimum spread of 12 to 15 inches.
- vi. **Groundcovers** shall be a minimum of one-and-a-half (1½) to two-and-a-half (2½) inch pots with a minimum spread of four (4) inches.

b. **Planting Area**

- i. **Canopy Trees:** Each canopy tree shall be provided with a minimum pervious ground area of 300 square feet for root growth (exception: Street Trees) and should be planted on slopes not to exceed 1:4 vertical to horizontal distance.
- ii. **Groundcover:** Groundcover must be planted with on-center spacing equivalent to the average mature spread for each particular species.

- c. **American Standard for Nursery Stock:** All new plant material shall be of good quality, free from disease, installed in sound manner, mulched (3-4 inch layer) and meet the standards set forth in the American Standard for Nursery Stock by the American Nursery & Landscape Association (ANLA). The selection of plants, planting methods, minimum height, root ball and container size, number of branches, and width, shall conform to the American Standard for Nursery Stock published by the ANLA for that type of tree or shrub at the time of installation.



- d. **Guying and Staking:** All new trees shall also be properly guyed and staked at the time of planting.
- e. **Mulch and Drainage:** Adequate drainage and mulching shall be provided in all cases, particularly for medians and islands.
- f. **Soil:** Installation practices shall be utilized which preserve and replace existing topsoil or amend the soil to reduce compaction.

- g. **Bare Earth Prohibited:** All portions of a landscaped area not planted with shrubs and trees or covered by a wall or other screening device shall be planted with ground cover and/or grass, or covered with natural mulch with a minimum depth of two (2) inches.
- h. **Overhead Utility Lines:** Where a canopy tree is required and overhead utility lines exist, two (2) understory trees shall be substituted with the approval of the Administrator.
- i. **Easements & Right-of-Ways:** Nothing shall be planted or installed within an underground or overhead utility easement or a drainage easement without the consent of the Town and the easement holder at the time of Master Plan approval.
- j. **Warranty:** Contractor shall warrant all new plant material for one (1) year from time of installation.
- k. **Certificates of Occupancy and Requests for Delay:** All landscaping, mulching and seeding shall be installed in accordance with the approved site plan and the standards of this Chapter prior to issuance of a Certificate of Occupancy. Requests for a delay in complying with this requirement will be considered following a written request directed to the Administrator. Such request for a delay shall note the timeframe during which the planting shall be completed. Certificates of Occupancy will be issued with the approval of a request for planting delay, if deemed reasonable. Reasonable requests may be granted due to:
 - Unusual environmental conditions such as drought, ice, over saturated soil (deep mud), or inappropriate planting, provided that the developer or the property owner provide the Town with a surety bond in accordance with Chapter 17 ensuring the installation of the remaining landscape materials; or
 - Circumstances beyond the developer's or property owner's control, such as incomplete construction or utility work to occur in a proposed landscaped area within 30 days after expected site completion, provided that the developer or property owner submits a letter from the utility company to the Town stating the estimated installation date, and provides a cash bond in accordance with Chapter 17 to ensure installation of the required landscaping.

In the former case, the Town may issue a Temporary Certificate of Occupancy for a period of 30 to 180 days, relative to the next planting season; while in the latter case, the Town of Knightdale may issue a Temporary Certificate of Occupancy for a period not to exceed 30 days.

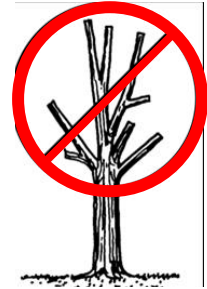
2. Maintenance

- a. **General Responsibility:** The owners of property shall be responsible for all natural and physical features required by this Chapter and shall preserve and maintain these features in healthy growing conditions, replace them when necessary, and keep the areas around them free of refuse and debris in a manner that prevents refuse and debris from washing onto public rights-of-way.

b. **Irrigation:** The use of irrigation is permitted in all required landscaping areas as required by this Chapter and may connect to the public water system subject to the requirements of the Town’s *Standards Specifications and Details Manual* and other applicable Town ordinances or policies. The use of moisture metering devices and automatic timers with any irrigation system is required. The use of xeriscape practices and drip irrigation is also encouraged, unless otherwise required.

