TOWN OF CLAYTON

GENERAL DESIGN GUIDELINES

A POLICY MANUAL

Guidelines to Enhance Community Appearance
and
Protect Natural Resources

Adopted February 20, 2006

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INTRODUCTION

Design Guidelines seek to identify elements of good design, which will enhance the appearance of the town and make it more livable. The framework of general guidelines to be applied to all development together with specific guidelines for specific land uses and parts of the town allows more aspects of design to be systematically considered. Consolidation of guidelines, which represent the contemporary concerns of citizen review bodies, staff practice and Council direction is intended to make the guidelines more readily available to the development community and the public.

These guidelines have been prepared in conjunction with the Town's newly adopted Unified Development Code (UDC) and are intended to clarify the visual aspects of the built environment as it relates to residential and economic development objectives in a way that is sensitive to the areas scale and character. It should be noted that the design guidelines do not prescribe specific architectural styles or images, nor do they encourage direct imitation of the past, or radical departure from the existing design context. There are many appropriate design considerations to a given situation. These guidelines are most concerned whether a project or site plan is in context/character with its surroundings, patterns and rhythms with a design that will contribute to the quality of the Town.

Design guidelines are flexible in order to respond to the unique set of circumstances of each site and type of development and to balance the many elements, which go to into a design. Reasons for deviating from the Design Guidelines should be compelling and clearly stated in the public record. Otherwise, a project or a request for a building permit may be disapproved for failure to meet the Town's land use policies.

These guidelines provide a basis for making decisions about the appropriate treatment of new construction and land development. Property owners, real estate agents, developers, tenants, architects and decision makers should use the guidelines contained in the document when considering a project. This will help establish an appropriate direction for its design. For any project subject to review, the applicant should refer to the guidelines at the outset, to avoid planning efforts that later may prove to be inappropriate.

Water Fountain

Wagner House

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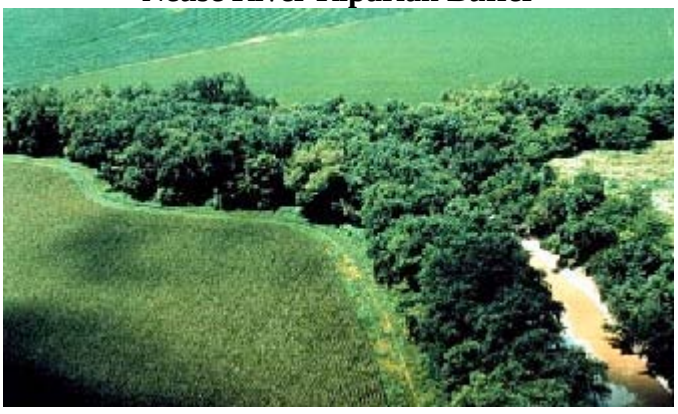
Neuse River Riparian Buffer



II. DESIGN GUIDELINES FOR SPECIFIC LAND USE

Riverwood Greenway Path

SITE PLANNING: GENERAL CONISDERATIONS

A good site plan creates an environment that is pleasant for human use while preserving the positive physical aspects of the site such as views, mature trees and historic buildings, and minimizing its physical problems such as flooding or noise. Compatibility of proposed uses with existing adjacent uses and the needs of the town as a whole is also a primary consideration. Site plans should indicate location of mature trees; location, use and stories of adjacent buildings and other significant site features. Photo montages, computer simulations, scale models, and/or detailed pedestrian-level elevations may be needed to assess the fit of the proposal with the site. A pre-application conference can help identify special site considerations and aid subsequent design.

- Use design to protect and feature the unique aspects of a site such as waterways, significant trees, public open space, views and/or sense of history.
- Cluster development in order to maintain continuity of open space, to shape more usable outdoor areas, and to avoid more hazardous areas such as floodplains.
- Give special attention to those parts of a development, which interface with public environments such as street frontages or parks. Scale landscaping and setbacks should be related.
- Site activities to avoid possible conflicts; one use can buffer another from nuisances such as noise and traffic.
- Site new buildings and landscaping to transition gracefully to permanent development around them and to preserve privacy of adjacent residential uses.
- Coordinate development to secure mutual advantages such as sharing curb cuts, parking lots and plaza areas.
- Consider a proposed development from all aspects; e.g., the roof equipment may be visible from units above a proposed structure, or a critical view corridor may be endangered.
- Encourage landmarks such as cupolas, steeples, towers, special roofs, or chimney forms for significant buildings, centers or transportation hubs to provide points of orientation.

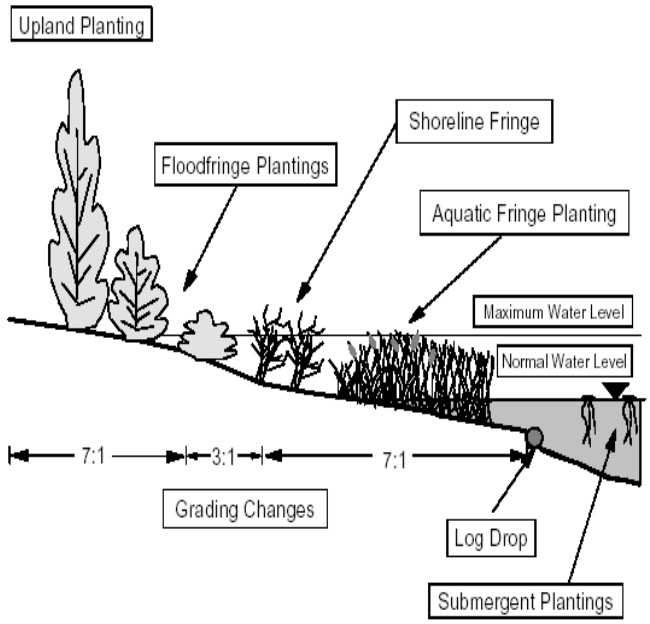
SITE PLANNING: LANDFORM

Open Space Cluster

Development must reflect landform in order to contribute to an attractive pattern for the town and to avoid problems of erosion, flooding, sliding and siltation.

- Clearly indicate portion of the site to be graded and calculate approximate percent of site to be graded on submission or review.
- Clearly indicate grades on adjoining land that may be affected. Fill must not create drainage problems for adjoining property.

Wet Detention Ponds can be Beautiful



Grading Scheme for Wet Detention Ponds

Pervious Pavers

SITE PLANNING: DRAINAGE

Grading alters the natural drainage patterns of the site. Provision for drainage must therefore be made when planning the site, to insure that all on-site drainage is through areas designed to serve this function. Surface runoff can then be disposed of without erosion or sedimentation and may be collected for use in water features.

- Set back development from creeks to allow riparian vegetation to control erosion and slow water runoff. Setbacks off perennial and intermittent streams must be 50’.
- Use grading techniques to retain as much run-off on site as practical, allowing for percolation in detention basins, dry wells and porous surfaces.
- Implement, review and add protective measures to insure trees within the Neuse Protective Buffers are maintained.
- Consider porous paving materials, e.g., interlock pavers, porous asphalt mixes, decomposed granite, and turfblock as consistent with required load bearing capacity.
- Sedimentation and Erosion Control BMPs (best management practices) should be utilized to the maximum extent possible.
- Establishment of a robust cover of vegetation is essential to the proper functioning of engineered drainage structures such as grass lined channels, detention basins, and wetlands.

TREE PRESERVATION

Mature trees and shrubs help control erosion and provide immediate shade and character to a new development.

- Retain existing healthy, mature plant materials as much as possible, especially large trees. A certified arborist should develop a preservation program for significant trees on large parcels.

- Maintain the level of soil around the tree and original water supply levels. Protect the root zone of trees as determined by the drip line of the tree and eliminate compaction of roots by heavy equipment.
- Landscape plans should identify areas of tree preservation as well as areas of replanting. Within planting areas the common and botanical names of proposed species, number of plants, size, and proposed location should be indicated.
- Large tracts of land (greater than 5 acres) should preserve at least 20% of on site forest growth.
- Use decorative annuals in locations with high visual impact.
- Use native species in natural areas and along greenway corridors.
- Coordinate tree placement with roadways and existing lighting to minimize competition. Be sure to utilize the mature size of trees.

Benefits to Clayton citizens derived from tree protection and replanting include:

1. Improved erosion control.
2. Moderation of storm water runoff & improved water quality.
3. Interception of airborne particulate matter and the reduction of some pollutants.
4. Enhanced habitat for wildlife.
5. Reduction of noise and glare.
6. Climate moderation.
7. Aesthetics and scenic amenity.
8. Increased property value

Tree Protection Zone

- Planting – Tree and shrub planting should occur between Oct 15 through Dec 15 and from Feb 15 through Apr 15.
- Trees should be provided with a 6’ mulch area. Where possible, locate trees within a continuous mulch bed for ease of mowing.
- In general, locate trees a minimum of 5’ from paved areas.
- Use ornamental plantings conservatively and at locations to maximize their benefit: pedestrian ways, building entrances, outdoor seating areas, and places where people congregate.

SITE PLANNING: NOISE CONTROL, MICRO CLIMATE AND AIR QUALITY

The site plan can minimize the intrusion of loud noises by utilizing noise buffers, by separating incompatible use, and by locating proposed uses in areas where they will be most compatible with surrounding noise levels.

The micro-climate can be modified through careful siting of structures, land forms and vegetation, improving outdoor living conditions and reducing energy demands for heating and cooling.

Air quality can be maintained and noise reduced by providing for pedestrian, bike and transit transportation, and by judicious siting and landscaping decisions.

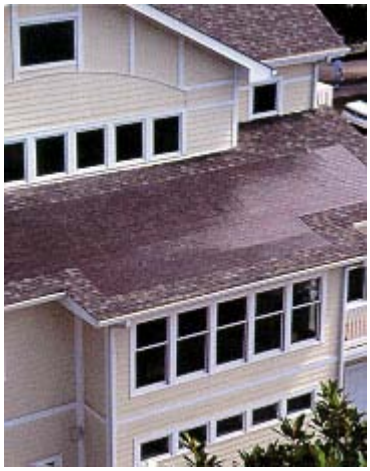
- Buffer noise with planting in conjunction with berms or walls. Vegetation alone is not an effective physical buffer. Visual screening of noise sources reduces perceived sound levels.

Wall for Noise

- Utilize orientation to deflect sound from sensitive uses like group open spaces.
- Design new buildings to prevent transmission of outside noise, minimize equipment noises, and minimize noise transmission between units.
- Protect exposed areas from prevailing winds with evergreen windscreens.
- Use deciduous landscaping to maximize winter heat gain on south side while minimizing summer heat gain.

Tree Protection Measures

- Locate areas used for intensive human activities such as sports fields away from significant air pollution sources and filter pollutants with mounding and landscaping next to emission sources.
- Roof-mounted solar collectors should be placed in the most inconspicuous location without reducing the operating efficiency of the collectors. Wall-mounted and ground-mounted collectors should be screened from public view with material that is compatible with the building's architecture.



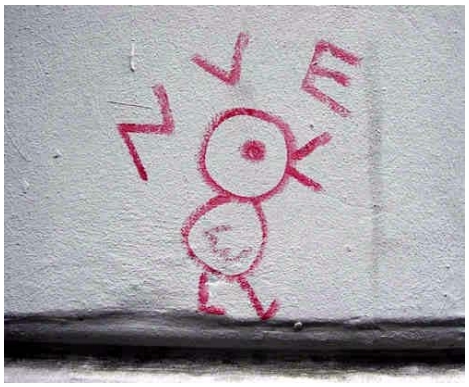
Solar Panels

SITE PLANNING:
OUTDOOR USE SPACES, SAFETY AND GRAFFITI

The placement, size and proportions of outdoor spaces should relate to their function and to associated indoor spaces to maximize utilization. Outdoor spaces cut off from the building they serve by driveways and parking are rarely useful as outdoor living spaces except as sports courts.

When outdoor space has clearly defined boundaries and a strong relationship to particular structures or cluster of structures, there can be a sense of proprietorship for the space by the owner or use of the structure, which discourages crime and encourages uses and maintenance of the space. Cluster units within larger complexes to create semi-public outdoor use spaces with amenities such as seating, thus creating a sense of community.

- Configure building so that adjacent open spaces are visible and easily surveyed. Greater surveillance and safety result from encouraging a variety of uses. Minimize remote, inaccessible outdoor spaces.



Graffiti

- Locate uses most sensitive to noise away from noise sources; avoid enclosing noise-producing facilities such as parking lots or swimming pools with living units.
- Consider visual access for police patrol in siting of parking, buildings and selection of vegetation. Doorways and addresses should be visible from major circulation routes and lit at night.
- Extend building territories into outdoor uses spaces with special landscape treatment such as trellises, paving, low walls or planting edges.
- Provide separate identifiable entries for each unit wherever possible with private control of that space clearly indicated by the layout.
- Consider safety along primary circulation corridors between parking and entries. These routes should be well defined, well lit and visually accessible.
- Where security is a concern, limit access into central open spaces to a few major entries and channel pedestrians past activity areas such as building manager's office, recreation facility or seating area for casual surveillance.
- In areas where graffiti presents a problem, consider painting surfaces with special paints designed to stop graffiti from adhering to surfaces.

MOBILITY:
GENERAL CONSIDERATIONS

Streets and pathways are special corridors providing for movement of people and goods, but they are also very important to commerce, socializing, visual orientation and town image.

- Developments linked by the street system should make their contribution to a harmonious streetscape, with adequate sidewalk space and landscaping.
- Improve entrances to Clayton with visually appealing landscaping, walls, and other monuments to show community pride.

Attractive Parkway

- Developments linked by the street system should make their contribution to a harmonious streetscape, with adequate sidewalk space and landscaping.
- Maintain good visibility at street corners.
- Extend existing street patterns for efficient circulation, while avoiding offset intersections.
- Design new streets to provide views of adjacent public open space. Open space visibility is essential to realize the value of these amenities and to maintain safety of park users.
- Enhanced planting, as well as monument signage, the removal of overhead lines and consolidation of other signage can contribute to an improved sense of entry.
- Developments located along potential urban pathways, bikeways or trails as shown in the Community Plan or Clayton Recreation and Park Master Plan should provide suitable linkages to Clayton's neighborhoods.
- U.S. 42 & 70 entrances into Clayton from the east and west are especially in need of a major landscaping and visual improvements overhaul. Greater visual separation in traffic lanes through median improvements is needed.

U.S. 70 Landscaping Needed

- Restrict number of curb cuts to ease traffic and pedestrian flow on arterials and in commercial areas. Utilize alleys or shared driveways to service parking and deliveries. Do not allow loading areas to dominate street frontage.
- Identify major auto entry points by special paving, lighting, signage, or landscaping.
- Accentuate creek crossings with attractive railings and narrowing of roadway where feasible by eliminating parking lane.

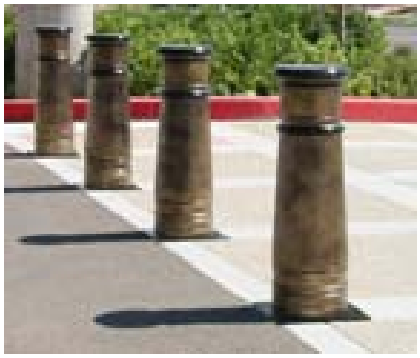
GENERAL CONSIDERATIONS CONT.

New developments should contribute to a functional and cohesive streetscape with well designed driveway connections and appropriate street landscaping. Street design must also be sensitive to terrain, especially in the hills and at creek crossings. A view of Clayton's permanent open space, and other orienting features or landmarks must be considered in street layout and planting designs.

- Provide planter strips for street trees on residential collector and arterial streets, and tree wells on commercial collector and arterial streets.

Tree Wells

- Provide for access by emergency vehicles. If emergency access is provided via pedestrian space, ensure removable bollards are spaced 36" apart for wheelchair access and to separate vehicular and pedestrian traffic. Required clearance for fire engines may combine driveway width with adjacent unobstructed sidewalk width.



Bollards

- Consider use of special paving of crosswalks to alert drivers on heavily traveled streets. In pedestrian districts, consider reduction of roadway at selected corners to widen sidewalk width, slow through traffic, and increase pedestrian amenity.

- Place bus shelters in highly visible locations near entrances to major employment centers, shopping centers and institutions. Provide turnouts at major destinations where appropriate.

- Design bus shelters to complement the style of the commercial development or residential area in which their located.

Special Paving

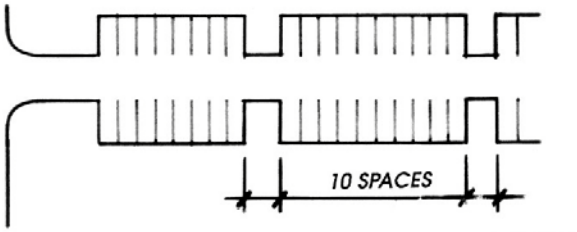
MOBILITY:
PARKING

Parking areas comprise a large amount of the urban open space. Parking should be easily located yet screened by architecture or landscaping to prevent auto storage spaces from becoming visually dominant features of the landscape. Zoning Performances Standards require a minimum of 10' of landscaping between parking lots and a public right-of-way.

