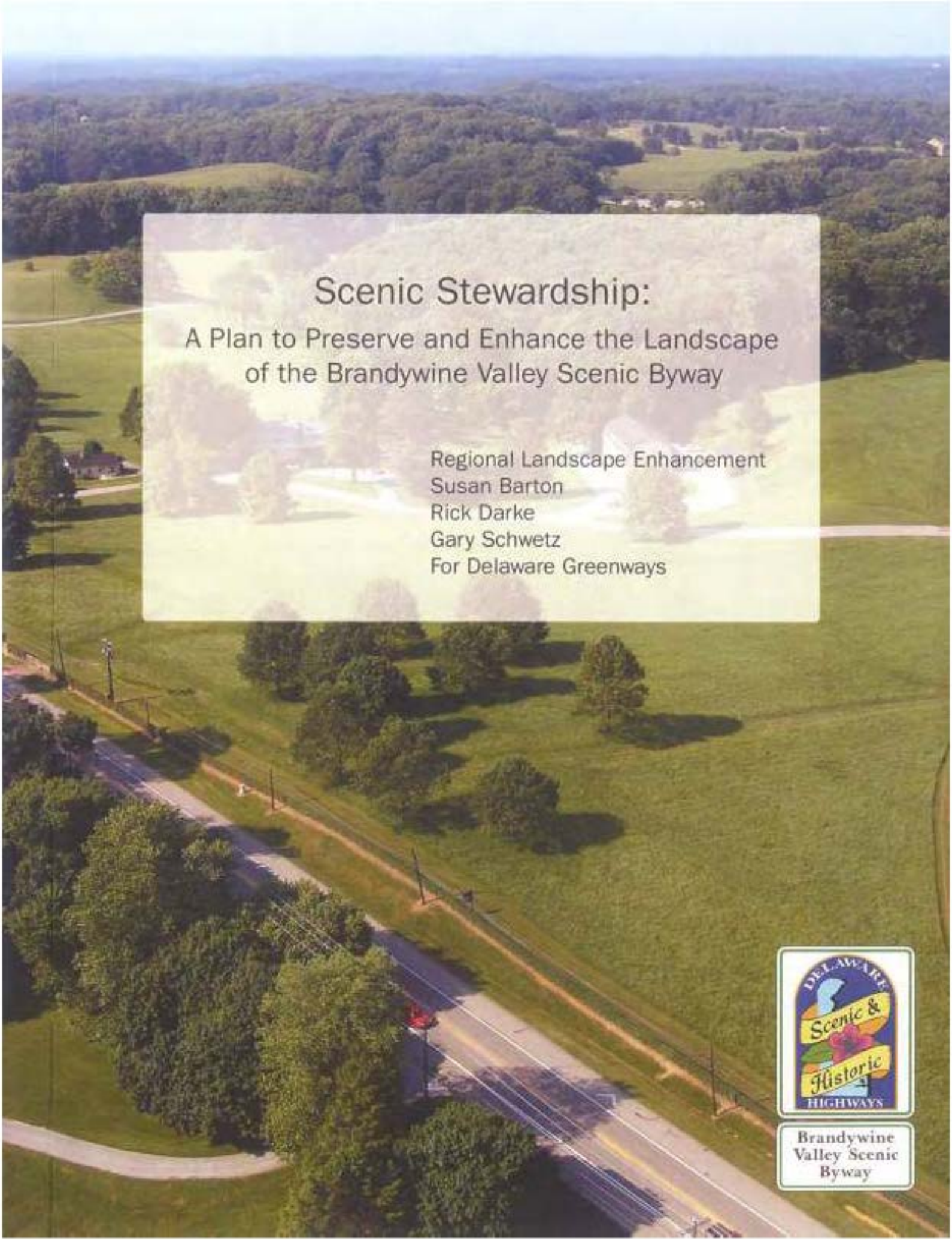

Scenic Stewardship:

A Plan to Preserve and Enhance the Landscape of the Brandywine Valley Scenic Byway

Regional Landscape Enhancement
Susan Barton
Rick Darke
Gary Schwetz
For Delaware Greenways