c. **Pruning:** All vegetation should be allowed to reach and be maintained at its mature size.

i. **Tree “Topping” Prohibited:** Tree “topping”—the removal of more than 25 percent of a tree’s canopy—is considered to be damage and disfigurement (Section 8.4G(2)d) and shall be prohibited on all trees on public property, public rights-of-way, required tree save areas and parking lot landscaping areas unless otherwise approved by the LURB. Trees in locations where proper pruning practices are impractical may be exempted from this article at the determination of the Administrator.



ii. **Responsibilities Along Public Rights-of-Way**

a) **Private Property Owners:** The owner of any tree or shrub on private property that overhangs any public right-of-way within the Town shall prune the branches so that such branches shall not obstruct the light from any street lamp or obstruct the view of any street intersection and so that there shall be a clear space of eight (8) feet above the surface of the street or sidewalk.

b) **Town of Knightdale:** The Town of Knightdale Public Works Director is authorized to prune trees and shrubs from public properties and public rights-of-way.

c) **State of North Carolina:** The North Carolina Department of Transportation (NCDOT) is authorized to prune trees and shrubs in the public rights-of-way owned by the State of North Carolina.

d. **Removal**

i. **Public Property and Rights-of-Way:** The removal by any entity of a tree or shrub that is dead, infected by disease, or determined to be a hazard to public safety and welfare and subsequent replacement may be approved by the Administrator. Trees removed must be replaced in accordance with the replacement provisions of this section.

ii. **Private Property:** Owners shall remove all dead, diseased or hazardous trees and shrubs as well as any broken or decayed limbs which constitute a menace to the safety of the public. The Town shall have the right to cause the removal of any dead or diseased trees and shrubs on private property when such tree or shrub constitutes a hazard to life and property, or harbor insects or disease which constitutes a potential threat to other vegetation in the Town. The

Administrator will notify property owner(s) of the requirement to remove such trees, shrubs or limbs. Removal shall be done at the owner(s) expense within sixty (60) days after the date of service of written notice. Failure of the owner(s) to comply with such provisions shall constitute a violation of this ordinance and shall be subject to the applicable procedures and penalties of Chapter 18.

- iii. **Stumps:** When removing trees and shrubs, stumps shall be removed or ground to a minimum depth of four (4) inches.



4" Minimum Depth

- e. **Disturbance, Damage and Disfigurement**

- i. **In General:** All disturbed, damaged or disfigured vegetation within tree protection and landscaping areas identified in this Chapter shall be replaced to meet the standards of this ordinance as well as the approved site plan.
- ii. **Severe Weather and Natural Disasters:** In the event that any required vegetation is severely damaged due to an unusual weather occurrence or natural disaster, the owner shall have one (1) growing season to replace or replant following the event or following the issuance of a Certificate of Occupancy for any event-related site reconstruction, whichever is later.

- f. **Replacement**

- i. **Responsibility:** Vegetation within a required tree protection or landscaped area that dies within one (1) year of construction completion shall be removed and replaced with new vegetation of equal or greater size by the contractor providing the warrant (Section 8.4G(1)j). Should any vegetation required in a tree protection or landscaped area die after the expiration of the warranty, the property owner shall replace it within 180 days with vegetation of equal or greater size.
- ii. **Plan Approval:** A plan denoting the proposed location and species of replacements shall be submitted to the Town of Knightdale for approval. The Administrator may elect to present the plan to the LURB for final approval.

iii. Standards

- a) **Canopy Trees Eight (8) Inch Caliper or Greater:** Any canopy tree with a caliper of at least eight (8) inches (measured along the trunk at 12 inches above grade) at the time of damage, disturbance, disfigurement or removal shall be replaced with one (1) or more trees which have a caliper of at least two and one half (2½) inches and a cumulative caliper equal to or greater than the original tree.
 - b) **All Vegetation:** All vegetation shall be replaced in a manner that satisfies the applicable type, amount and performance criteria required by this Chapter.
- g. **Inspections:** The Administrator may inspect the site once a year after the issuance of a Certificate of Occupancy in order to ensure compliance with the approved site plan and to ensure that the vegetation and landscaping is properly maintained. The Administrator may issue a Notice of Violation to comply with the provisions of this ordinance if warranted upon an inspection under the provisions of Chapter 18.