- Locate truck docking and loading areas to prevent interference with traffic.
- Screen parking lots along streets by changes in grade, berms, walls, and/or planting.

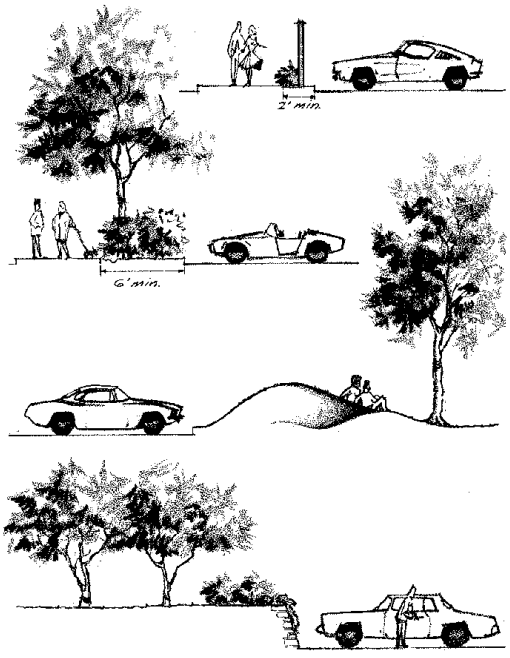
Well Designed Parking Lot

- Combine adjoining parking lots to minimize driveways on busy streets and gain parking efficiency. Reciprocal easements are suggested.
- Buffer incompatible and adjoining outdoor use spaces with walls and plantings.
- Minimize large expanses of paving by introducing plant materials, particularly shade trees. For small cutouts in paving, be certain to select deep-rooted species.
- Locate parking lots so there is some casual surveillance from the building it serves.
- Vary arrangement of required parking lot trees to relate to the configuration and a style of building and/or to the characteristics of the trees selected.
- Consider 5' by 5' diamond tree cutout wheel stop at the center of four 90 degree opposed parking spaces to provide planting areas without reducing the number of parking stalls.



Use 12' wide landscape bulb for each 10 spaces.

- Emphasize pedestrian safety by providing pathways to move pedestrians to building entrances with ease. Consider crossing zones of special pavement to alert drivers.

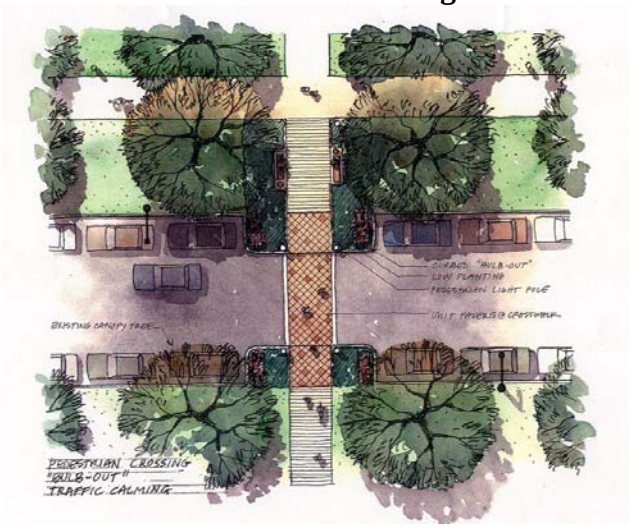


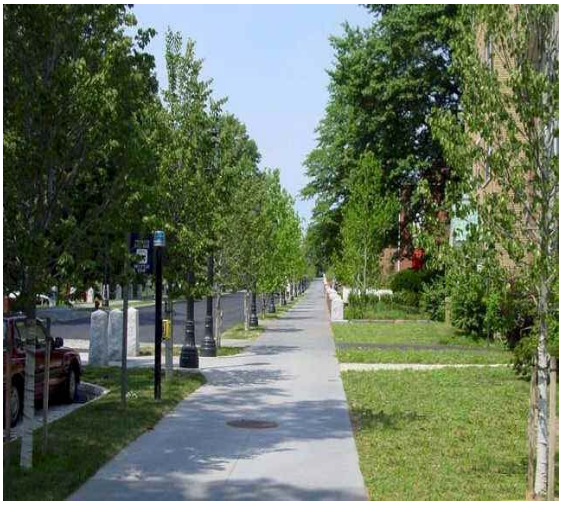
MOBILITY:
PEDESTRIAN WAYS

Pedestrian ways should be destination-oriented, separated from auto traffic, and tailored to the intended use of the path. The primary circulation route should be the widest and most direct.

- Separate pedestrians from heavy traffic with parked cars and street trees wherever feasible.
- Provide walkways from sidewalk to entrances and in large developments, utilize walkways with decorative paving and landscaping.
- Design pedestrian pathways for short walking distances to transit locations, shops, parks, and other walk -able destinations.
- Provide access to creeks or other natural features such as viewpoints where suitable for public enjoyment.
- Orient pedestrian ways with vistas connecting destinations.
- Develop a sequence of spaces in conjunction with the path. Avoid long stretches of sameness and overly large spaces, and provide points of visual interest such as a fountain or other focal features where paths cross or special functions occur.
- Interconnect neighborhoods with commercial and employment centers by utilizing greenways, paths, parks and other areas.

Pedestrian Crossing





Pedestrian Way

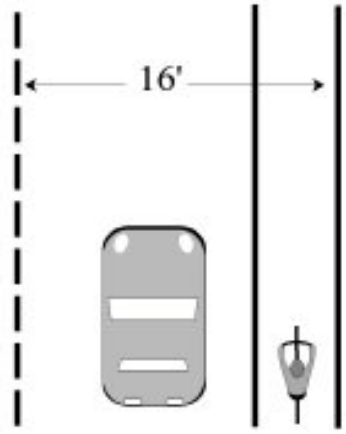
MOBILITY:
BIKEWAYS

Bicycle use should be encouraged with provision of safer bikeways and bicycle storage. Separation of car, bike and pedestrian circulation networks should be designated at the site plan review stage for new developments.

- Keep bikeway opportunities open along creeksides. Provide bikeways or easements for future development as appropriate.
- Design bikeways to connect to transit station bike storage, shopping centers bike racks, schools, colleges and parks.
- Consider provision of bike lockers or locked fenced bike storage for multifamily residential developments where bike storage is not incorporated in design of individual units.

Bike Lane Too Narrow

- Most bicycle/motor vehicle crashes occur at intersections and driveways. Bike lanes should be avoided on streets with complicated intersections, interchanges and where parking obscures visibility.
- Sidewalks should never be designated as a multi-use path for bicyclists.
- Locate bicycle racks in easily observable locations on commercial centers and in parks and near school and office entrances.



Typical Bike Lane

- Bicycle lanes should be one way and should be marked to guide bicycle traffic in the same direction as adjacent motor vehicle traffic.
- Avoid placing bicycle lanes in areas that may terminate abruptly causing bicyclists to make awkward movements in traffic.
- Bicycle lanes should not be striped adjacent to on-street parking due to the hazard of car doors opening into the bike lane space.
- Multi-use pathways can be attractive for novice, child and family cyclists, if properly located and designed.
- Locations of bikeways need to be located on well maintained streets that are free of debris.

Bike Lane – With Debris

ARCHITECTURAL DESIGN: GENERAL CONSIDERATIONS

These design guidelines emphasize compatibility of new construction with existing structures, natural features, and/or specific area plans. No building can be evaluated separately from its context – whether natural land forms or surrounding development. Individual buildings should fit well with existing or planned character of surroundings and should help form a coherent pattern of circulation and open space.

To achieve a comfortable scale, buildings can be organized as a complex of smaller buildings or parts connected by arcades, plazas and paths. At higher densities, a single building can be sculpted to provide identifiable parts.

ARCHITECTURAL DESIGN: HISTORICAL CONTENT

Buildings and places can be "historical" because of association with noted activities and people of the past, or simply because they recall valued periods in the past. Maintaining some of the architectural styles from early Clayton helps give the town a sense of perspective and continuity.

The Clayton Center

Preserving a historical sense of place is not limited to maintaining the architectural style of individual buildings. In order to achieve a cohesive historical form, preservation efforts should include entire block or lot patterns, building massing and new corridors.

- Encourage preservation of historical buildings. Consider adaptive reuse such as using old homes for restaurants or offices.
- Design new buildings in areas of historical character to be compatible with that character in their use of materials, building orientation and building form.
- Design additions to Victorian and other historical buildings to be compatible with the design, concept and details of the original structures.

1910 Clayton Queen Ann

ARCHITECTURAL DESIGN: FORM

The form of a building should derive from the context, interior and exterior functions of the building and the symbolic importance of the building and its components. All components should be integrated into a harmonious arrangement.

Scale is created by the size and proportion of all physical elements that comprise our environment and relationship to human physical dimensions, perception and comprehension. Large buildings can be designed to blend with smaller structures by breaking buildings into smaller components, which relate to heights of adjacent buildings by providing views into interior spaces, and by increasing setback.

- Connect new buildings visually with the form of existing structures. Use colors, materials and a scale that are harmonious with nearby development.
- Increase setbacks for bulky structures from adjacent structures or pathways, except at major intersections where larger buildings may be appropriate.
- Improvements in materials have led to some attractive alternatives to some previously stereotyped products such as vinyl, metal and stucco. Each façade should be evaluated based on the merits of the finished product.

Steel Structure

- Design buildings with public significance such as transit stations and hospitals to have a distinctive profile and /or physical setting.
- Incorporate all the exterior components of a structure – the chimney, the decks, the eaves, the windows – in the overall configuration and form of a building.
- Give special attention to the architectural interest in pedestrian areas by using an articulated façade, sheltered pedestrian corridors and human scale detailing.
- Give attention also to building appeal as viewed from the street by motorist.
- Avoid structures that are isolated from the surrounding environment by parking lots. Tie the building to the ground with terraces, steps and planters.

Utilizing Pocket Spaces

- Create outdoor use spaces, which are partially enclosed by the building(s), defining the open space as a useful entity rather than leftover space.
- Break bulky buildings such as engineered metal structures into components, which relate to interior and exterior functions with variations in height, color and texture.

ARCHITECTURAL DESIGN: FACADE/ELEVATION

Buildings should be designed with all exterior surfaces treated as a whole, and with utility areas incorporated unobtrusively. Building components, such as windows, doors, and eaves, should have good proportions and relationships to one another.

A building should have consistent character on all elevations. Surface treatment on front elevation only generally should be avoided. Entries, storefronts, and housing units should be articulated in the shape of roofs and walls. Flat facades with little or no articulation detract from the aesthetic quality of neighborhoods and shopping areas.

- Generally an offset of at least 30" is needed to break up building mass into components. Large buildings would require larger offset to break up mass.
- Avoid extensive blank walls in neighborhoods and activity centers. Create shadow relief and high shade and light contrast with recesses, bays, trellises or other features.
- Feature building penetrations and projections that are compatible with those of adjacent structures in order to create a rhythm of shadow patterns for the streetscape. Wall surfaces of permanent structures should suggest quality and thickness. Pre-engineered metal shell buildings should be avoided.
- Feature balconies as an integral part of the total design. Balconies recessed into the structure generally offer greater outdoor privacy and avoid a tacked-on look.
- Feature windows by projecting or recessing them for added shadow interest on otherwise uninteresting facades.
- Design development to be attractive from all visible sides by providing consistent architectural detail and landscaping.
- Place transformers, utility meters, pipes, vents, air conditioners, and any other equipment in a way as to avoid detracting from the architecture and landscaping.

Utilities Should be Hidden

- Site plans submitted for approval should show all sides of a proposed structure and not just the front to ensure overall quality in design and materials.

ARCHITECTURAL DESIGN: MATERIALS AND COLORS

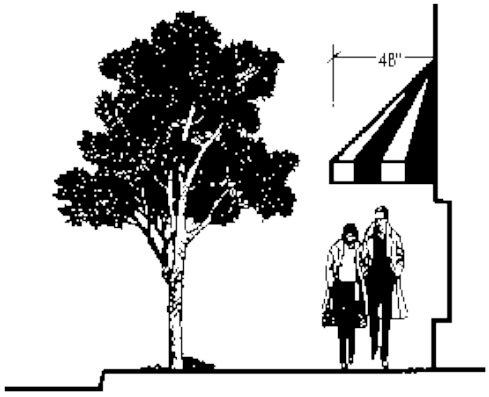
The selection of exterior materials and colors should take into account the existing fabric of the surrounding community.

- Wrap the materials used on buildings around outside corners to avoid a false façade appearance. Utilize materials for additions that relate to original building to avoid a tacked on appearance.
- Select materials that are durable in order to avoid maintenance demands that may not be met.
- Select colors that are harmonious with surroundings and other building materials. Avoid harsh, glaring white or primary colors on large surfaces. Accent colors are encouraged to enliven commercial buildings.

ARCHITECTUAL DESIGN: ENTRIES & AWNINGS

Entries function as a transition from the street or sidewalk to the building and are indicated by distinctive features. A change in grade or paving materials is frequently used along with a change of architectural scale. Overhead elements such as canopies or arbors can also be used to create "gateways".

- Locate the main entrance near the approach to the building so that it is visible as soon as the building itself is visible.

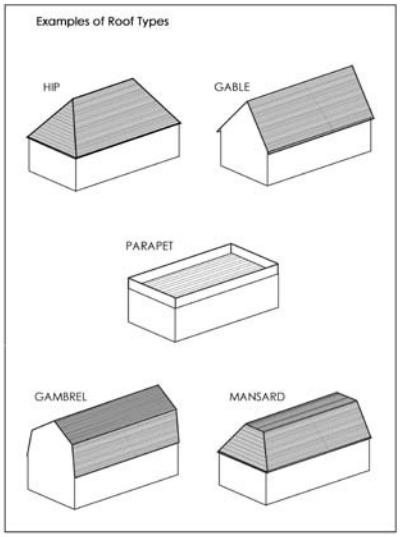


- Consider awnings to provide shade from sun and protection from rain, to protect windows from excessive heat gain and glare, and to give a comfortable, human-scale to entrances. Awnings along a row of contiguous buildings should be related.
- Indicate the entry to a building by changes in the building footprint, elevation and volume, and in the landscaping.
- Avoid narrow or deeply recessed entries and entries hidden under exterior staircases.

ARCHITECTUAL DESIGN: ROOFS

The form of the roof should relate to the form of the building. It should enfold the structure or be integral to it, not sitting on top like a cap. The roof should not dominate the overall design of a building, but should be a significant feature in terms of creating a sense of shelter.

- Avoid "false" roofs, which appear only on the upper portions of the exterior building walls and have no functional purposes.
- Place the most dominant roof form over the most significant part of the building or complex. Roof form should help identify the main entrance of a large building.
- Respond to the general design of other roofs along the street. Avoid adding discordant roof shapes, pitches or material unless the building is appropriately a landmark.
- Continue rooflines around the building unless the building is of a historical architectural type that does not have this characteristic.



- Provide screening for mechanical and electrical equipment as an integral part of roof structure design.

ARCHITECTUAL DESIGN: SIGNAGE

Signs should be employed to identify uses and to offer public information. Signs should be compatible with the adjacent surroundings appropriate to their circumstances, (i.e., motorist or pedestrian-oriented) and in conformance with Town standards. Within those parameters individual and group expression is encouraged and graphic flavor of signs can reflect the individual business or reinforce the identity of an area. Pole signs are discouraged and should only be permitted in situations where the site has significant constraints making other types of signage unfeasible.

- Indicate location and form of signs in application and building plans. Monument signs should relate to the materials and style of the building.
- Keep signs simple. Too many combinations of colors, typefaces, and symbols can result in visual chaos. Signs are more legible if upper and lower case letters are combined and the image area does not exceed 1/2 of the total sign area.
- Keep freestanding signs low, as high signs will be less visible because of street trees; if there are no parked cars, optimum height for viewing by motorist is very low.

Too Busy

- Identify multi-tenant developments by the name of the center and/or the address; listing tenants typically produces visual clutter illegible to passing motorists.
- Keep projecting signs 8’ above sidewalks and if attached to a wall, mounted 6” minimum from face of building. Such signage is appropriate for pedestrian shopping area.
- Paint any awning signage on the awning itself. The awning’s flap or end panels provide highly visible surfaces.
- Draw attention to signs with attractive landscaping, eye level placement on prominent building elements. Avoid pole installations. Preferred monument signs are low, horizontal, with raised lettering set off by flowers, shrubs or lawn.

Attractive Ground Sign

- Ensure areas located along strip commercial development are not conducive to temporary sign clutter by breaking up the space with vegetation and other landscaping.