Delaware Scenic & Historic Highways

Brandywine Valley Scenic Byway

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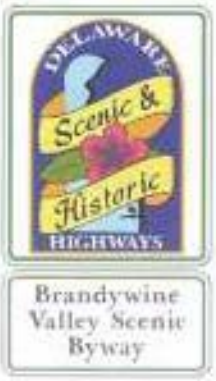

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Acknowledgements

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Contents

Introduction

For the first time in the state of Delaware, with the support of an FHWA National Scenic Byway grant, Delaware Greenways, the Delaware Department of Transportation and their partners have been able to inventory and make recommendations for the management of a state scenic byway roadside landscape, the Brandywine Valley Scenic Byway. This byway is composed of two parallel roadways, Route 52 (Kennett Pike) and Route 100 (Montchanin Road), beginning in the City of Wilmington and extending to the Pennsylvania state line. This Landscape Management Plan constitutes the management goals and recommendations necessary to recognize and preserve the unique character that defines the Brandywine Valley Scenic Byway.

Route 52 (Kennett Pike), the main spine of the byway, developed from the early days of the Brandywine Valley as a utilitarian road–an efficient toll road connecting the City of Wilmington with points north through the surrounding working-agricultural landscape. Route 100 (Montchanin Road) is the back country byway, a narrow meandering roadway following the course of the Brandywine River, and remaining largely unchanged over the years, especially north of Route 92.

The vision of Kennett Pike as a beautiful highway begins early in the twentieth century with Pierre du Pont. Prior to Pierre's extensive modernization efforts, Henry Algernon du Pont originally rebuilt the roadway to facilitate the transport of goods into the city of Wilmington from surrounding farms.

In June 1919, Every Evening told its Wilmington readership that Pierre du Pont "will make the Old Kennett Pike a thing of beauty, a highway that will be a priceless gift to the public for all time." It was the comprehensive land acquisition and highway modernization project, completed by Mr. du Pont, that created the straight and broad roadway we see today.

The look of the byway has dramatically evolved from a largely working-agricultural landscape mixed with scattered forest and wetland remnants to a landscape of country estates and cultural institutions. The cultural institutions have become regional and international tourist destinations. The evolving vision of this corridor was strongly impacted by the horticultural heritage of these institutions and their caretakers, resulting in extensively refurbished landscapes, augmenting local and regional vegetation with the ornamental planting palette of the period. Kennett Pike includes great avenues of trees and grand vistas into open spaces, and it is the combination of these features that makes the byway so appealing and regionally unique.

The landscape management plan recognizes Mr. du Pont's early 20th century efforts to transform Kennett Pike, and how those early efforts evolved into a sophisticated historic and cultural landscape that includes Montchanin Road and forms the backbone of today's vision for the Brandywine Valley Scenic Byway. Today's civic-minded stakeholders who enjoy the historic and cultural landscapes along Kennett Pike and Montchanin Road are making great strides in their efforts to shape the Byway in a manner that will preserve the essential qualities of this significant historic and cultural landscape while ensuring that individual property rights and responsibilities are maintained.

The purpose of this landscape management plan is to help the Byway's stakeholders—those who are responsible for the byway's stewardship including DelDOT, adjacent property owners, civic associations, and its major institutions—to work together towards a coordinated and common goal of preserving and enhancing the Byway's identity as one of Delaware's most significant historic and cultural landscapes. The roadside landscape is one piece of the puzzle that, if appropriately managed, can have a huge impact on achieving overall preservation and enhancement goals

The plan is organized according to the fifteen distinctive character areas that comprise the Brandywine Valley Scenic Byway's three recognizable segments—the City of Wilmington, Kennett Pike (Route 52), and Montchanin Road (Route 100). The landscape management plan includes an analysis of some of the common problems within each character areas and offers recommendations for appropriate ways to address those problems.

The recommendations are based upon the historic, cultural and natural processes that have shaped the landscape over time. They include practical and easy to understand illustrations showing how the various treatment and management recommendations might be applied to specific areas together with a full range of topics germane to the preservation and enhancement of the byway's roadside qualities. These include:

- Expansion of urban green space and planting opportunities
- Improving urban planting environments in response to stresses of pollution, compaction, root restrictions and other common urban horticultural problems
- Reducing maintenance requirements in existing urban parks along the byway
- Enhancing the aesthetic qualities of the byway in urban, village and rural settings, especially where views are less desirable, such as around parking lots and major intersections
- Using landscape elements to reinforce overall traffic calming and pedestrian safety goals
- Framing attractive views and structures with plantings

- Balancing the need for privacy and screening along the byway with the need to preserve open and expansive views
- Finding innovative solutions to more common roadside problems including drainage, shoulders, and guardrails.