8.5 Tree Protection

A. **Required Tree Save Areas:** Trees and existing vegetation shall be preserved in accordance with the table below.

	Tree Save Area	Protection Measures
Priority Tier 1	Floodways Required Stream Buffers Required Buffer Yard Slope Areas Greater than 25% Wetlands	All Vegetation and Soil to Remain Undisturbed <i>In some cases, limited disturbance may occur within the areas to be protected provided all necessary approvals are obtained. Such activities include, but are not limited to the following:</i> <ol style="list-style-type: none"> 1. Mitigation of development activities. 2. Restoration of previously disturbed areas. 3. Utility installations and emergency public safety activities. 4. Construction of a trail or pedestrian walkway that will provide public access. 5. Required Street or Driveway connections.
Tier 2	100 Year Floodplains Front Setback Areas Street Tree Planting Strip Residential Landscaping Areas Required Open Space Slope Areas of 15-25%	All Trees Greater than 12” DBH to Remain Undisturbed, or Replacement trees shall be planted at a rate of 1 tree per 12” DBH, and should be incorporated into open space amenities wherever possible.**
Tier 3	All Other Locations	All Trees Greater than 24” DBH to Remain Undisturbed, or Replacement trees shall be planted at a rate of 1 tree per 12” DBH, and should be incorporated into open space amenities wherever possible.**

** Required street trees, parking lot landscaping, residential landscaping and buffer yard plantings may not be counted towards replacement requirements.

B. **Credits for Preservation of Existing Trees in Parking Lots:** Trees that are saved in a parking lot landscaping area may be credited towards the requirements of Section 8.8. Each tree preserved will require a minimum pervious area around its trunk equal to an area measuring five (5) feet beyond the drip line.

Size of Preserved Tree	Credit Toward Required Plantings
Tree Measuring 6-12” DBH	One (1) Required Parking Lot Tree
Tree Measuring 13-24” DBH	Two (2) Required Parking Lot Trees
Tree Measuring 25” DBH or Greater	Three (3) Required Parking Lot Trees

8.6 Buffers

- A. **Required Buffer Yards:** Required buffer yards are intended to give spatial separation and to decrease visual contact between incompatible uses. To further this intent, at least 40% but no more than 60% each of canopy trees and understory trees, and at least 80% of shrubs must be evergreen. Buffer yards shall be required in accordance with the table below when any use is being established on a property that abuts an existing developed lot or less intense zoning district.

Buffer yards are intended to be constructed along the perimeter of the property; however, when there is irregular topographic conditions such as the perimeter of the property is at a lower grade than the use being screened, the Administrator may require the relocation of the required buffer yard in order to better serve its purpose.

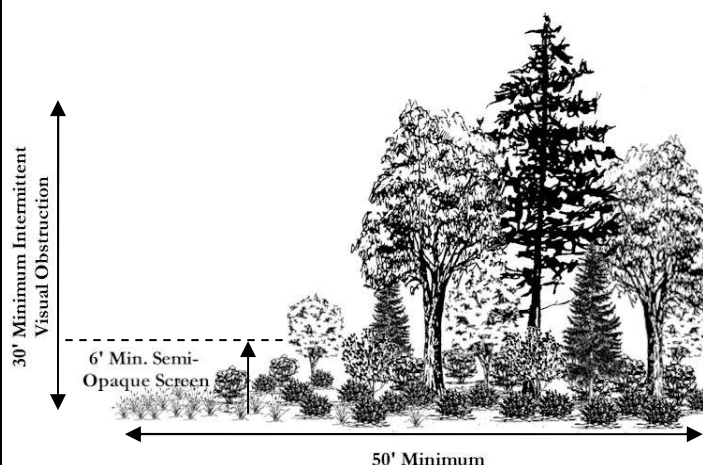
		Adjacent Base District				
		OSP RR GR3 GR8	UR12 RMX	NMX TC	HB	MI
Base District of Proposed Development	OSP RR GR3 GR8					
	UR12 RMX	B				
	NMX TC	C	A			
	HB	D	C	B		
	MI	D	D	D	C	