Temporary Sign Clutter

LANDSCAPE DESIGN:
GENERAL CONSIDERATIONS

Landscaping is versatile. For conservation, landscaping serves to stabilize hills, to reduce runoff, and to retain open space character by blending in development. For climate control, landscaping can be used to provide needed shade or windbreak and to buffer noise, dust and glare. Aesthetically, landscaping can form attractive streetscapes, screen ugliness, add seasonal interest, and frame architecture. Functionally, landscaping defines spaces for outdoor use, circulation and entries. Psychologically, landscaping reduces stress and provides an inviting urban environment.

- Use plant materials to define outdoor spaces such as the street edge or outdoor eating areas, or movement paths between parking area and building entry and to tie buildings into the landscape.
- Plant street frontages with large specimen trees to match existing tree planting or streetscape plans.
- Landscape around the full perimeter of the site adjacent to the property line where buffering of adjacent land use is necessary.
- Screen parking areas, utility areas and retaining walls. Select forms, quantities and varieties of plant materials suitable to adequately cover areas.

Well Landscaped Entrance

- Design landscaping uses near entry/exit points and circulation routes to permit adequate sight distance for motorist and pedestrians entering or exiting the site.
- Include an adequate sprinkler or irrigation system in landscape plans with fully automatic systems for commercial, industrial and residential projects. Design irrigation systems for deep root development, and water conservation by thorough, infrequent watering
- Minimize use of materials such as crushed rock, redwood bark chips, pebbles and stone or masonry slabs in place of live plant material. Live plant materials moderate the climate, improve air quality, provide seasonal interest and relive hard urban forms.

Incorporated Sprinkler System

LANDSCAPE DESIGN: WALLS AND FENCES

Walls fill a number of roles in the landscape. They serve to screen obnoxious visual elements and limit sonic intrusion. They retain slopes and provide safety from hazards or heights. Walls can create sheltered microclimates in windy areas and define territories, whether for a private residence or a neighborhood. They may also be an obnoxious visual element if they block significant views, provide a surface for graffiti, or are out of proportion
to the project.

- Consider low walls to suggest spatial separation or definition of territory such as seating walls or planting walls.
- Allow for surveillance by police and emergency access when planning security fences and gates. Use wrought iron or case iron fences and gates in prominent locations instead of chain link.
- Provide a 6'-8' masonry wall and landscape buffer for noise attenuation and visual screening, e.g., where commercial loading or parking areas abut residential use.
- Reduce the perceived scale of high walls with planters, benches or berms. Consider a series of lower walls and/or riprap as an alternative to a single overbearing retaining wall.

Alternative to Chain Link

- Where significant views would be blocked or pedestrian routes cut off, limit use of sound and privacy walls. Utilize berms, greater setbacks and plantings to provide privacy while preserving views and pedestrian options.
- Provide a 10-foot-wide landscaped area in front of walls abutting a public street.
- Avoid long monotonous walls. Vary the height, elements and alignment of the wall; include gates or other penetrations; repeat modular patterns along the length of the wall.

- Design walls to complement adjoining architecture in materials, detail and proportion.

Plant Ivy To Blend In Fence

- Modify chain link fencing where its appearance is objectionable. Color coat fence dark green or black where transparency is desired for view of open space. Where screening is desired, vines can transform the fence into a green wall.

LANDSCAPE DESIGN: PLANT SELECTION

Selection of plant materials should be based on year-round interest (deciduous, color, spring flower, fruits, branching pattern) as well as form, texture, shape and ultimate growth. The plant materials should provide pleasing combinations of trees, shrubs and ground covers. Plants should be of a size that will produce the desired effect within a reasonable period of time.

- Retain native vegetation and use drought-tolerant plants to reduce the demand for irrigation.
- Select plant species that are tolerant of site conditions and relatively free from pests and disease. Consider maintenance requirements.
- Select plants of the appropriate size for the intended use, maintaining clearance for doors, windows and walkways.

- Avoid trees with aggressive roots near paving. Avoid placing plant materials near or over underground utilities if they have root systems that characteristically damage underground pipes.
- Control erosion by planting fast-growing plants for quick soil coverage as well as slower-growing, longer-lived plants.
- Select plants that complement existing themes in the area and architectural design. Taller trees soften the line of stark towers while spreading trees may complement low horizontal development.
- Encourage flowering species of trees and plants to help soften the urban landscape.

Native Wisteria

- Select plants compatible with activity in area. Near walkways, parking lots or outdoor use areas avoid invasive plants, poisonous plants, or plants with thorns, sharp leaves, messy fruit drop or brittle branches.

Mixed Use of Plants

LANDSCAPE DESIGN: LIGHTING

Night lighting has several functions in addition to contributing to safety and security for drivers and pedestrians. It can be used to identify important civic buildings; it can be used to convey a private image for commercial or residential developments; and it can be use to increase the use of public places at night.

Diffused lighting, the creation of a both of soft, shadow less light, may be attained by mounting flood lamps high in trees or on building walls. Such illumination can have application in park and plaza lighting.

Architectural lighting can be used to accent special features such as towers, cornices or columns. Spots can also be used to silhouette attractive tree forms. Night lighting must be selective to be effective and not crate a nuisance for residences.

- Light premise identification for rapid emergency response and minimal confusion of visitors.

Architectural Street Lamp

- Minimize impact of site lighting by use of down lighting and controlled sign lighting.
- Shield lights on urban streets for privacy in upper story residences. Lower level lights can be hung on street light poles for sidewalk illumination.

URBAN AMENITIES

Telephones
Public telephones are essential to many people. Plan telephones as part of the building rather than a separate structure. They should be covered and shielded from major street noise, yet visible. Adequate lighting should be provided in the telephone area for nighttime use.

Tree Guards and Grates create a desirable urban ambiance. Tree guards provide trunk protection to young trees, and grates allow water infiltration and oxygen exchange. They should be selected to accommodate tree growth.

Tree Guard

Public Art (such as sculpture, fountains and tile work) in heavily used spaces is strongly encouraged to give unique character to the space, to provide meeting places and orientation points, and to build a stimulating urban environment.

Public Art

LANDSCAPE DESIGN:
SITE FURNISHING

Site furnishings should be made of high quality, durable and low maintenance materials. Provisions for long term maintenance, on a regular basis, need to be considered.

Surfacing

Surfacing materials strongly influence the usability and comfort of a space as well as its aesthetic quality. Textural qualities of modular paving materials can scale down large spaces; distinctive paving can direct or orient uses, and color variations in pavement can enliven and distinguish outdoor use spaces.

Arbors

Arbors can be used to keynote entries to buildings and spaces or act as gateways to large developments. They can provide protection from sun or rain, define a special area, provide privacy from overlooking units, and soften paved surfaces with shadow patterns and overhanging plants.

Attractive Arbor

Water Fountains

Water fountains help give an inviting feeling to public places such as downtowns and parks. They should be placed in visible and easily accessible locations.

Seating

Benches should be provided in places where people might want or need to spend time. They should not be located where they would obstruct pedestrian movement. Back support and armrests provide more comfort for adults and the elderly, and are essential to many disabled individuals. Set back seating a minimum of 24” from walks in order to avoid interrupting adjacent pedestrian traffic.

Public Seating

Trash Receptacles

Trash receptacles should be durable, covered and placed where they are visible and most likely to be needed, but not so they are obtrusive.

Trash Receptacle

Pots and Planters can offer seasonal display and keynote special features, such as entries.

RESIDENTIAL:
GENERAL CONSIDERATIONS

Residences are the most personal of spaces to be designed. Because people's preferences, needs and financial capabilities vary widely, it is generally desirable to offer a wide range of housing choices in order to accommodate the town's residents in the most satisfactory ways. New housing should support Clayton's expressed policy of encouraging long-term residency. It should add to the attractiveness of the area where it is located and provide a residential setting that will remain desirable for the type of resident it is designed for – families or singles; residents seeking transit and shop accessibility or residents seek a natural setting; people for whom home is an escape or people for whom home is a business location.

Because the remaining sites for housing in Clayton are not always configured for standard parcelization or unit arrangement, the best development patterns may be unique to the site. These Design Guidelines cannot suggest all possible housing arrangements, but do provide general design principles for developments which respond to the site (e.g., provide transitions to adjoining development, feature usable or natural open space, provide solar access, etc.) As the orientation of housing affects the way in which residents see themselves as part of a neighborhood, the connection development makes to the public realm of streets and parks is critical.

Illustrations below begin to suggest the range of housing configurations, which may respond to particular locations and resident preferences.

RESIDENTIAL:
SINGLE-FAMILY DETACHED

***Subdivision Pattern*:**
The layout of a new subdivision is important to the livability, serviceability and contribution to the overall attractiveness of the city.

- Design new street patterns and classifications to be continuous with existing adjacent patterns and appropriate to the site terrain. Avoid structures which discourage transit, pedestrian and bike travel. Provide for short walking distances to bus stops, schools, and shops and collector streets suitable for bus service.
- Minimize curb cuts on busier streets. Consider alley access to parking or shared driveways with turnaround on site.

Private Open Space

- Provide access to and views of existing parks and creeks. Save natural features of a site by varying lot sizes and shapes, and cluster development to preserve valuable open space.
- Do not create negative view corridors, such as a street ending at a blank wall or a dead end that cannot be extended.
- Consider nonstandard lots to provide more private open space.
- In Clayton's climate, outdoor space should be designed as part of daily living space. Detached housing should make good use of its outdoor access.

Parking:
The Town generally expects two off-street parking spaces plus provisions for one guest space per house. Central areas with pedestrian access to transit and shops may require less pavement.

- Locate driveways to allow on-street parking spaces on streets with parking lanes.
- On-street parking should be avoided to the maximum extent possible.
- Limit garage to less than 50% of structure frontage in order to maintain living spaces overlooking the street.
- Consider alley access to parking, use of tandem parking or shared driveways, especially in central neighborhoods, to avoid excessive paving of frontage and loss of windows overlooking the street.

Typical Suburban Home

- Design and incorporate adequate storage facilities into single-family home construction in order to avoid garages being utilized for storage purposes instead of parking.

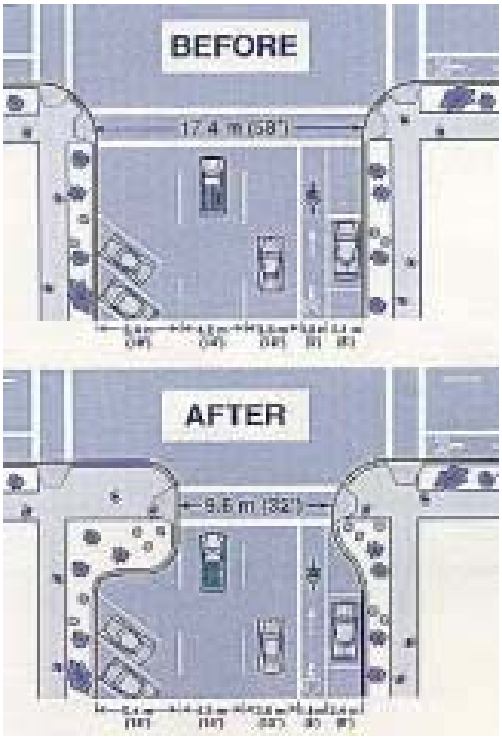
Architecture:

Architecture should respond to the characteristics of the site and adjoining homes to create a harmonious look for an area. The individuality possible in lower density development should also be expressed with a variety of compatible forms, layouts and materials.

- Avoid unrelated bulk and height in the placement of one and two-story structures. One-story transitional elements should be included where second stories are being added in predominantly single-story neighborhoods.
- Avoid locating identical units adjacent to one another. Several floor plans and elevations should be used in developments.
- Alternate roof lines and changes in directions to create a sculptural interest while maintaining compatibility of roof forms.
- Feature entries and windows; bay windows are allowed to extend into front setbacks. Entry and house number should be clearly visible from the street.
- Maintain privacy of adjacent homes by sensitive window placement. Avoid placing windows directly opposite each other in side yards, especially projecting bay windows.
- Take advantage of good views and natural light for living areas.

Variations in Roof Forms

- Provide for visibility of street from a living area in order to maintain the social functions of the street (which include informal surveillance preventing crime).
- Downtown pedestrian orientation is improved by the creation of pedestrian corners or refuges at street intersections and mid-block crossings.



Safer Corners/Crossings

RESIDENTIAL:
ATTACHED, MEDIUM DENSITY

New attached medium density residential housing typically takes the form of garden apartments, townhouses or duplexes.

Maintenance of individual identity of units and the treatment of parking are important. As densities increase, care should be taken so that car uses do not dominate the site or front elevations at the expense of the social functions of the street, aesthetics or open space. Landscaping along the street is very important to the visual appeal of the development.

Parking:

Where possible, parking should be located where it is unobtrusive and does not isolate the project. Unless the adjacent uses are considered incompatible with residential uses, the extent of perimeter parking drives should be minimized. Decorative paving, landscaping and curved alignments for driveways make them more pleasing.

- Adjust the form of parking and homes so as to create centrally located usable open space to have entries or living spaces overlooking street space. Parking should not dominate street frontage. Windows and entries should be featured rather than garage doors.

Architecture

Generally, continuity in the style of all structures within a project, including housing units, parking structures, recreation facilities, and entry features, creates a sense of community and harmony. In some areas a variety of architectural styles within a large project may help it blend with neighborhood architectural themes. The amenity of the individual units should also be carefully designed.

- Break up parking areas into small lots or garages to keep a residential neighborhood character.
- Separate surface parking from dwelling units with landscaping consisting of low growth vegetation.
- Limit percentage of the total site for paved street, parking, drives, parking courts, or access roads to approximately 25% (not including parking located beneath dwelling units).

Quality Building Materials

- Generally utilize a consistent design theme with compatible materials and colors. Special durable details which relate to the design theme give character to the development.
- Utilize a design theme that is suited to surrounding topography or neighborhood. Buildings with pitched roofs and overhangs are generally found more attractive and homelike in Clayton.
- Articulate individual units in multifamily structures; avoid large, flat wall surfaces, and long continuous roof lines.

- Create individual entrances by recesses, landscaping or architectural detail.
- Maintain privacy of individual units. Facing living room windows should generally be at least 35' apart to provide at least one view window. Avoid second-floor views into adjoining ground-level patios. Besides visual contact, privacy requires control over noises, lights and odors.
- Place wall extensions, windows, doors and roof treatments such as arbors or trellises so as to visually expand inside rooms out to decks or patios.

Private Open Space

The common open space system connects unit entrances spaces with outdoor use areas, and the town beyond. The configuration and size of open space should respond to the site (mature trees, topography…) and the number of units served. Group open space may be waived in small developments that provide superior private open space.

- Create group open spaces that visually link the individual buildings making up the cluster, that serve uses like children's play and barbecue areas, and that have good solar access and protection from wind and noise.
- Screen trash areas from ground level view as well as from over-looking views. Provide adequate storage space for recyclable materials.
- Provide pleasurable pedestrian ways oriented towards community facilities such as shops or schools.
- Seek to permit views to adjacent open space. For example, a low fence, permitting a seated person to look through or over.
- Locate intense use common open space away from private open space. Buffer private open spaces from any adjoining parking areas with fencing and landscaping.
- Design open space around any natural features such as mature trees, rock out-cropping and creeks to give character to the landscape. Naturalistic landscaping with curving pathways, water features and informal planting arrangements are generally appealing
- Design decks carefully as they affect the light admitted to lower levels of building and neighbor's privacy.

Connect Natural Areas

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RESIDENTIAL: INFILL / DOWNTOWN

New development, which is less than a block in size and occurring in a developed area, is considered "infill" unless there is a plan for redevelopment. Infill development should be related to the best features of the surrounding neighborhood and be particularly sensitive to adjacent development when it is of greater intensity or scale than existing development. There should be no abrupt changes in height or mass, specifically; no multifamily structure at minimum setback should be over two stories where immediately adjacent to a single-family home of lesser height.

- Consider privacy of neighbors. If feasible, new upper level units should not overlook or shade the primary outdoor spaces of existing dwellings.
- Trash enclosures, entries to large parking areas and active recreation areas should be located away from adjacent houses.
- Maintain continuity of street frontages with related roof lines, entries, materials and landscaping.

Clayton Downtown Infill

- Maintain equal or greater street setbacks. Taller, bulkier building should be set back further. Location and stories of building on adjacent parcels should be included in plans submitted.
- Encourage joint development of neighboring properties to minimize driveways, to provide for better emergency access, and to provide better sites for housing and open space where such development will not detract from historic character of neighborhood. Deep narrow lots must be combined to get the maximum density allowed under the zoning classification.

RESIDENTIAL: INFILL/ REMODELS

- Maintain a neighborly pattern of front doors and living area windows towards the street, with the building screening parking areas in the rear. Front yard may be defined as an outdoor use area with a low hedge, seating walls or other landscaping that retains a filtered view of the street.
- Make automobile circulation area into a pleasant courtyard for multiple use by landscaping unused backup areas, utilizing attractive pavement and providing recreation amenities.
- Articulate individual dwelling units with entry and roof forms.
- Consider combining some units to form larger units. In addition to the amenity of more spacious units, lessened parking requirements would allow more open space, creating more desirable units for long term residency.
- Take advantage of small lots, alley parking, shared green spaces and reducing off street parking requirements.
- Pedestrian connections should be strengthened between the downtown area and neighborhoods to the north and south by extending sidewalks.