The landscape management plan focuses primarily on the roadside areas—both within the DelDOT right-of-way and along the frontage of individual properties. A companion document is planned that will help individual property owners who wish to do their part to preserve and enhance the byway's views and context as they consider changes to the use of their private properties.

The landscape management plan is intended to help those who want to do their part in the stewardship of roadsides that comprise the significant historic and cultural landscapes of Delaware's Brandywine Valley. These recommendations are intended to help caretakers of the Brandywine Valley Scenic Byway make decisions in harmony with the byway's regionally unique character and guide any new plantings to capture and continue the essence of the historic byway aesthetic. The elements of estate scale and era plantings, located so they are able to mature to their full size and majesty, create a unique Brandywine Valley landscape experience. It is obvious that the byway was planted for the future rather than short-term immediate effects and has evolved into a very eloquent, but understated landscape that will continue to stand the test of time.

The goal is to insure the journey along the byway remains as scenic and significant as the destinations themselves. This will be accomplished by preserving and maintaining the evolving roadside landscape of the byway from city to the countryside.

City of Wilmington

Within the City of Wilmington, the byway is comprised of five character area segments, extending from the urban core of central Wilmington, through transitional urban residential areas, to the commercial district of Union Park, and beyond to the distinct early twentieth century residential neighborhoods at the city line. The character of the byway is dependent upon plantings both within and beyond the public right-of-way. Preservation and enhancement will require an inclusive approach that promotes cooperation between public and private entities.

Design goals:

- Provide and encourage more green infrastructure (trees, shrubs and other plantings) within the built city on public right-of-way and private property including parking lot buffers, building frontages and other open spaces.

- Increase color/seasonal interest in existing parks.

- Preserve and increase unpaved areas to sustain a significant tree canopy throughout the city in partnership with private landowners where feasible.

- Maximize the potential of landscape elements to calm traffic and increase pedestrian safety, especially at crosswalks.

- Adopt guidelines for parking lots, traffic medians, sidewalks, tree pits and other enclosed planting spaces to provide healthful growing conditions and innovative rooting-space and drainage solutions for plantings (i.e., structural soil and pervious paving) that will reduce the need for frequent replacement.

Management goals:

- Develop efficient, effective, and sustainable maintenance strategies for green infrastructure improvements (plantings).

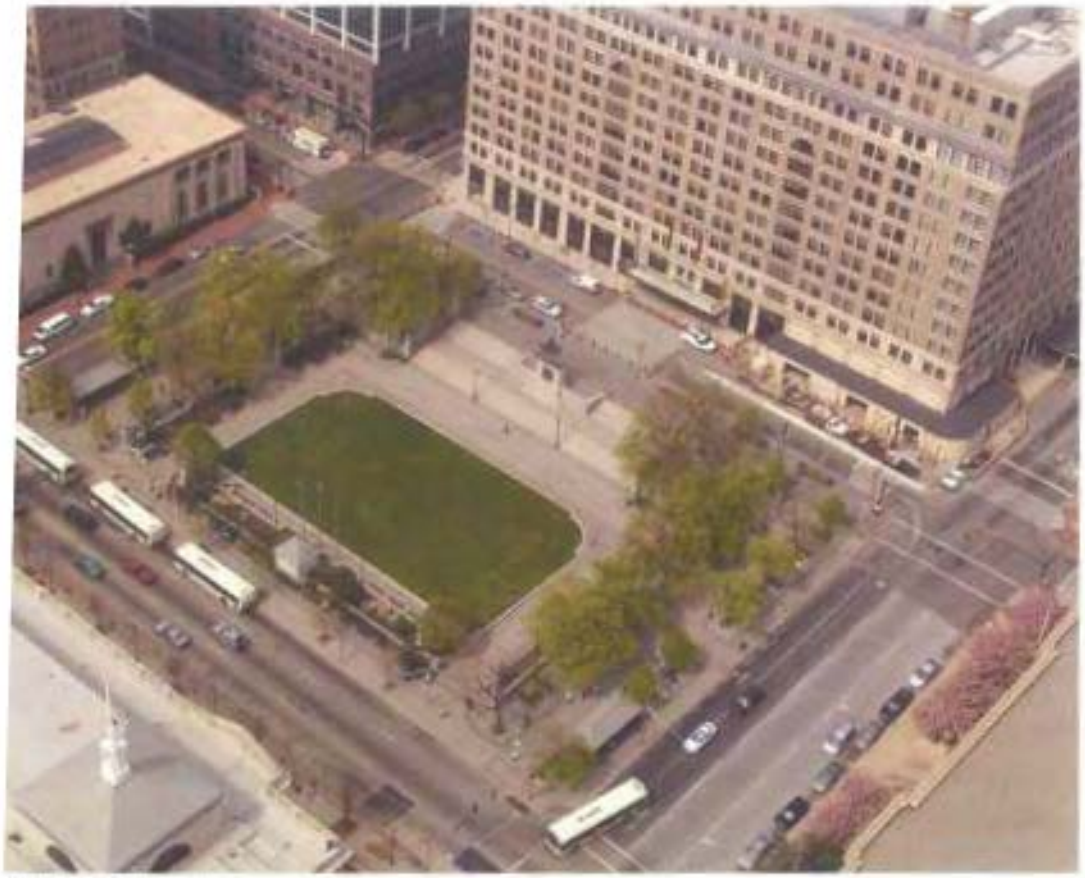
- Seek public/private partnerships to fund, develop, and manage sustainable enhancements.