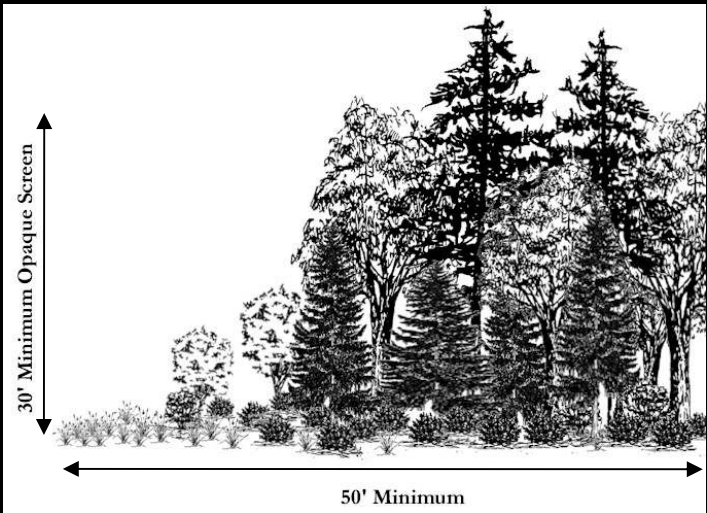
	Buffer Yard not required by Proposed Development
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B. Buffer Yard Types

<p>1. Type A Buffer Yard</p>	<p>The diagram illustrates a 10-foot wide buffer yard. A dashed horizontal line at a height of 4 feet from the ground is labeled '4' Minimum Semi-Opaque Screen'. Above this line, a vertical double-headed arrow indicates a '30' Minimum Intermittent Visual Obstruction'. To the right, a black and white illustration shows a variety of trees and shrubs of different heights and densities within the buffer zone.</p>
<p>a. Minimum Width</p>	<p>10 feet</p>
<p>b. Minimum Height & Opacity</p>	<p>Ground to Four (4) feet - <i>Semi-Opaque Screen</i> Four (4)-30 feet - <i>Intermittent Visual Obstruction</i></p>
<p>c. Maximum Horizontal Openings</p>	<p>Five (5) feet - <i>Semi-Opaque Screen</i> 20 feet - <i>Intermittent Visual Obstruction</i></p>
<p>d. Performance Standard</p>	<p>A buffer which is 10 feet in width and contains screening materials which at maturity provide semi-opacity from the ground to a height of four (4) feet as well as intermittent visual obstruction from a height of four (4) feet up to a height of 30 feet. Vegetative screening materials within intermittent visual obstruction areas shall contain horizontal openings no greater than 20 feet in width upon the plants' maturity.</p>
<p>e. Required Plantings</p>	<p>For every 100 linear feet, there shall be at least three (3) Canopy Trees, two (2) Understory Trees and 20 shrubs. Depending on the species chosen, additional trees or shrubs may be necessary to meet the performance standard in subsection "d" above.</p>

<p>2. Type B Buffer Yard</p>	<p>The diagram illustrates a 20-foot wide buffer yard. A dashed horizontal line at a height of 6 feet from the ground is labeled '6' Min. Semi-Opaque Screen'. Above this line, a vertical double-headed arrow indicates a '30' Minimum Intermittent Visual Obstruction' extending to a total height of 30 feet. The ground level is marked with a horizontal double-headed arrow labeled '20' Minimum'.</p>
<p>a. Minimum Width</p>	<p>20 feet</p>
<p>b. Minimum Height & Opacity</p>	<p>Ground to Six (6) feet – <i>Semi-Opaque Screen</i> Six (6)-30 feet – <i>Intermittent Visual Obstruction</i></p>
<p>c. Maximum Horizontal Openings</p>	<p>Five (5) feet – <i>Semi-Opaque Screen</i> 20 feet – <i>Intermittent Visual Obstruction</i></p>
<p>d. Performance Standard</p>	<p>A buffer which is 20 feet in width and contains screening materials which at maturity provide semi-opacity from the ground to a height of six (6) feet, and intermittent visual obstruction from a height of six (6) feet up to a height of 30 feet. Vegetative screening materials within intermittent visual obstruction areas shall contain horizontal openings no greater than 20 feet in width; and vegetative screening materials within semi-opaque areas shall contain horizontal openings no greater than five (5) feet in width upon the plants' maturity.</p>
<p>e. Required Plantings</p>	<p>For every 100 linear feet, there shall be at least three (3) Canopy Trees, five (5) Understory Trees and 20 shrubs. Depending on the species chosen, additional trees or shrubs may be necessary to meet the performance standard in subsection “d” above.</p>