Attached Infill Development

RESIDENTIAL: HIGH DENSITY

High density residential development should be designed for compatibility of scale with surrounding uses and livability. Large buildings can be designed to blend with smaller structures by reducing bulkiness into smaller components, by providing visual penetrations to interior spaces and courts, and by use of overhangs, indentation, arches, etc.

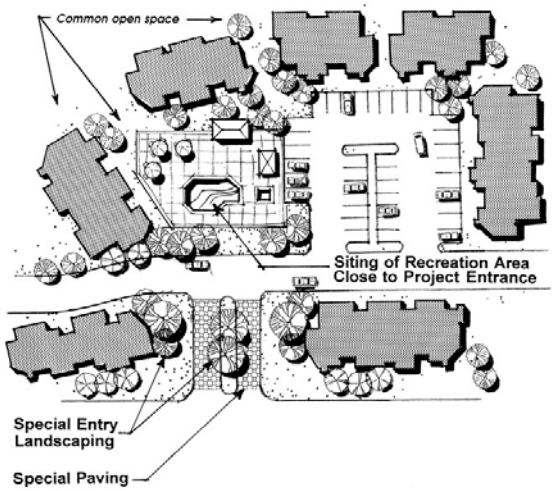
High-density housing should typically be a part of an activity center or located on a major transit route with nearby shopping. The design of residences in an activity center should have a distinctly urban character, contributing to a lively pedestrian orientation.

- Maximize continuous street frontages with distinctive pedestrian oriented entries.
- Create vistas with building configuration and link to pedestrian network. Views into project open space help connect the project with the rest of the town and add interest to the streetscape.
- Consider awnings or overhangs to shelter pedestrian space on principle paths/sidewalks.
- Choose amenities appropriate to potential residents. Older residents may be drawn by the convenience of easily accessible stores, restaurants, medical facilities, attractive outdoor seating areas, security features and elevators.
- Developments likely to have children should provide outdoor play space and consider the incorporation of a childcare facility. Party rooms, pools, spas, and exercise facilities are appropriate to developments.
- For mixed use development, provide distinctive entries for each use. Different hours of use and separate management should be anticipated.

Open Space

Common open space should be designed as centrally located outdoor use area. Open space that is the result of setback requirements serves little usable purpose without screening or other definition of space. Decks and balconies provide relatively private, desirable areas for outdoor activity and relaxation if well located and designed.

- Vary private open space to suit unit location and to provide variety, with some larger and some more enclosed.
- Develop interior courtyards sheltered form traffic nose. Avoid paved court configurations that sustain echoes.
- Break up expanses of open space with berming, planters, walks and overhead elements such as arbors, awnings and trees.
- Mitigate noise and wind problems; consider safety glass screen to retain views.



HIGH DENSITY CONTINUED

High density housing involves greater separation from the ground level. The hallway or corridor spaces should receive special design attention because it is used to access each home. Because homes are normally bounded on two sides by adjacent units and hallway, or a landing on a third side, the amount of exterior wall that may be utilized for windows and ventilation is reduced and needs artful articulation with bays, alcoves, corners and setbacks. Access to open space and maintenance of privacy and security also need careful design attention.

- Avoid long monotonous facades. They result in relatively unusable open space and create a negative community image. Step structures and vary heights to reduce bulk and give individuality.
- Do not provide access via common exterior corridors which border on unit windows.
- Seek to articulate individual living units and to create individual entrances by recesses, landscaping or architectural details.
- Reduce the number of homes being served by a given section of hall or stairway; seek to vary hall or stair vestibules.

Multi-family Apartments

- Seek to stagger or offset decks above part of the living areas of the units below so that natural light and views are not obstructed. Building offsets integrate decks and balconies with buildings and provide a greater sense of privacy and security.
- Incorporate good solar orientation and views wherever possible; protect from prevailing winds.

Parking

Below grade parking facilities are appropriate for high density residential development to minimize separation from shops and transit by massive parking lots. Parking structures must provide clear entries, exits and circulation patterns as well as visitor/delivery space.

- Locate elevators and stairs in the most convenient and least obstructed area of the parking floors, preferably external to the structure. For security reasons the stairs should provide for visibility from outside.

COMMERCIAL:
GENERAL CONSIDERATIONS

Commercial development, strung along the town's main thoroughfares, is a highly visible part of the town. It should contribute to the legible, attractive pattern by respecting district character, landmarks and views.

1. District character

Where there is an established theme or historic pattern in the area, new development should be designed to fit with the theme or historic pattern in order to build a cohesive district character.

Architectural themes have been chosen by some neighborhoods in the neighborhood planning process or may be derived from history of the area of preferred recent development. Incorporation of preferred architectural features builds an identity for neighborhood shopping center. Standard designs of franchises stores are discouraged. Insist that national and regional franchises and chain stores change their standard building design to "fit in" with the local character of the surrounding community. The use of existing buildings is encouraged.

2. Landmarks

Major intersections, building and/or landscaping should provide strong edges for the extensive asphalt. Here, and in very large developments singular design may be desirable to provide a landmark, unless it would detract from a more significant landmark.

3. Views

Views along major public rights-of-way need to be taken into account in landscaping, signage, and siting of buildings. Street trees, screening of parking lots and coordinated signage are particularly important in improving areas of visual chaos.

4. Ambience

Commercial development supplies goods, services and jobs; quality design will encourage shopping in Clayton and provide good working environments. Commercial areas are also settings for social interaction; designs support this use with amenities such as courtyard seating, notice boards and walkways connecting to residential areas and thus encourage local shopping.

Historical Landmark

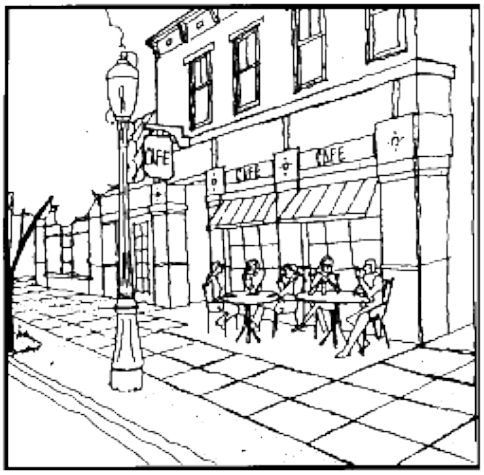
Alternative Franchise Design

COMMERCIAL:
DOWNTOWN / SIDEWALK ORIENTED

Development with a pedestrian and transit orientation is preferred on arterials approaching the downtown and in activity centers. Buildings are to be generally set forward to maintain continuity of architecture and pedestrian interest. The design of buildings and spaces within these areas should encourage pedestrian and transit use.

Attractive Sidewalk

- Coordinate rear parking lots through use of cross access easements. Provide access to parking from side streets where possible.
- Provide bus shelters that complement commercial design, with appropriate advertising space for stores/centers that provide them.
- Wide sidewalks, benches and café tables encourage people to walk downtown for a pleasant experience.
- Where possible, ensure that utilities are kept out of the way of areas where pedestrian movement is being encouraged.
- Mixed-use development projects should be encouraged in order to create 24-hour activity downtown.
- Seek continuity of commercial frontage and sustain building scales with street architecture (at least two stories).
- Utilize street trees and/or closely spaced pedestrian-oriented lighting standards and other street furniture to separate pedestrians from vehicular traffic.
- Maintain continuity of streetscape, facades and pathways, limiting driveways, parking lots or auto service bays which detract from character.
- Provide signage oriented to pedestrians (see Signage section).
- Create outdoor use areas with building orientation, landscaping and street furniture.
- Provide high percentage of “transparency”, i.e., display windows along walks to sustain pedestrian interest. Design lighting to feature wares, dining or other attractions.
- Provide detailed architectural features and well framed doorways.



COMMERCIAL: MIXED USE

Mixed use development has existed a long time. Residents are in close proximity to their public living rooms along the street and within walking distance of transit to additional urban attractions. Even a limited component of mixed use, such as a ground floor corner store where a large housing development meets a major intersection, can contribute to a sense of community and reduce car trips.

Care should be taken to provide separate access to residences and to commercial uses that may operate different hours in mixed use development. But shared parking for uses with different peak parking needs, like residential use and office use, is encouraged to reduce expanse of parking in compact, pedestrian-oriented development.

- Minimize segregated parking in order to get the most efficient use of parking spaces.
- Design distinctive entrances to residences from sidewalks. Pedestrian entrances to residences located on a side street will usually provide more privacy and space for lobbies without compromising the continuity of the retail frontage on the main street.
- Maintain high visibility for retail uses on the ground floor by placing store fronts close to sidewalk.
- Consider infill development mixed uses in downtown Clayton. A building with commercial uses on the bottom and residential at the top may be especially appropriate.
- Orient residential uses to take advantage of available views: street action and street trees, internal courtyards, adjoining creeks, parks, or historic buildings or distant hill. Private or common open space needs may be satisfied for some units by lobby space, solariums or other amenities where private open space with a good orientation is infeasible.
- Provide amenities, which enhance both the commercial and residential use and create an attractive, distinctive place connected to the adjoining neighborhood.

Riverwood Mixed Use

COMMERCIAL:
COMMUNITY / NEIGHBORHOOD SHOPPING CENTER

Community shopping centers are generally 8 acres or larger, and are characterized by unified architecture for the building or buildings (which contain separate commercial establishments with at least one major anchor), weather protection and contiguous on-site parking. Typical bad qualities which should be corrected or avoided are: lack of a strong sense of entry; a weak presence along the street; monolithic parking with no provisions for pedestrians, bikes or transit; linear buildings with uninteresting roof; and poorly developed pedestrian spaces.

- Create a strong sense of entry and orientation to the storefronts. A central space such as a plaza or a focal point can be used to orient and direct shoppers.
- Arrange parking to provide adequate entrances, exits and acceptable walking distances.
- Accommodate public transportation as an integral part of design.
- Incorporate fast food outlets into the shopping center rather than on isolated pads in the parking lot in order to encourage linked trips and a more attractive, cohesive site development. Avoid free-standing "pad" development in the parking areas which does not integrate with the overall development.

Neighborhood Business Can Blend In

- Provide for bicycle access and storage.
- Break up mass of parking with planting and/or building masses.
- Provide pedestrian access to site with special paving differentiating where walkways cross roadways.
- Keep service functions out of the site and hearing of adjacent property owners.
- Buffer adjoining land use from light, sound and traffic intrusion. Utilize screen plantings as well as masonry walls where truck activity would disturb residences.
- Vary lighting to differentiate street parking pedestrian and entry areas.
- Articulate the building footprint to create an interesting sequence of spaces. Provide architectural detail at the pedestrian level such as special paving, storefronts, and site furnishings.
- Establish parameters for compatible tenant signage placement and lighting.
- Incorporate amenities such as sculptures, fountains, food vendors, restrooms, telephones, newspaper stands, benches, drinking fountains, kiosks and seating areas.
- Provide landscaping at perimeter with accent planting at entrances and master sign.
- Use innovative design principles to blend these commercial areas into surrounding neighborhoods. Mixed use principles are especially appropriate.
- Design the roof as an integral part of building mass and form, and house equipment within roof volumes. Use roof articulation to identify entrances.

COMMERCIAL:
REMODELING / INFILL / DOWNTOWN

The viability of older commercial developments has continued to shift with increasing use of cars to access new or larger shopping centers. Currently, shopping centers less than about eight acres are generally considered too small to have major anchors and thus too small to compete with larger centers. There is interest in developing more neighborhood ties with such centers as their uses transition so that they become a destination for walking trips and provide more personal services and social contact.

Commercial establishments need a fresh, up-to-date look for maximum appeal to customers and to improve the image for the town as a whole. Negative image problems, which the town is seeking to correct, include outdated signage, especially large pole-mounted installations, which give the town a chaotic commercial strip appearance and lack of landscaping around and in parking lots, which add to a bleak appearance. Signage and street trees are related issues because the old pole mounted signs rely on a lack of trees for visibility. Businesses will increasingly rely on the attractiveness of their buildings and landscaping to draw attention rather than signs hoisted in the air.

Development opportunities include new construction and the adaptive reuse of existing buildings. Opportunities for new buildings are present along Main Street, Second Street, Front Street and First Street with the removal of incompatible and noncontributing buildings in addition to utilizing currently vacant lots. While opportunities along Main Street should serve primarily retail, office and commercial space, opportunities along Second Street could accommodate residential land use. Buildings along Main Street could accommodate residential use on upper floors. Along First Street buildings could exhibit a mix of uses.

- Design walkways connecting neighborhood sidewalks with the center. Seek to extend street pattern into the center as walkways to shorten walking distances and to provide vistas into the center.
- Provide some outdoor sales space for seasonal offerings to add visual interest.
- Reduce driveway entries where feasible to improve traffic safety and allow more landscaping.

Commercial Infill

- Design tenant spaces for coffee shop or café with good solar exposure, outside seating and amenities such as trellises, raised flower beds, interesting pavement, or fountain.
- Add new lighting, landscaping canopies and entry features to convey a fresh welcome for pedestrians and motorist. Adopt a sign program conforming to current sign regulations.
- Avoid blocking visibility and identity of center with unrelated buildings on separate pads in the parking lot. Seek to connect fast food franchises with the main building to gain impulse shoppers and to link trips, reducing traffic and air congestion.
- Development of pedestrian connections between buildings from rear parking areas to Main Street should be strong, direct, and convenient.

- Consider utilization of space for day care of elders and/or pre-schoolers, if contiguous outdoor use space can be developed, and other local service enterprises. Provide display space for local artists to temporarily fill in vacant store fronts.

COMMERCIAL: HIGHWAY

The automobile oriented shopping corridor is a miscellaneous collection of individual stores or services along major streets, which rely on ease of access and movement for vehicles. Parking is often between store and street. To compensate for extensive paving and disjointed architecture, extensive landscaping is needed to maintain an attractive boulevard appearance along such streets as Highway 70 and Highway 42.

- Establish cross access agreements to combine parking areas and entries for more efficient use and reduction of curb cuts. Wider lots should be maintained on auto-oriented shopping strips for practical parking arrangements and continuity of landscaping.
- Plant street trees and parking lot trees to temper harsh expanse of asphalt. Landscaped area between parking and street should relate to adjoining landscaped areas to maintain visual continuity along street. Wider landscaped areas are generally appropriate at entrances and street corners, and along more extensive frontages. The minimum landscaped area required between public right-of-way and parking is 10'. Plant with low shrubs to screen parking area.

Highway Landscape Buffer

- Utilize design that contributes to cohesiveness of the existing streetscape rather than adding discordant elements. See compatibility of rooflines, setbacks, materials, color, character and scale.
- Use high quality, durable materials to ensure lower maintenance requirements and improved aesthetic appeal.
- Design the entrance and signage to express the building use as well as the design theme.
- Emphasize low maintenance landscaping but consider accent planting at entries and intersections.
- Screen auxiliary structures such as trash, storage and mechanical equipment, and relate screening to architecture or landscaping.
- Consolidate complementary commercial uses into a joint development where possible in order to link trip destinations and better utilize land.
- Creative, unique and innovative designs are encouraged. Establish coherent design themes to include updated signage and lighting.
- Landscape barren street frontages and parking lots.
- Create attractive outdoor use spaces framed by building(s).
- Consider pedestrian; bike and transit access as well as more efficient parking arrangements
- Use low monument signs instead of free standing signs in suburban commercial corridors (see signage section).

COMMERCIAL:
AUTO SALES, SERVICING AND DRIVE-THRU SERVICE

Clayton's residents rely heavily on automobile transportation. Consequently, a high proportion of the town is paved for automobile circulation and parking. The town has landscape and screen requirements to relieve the expanse of parking lots and streets. Car sales, rental, repair and service businesses and businesses with drive-up service tend to have higher proportions of pavement, weak architectural presence and conflicts with pedestrians which need to be addressed in their design.

- Structures should be designed to provide a solid presence on the street that relates to surrounding buildings in form, materials and/or detailing. Light-weight metal, plastic or other temporary appearing materials are not appropriate in highly visible locations.
- Franchise architecture that doesn't relate to the surrounding and thus contributes to a disjointed streetscape is to be avoided; such buildings do not enhance Clayton and cannot easily be used by other businesses if the original use leaves.