- Maintain and periodically update the tree inventory for the City of Wilmington.

- Implement a preservation and replacement strategy for existing tree plantings.

- Modify DelDOT's routine roadside management practices to include pruning to maintain clearance.

- Maintain inventory, recognize and preserve notable specimen trees (see Appendix C).



ate 002. Rodney Square

Plate 003. H. B. du Pont Plaza

Plate 004
Early 20th century Rodney Square

Character segment 1

Eleventh Street Corridor – Walnut Street to Jefferson Street; including Rodney Square

Description:

Wilmington's tallest buildings, clustered together and creating a canyon-like effect, dominate the Eleventh Street Corridor. In this highly built environment, green spaces provided by trees, turfgrass, and planting beds offer pleasing respites from the enclosing abundance of concrete, blacktop, brick and glass. The most dramatic and historic of these openings is Rodney Square (Plate 002). Second in size and more recent in origin is H.B. du Pont Plaza, a triangular park located between Washington, 10th, 11th and Orange streets (Plate 003).

On some streets, trees are the only green component. When planting beds are not available, planter boxes and containers are sometimes placed directly on the pavement. A few smaller park spaces exist as traffic islands or pocket parks.

Analysis:

The City Beautiful Movement in the early 1900's promoted public open space. Inspired by this movement, the New Castle County Courthouse of 1880 was demolished and the new City/County Courthouse was positioned east of King Street providing the opportunity to create the open space that is now Rodney Square. Rodney Square was originally conceived as a central rectangular lawn bordered by symmetric flowerbeds. Double rows of trees were planted around the periphery in turf beds (Plate 004). The labor-intensive flowerbeds were discarded late in the 20th century in favor of naturalistic beds using native plants. As replacements have been made to meet the demands of garden culture and human use, the result has been a greater diversity of plants. The naturalistic design and increased diversity is at odds with the traditionally ordered symmetry of the park (Plate 005). This symmetry has been further degraded by the random loss of trees and shrubs through natural attrition and unhealthy conditions.

Plate 005 Rodney Square, winter 2003

Plate 006: Early 20th century Rodney Square

In fact, the original design provided healthier growing conditions for trees. An historic photo shows large continuous tree beds (Plate 006), which have since been replaced by inadequately small tree pits set in stone pavers (Plate 007). To be consistent with the site's historic tradition, mature trees must reach a stately size. Under current conditions, trees grow no larger than 12-inches in caliper before beginning to decline. This situation is typical of many tree conditions throughout the segment (Plate 008).