<p>3. Type C Buffer Yard</p>	 <p>The diagram illustrates a 50-foot wide buffer yard. A horizontal line at the bottom is labeled '50' Minimum'. A vertical line on the left is labeled '30' Minimum Intermittent Visual Obstruction'. A dashed horizontal line at a height of 6 feet is labeled '6' Min. Semi-Opaque Screen'. The area between the ground and the 6-foot line contains various shrubs and small trees. The area between the 6-foot line and the 30-foot line contains taller trees, including a large evergreen and several deciduous trees.</p>
<p>a. Minimum Width</p>	<p>50 feet</p>
<p>b. Minimum Height & Opacity</p>	<p>Ground to Six (6) feet – <i>Semi-Opaque Screen</i> Six (6)-30 feet – <i>Intermittent Visual Obstruction</i></p>
<p>c. Maximum Horizontal Openings</p>	<p>Five (5) feet – <i>Semi-Opaque Screen</i> 20 feet – <i>Intermittent Visual Obstruction</i></p>
<p>d. Performance Standard</p>	<p>A buffer which is 50 feet in width and contains screening materials which at maturity provides semi-opacity from the ground to a height of six (6) feet, and intermittent visual obstruction from a height of six (6) height up to a height of 30 feet. Vegetative screening materials within intermittent visual obstruction areas shall contain horizontal openings no greater than 20 feet in width; vegetative screening materials within semi-opaque areas shall contain no horizontal openings greater than five (5) feet in width upon the plants' maturity.</p>
<p>e. Required Plantings</p>	<p>For every 100 linear feet, there shall be at least three (3) Canopy Trees, five (5) Understory Trees and 20 shrubs. Depending on the species chosen, additional trees or shrubs may be necessary to meet the performance standard in subsection "d" above.</p>

<p>4. Type D Buffer Yard</p>	 <p>The diagram illustrates a buffer yard consisting of a dense line of trees and shrubs. A vertical double-headed arrow on the left indicates a height of '30' Minimum Opaque Screen'. A horizontal double-headed arrow at the bottom indicates a width of '50' Minimum'.</p>
<p>a. Minimum Width</p>	<p>50 feet</p>
<p>b. Minimum Height & Opacity</p>	<p>Ground to 30 feet – <i>Opaque Screen</i></p>
<p>c. Maximum Horizontal Openings</p>	<p>None permitted</p>
<p>d. Performance Standard</p>	<p>A buffer which is 50 feet in width and contains screening materials which at maturity provides opacity from the ground to a height of 30 feet. Vegetative screening materials within opaque areas shall contain no horizontal openings upon the plants' maturity.</p>
<p>e. Required Plantings</p>	<p>For every 100 linear feet, there shall be at least five (5) Canopy Trees, eight (8) Understory Trees and 40 shrubs. Depending on the species chosen, additional trees or shrubs may be necessary to meet the performance standard in subsection “d” above.</p>

C. Berms with a Fence or Wall: Fences or walls with earthen berms may be substituted for half of the shrub requirement in all buffer yard types (Section 8.6B). All berms shall not exceed:

- a slope with maximum rise of one (1) foot to a run of two (2) feet,
- a maximum height of four (4) feet and
- a maximum width of 40% of the required buffer width.

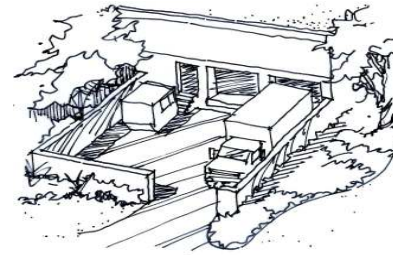
Berms shall be stabilized with a ground cover or other suitable vegetation or permanent slope retention device. Berms taller than four (4) feet shall be approved by the Administrator on a case by case basis, but shall conform to the slope and width restrictions as previously detailed.