- Curb cuts should be located as far as possible from conflicting movements, such as corners, and should be limited in number and width in order to maximize continuity of landscaping along the street.
- Businesses with auto repairs need to have cars moved and tagged within 30 days.
- Landscaping should compensate for high proportions of paving. Car dealers who keep front landscaping relatively low and simple for car visibility should provide enhanced landscaping at other perimeters to buffer neighborhood and to provided a green, inviting backdrop for the car lot.
- Car repair and washing activities should be enclosed in structures, which shield adjacent residential or commercial use for noise. Repair and service bays should not face residential properties or open towards public streets, unless screened by street trees and other landscaping.
- No public address systems should be used in outdoor areas; personal pagers can be used to contact employees outdoors without disturbing adjacent residences or businesses. Lighting should be shielded from neighbors.

- Except for gas stations, drive through service lanes should be separated from the parking lot or Public Street by a landscaped strip; service lanes should not be routed near residential property and should not interfere with pedestrian access to the business.
- Adequate stacking and parking must be provided to prevent back up into arterials or parking along adjoining neighborhood or commercial frontage.
- Stacking spaces shall be designed to not conflict with interior traffic flow or on-site parking.

INDUSTRIAL: GENERAL CONSIDERATIONS

Historically, land use in industrial areas was sharply defined and included only heavy industry, light industry and warehousing. The distinctions began to blur in the 1950s with the industrial park, in the 1960s with the research and development park, and in the 1970s with the office/business park. These "parks" have a mix of light industrial, warehouse, distribution and office. Because industrial parks have private covenants, codes and restrictions covering design elements, the Town has not required design review except where industry abuts residential use. This section is divided into Industrial Corridor and Light Industry based on proximity to residential uses.

INDUSTRIAL: INDUSTRIAL CORRIDOR

Industrial park development has been generally attractive. Provisions for transit, mixed use, pedestrians and bikes need to be incorporated.

- Separate incompatible elements such as: visitor and employee parking, loading zones, truck parking, stacking and circulation, storage yards, and rail sidings.
- Coordinate site access with the roadway system (e.g., setback curb cuts from intersections and provide sidewalks).
- Create legible entries for trucks, cars and pedestrians. Maintain accessibility for fire fighting equipment at all hours.
- Ensure stormwater control measures are in place to treat stormwater on-site.

Attractive Entry

- Provide bus shelter, convenient walkway system, bike storage and preferential carpool parking to reduce traffic impacts.
- Utilize planting to define site and building entries, to provide a visual amenity for office spaces, to define traffic and walkway routes within parking lots, and to provide screening and shade. Maintain continuity of berming, large grouping of trees, below-ground wires, and controlled signage and lighting.

Attractive Industrial Buffer

- Screen parking for autos and trucks, exterior storage and trash bins, etc., with earth berms, plantings, walls, fences, grade changes or a combination of these elements.
- Screen loading and service areas on major streets like Industrial Parkways that are also used to access residential areas.

- Provide easement for public access where industrial development adjoins bay lands or water channels connecting to bay lands. Improve as recreational amenity for outdoor eating, walking and cycling where appropriate.
- Consider provision of passive recreational facilities and opportunities, shaded outdoor eating, changing rooms and showers to reduce employee car trips and stress.

INDUSTRIAL: LIGHT INDUSTRY

"Light industry" is a general term referring to industrial uses which are more compatible with other land uses than "heavy" industry. "Heavy" industrial uses are incompatible because of obtrusive scale or with nuisance aspects like odor, noise, vibrations, smoke, heavy truck traffic or concentrations of hazardous materials. Many kinds of 'Light Industrial" businesses can occur in close proximity to residential or commercial development if operated in a neighborly fashion and properly designed.

- Avoid frequent curb cuts along roads, which would hinder traffic flow, and reduce potential landscaping along street.
- Enclose industrial operations in a substantial building which is capable of containing operational noise and filtering out any fumes. Bays should not face residential development.
- Provide landscaping and masonry wall on perimeters adjoining residential use and landscaping along public right-of-ways. Provide additional setbacks and landscaping to screen buildings of larger scale than adjoining development.
- Site building to shield neighborhood from noise of arterial, railroad and industrial uses wherever feasible.
- Screen outdoor storage facilities near residential areas. No outdoor storage should be visible from a residence or along streets serving residences unless it serves needs of residents (such as boat and RV storage and home improvement equipment rental) and is not unsightly. Auto salvage yards are considered unsightly.
- Provide direct access from an arterial truck route for large truck docks. Docks and parking should not face or be located adjacent to residential uses. Loading noise, tractor-trailer truck traffic and overnight parking of refrigeration units severely compromise residential amenity.

GREENWAYS AND TRAILS: GENERAL CONSIDERATIONS

The design development guidelines featured in this Appendix have been tailored to meet the specific facility development needs of the Town of Clayton's open space and greenway system. The purpose of these guidelines is to assist partnering organizations in developing open space and greenway facilities.

These guidelines provide a variety of trail facility and ecological system restoration concepts and ideas, and are not a substitute for a more thorough examination and detailed landscape architectural engineering evaluation of each project segment. These guidelines serve as minimum standards for greenway facility development. *Greenways typically follow natural or constructed features such as streams or roads and are designed to incorporate natural settings such as creeks and significant stands of trees within neighborhoods, and are used for transportation, recreation, and environmental protection. Greenways differ from parks; plazas and squares in that their detailing is natural (i.e. informally planted) except along rights-of-way, and may contain irregular topography.*

Design of the greenway should incorporate conservation of existing mature tree canopy and landscape, protection of existing natural drainage ways and creeks. Improvements shall include paved walks/trails and benches, and trash receptacles.

CORRIDORS

Riparian buffers serve many functions. They filter storm water pollutants, help moderate stream flow, stabilize stream banks, moderate stream temperature, and provide aquatic and terrestrial habitat. The Neuse Nutrient Sensitive Waters (NSW) rules require that new developments maintain an existing 50-foot vegetated buffer on both sides of all intermittent and perennial streams, lakes and ponds within the Neuse River Basin. The entire Town of Clayton and its planning jurisdiction lay within the Neuse River Basin. Buffers are also required in water supply watersheds throughout the state as part of the Water Supply Watershed Management Program.

Stream buffers within the Town of Clayton should be maintained to protect water quality and animal habitat. For the purpose of greenway facility development, a minimum 80-feet wide buffer as measured from the top of stream bank is preferred in order to mitigate the damaging effects of flooding from storms, filter pollutants from overland flow and to develop appropriately sized greenway trail facilities. The 80 ft. includes the 50 ft. mandate for Neuse NSW rules as well as an additional 30 ft. for greenway trail development.

GREENWAYS AND TRAILS:
CORRIDOR PLANTING

Some basic guides for planting in corridors are as follows:

- Efforts should be made to eliminate non-native invasive species, such as privet, from corridors
- Native over story and under story trees/shrubs should be replanted where vegetation is removed or harmed due to construction of parks, trial, etc. in greenway corridors or open space
- Fallen trees should not be removed unless they obstruct trails, streams or present danger. Otherwise, they should be left to decay naturally
- Evergreens, conifers (pines) and deciduous trees should all be used proportionally
- Mass producing trees and shrubs with berries should be utilized for wildlife food when possible.
- Flowering trees and shrubs can be used to draw attention to important intersections and entrances
- Evergreen shade trees are needed near seating areas and picnic tables

GREENWAYS AND TRAILS:
TYPES OF TRAIL TREADS

One of the following types of trail treads should be used when designing greenway trails and sidewalks. The appropriate trail type will depend on the specific site conditions of the trail segment, amount of available right-of-way and the primary purpose of the trail. Some of the characteristics of the trail corridor to consider are soil type, vegetation cover, flooding, slope and wildlife habitat sensitivity.

Creekside Trail Tread

Creekside trails are located only in urban areas where right-of-way constraints and channelized streams restrict trail development to the floodway. Creekside trails have to be redesigned to accommodate walkers, bicyclists, skaters, and joggers. These multi-use trails are typically positioned directly adjacent to the stream channels and are therefore subject to frequent flooding. These trails require hard-paved surfaces such as concrete to withstand high-velocity stream flows. Retaining walls or other structural elements may also be required for stable construction and to protect the trail from erosion and flood damage.

Creekside trails should be a minimum of 10'-wide for multi-use trails. The installation of railings, benches, signage, and trash receptacles that could obstruct flow during storm events should be carefully considered. Creekside trails must be designed and installed in a manner that minimizes their effect on floodwaters and protects the amenities from flood damage. The use of retaining walls as set walls is one way in which non-obtrusive amenities can be included on this type of trail facility. Special consideration should be paid to mitigating the impacts of trail construction on the natural environment.

Flooded Trail

Floodway/ Floodplain Trail Tread

Multi-use trails within the floodway are designed to accommodate a variety of users including walkers, joggers, cyclists, and skaters. These multi-use trails are typically positioned within the floodway but not directly adjacent to streams. Some vegetative buffer between the stream and trail should be left intact. Like the creekside trails, trails within the floodway and floodplain are subject to periodic flooding, however, not as frequently. These trails require paved surfaces of either asphalt or concrete depending on frequency of flooding and expected velocity of flow. A proper trail foundation is important and will increase the longevity of the trail. No soft shoulder should be constructed due to flood considerations. Special considerations should be given to the mitigation of negative impacts from trial development on the natural stream environment.

Multi-use trails within the floodway should be built with a minimum width of 10-feet. All elements of the trail tread, railing of the trail including the trail treads, railings, benches, and trash receptacles will be periodically flooded. The design and materials for these trails should be carefully selected accordingly.

Upland Trail Tread

Upland multi-use trails are designed to accommodate a variety of users including walkers, joggers, cyclists and skaters. These upland multi-use trails are typically positioned completely outside designated floodplains. Significant vegetative buffer between any streams and the trail should be left intact. It is recommended that these trails be built with paved asphalt or aggregate stone, depending on the preference of local user groups. Upland multi-use trails should be built to a minimum width of 10'.

Clayton Community Park Trail

Footpath/Hiking Trail

Footpaths or hiking trails are designed to accommodate pedestrians and are not intended for cyclists or other wheeled users. These natural surface trails typically make use of dirt, rock, soil, forest litter, pine mulch and other native materials for the trail surface. Preparation varies from machine-worked surfaces to those worn only by usage. This is the most appropriate surface for ecologically sensitive areas.

These pathways, often very narrow, sometimes follow strenuous routes and may limit access to all but skilled users. Construction of these trails mainly consists of providing positive drainage for the trail tread and should not involve extensive removal of existing vegetation. Timbers may be used for steps along steep slopes. These trails vary in width from 3 feet to 6 feet and vertical clearance should be maintained at 9 feet. These trails are most commonly found within the streamside zone.

Boardwalk Trail Tread

Boardwalks, or wood surface trails, are typically required when crossing wetlands or poorly-drained areas. While boardwalks can be considered multi-use trails, the surface tends to be slippery when wet and not best suited for wheeled users. Boardwalks intended for use by bikes, pedestrians skaters and others should be a minimum of 10 feet wide. However, boardwalk trails limited to pedestrian use can be as narrow as 8 feet. If maintenance vehicles use the boardwalk for access, it should be a minimum of 14 feet.

Clayton Community Park Bridge

Wood surfaced trails are usually composed of sawn wooden planks or lumber that forms the top layer of a bridge, boardwalk or deck. The most commonly used woods for trail surfacing are exposure- and decay-resistant species such as pine, redwood, fir, cedar, hemlock and spruce. Wood is a preferred surface type for special applications because of its strength, aesthetic appeal and its versatility. Synthetic wood, manufactured from recycled plastics, is now available for use as a substitute in conventional outdoor wood construction. While these products are more expensive than wood lumber, recycled plastic lumber last much longer, does not splinter or warp and will not discolor.

Appendix #1: Approved Landscaping Considerations and Trees, Plants & Shrubs List

INTRODUCTION

This planting information has been prepared to accompany the landscaping requirements found in the Town of Clayton's Unified Development Ordinance. The Town has expanded the application of landscaping requirements citywide and encourages tree preservation through these guidelines. The Town recognizes that one of it's greatest assets for beautification of the town lies in the types and quality of approved vegetation and trees during development.

PURPOSE

This data is designed to inform the citizens of Clayton about the varieties of native and locally adapted plant materials and their characteristics as they relate to meeting landscaping regulations. Aside from the aesthetics of plant materials, trees, shrubs and ground covers are extraordinary natural resources. They produce oxygen thereby purifying polluted air. Through their root systems, trees, shrubs, ground covers and vines stabilize the groundwater tables, and are an effective agent in soil conservation, erosion control and flood control. Trees, especially larger, older trees, are a valuable amenity to the urban environment providing historical, physical, aesthetic and physiological benefits. Plant materials moderate the effects of cold and heat by providing shade and protection from the wind, reducing glare and noise levels, and by offering a haven for birds and animals.

PLANT LIST AND NOMENCLATURE

Plant Materials List

Plant materials are listed in chart form and include the characteristics, descriptions and possible uses of various plants. Of the thousands of plants that will grow in this region of North Carolina, those included on the list are landscape plants that are attractive in appearance, require little maintenance and have a tolerance of urban conditions. Herbaceous (non-woody) perennial and annual flowering plants are not included in this list because of their great numbers, variety and seasonal color.

Plants are listed alphabetically by their botanical (scientific) name, followed by their common name. The plant characteristics described in the first five columns address the plant type, and the physical attributes of the plant including height, spread, urban tolerance and disease and insect tolerance. The next seven columns include a description of how to use the plant as a street tree, within the property perimeter, within the interior of the site, within a vehicular sight triangle, under overhead utility easements, and for screening purposes. Following the Plant Materials List is an index that lists all plant materials in alphabetical order for easy reference.

Canopy Tree: A species of tree which normally grows to a mature height of 40 feet or more. Canopy trees are typically shade producing trees.

Understory Tree: A species of tree which normally grows to a mature height of 25 to 40 feet. Understory trees often grow beneath canopy trees.

Specimen Tree: Certain species of canopy or understory trees which are either rare and/or which have unusual plant characteristics. A listing of specimen trees appears in the Plant Index.

Large Shrub: A species of shrub which normally grows to a mature height of 10 to 20 feet. Large shrubs can be used for screening.

Medium Shrub: A species of shrub which normally grows to a mature height of six to 10 feet. Medium shrubs can be used for screening.

Small Shrub: A species of shrub which normally grows to a mature height of one to four feet. Small shrubs can be used for screening and for aesthetics within the required landscape.

Ground Cover: A species which is normally below one foot in height. Ground covers are used as an alternative to grasses. On slopes, ground covers control erosion while eliminating the maintenance of mowing on hillsides. Many ground covers survive in poor soils, shade and other adverse conditions.

Vines: A species which has a spreading pattern of growth. Vines may be used on the ground, on walls and on trellises.

Plant Nomenclature

The names of plants given in the Plant Materials List conform to those set forth in "Standardized Plant Names", 1942 edition, prepared by the American Joint Committee on Horticulture Nomenclature. Names of plants not included in either source conform generally to those accepted in the nursery trade.

Plants cataloged in the Plant Materials List are identified by genus and species and occasionally by cultivar. Genus is a closely related group of plants with similar characteristics. Similarity of flowers and fruits is the most widely used feature although roots, stems, buds and leaves are also used. Species is a subdivision for a genus and consists of plants which have many more similarities than do the members of a genus. A cultivar is a subclassification of a species and is similar in many respects to a variety.

Example: Pyrus calleryana 'Bradfordi' (Scientific Name)
Bradford Pear (Common Name)
Pyrus (Genus)
calleryana (Species)
'Bradfordi' (Cultivar)

PLANT CHARACTERISTICS

Plant Type: Plant type refers to whether the plant material is native (N) to North Carolina and if it is deciduous (D), meaning the plant drops its leaves in the fall, or whether it is evergreen (E), meaning the leaves on the plant are retained throughout the year.

Height : Height refers to the average height of plants at maturity under optimal growing conditions. Variations in climate, temperatures, soils and urban conditions can greatly affect the growth of all plant materials.

Spread: Spread refers to the expanse of the horizontal branching pattern at maturity under optimal growing conditions. Plants with wide-spreading forms require a large area to develop. Upright forms are used effectively where space is limited. Spread is listed as a range because of its variability.

Environmental Tolerance: Environmental tolerance refers to whether the plant material is urban tolerant (U), which implies the plant requires minimal maintenance, or whether it is drought tolerant (D), meaning the plant can withstand an extended period without rain or watering. Urban conditions consist of airborne pollutants, fluctuating moisture and temperature levels, salt, and other similar environmental factors.

Disease and Insect Tolerance: Plant materials can be adversely affected by the invasion of insects and disease. Tolerance to insects and diseases indicates that, while plants may be affected by a pest or pathogen, they may not become stressed or unsightly, and may recover during the next growing season.

PLANT USES

Street Trees

Street tree plantings parallel roadways to provide for a continuous, unified planting pattern. Street trees help reduce the impact of urban development along thoroughfares and soften the vertical lines of buildings. Street trees aid in reducing air pollution, noise, and glare.