Plate 007
Grate and pavers around Linden trees

Plate 008
Tree pit conditions on 11th Street

While the overall trend during the past century has been towards increased paved area in downtown Wilmington, there are instances where paving has actually decreased. Two photographs, 60 years apart, demonstrate the greener current conditions. Plate 009 shows the triangular space between 11th and 10th streets almost totally covered in paving and masonry. The same space in 2004, (Plate 010) is characterized by a significant tree canopy, which is supported by ample bed spaces and 10-foot square tree pits. This type of landscape space provides a pleasant green oasis in the city (Plate 011).

Plate 009
Historical photo of triangle at 11th, 12th and Washington Streets.

Plate 010
H. B. du Pont Plaza at 11th, 12th and Washington Streets, 2004

Plate 011 H. B. du Pont Plaza, 2004

Recommendations:

- Remove some existing plants in Rodney Square beds to reduce the diversity and replace with equally drought tolerant species that achieve a more formal "bedding look." Use large masses of relatively few species to provide seasonal flowering interest in different sections of the square (arranged symmetrically in planting blocks). One area should contain masses of minor bulbs (*Scilla sibirica, Crocus tomasinianus, Galanthus nivalis, Chionodoxa luciliae*) in spring followed by plumbago (*Ceratostigma plumbaginoides*) or Christmas fern (*Polystichum acrostichoides*). Other planting blocks should be filled with summer phlox (*Phlox paniculata* 'Robert Poore') with bugleweed (*Ajuga reptans*) in front (for summer bloom) and *Chrysanthemum* 'Sheffield Pink' (for fall bloom) (Plates 012 and 013).
- Plant additional shrubs such as cherry laurel (*Prunus laurocerasus*) and Korean spice viburnum (*Viburnum carlesii*) to recreate the symmetrical character of the square. Select durable survivors relating to the historical period palette (such as *Spirea* 'Snowmound' and Japanese holly (*Ilex crenata*) so the planting is evocative of a time when Rodney Square was conceived but is smartly adapted to today's maintenance constraints.
- Consider removing pavers (in 10-foot by 10-foot area) around some of the large perimeter trees in Rodney Square along 10th and 11th streets to provide more growing space/root space. (At time of report writing, a number of Linden trees are dead/dying on Rodney Square.) Use a consistent drought tolerant groundcover (such as a combination of Silver Sceptre sedge and Ice Dance sedge (*Carex morrowii* 'Silver Sceptre' or 'Ice Dance') at the base of trees where pavers are deleted and add high curb to discourage and control pedestrian traffic as illustrated in Figure 1, page 19.

Plate 012 *Phlox paniculata* 'Robert Poore'

Plate 013 *Chrysanthemum* 'Sheffield Pink'

Plate 014 Planting opportunity around H. B. du Pont Plaza fountains

- Maintain emphasis on public open space in keeping with the precedent set by the City Beautiful Movement. Work with private property owners to incorporate plants for beautification, screening and expanded tree canopy.
- Improve plantings in H.B. du Pont Plaza on 10th street by adding flowering interest with planted containers or by planting a row of shrubs (such as *Spirea* 'Snowmound') around the circular fountain (Plate 014).
- Adopt innovative methods for providing greater tree root space, which will reduce the decline and death of street trees. Evaluate the use of a structural soil technique developed by Cornell University (Appendix A), which was piloted in Wilmington in 2002 on 11th between Walnut and Spruce and has also been used on Market Street renovations in 2004. Investigate modeling other emerging methods to increase root space including cantilevered and modular pavement support systems.
- Work with property owners and managers to screen and beautify existing and new parking lots with plantings of trees and shrubs, fences and partial walls. Identify unused spaces on parking lot edges that can be utilized for tree and buffer plantings without losing parking capacity as illustrated in Figures 2, 3, 4 and 5, pages 20-23.
- Replace dying Zelkova trees in this character segment with other trees from the City of Wilmington Recommended Street Tree List (Appendix B) to reduce the overuse of Zelkova trees in Wilmington.