D. Special Highway Overlay District (SHOD): The SHOD acts as a buffer yard around freeways within Knightdale’s ETJ (Section 2.15B).

8.7 Screening

A buffer yard’s vegetation requirements may also be used where specified as a screening device to mitigate the negative visual impacts of certain site amenities. Unlike buffer yard, screens are intended to be compact and constructed adjacent to the amenity for which the screen is required. A screen shall not exceed the minimum width specified for the buffer yard (*thereby the minimum width now functions as a maximum width*). Where irregular topographic conditions such as steep slopes, the Administrator may require the relocation of the screen in order to better serve its purpose. Effective screening devices may include solid decorative brick walls, or wood fences with an earthen berm or tight evergreen hedges which shall reach the required height within two (2) years of planting, or any combination of the above. Where sight triangles for drives or streets overlap, these requirements are waived and groundcover vegetation shall be used exclusively. (Exception: Single-family Dwellings and Duplexes)

A. Vehicle Accommodation Areas: Except for driveways and associated parking pads serving single-family dwellings, the sides of all vehicle accommodation areas (*parking lots, loading docks, drive – thru facilities, circulation drives, etc.*) fronting a public right-of-way and sides not otherwise protected by a buffer yard as determined by the Administrator shall be screened as follows to reduce the negative impacts of automobile headlights and glare on adjacent properties.



1. **Parking Lots:** All sides of parking lots shall be screened with a Type A Buffer Yard (Section 8.6B(1)). Sides adjacent to an arterial shall be screened with a Type B Buffer Yard (Section 8.6B(2))
2. **Other Vehicle Accommodation Areas:** Other vehicle accommodation areas shall be screened from off-site view with a Type B Buffer Yard (Section 8.6B(2)).

B. Open Storage

In addition to meeting any fencing or wall requirements in Chapter 3 or Chapter 4 of this Ordinance, any open storage of merchandise, equipment, tractor trailers, materials or goods other than those on display for retail sales shall be screened from view from any street right-of-way in accordance with the standards prescribed for Type B Buffer Yards in Section 8.6B(2), except for in the MI District where such areas shall be screened from view from any internal street right-of-way with a Type A Buffer yard as prescribed in Section 8.6B(1).

C. Above Ground Utilities and Enclosed Containment Areas for Trash and Recyclables

Above ground utilities and enclosed containment areas for trash and recyclables shall be screened by the elements of a Type B Buffer Yard in Section 8.6B(2) that pertain to Semi-Opaque Screens up to six (6) feet in height or the height of the utility or enclosure, whichever is less.



D. Wireless Telecommunication Facility – Tower: See Section 3.3YY for specific information necessary to meet the required additional screening standards.

Images depicting appropriate screening requirements of loading docks (top) and enclosed dumpsters (bottom) in accordance w/ Section 8.7.

8.8 Parking Lot Landscaping

- A. **Purpose:** Parking lot landscaping functions as a tree ceiling providing shelter from sun and rain and minimizing the impact of runoff by providing “green” surface area on which to collect.
- B. **Applicability:** Parking lots with more than 16 parking spaces shall be landscaped. (Exception: Single-family Dwellings and Duplexes)
- C. **Minimum Plantings:** No parking space shall be more than 60 ft from the base of a deciduous canopy tree. In addition, landscape areas shall be provided at the end of each parking row and shall contain a deciduous canopy tree. The use of differing species around the parking lot is encouraged to promote diversity in the overall urban tree canopy.
- D. **Performance Standards:** Deciduous canopy trees shall be planted in a manner that provides shade for the entire parking lot at maturity. Each canopy tree shall be provided with a minimum pervious ground area of 300 square feet for adequate root growth which shall be separated from parking spaces by an 18 inch standard curb and gutter designed to minimize damage by vehicles to plants within the landscaped area.

8.9 Residential Landscaping and Plat Notes

The following paragraphs shall be noted on an approved Preliminary Plat and Final Plat:

Each single-family or duplex lot shall contain a minimum of one (1) canopy tree for every 2,000 square feet of lot area or fraction thereof up to 20,000 square feet in lot area. Any portion of the residential lot occupied by a recorded utility easement shall not be included as part of the total lot area. The location of planting to account for physical conditions may be adjusted by the Administrator.