Plant materials suggested for use as street trees must be able to withstand the stresses associated with the location of the planting yard near streets. Stresses include extreme temperatures during the winter and summer months, strong winds, compacted and poor soils and air pollution. The selection of trees that can tolerate these conditions is limited. Trees that have a straight trunk, an oval or rounded form, symmetrical branching, and that are relatively free of insects and disease are preferred for use as street trees. The branches of the trees should be trimmed up to seven feet above the ground to allow for vehicular parking, walking and landscape maintenance.

The recommended spacing of large trees is one tree per 50 feet of street frontage. Small trees should be planted one tree per 25 feet of frontage. Recommended trees should be urban tolerant and have a moderate growth rate with a high survival rate.

Proper selection and placement of street trees will minimize potential damage by cars, delivery trucks, heavy equipment, street improvement projects, and abuse from people and animals. Using a variety of species will not only offer contrasts of form, texture, height, color and general visual effect, but will also minimize the danger of losing an entire mono-specific planting to insects, blight, wilt or some other species-specific condition.

The minimum required street tree planting yard width is eight feet. This will ensure that street trees can develop adequate root systems without damaging sidewalks or curbs. The specific planting requirements are determined by the type of tree and its growth habits. In general, a canopy tree requires a minimum five-foot wide planting yard, and the smaller understory trees and large shrubs require a three-foot wide planting yard.

Property Perimeter

Property perimeter screens refer to plant materials which are planted along property boundaries and which are used as a screen to help minimize impacts between adjacent land uses. Suitable plants include canopy and understory trees and large, medium and small shrubs.

Vehicular Use Area Interior

Interior landscaping requires that all parking areas be planted with a minimum of one tree per 12 parking spaces. Trees dispersed throughout paved areas visually break up and/or screen large open areas, while tree canopies reduce heat buildup from the pavement during the summer months. Trees with expansive branching characteristics of growth and a tolerance to extreme elements are encouraged for use within the interior of the site.

Vehicular Sight Triangle

The vehicular sight triangle is a defined area on either side of street intersections, street corners or vehicular access points which allows for sufficient sight distance to allow drivers approaching simultaneously to see each other in time to prevent a traffic accident. The size of the sight triangle is governed by space, time and traffic volume of the subject intersection. Planting in the sight triangle is permitted as long as the plants do not present a safety hazard and thus is subject to review and approval obythe city's Technical Review Committee.

Screening

Plant materials can be used to visually control or block out objectionable views, define and create outdoor space, provide a sense of privacy, reduce glare and reflection, direct views and control noise and wind. These materials can be in the form of hedge plantings, fences, walls, berms or any combination of those just listed. Plantings used for a screening effect are planted closer together. Evergreen plant material is preferred for its year-round effectiveness.

Overhead Utility Easements

Large canopy trees and overhead utility lines are incompatible. Only small trees and shrubs are suggested near or under overhead utilities. Great attention should be taken in the selection and placement of plant materials near overhead power lines to prevent encroachment and unnecessary severe pruning. Landscaping within utility easements for overhead utility lines is subject to the review and approval by the city's Technical Review Committee.

PLANTING TIPS

Water Conservation

Water conservation practices incorporated into the landscaping plan will greatly reduce maintenance and watering costs associated with landscaping. A site plan, addressing drainage, site and soil conditions, rainfall, prevailing winds, yearly temperature ranges, and topographic features will be the basis on which to build a water conservation landscaping plan. The resources saved through a water conservation landscaping plan are a direct result of improving the existing watering practices and soil conditions by using available mulches, and by increasing the use of low maintenance, native and drought-tolerant plant materials.

Soil Analysis

The quality of the soil will have a direct influence on the survivability and hardiness of plant materials. Plants depend on good soil for the nutrients and water they need for a healthy rate of growth. Analysis of the soil content will help to ensure that new plantings are installed in the best possible soil conditions.

Providing a good soil mix will enhance the watering efforts and decrease the cost involved with watering the landscape. Loamy soil is an important aspect of efficient watering. If the soil contains too much sand or gravel, the water will drain quickly and the roots will not have time to absorb the water. If the soil has too much clay or silt, then the water cannot penetrate to the tree's root system. Consequently, more water is added to the inefficient soil, creating a wasteful watering cycle. A loamy soil enables water to penetrate through the earth's surface and to attach to the the soil particles, making the water available to the roots.

Soils should be tested for pH and fertility prior to the installation of plant materials. Soil testing is available through the North Carolina Department of Agriculture. Results of the soil test will determine if organic matter, sand, lime or other additives will be required to be mixed into the existing soil to achieve a loamy soil.

Plant Selection

The information provided through the site plan analysis can help to determine which plant materials are best suited in the landscape. Ideal growing conditions are different for each plant species. Understanding the plant characteristics and matching the appropriate plant to the appropriate location will help to achieve optimal growing conditions. For example, Willow Oaks have a wide root spread and should not be planted in narrow areas or small lots. The River Birch is an understory tree that needs protection from nearby canopy trees, and should only be planted in protected areas where wind and extreme heat will not damage the tree.

In designing a water conservation landscaping plan, using plant materials that are drought tolerant and that require low maintenance will help to reduce the expenditures associated with watering. All plants need an adequate supply of water. Utilizing efficient irrigation systems can further decrease the amount of water used for maintaining healthy plant materials. Examples of drought tolerant plants include Golden Rain Tree, Ginko (female), most Junipers and Hollies. A complete listing of drought tolerant plants is contained in the Plant Index.

Native plant species have adapted to the climate conditions of the Piedmont, typically require less maintenance, and have a higher rate of survival. These plants have been in existence for generations and can be maintained without much additional care. Using these species will greatly reduce the cost involved with maintenance, replacement and water resources. Examples of native plant material include: Beech, Ash, American Holly, Dogwood, and many varieties of Hollies and Rhododendron.

Plant Quality

Selection of healthy plant materials will increase the survivability of the species used in the landscaping plan. Plants should be vigorous and free of disease and insects. The trunk and stems should be firm with no indication of insect borers, die back, frost cracks, sun scald, fungus cankers, or other defects. Tree branches should be well-developed and diverge from the trunk at a wide angle except in those varieties that grow in an upright form. The root ball of deciduous and evergreen trees should be balled and wrapped with burlap. The ball should be of sufficient size to encompass all the fibrous feeding roots necessary for recovery and continued growth of the plant. Plant materials meeting the guidelines set forth in the American Standards for Nursery Stock of Nurserymen will meet the intentions of the landscaping ordinance regulations.

Plant Installation

The ideal time for transplanting is mid-September to mid-November and from March through May. Fall planting of deciduous trees and shrubs should roughly coincide with the leaf drop period, but early enough for sufficient root regeneration to support the plant during the winter months. Early spring, before new growth begins, is the most favorable time. Evergreens can be planted any time the ground is not frozen but the optimum time is September or October. Younger plants survive transplanting more often than mature plants. Spring planting should take place prior to the development of leaves or flower buds starting to open. All plants should be commercially grown. No plant should be removed from its natural environment unless that plant material will be damaged in the near future by new development or redevelopment.

Plants are packed in three ways: balled and burlapped, container, and bare root. Plant materials should be installed in a planting hole of sufficient size to accommodate the root system of the plant. With balled and burlapped trees, the burlap should be rolled back once the plant is set in the hole, but the root ball should not be disturbed. Sometimes twine is used in addition to burlap. This should be removed from the base of the tree. Bare root trees have a soil line stain at the base of the trunk which indicates the previous planting level. Bare root trees should have the roots spread out. In areas where water tends to accumulate, select from the limited number of plants which tolerate these conditions or improve the site with underground drainage and re-grade to alter surface run-off.

To install a container plant, remove the pot from the plant by inserting a sharp knife about 1/3 of the way into the ball. Three vertical slits should be made on the sides of the soil and an "X" on the bottom. This will encourage new roots to grow outward into the new soil. If the roots are not cut they will continue to grow in a circle around the plant and eventually kill it.

The planting depth of all trees and shrubs should be such that the finished grade level of the plant after settling is approximately the same as that which the plant was grown. Once the depth is determined and the hole and soil prepared then the plant material can be installed. All plant materials should be centered in the planting hole, trench or bed in an upright position to allow for the best appearance and pattern of growth. The size of the hole should be large enough to ensure the root system can grow as the plant matures.

Typically, when planting, dig a hole 50 percent wider than the diameter of the roots or root ball. If the soil is well drained, dig as deep as the roots but insert the plant so that it sits a couple of inches higher than it was in the nursery, as shown in the diagram. If loose soil is added under the plant, it will settle. Set the plant several inches higher than the soil level to compensate for settling. In poorly-drained areas, a plant can be set a bit higher. Once settling has occurred, the plant will remain above the original soil level. Mound the soil from the existing grade up to the point on the tree or shrub where it was originally growing. NEVER plant it deeper than it was originally.

If it is necessary to transplant at times of the year other than the recommended time, balled and burlapped and container plants can be transplanted more successfully than bare root plants. If you are unable to plant immediately after obtaining plants, care should be taken to prevent the roots from drying out. Water the roots and store in a cool place, out of direct sunlight. Protect bare root plants by temporarily planting them in the soil. Remove one half of the foliage to reduce evaporation during this period. Mulch the balled and burlapped root ball and leave the burlap or container on the root ball until the depth of the hole is ready for planting.

Except for hedge plants and ground covers, all plants should be planted in individual holes. Hedge plant materials may be planted in a continuous trench as long as adequate space is allowed for root growth. Ground covers may be planted in planting beds a minimum of six inches deep. All plant materials should be centered in the planting hole, trench or bed in an upright position to allow for the best appearance and pattern of growth.

Watering

Once plant materials are installed, adequate watering during the first 12 to 15 can make the difference between success and failure of the landscape project. All plants should be completely soaked after installation. The soil around trees should be watered at least once a week unless there has been adequate rainfall. Watering should occur twice a week in cases of hot, dry and windy weather.

Many automatic and manual watering systems are available for above ground and below ground installation. Local professionals and a North Carolina Agricultural Extension Agent can be of assistance in choosing the appropriate irrigation system for plantings.

Mulching

Mulching will decrease the adverse effects that climatic changes have on the soil's ability to retain water. Prevailing winds and heat will dry the soil. Extremely cold temperatures can freeze soil moisture. Mulching will help to retain ground moisture which can otherwise be reduced by surface evaporation. During the winter months, mulching will insulate the ground, offering protection to the plant's root system. During the hot summer months, mulching offers protection against ground drying and cracking. Mulching also helps to amend soils through decomposition, thereby providing natural fertilizer to the plants.

Mulching materials include pine needles, straw, wood chips, shredded bark, grass clippings, leaves, crushed rock, and pecan and peanut hulls. Mulching also helps to minimize weeds, which will reduce the amount of required maintenance while improving the appearance of the landscaped area. Mulch should not be applied to plants in early spring until the soil has warmed.

Staking

Some evergreen or deciduous trees may need support by an acceptable method to keep the tree trunk in an upright position after planting. Staking and wiring helps the plant withstand heavy winds that can damage the branches and loosen soil around the base of the tree causing injury to the root system. Stake trees the first year or two until roots are firmly established. Drive two or three stakes in the ground and attach wire enclosed in a garden hose to protect the trunk.

Wrapping

Trees planted in direct sunlight or along the western property line may need the trunks wrapped with burlap or paper to prevent sun scald or water loss of the bark. Wrapping the trunks of deciduous trees can also offer protection against insect and lawn maintenance damage. It is not recommended that tree wrap be kept on the trunks during summer months, however, trees should be rewrapped before the first winter freeze.

Pruning

One of the most necessary garden practices is pruning. Pruning, trimming and shaping plant materials should be done in accordance with standard horticultural practice. First, it is important to remove dead, diseased and broken branches. But pruning should also be done for the following purposes:

- to reduce size of overgrown plants
- to train young trees
- to thin out trees and shrubs
- to remove dead flowers and seed pods
- to rejuvenate a declining shrub
- to make young shrubs more bushy
- to develop a special form

- to prevent interference of overhead utility lines
- to offset root loss after transplanting
- to eliminate lower branches from interfering with pedestrians or vehicular sight distances
- to provide an additional supply of energy for the growth of flowers, fruits and branches

Branch Pruning

Large branches from trees and branches over one inch in diameter should be removed with the three-cut method to prevent bark stripping. First, make two cuts to remove the branch without splitting wood. Then, make the final cut at the end of the branch collar. This will avoid wounds from stripping the bark down the trunk. Minor pruning can be accomplished with four tools: hand pruners, hedge shears, long handled lappers and a crescent saw. Tools should be sharp, not only to make the job easier but also to make smooth, even cuts. Do not prune the main branch from a shrub or tree.

Hedge Pruning

Hedges should be sheared narrower at the top. The lower branches will not receive adequate light and air for dense growth if shaped wider at the top. Restrict pruning of new plant material to injured, weak or interfering branches. Always prune to a clean cut without bruising or tearing the bark, and without leaving any large, prominent stub.

Shrub Pruning

Some shrubs, such as roses, are headed back by pruning individual branches. Position the blunt end of the pruners on the opposite side of the branch than the bud. Make cuts about one-quarter inch above a bud, and at a 45 degree angle so the cut surface will shed water. Cutting too close may cause the bud to dry out. If the branch is cut too far above the bud, the stub will die back to the bud and increase chances of bacteria and fungus entering a cavity forming in large branches.

Maintenance Pruning

Maintenance pruning for early flowering trees and shrubs should occur immediately after the trees and shrubs flower. Trees that flower in the summer should be pruned in the winter or early spring. Trees such as elm, maple, birch, dogwood and walnut bleed freely if pruned in late winter. Therefore pruning these trees can be postponed until the leaves mature. Most evergreens do not need pruning except for the removal of damaged branches, which can be done at any time, provided the wood is not frozen. Late summer pruning of many trees and shrubs should be avoided since it could encourage new growth, which will not harden in time for the winter months.

Deciduous and evergreen hedges should be pruned wider at the base than at the top to allow light and air to reach the lower branches. Pruning hedge plant materials is effective for increasing the density of a hedgerow.

Antitranspirants

Antitranspirants are foliage sprays that contain chemicals that reduce the amount of water loss throughout the surface of the leaf. The spray dries and forms a protective covering on the leaf which lasts for several weeks before eventually wearing off. The use of antitranspirants is not an alternate method for watering. The antitranspirant is only effective for reducing stress caused by lack of moisture during the summer months.

TREE PRESERVATION

Benefits Of Tree Preservation

The landscaping regulations encourage the preservation of existing trees. Preserved trees may be credited toward landscaping requirements of the Ordinance. Utilizing existing trees aids in the control of soil erosion, moderates storm water runoff which improves water quality, intercepts airborne particles thereby reducing air pollution, provides a habitat for wildlife, and helps to buffer noise and glare.

Tree Preservation Terms

A good understanding of the terms associated with tree preservation will aid in successful tree retention projects. Some of the words in this manual are used within the landscaping regulations and throughout this manual.

Crown Canopy: The cover formed by the top branches of trees.

Drip-line: A vertical line extending from the outermost portion of a tree's canopy to the ground.

Trunk: The main stem of a tree apart from limbs and roots.

Roots: The underground part of the tree that functions as an organ of absorption, food storage, aeration and support system.

Feeder Roots*:* A complex system of small annual roots growing outward usually from the transport roots. These roots make a complex branching pattern. These roots make up the major fraction of a tree's root system surface area, and are the primary sites of absorption of water and nutrients.
Transport Roots: The system of tree roots comprised of major woody roots and rope roots.

DBH: Diameter-at-breast-height is a standard measure of tree size, and is a tree trunk diameter measured in inches at a height of 4 1/2 feet above the ground. If a tree splits into multiple trunks below 4 1/2 feet, then the trunk is measured at its most narrow point beneath the split.

Circumference: The external, circular measurement of the tree trunk as measured in inches at 4 1/2 feet above the ground.

Caliper: American Association of Nurserymen standard for trunk measurement of nursery stock. Caliper of the trunk shall be taken six inches above the ground for up to and including four inch caliper size, and 12 inches above the ground for larger sizes.

Soil Compaction: A change in the soil weight per unit volume and an increase in soil weight. Compacted soil causes a decrease in the availability of oxygen in the soil and an increase in toxic gases and physical root damage.

TREE PRESERVATION PROCEDURES

Evaluation

Determining which of your trees will be saved is an important process of tree preservation. An analysis of the health, species, size, age and location of the tree in relation to the total development of the site, should be done prior to the commitment of preservation. Evaluating the cost and benefits of tree preservation should be considered carefully.

Health

Examine carefully the tree(s) being considered for tree preservation. Make sure they do not display signs of sunscald, infestation, urban stress or root damage. Site disturbance creates hardships on plant materials and only the most healthy trees should be preserved. While large trees offer great shade and screening, they do not adapt well to changes in the environment and should only be saved in those areas offering great protection to the root system. Conversely, small trees can be replaced easily and may be more cost effective in the long run.