Carex siderostricha

Carex morrowii

Carex morrowii

Figure 1b. Rodney Square

Perspective illustrating removal of pavers at trees and replacement with *Carex sp.* groundcovers

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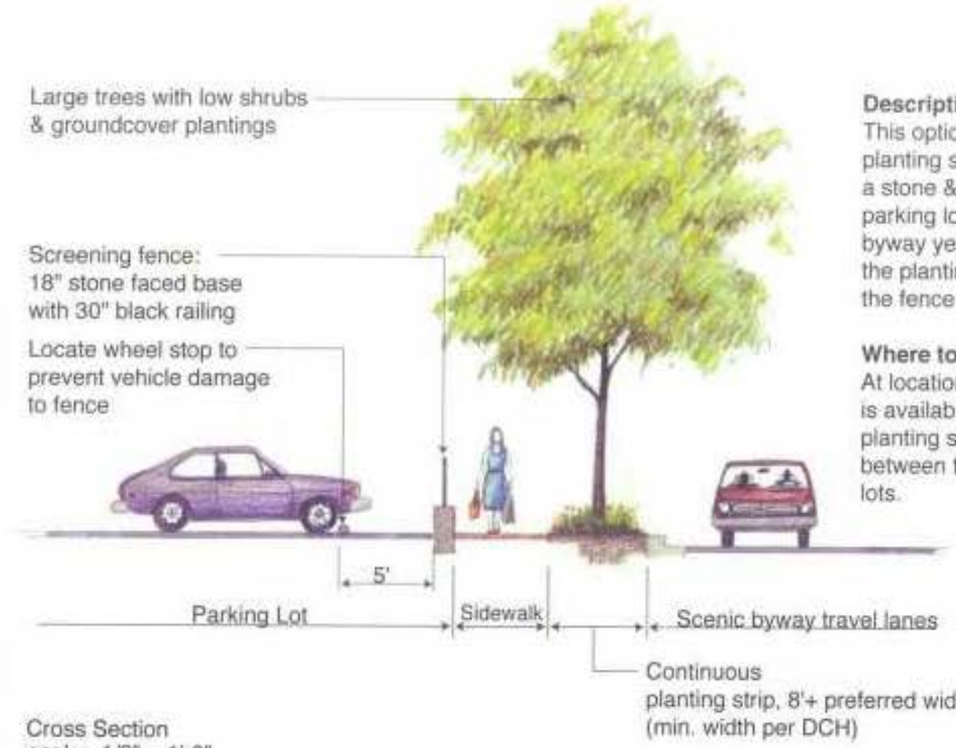
February 2005



Description:
This option uses a continuous planting strip in conjunction with a stone & rail fence to screen parking lots and enhance the byway year round. As shown, the plantings are separated from the fence by a sidewalk.

Where to Use:
At locations where right-of-way is available to install continuous planting strip and sidewalk between the Byway and parking lots.

Impact to private parking facility:
Minimal. Owners must accommodate fence wall base (estimated 18" max. width) into lot area; and locate wheel stops to prevent damage to fence wall.

Benefits:
Enhances character of byway;
Pedestrian experience perceived to be safer (pedestrians separated from traffic by plantings);
Plantings accommodated within right-of-way;
Minimal impact to adjacent property owners.

Figure 2. BVSB Parking Lot Screening
Option 1

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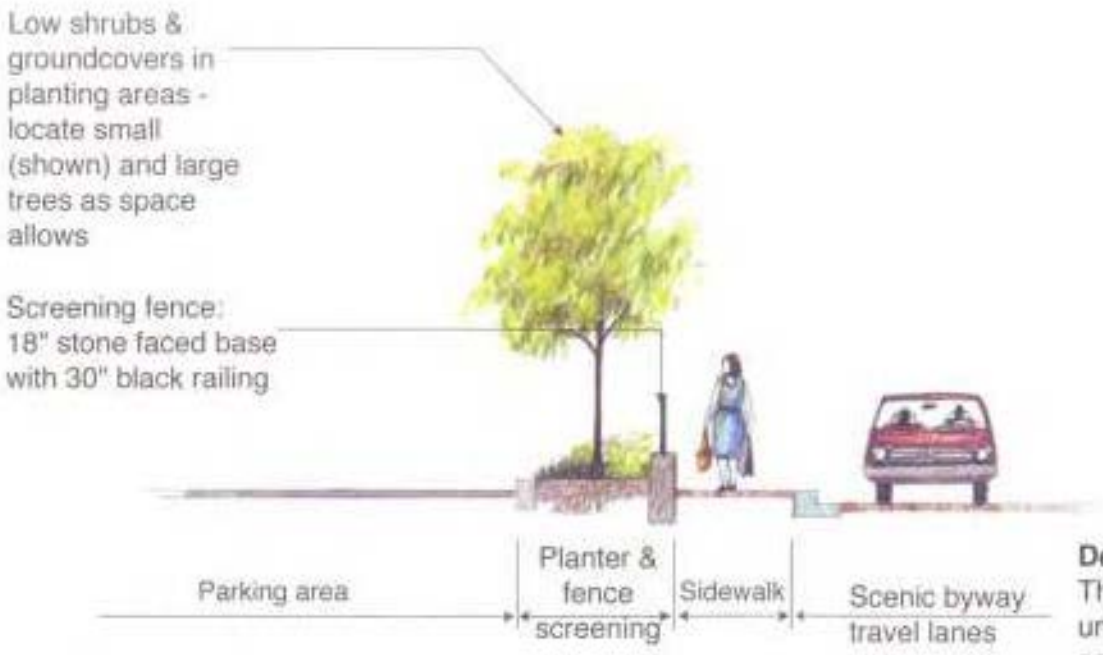
February 2005