The use of existing trees meeting the following standards to satisfy this requirement is encouraged. Existing large shade trees measuring more than six (6) inches in DBH may be counted towards fulfilling this requirement.

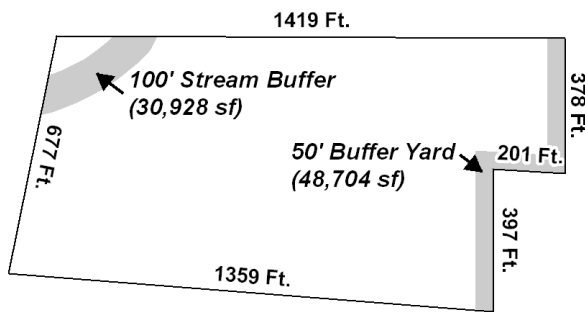
Required street trees (Section 8.8) may not be counted towards the fulfillment of the residential landscaping requirement. Apart from required street trees, all other trees required under this Chapter shall be planted within the private lot.

8.10 Street Tree Plantings

- A. All development shall be required to have street trees along all public rights-of-way in accordance with the illustrations of Street Classification and Design found in Chapter 17. Street trees are not required along public rights-of-way in the Open Space Preserve (OSP) or Rural Residential (RR) zoning districts.
- B. Canopy trees shall be installed at a minimum average distance of 40 feet on-center in a planting strip a minimum of five (5) feet in width. Where overhead utilities exist prior to development, understory trees may be substituted.
- C. Street trees shall be placed at least 10 feet from light poles and 12 feet from electrical transformers in order to allow these utilities to be safely serviced (understory trees may be placed within five [5] feet of such devices).
- D. Street trees shall be deciduous hardwoods and shall meet the criteria set forth in sections 8.3 and 8.4G.

8.11 Overall Tree Canopy

- A. **Applicability:** To preserve and maintain appropriate undisturbed tree cover, and where needed, require the provision of replacement tree cover on development sites.
- B. **Tree Cover Area:** All new development on lots or parcels over two (2) acres must meet the following tree cover requirement during the initial master plan process. A tree cover area equal to the perimeter of the development in feet multiplied by 20 shall be maintained on site up to a maximum tree cover area consisting of 10 percent of the entire site. Any required landscape buffer yards and NRBs (see Section 6.3) may be credited toward this requirement. In the event that the required tree cover area cannot be met with required landscape buffer yards and NRBs, additional space must be set aside.



Example:

$1,419 + 378 + 201 + 397 + 1,359 + 677 \text{ ft.} = 4,431 \text{ ft. perimeter}$
 $4,431 \text{ ft.} \times 20 \text{ ft.} = 88,620 \text{ square feet of tree cover area}$
 $88,620 \text{ ft.} / 1,044,132 \text{ total square feet} = 4.3\% \text{ of total lot area } (< 10\% \text{ max})$
 $88,620 \text{ sf} - 30,928 \text{ sf} - 48,704 \text{ sf} = 8,988 \text{ sf additional space required}$

In this additional space, preference is given to preserving existing trees rather than utilizing new plantings.

C. **Performance Standards for Additional Space:**

1. **Mature Forest:** (100% of calculated additional space required) If not directly adjacent to NRBs or landscape buffer yards, each preserved tree cover area of mature forest must be at least 2,500 square feet with no dimension less than 50 feet wide. To qualify, the average tree canopy height must exceed 25 feet.
2. **Maturing Forest:** (110% of calculated additional space needed) If not directly adjacent to NRBs or landscape buffer yards, each preserved tree cover area of maturing forest must be at least 2,500 square feet with no dimension less than 50 feet wide. To qualify, the average tree canopy height must exceed 12 feet.
3. **Re-planted Areas:** (125% of calculated additional space needed) If not directly adjacent to NRBs or landscape buffer yards, each re-planted tree cover area must be at least 2,500 square feet with no dimension less than 50 feet wide. To qualify, trees must meet the standards for new plantings as found in Section 8.12(B), and the area must be vegetated with three (3) canopy trees and five (5) understory trees per 500 square feet.