Location of Trees

The location of each tree should be analyzed with respect to its proximity to the proposed development on the site. Most of the trees growing in the Piedmont have root systems within 12 inches of the earth's surface. Before building plans are finalized, it should be resolved that :

- the roots of the tree(s) to be preserved will not be damaged during the grading process,

- an increase or decrease in grade will not affect the survivability of the plant(s),
- construction machinery, supplies and vehicles associated with operations will not harm the tree(s), and
- the tree(s) will be protected from excavation for utilities, paving and all other site development processes.

Root Protection

Preserving a tree's root system from direct and indirect damage will significantly enhance its survivability. Direct root damage to the feeder and transport roots usually occurs during grading and site clearing operations where roots are cut, torn or removed. Feeder and transport roots tangle and fuse with other roots of nearby trees. Removal of adjacent trees can result in considerable damage to the root system of trees being preserved. The most common and substantial root damage happens when roots are cut during grading and trenching for sanitary sewer, storm sewer and underground utilities lines. Feeder roots that are found within the organic layers of the soil (first four inches), are often damaged by vehicular traffic on the site and during the stripping or filling of top soil.

Indirect root damage can result from grade changes, temporary storage of construction materials, soil compaction, soil chemical changes and the sedimentation of erosion materials. The oxygen levels within the soil will increase or decrease with a change of grade or as a result of fill and increased sedimentation. The changes in oxygen levels, an increase in soil carbon dioxide and other toxic gases can adversely affect the root respiration process, which is essential for the absorption and transport of nutrients and minerals. Soil compaction caused by the weight and vibrations of machinery, vehicle parking, and the storage of construction materials will result in a denser soil with a decrease in soil particle space, thereby preventing water and nutrients from penetrating to the roots.

Tree Preservation Methods

Prior to obtaining a grading or building permit, a landscaping plan must be prepared as specified in the Map Standards (Appendix 2). The plan should identify all trees to be preserved. The design of the project site should show protection against grade changes, material storage, concrete washout, parking and all other construction site activities within the canopy drip-line. Absolutely no site disturbance should occur within this protected area.

The tree preservation area should be protected from the sedimentation of erosion material. The grading plan should illustrate that silt screening will be placed along the outer edge of the tree protective zone to prevent excessive drainage, washout and erosion under the tree canopy. To maximize protection to the tree preservation area, the fencing and erosion control barriers should be installed prior to any land disturbance and be maintained throughout the construction process, until the landscaping and/or ground cover is installed.

A fence or barrier should be installed around the outer edge of the canopy completely surrounding the drip-line of the trees to be preserved. This fencing will serve as a visual guide, marking the "off limits" area for construction crews. The fencing must be at least four feet high and made of silt fencing, polyethylene safety fencing, hurricane fencing or any other type of safety fencing.

The tree protection area should be designated as such with "restricted area" or "tree preservation area" signs posted visibly on the outside of the fenced-in area. Do not post these signs on the trees! Additional signs placed at the site entrances, requesting subcontractor cooperation and compliance with tree protection standards, is recommended to increase the awareness of the tree protection process.

Grade Change

Raising and/or lowering the grade can significantly alter the ability of water, air and nutrients to penetrate the root system. Removal of dirt from on top of the tree's roots can cause drying, flooding and cutting of the roots, while too much soil on top of the tree's roots inhibits water and nutrients from getting to the roots and can suffocate them.

An estimation for the diameter of the root spread is the circumference of the canopy spread or twice the height of the tree. The root system of the tree can extend beyond the tree canopy spread but the root system within the drip

line area is considered the critical root zone and must be protected in its entirety throughout the site development process.

Grade changes around the canopy drip-line can be accommodated through additional planning and a few special procedures.

A decrease in grade is best accomplished through the installation of retaining walls or through terracing.

If filling is required within a tree's critical root zone for grading purposes, an aeration system can be installed so that the tree's roots will still be able to attain necessary oxygen levels.

In the event of the installation of utilities through a protective zone it is recommended that the lines be installed by way of tunneling rather than trenching. If the tree's roots must be cut, proper root pruning procedures must be used.

APPROVED PLANT LIST

Ground Covers

Botanical Name and Common Name	Drought-tolerance	NC Hardiness Zone	Flower Color/Time of Bloom	Normal Height (in)	Growth Rate	Group	Exposure
Ajuga reptans **Carptet Bugle**	Medium	7a to 8	Purple/Spring	2-4	Medium to Fast	Evergreen	Shade/ Semi-Shade
Euonymus fortunei 'Coloratus,' **Wintercreeper**	High	6b to 7a	Not Showy	6-18	Fast	Evergreen	Sun/ Semi-Shade
Hedera canariensis **Algerian Ivy**	High	8	None	6-~	Medium	Evergreen	Shade/ Semi-Shade
Hadra helix **English Ivy**	High	6b to 8	None	6-12	Slow to Medium	Evergreen	Shade
Hypericum calycum **Aaronsbeard, St. Johnswort**	High	6b to 8	Yellow/Spring	8-12	Medium to Fast	Semi-Evergreen	Sun/ Semi-Shade
Juniperus conferta **'Blue Pacific,' Shore Juniper**	High	6b to 8	None	12-18	Fast	Evergreen	Sun
Juniperus horizontalis **Creeping Juniper**	High	6b to 8	None	12-24	Medium	Evergreen	Sun
Liriope muscarii **Liriope**	High	6b to 8	Purple/Summer	8-15	Medium	Evergreen	Sun/Shade
Liriope spicata **Spreading Liriope**	High	6b to 8	Purple/Summer	8-15	Medium	Evergreen	Sun/Shade
Ophiopogon **Japonicus Dwarf Lilyturf or Mondograss**	Medium	6b to 8	Not showy	5-6	Medium	Evergreen	Shade
Phlox subulata **Moss Phlox or Thrift**	Medium	6b to 8	Pink, White, Purple/Spring	3-4	Medium	Evergreen	Sun
Vinca minor	Medium,	6b to 7b	Purple/Spring	5-6	Fast	Evergreen	Shade

Common Periwinkle	High						
Vinca major **Large Periwinkle**	1,Medium	7 to 8	Purple/Spring	12-24	Fast	Evergreen	Sun/ Semi-Shade

Small Shrubs (2 to 5 feet)

Botanical Name and Common Name	Drought-tolerance	NC Hardiness Zone	Texture	Form	Normal Height	Growth Rate	Group	Exposure
Aucubajaponica **Dwarf Aucuba**	High	6b to 8	Coarse	Oval	3-4 ft	Slow	Evergreen	Shade/ Semi-Shade
Azaleas, Hybrids	Medium	6b to 8	Fine	Upright	3-5 ft	Slow to Medium	Evergreen	Semi-Shade
Berberis thunbergii **Japanese Barberry**	High	6b to 8a	Medium	Oval	3-5 ft	Medium	Evergreen	Sun/ Semi-Shade
Buxus microphylla var. jaonica **Japanese Boxwood**	High	7a to 8	Fine	Rounded	3-4 ft	Slow	Evergreen	Sun/ Semi-Shade
Deutzia gracilis **Slender deutsia**	High	6b to 8a	Fine	Mounded	2-4 ft	Medium	Semi-Evergreen	Sun/ Semi-Shade
Gardenia radicans **Creeping Gardenia**	Medium	7a to 8	Fine	Spreading	2-4 ft	Slow	Evergreen	Semi-Shade
Hydrongea arborescens **'Annabelle' Smooth Hydrangea**	Medium	6b to 8	Coorse	Rounded	3-5 ft	Fast	Semi-Evergreen	Sun
Ilex cornuta **Carissa Holly**	High	6b to 8	Medium	Rounded	3-4 ft	Slow	Evergreen	Sun/ Semi-Shade
Ilex cornuta **'Rotunda' Dwarf Chinese Holly**	High	6b to 8	Coarse	Rounded	3-4 ft	Slow	Evergreen	Sun/ Semi-Shade
Ilex crenata 'Compacta' **Compact Holly**	Medium	6b to 7	Fine to Medium	Rounded	3-4 ft	Medium	Evergreen	Sun/ Semi-Shade
Ilex crenata **'Green Lustre'**	High	6b to 8a	Fine to Medium	Rounded	3-5 ft	Medium	Evergreen	Sun/ Semi-Shade
Ilex crenata 'Helleri' **Japanese Holly**	Medium	6b to 7	Fine	Spreading	2-3 ft	Slow	Evergreen	Semi-Shade
Ilex cranata **'Hetzi' Hetz Holly**	Medium	6b to 7	Fine to Medium	Rounded	4-5 ft	Medium	Evergreen	Sun/ Semi-Shade
Ilex vomitoria **'Nana' Dwarf Yaupon Holly**	High	6b to 8	Fine	Rounded	3-4 ft	Slow	Evergreen	Sun/ Semi-Shade
Itea virginica **Virginia Sweetspire**	Medium	6b to 8b	Medium Branching	Upright	3-5 ft	Medium	Deciduous	Sun/Shade
Jaminum floridum **Showy Jasmine**	Medium	8	Medium	Upright	3-5 ft	Medium	Evergreen	Sun/ Semi-Shade

Jasminum nudiflorum **Winter Jasmine**	High	6b to 8	Fine	Mounded Spreading	3-4 ft	Fast	Evergreen	Sun/Shade
Juniperus davurica 'Expansa' **Parsons Juniper**	High	6b to 8	Fine	Spreading	2 ft	Medium to Fast	Conifer	Sun
Juniperus hoirizontalis 'Plumosa,' **Andorra Juniper**	High	6b to 8	Fine	Spreading	2 ft	Slow	Conifer	Sun
Kerria japonica **Japanese Kerria**	High	6b to 8	Medium	Upright Arching	3-5 ft	Medium	Evergreen	Sun
Lonicera pileata **Privet Honeysuckle**	High	6b to 8a	Medium	Oval	2-3 ft	Medium	Evergreen	Sun/ Semi-Shade
Nandina domestica **'Harbour Dwarf'**	High	6b to 8	Fine	Upright layered	2-3 ft	Medium	Evergreen	Sun/Shade
Pittosporum tobira **'Nana,' Dwarf Pittosporum**	Medium	7b to 8	Medium	Spreading	3-4 ft	Medium	Evergreen	Sun/ Semi-Shade
Pyracantha koidzumii **'Santa Cruz'**	High	7b to 8	Medium	Prostrate Spreading	2-3 ft	Medium	Evergreen	Sun
Rhaphiolepis indica **Indian Hawthorne**	High	7 to 3	Medium	Spreading	2-4 ft	Slow	Evergreen	Sun
Spirea x burmalda **Bumald Spirea**	High	6b to 8a	Fine	Mounded	2-3 ft	Fast	Deciduous	Sun/ Semi-Shade
Spirea nipponica **'Snowmound'**	High	6b to 8a	Fine	Mounded	3-5 ft	Fast	Deciduous	Sun/ Semi-Shade
Spirea thunbergii **Thunberg Spirea**	High	6b to 8	Fine	Irregular	3-4 ft	Medium	Deciduous	Sun

Medium Shrubs (5 to 8 feet)

Botanical Name and Common Name	Drought Tolerance	NC Hardiness Zone	Texture	Form	Normal Height	Growth Rate	Group	Exposure
Abelia x grandiflora **Abelia**	High	6b to 8	Fine	Irregular	3-4 ft	Slow to Medium	Evergreen	Sun/ Semi-Shade
Aucubajaponica Japanese **Aucuba**	Medium	6b to 8	Coarse	Upright	6-8 ft	Medium	Evergreen	Semi-Shade/ Shade
Berberis julianae Wintergreen **Barberry**	High	6b to 8	Medium	Oval	5-6 ft	Slow to Medium	Evergreen	Sun
Buxus	High	6b to 7a	Fine to	Rounded	5-8 ft	Slow to	Evergreen	Semi-Shade

sempervirens **Common Boxwood**			Medium			Medium		
Cytissus scoparius **Scotch Broom**	High	6b to 8a	Fine	Upright Open	5-6 ft	Medium	Evergreen	Sun
Forsythia intermedia, **Border Forsythia**	Medium	6b to 8	Medium	Irregular	5-7 ft	Fast	Deciduous	Sun
Hydrangea macrophylla **Bigleaf Hydrangea**	Medium	6b to 8	Course	Rounded	5-8 ft	Fast	Evergreen	Semi-Sun
Hydrangea quercifolia **Oakleaf Hydrangea**	Medium	6b to 8	Coarse	Upright	6-8 ft	Medium	Deciduous	Sun
Ilex cornuta, 'Burfodii Nana' **Dwarf Buford Holly**	High	6b to 8	Medium to Coarse	Rounded	5-6 ft	Slow	Evergreen	Sun/ Semi-Shade
Ilex glabra **Inkerry Holly**	Medium	6b to 8	Medium	Rounded	6-8 ft	Medium	Evergreen	Sun
Kalmia latifolia **Mountain Laurel**	Medium	6b to 7	Medium	Upright	5-8 ft	Slow to Medium	Evergreen	Semi-Shade
Lespedeza thunbergii **Thunberg Lespedeza**	High	6b to 8a	Medium	Upright Arching	5-6 ft	Fast	Deciduous	Sun
Mahonia bealei **Leatherleaf Mohonia**	High	6b to 7b	Coarse	Upright	6-7 ft	Medium	Evergreen	Semi-Shade/Shade
Nandina domestica **Nandina or Heavenly Bamboo**	High	6b to 8	Medium	Upright	5-6 ft	Medium	Evergreen	Sun/Semi-Shade
Southern Indian Azalea	Medium	7a to 8	Medium	Rounded	5-8 ft	Medium	Evergreen	Semi-Shade
Spiraea prunifolia, 'Plena' **Bridalwreath Spirea**	High	6b to 8	Fine to Medium	Rounded	5-7 ft	Medium to Fast	Deciduous	Sun
Spiraea vanhouttei **Vanhoutte Spirea**	High	6b to 7b	Medium	Rounded	5-7 ft	Medium to Fast	Deciduous	Sun
Yucca filamentosa **Adam's Needle Yucca**	High	6b to 8	Coarse	Upright	5-6 ft	Medium	Evergreen	Sun

Large Shrubs (8 feet and up)

Botanical Name and Common Name	Drought Tolerance	NC Hardiness Zone	Texture	Form	Normal Height	Growth Rate	Group	Exposure
Buddleia davidii **Butterfly Bush**	High	6b to 8	Medium	Upright, Oval	10-15 ft	Fast	Deciduous	Sun
Calycanthus floridus **Sweetshrub**	Medium	6b to 8	Medium	Broad, Rounded	8-12 ft	Medium	Deciduous	Sun/Shade
Camellia japonica **Camellia**	Medium	6b to 8	Medium to Coarse	Rounded to Oval	8-10 ft	Slow to Medium	Evergreen	Sun/ Semi-Shade
Camellia sansanqua **Sansanqua Camellia**	Medium	7 to 8	Medium	Irregular to Upright	8-10 ft	Slow to Medium	Evergreen	Sun/ Semi-Shade
Chaenomeles speciosa **Flowering Quince**	High	6b to 8	Medium	Rounded	8-10 ft	Medium	Deciduous	Sun/ Semi-Shade
Cryptomeria japonica **'Yoshino' Japanese Cryptomeria**	Medium	6b to8	Fine	Pyramidal to Conical	8-35 ft	Medium	Evergreen	Sun
Elaeagnus x ebbingii **Elaegnus**	High	6b to 8	Medium	Irregular	8-10 ft	Fast	Evergreen	Sun/ Semi-Shade
Euonymus alatus **Winged Euonymous**	High	6b to 8	Medium	Mounded	15-20 ft	Slow	Deciduous	Sun/Shade
Hamamllis vernalis **Vernal Witchhazel**	High	6b to 8a	Medium	Dense, Rounded	8-12 ft	Medium	Deciduous	Sun/ Semi-Shade
Hibiscus syriacus **Shrub Althea (Rose of Sharon)**	High	6b to 8	Medium	Rounded	8-12 ft	Medium	Deciduous	Sun
Ilex x attenuata **'Fosteri,' Foster Holly**	Medium	6b to 8	Medium	Upright	8-10 ft	Slow	Evergreen to Medium	Sun/ Semi-Shade
Ilex cornuta **'Burfordii,' Buford Holly**	High	6b to 7b	Coarse	Oval to Rounded	8-12 ft	Medium to Fast	Evergreen	Sun/ Semi-Shade
Ilex vomitoria **Yaupon Holly**	High	6b to 8	Fine	Upright	8-12 ft	Medium to Fast	Evergreen	Sun/ Semi-Shade
Juniperus Chinesis **'Hetzi,' Hetz Juniper**	High	6b to 8	Fine	Upright	15 ft	Fast	Conifer	Sun
Juniperus chinensis **'Pfitzeriana,' Pfitzer Juniper**	High	6b to 8	Fine	Broad, Upright	8-10 ft	Fast	Conifer	Sun
Leucothoe populufolia **Fetterbrush**	Medium	7a to 8	Medium	Upright, Arching	8-12 ft	Medium	Evergreen	Semi-Shade/ Shade
Ligustrum japonicum **Japanese Privet**	High	7b to 8	Coarse	Dense/Rounded	8-12 ft	Medium	Evergreen	Sun/Shade
Ligustrum lucidum	High	7b to 8	Medium	Rounded	10-20 ft	Medium	Evergreen	Sun/ Semi-

Waxleaf Privet			to Coarse			to Fast		Shade
Ligustrum sinense **Chinese Privet**	High	7a to 8	Medium	Dense, Rounded	10-15 ft	Medium	Evergreen	Sun/Shade
Ligustrum x vicaryi **Vicary Golden Privet**	High	6b to 8	Medium	Rounded	10-12 ft	Medium	Evergreen	Sun/ Semi-Shade
Magnolia stellata **Star Magnolia**	Medium	6b to 8a	Coarse	Rounded	10-15 ft	Medium	Deciduous	Sun/ Semi-Shade
Myrica cerifera **Southern Waxmyrtle**	High	7b to 8b	Medium	Upright, Rounded	8-10 ft	Medium	Evergreen	Sun/ Semi-Shade
Osmanthus fortunei **Fortunes Osmanthus**	High	6b to 8	Medium	Rounded	8-10 ft	Slow to Medium	Evergreen	Semi-Shade
Philadelphis coronarius **Sweet Mockorange**	High	6b to 8a	Medium	Rounded	10-12 ft	Medium	Deciduous	Sun/ Semi-Shade
Pittosporum tobira **Japanese Pittosporum**	Medium	7b to 8b	Medium	Rounded	8-10 ft	Fast	Evergreen	Sun/ Semi-Shade
Podocarpus macrophyllus var maki **Southern Yew**	Medium	7a to 8b	Medium	Upright	8-12 ft	Medium	Evergreen	Sun/ Semi-Shade
Pyrancantha species **Firethorn**	Medium	6b to 8	Medium	Irregular	10-12 ft	Fast	Evergreen	Sun
Rhododendron austrinum **Florida Azalea**	Medium	6b to 7	Medium	Rounded	8-12 ft	Medium	Deciduous	Semi-Shade/ Shade
Rhododendron calendulaceum **Flame Azalea**	Medium	6b to 7	Medium	Rounded	10-15 ft	Medium	Deciduous	Semi-Shade/ Shade
Rhododendron canescens **Piedmont Azalea (Rosy Purple Flower)**	Medium	6b to 7	Medium	Rounded	10-15 ft	Medium	Deciduous	Semi-Shade/ Shade
Rhus typhina **Staghorn Sumac**	High	6b to 8	Fine	Open, Spreading	15-25 ft	Fast	Deciduous	Sun/ Semi-Shade
Ternstoemia gymnathera **Cleyera**	Medium	6b to 8	Medium	Upright	8-10 ft	Slow to Medium	Evergreen	Sun/ Semi-Shade
Viburnum lantana **Wayfaringtree**	High	6b to 8a	Coarse	Round, Spreading	10-15 ft	Medium	Deciduous	Sun/ Semi-Shade
Viburnum opulus **European, Cranberrybush**	High	6b to 8a	Coarse	Upright, Spreading	8-12 ft	Medium	Deciduous	Sun/ Semi-Shade
Viburnum plicatumtomentosum **Doublefile**	High	6b to 8a	Coarse	Round, Spreading	8-10 ft	Medium	Deciduous	Sun/ Semi-Shade
Viburnum x	High	6b to 8a	Medium	Oval	10-12 ft	Medium	Deciduous	Sun/ Semi-

pragense **Prague Viburnum**								Shade

Small Trees (10 feet to 30 feet tall)

Botanical Name and Common Name	Drought Tolerance	NC Hardiness Zone	Texture	Form	Height/ Spread (ft)	Growth Rate	Group	Exposure
Acer barbatum **Southern Sugar or Florida Maple**	High	6b to 8	Medium	Spreading	20-30/15-20	Medium	Deciduous	Sun/ Semi-shade
Acer buergeranun **Trident Maple**	High	7b to 8	Medium	Oval	20-25/10-15	Slow	Deciduous	Sun
Acer campestre **Hedge Maple**	High	6b to 8	Medium	Rounded	25-35/20-30	Slow	Deciduous	Sun
Acer ginnala **Amur Maple**	Medium	6b to 8a	Medium	Rounded	15-20/10-15	Slow	Deciduous	Sun
Acer japonica **Japanese Maple**	Medium	6b to 8	Fine	Rounded	15-25/15-25	Slow	Deciduous	Semi-shade/ Shade
Acer leucoderme **Chalkbark Maple**	High	6b to 8	Medium	Spreading	25-30/15-20	Medium	Deciduous	Sun
Carpinus caroliniana **American Hornbean**	High	6b to 5	Medium	Loose, Rounded	20-30/15-25	Slow	Deciduous	Sun/Shade
Cercis canadensis **Redbud or Judas Tree**	Medium	6b to 8	Medium	Oval	25-30/20-28	Medium	Deciduous	Sun/Shade
Chionanthus virgincus **Fringe Tree or Grancy Gray-beard**	High	6b to 8	Coarse	Irregular	10-20/15-20	Slow to Medium	Deciduous	Sun/ Semi-Shade
Continus coggygria **Common Smoketree**	High	6b to 8a	Medium	Upright, Spreading	10-15/10-15	Medium	Deciduous	Sun/ Semi-Shade
Cornus florida ***Flowering Dogwood***	Medium	6b to 8	Medium	Rounded	15-25/15-20	Medium	Deciduous	Semi-Shade/ Shade
Cornus kousa ***Flowering Dogwood***	Medium	6b to 8	Medium	Rounded	15-20/10-15	Medium	Deciduous	Sun-/Semi-Shade
Cupressocyparis leyiandii **Leyland Cypress**	High	6b to 8	Fine	Upright	60-70	Fast	Evergreen	Sun/ Semi-Shade

Eriobotrya Japonica **Loquat**	Medium	7b to 8	Coarse	Rounded	10-20/8-12	Medium to Fast	Evergreen	Sun
Halesia carolina **Silverbell**	Medium	6b to 8	Medium	Spreading	20-30/15-20	Medium	Deciduous	Sun/ Semi-Shade
Ilex x attenuata **'Savannah,' Savannah Holly**	High	6b to 8	Coarse	Pyramidal	25-30/10-15	Medium	Evergreen	Sun/Shade
Ilex decidua **Possumhaw**	High	6b to 8	Medium	Loose, Rounded	20-30/15-20	Medium	Deciuous	Sun/ Semi-Shade
Ilex latifolia **Lusterleaf Holly**	High	6b to 8	Coarse	Pyramidal	20-25/15-20	Medium	Evergreen	Sun/Shade
Ilex x 'Nellie R. Stevens' **Nellie R. Stevens, Holly**	High	6b to 8	Coarse	Pyramidal	15-25/10-15	Medium	Evergreen	Sun/Shade
Ilex opaca **American Holly**	Medium	6b to 8	Medium to Coarse	Pyramidal	20-30/15-20	Medium	Evergreen	Sun/Shade
Koelreuteria paniuclata **Goldenraintree**	High	6b to 8	Fine	Rounded	20-30/10-15	Medium	Deciduous	Sun
Lagerstroemia indica **Crape Myrtle**	High	6b to 8	Fine	Upright	20-30/10-15	Fast	Deciduous	Sun
Maclura promifera **Osage-orange**	High	6b to 8	Medium	Rounded, Irregular	20-30/20-30	Fast	Deciduous	Sun
Magnolia x soulangiana **Saucer Magnolia**	High	6b to 8	Coarse	Rounded	20-30	Medium	Deciduous	Sun/ Semi-Shade
Malus hybrids & cultivars **Flowering Crabapples**	Medium-High	6b to 8	Medium	Rounded to Upright	15-30/15-30	Medium	Deciduous	Sun
Ostrya virginiana **American Hophornbeam**	High	6b, 8	Medium	Rounded	25-35/15-25	Slow	Deciduous	Sun/ Semi-Shade
Oxydendrum arboreum **Sourwood**	Medium	6b, 7a	Medium to Coarse	Upright	30-40/15-20	Medium	Deciduous	Sun/ Semi-Shade
Prunus caroliniana **Carolina Laurel, Cherry**	High	7 to 8	Medium	Oval	20-30/15-20	Fast	Evergreen	Sun/Shade
Prunus serrulata **Japanese Flowering Cherry**	Medium	6b to 7b	Medium	Vase to Rounded	20-30/20-30	Medium	Deciduous	Sun
Prunus subhirtella vars.	High	6b to 8	Medium	Pyramidal Pendulous	20-40/15-30	Medium	Deciduous	Sun

pendula & autumnalis **Weeping & Autumn Higan Cherry**				& Upright Oval				
Prunus x yedoensis **Yoshino Cherry**	Medium	6b to 8	Medium	Oval, Spreading	20-35/20-25	Medium	Deciduous	Sun
Pyrus calleryana **Callery Pear & Bradford, Aristocrat, Chanticleer**	High	6b to 8	Medium	Upright Oval to Rounded	35-40/15-20	Medium to Fast	Deciduous	Sun
Vitex agnus-castus **Chastetree**	High	6b to 8	Medium	Oval	15-20/10-15	Medium	Deciduous	Sun

Large Trees (30 feet and taller)

Botanical Name and Common Name	Drought Tolerance	NC Hardiness Zone	Texture	Form	Height/ Spread (ft)	Growth Rate	Group	Exposure
Acer rubrum **Red Maple**	Medium	6b to 8	Medium	Rounded	40-50/25-35	Medium	Deciduous	Sun/ Semi-Shade
Acer saccharum **Sugar Maple**	Medium	6b to 7a	Medium	Oval	60-80/25-40	Medium to Fast	Deciduous	Sun/ Semi-Shade
Betula nigra **River Birch**	Medium	6b to 8	Medium	Oval	40-70/40-60	Fast	Deciduous	Sun
Carpinus betulus **European Hornbeam**	High	6b to 8	Medium	Oval	40-70/40-60	Slow	Deciduous	Sun
Carya illinoesis **Pecan**	Medium	7a to 8	Medium	Rounded	50-60/30-40	Medium	Deciduous	Sun
Cedrus deodara **Deodar Cedar**	High	7a to 8	Fine	Pyramidal	50-70/40-50	Medium	Evergreen	Sun
Cercidiphyllum japonicum **Katsura Tree**	Medium	6b to 8	Medium	Oval	40-60/35-50	Fast	Deciduous	Sun
Cladrastis lutea **Yellowwood**	High	6b to 8	Medium	Rounded	30-50/35-50	Medium	Deciduous	Sun
Corylus colurna **Turkish Filbert**	High	6b to 7b	Medium	Pyramidal	40-50/20-30	Medium	Deciduous	Sun
Cunninghamia lanceolata **Common Chinafir**	Medium	7b to 8	Fine	Conical	30-75/10-30	Slow	Evergreen	Sun/ Semi-Shade
Cupressocyparis leylandii **Leyland Cypress**	High	6b to 8	Fine	Upright	60-70/10-15	Fast	Evergreen	Sun
Franxius pennsylvanica	High	6b to 8	Medium	Upright, Spreading	50-60/30-50	Medium	Deciduous	Sun/ Semi-shade

Green Ash								
Franxius americana **Green Ash**	Medium	6b to 8	Medium	Upright, Spreading	50-80/40-60	Medium	Deciduous	Sun/ Semi-shade
Ginko biloba **Ginko or Maiden Tree**	Medium	6b to 8	Medium	Irregular	50-70/30-40	Very Slow	Deciduous	Sun
Gleditsia triacanthos var. *inermis* **Thornless Honey Locust**	High	6b to 8	Medium	Upright, Spreading	30-50/30-50	Medium	Deciduous	Sun
Juniperus virginiana **Deodar Cedar**	High	6b to 8	Fine	Oval, Conical	40-60/10-30	Medium	Evergreen	Sun
Liriodendron tulipifera **Tuliptree (Yellow Poplar)**	Medium	6b to 8	Coarse	Broad, Rounded	70-90/35-50	Fast	Deciduous	Sun/ Semi-shade
Liquidambar styraciflua **American Sweetgum**	High	6b to 8	Medium	Pyramidal, Oval	60-75/30-40	Fast	Deciduous	Sun
Magnolia grandiflora **Southern Magnolia**	Medium	6b to 8	Course	Upright, Pyramidal	60-80/40-50	Slow to Medium	Evergreen	Sun/ Semi-shade
Metasequoia glyptosfroboides **Dawn Redwood**	Medium	6b to 8	Fine	Conical	40-50/20-25	Fast	Deciduous	Sun
Nyssa sylvatica **Blackgum, Tupelo**	High	6b to 8	Medium	Oval, Rounded	30-50/20-30	Medium	Deciduous	Sun
Phelledendron amurense **Amur Corktree**	High	6b to 7	Medium	Broad Spreading	30-45/30-45	Medium	Deciduous	Sun
Pinus nigra **Austrian Pine**	High	6b to 7	Medium	Pyramidal	50-60/20-40	Medium	Evergreen	Sun
Pinus palustris **Longleaf Pine**	High	7b to 8	Coarse	Coarsely Pyramidal	50-60/30-40	Slow	Evergreen	Sun
Pinus taeda **Loblolly Pine**	High	6b to 8	Medium	Loosely Pyramidal	80-100/20-30	Fast	Evergreen	Sun
Pinus virginiana **Virginia Pine**	High	6b to 8a	Fine	Conical	25-45/20-35	Medium	Evergreen	Sun
Pistachia chinensis **Chinese Pistache**	High	6b to 8	Medium	Oval to Rounded	30-40/25-35	Medium	Deciduous	Sun
Platanus x acerifolia **London Planetree, Sycamore**	High	6b to 8	Coarse	Open Spreading	70-100/60-80	Medium	Deciduous	Sun
Quercus alba	High	6b to 8	Medium	Broadly	50-80/50-	Slow	Deciduous	Sun

White Oak				Rounded	80			
Quercus acutissima **Sawtooth Oak**	High	6b to 8	medium	Broad, Oval	35-45/35-45	Medium	Deciduous	Sun
Quercus coccinea **Scarlet Oak**	High	6b to 8a	Medium	Pyramidal	70-80/40-50	Medium	Deciduous	Sun
Quercus falcata **Southern Red Oak**	High	6b to 8	Coarse	Rounded	70-80/30-40	Medium	Deciduous	Sun
Quercus imbricaria **Shingle Oak**	High	6b to 8	Medium	Oval to Rounded	50-70/50-60	Medium	Deciduous	Sun
Quercus lyrata **Overcup Oak**	High	6b to 8	Coarse	Oval to Rounded	40-60/40-60	Medium	Deciduous	Sun
Quercus hemisphaerica **Laurel Oak, Darlington Oak**	High	6b to 8	Fine	Rounded	40-60/30-40	Medium to Fast	Semi-evergreen	Sun
Quercus laurifolia **Swamp Laurel Oak**	High	6b to 8	Fine	Rounded	40-60/40-60	Medium to Fast	Deciduous	Sun
Quercus nigra **Water Oak**	High	6b to 8	Medium	Rounded	80-90/40-50	Medium to Fast	Deciduous	Sun
Quercus nutallii **Pin Oak**	High	6b to 8a	Medium	Pyramidal	70-80/40-50	Medium	Deciduous	Sun
Quercus palustris **Pin Oak**	Medium	6b to 8a	Medium	Pyramidal	70-80/40-50	Medium	Deciduous	Sun
Quercus phellos **Willow Oak**	High	6b to 8	Fine	Rounded	80-100/40-50	Medium to Fast	Deciduous	Sun
Quercus rubra **Northern Red Oak**	Medium	6b to 7b	Medium	Rounded	60-75/60-75	Medium to Fast	Deciduous	Sun
Quercus shumardii **Shumard Oak**	High	6b to 8	Medium	Pyramidal	40-60/40-60	Medium	Deciduous	Sun
Quercus virginiana **Live Oak**	High	7b to 8	Medium	Rounded	60-80/50-60	Medium	Evergreen	Sun
Tilia x euchlora **Crimean or Caucasian Linden**	Medium	6b to 7b	Medium	Broad Ovate	40-60/20-30	Medium	Deciduous	Sun
Tilia tomentosa **Silver Linden**	High	6b to 7b	Medium	Upright Ovate	50-70/30-40	Medium	Deciduous	Sun
Taxodium distichum & T. ascendens **Baldcypress & Pondcypress**	High	6b to 8	Fine	Conical & Columnar	50-70/20-30	Medium	Deciduous	Sun
Ulmus parvifolia	High	6b to 8	Medium	Rounded	40-50/30-	Fast	Deciduous	Sun

True Chinese Elm, Lacebark Elm)					40			
Zelkova serrata **Japanese Zelkova**	High	6b to 8a	Medium	Broad, Oval	50-80/50-60	Fast	Deciduous	Sun