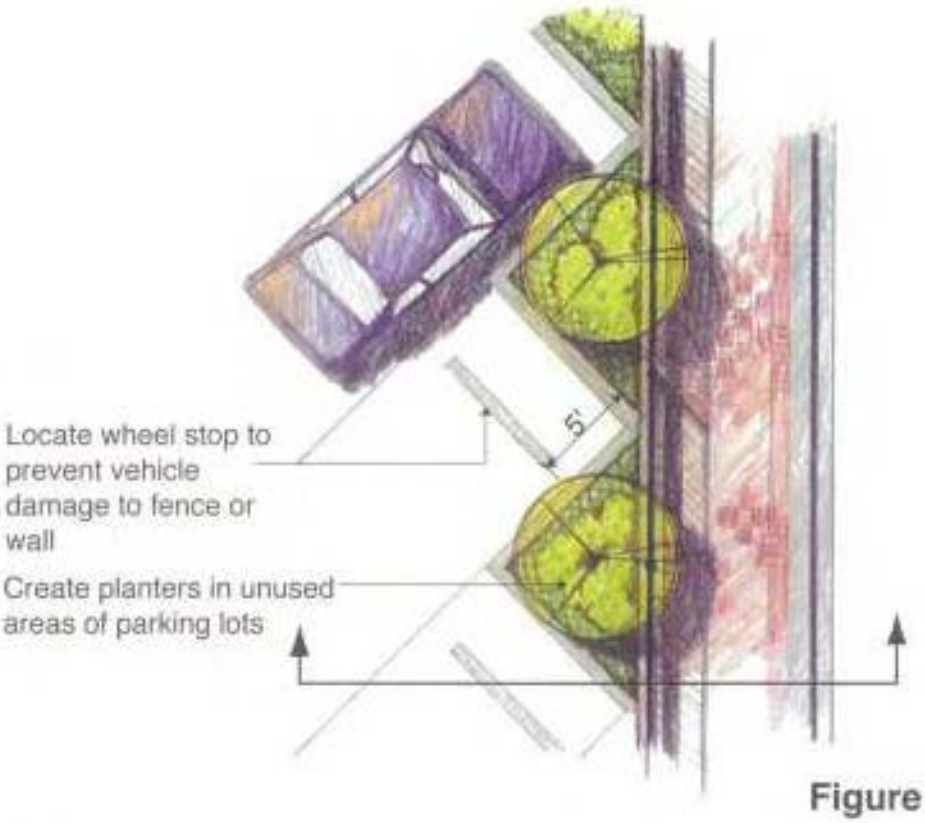
Cross Section
scale: 1/8" = 1'-0"

Description:
This option takes advantage of unused space found in existing parking lots to create planting areas within the parking lot. A stone & rail fence works in combination with the new planting spaces to enhance the byway character.

Where to Use:
At locations that meet the following conditions:
(1) right-of-way is not available to install continuous planting strip between sidewalk and travel lanes, and (2) unused space is available in existing parking lots that can be converted to planters.

Impact to private parking facility:
Minimal. Fence wall & planters work around existing parking configurations found in lots. Owners will need to locate wheel stops to prevent damage to fence wall.

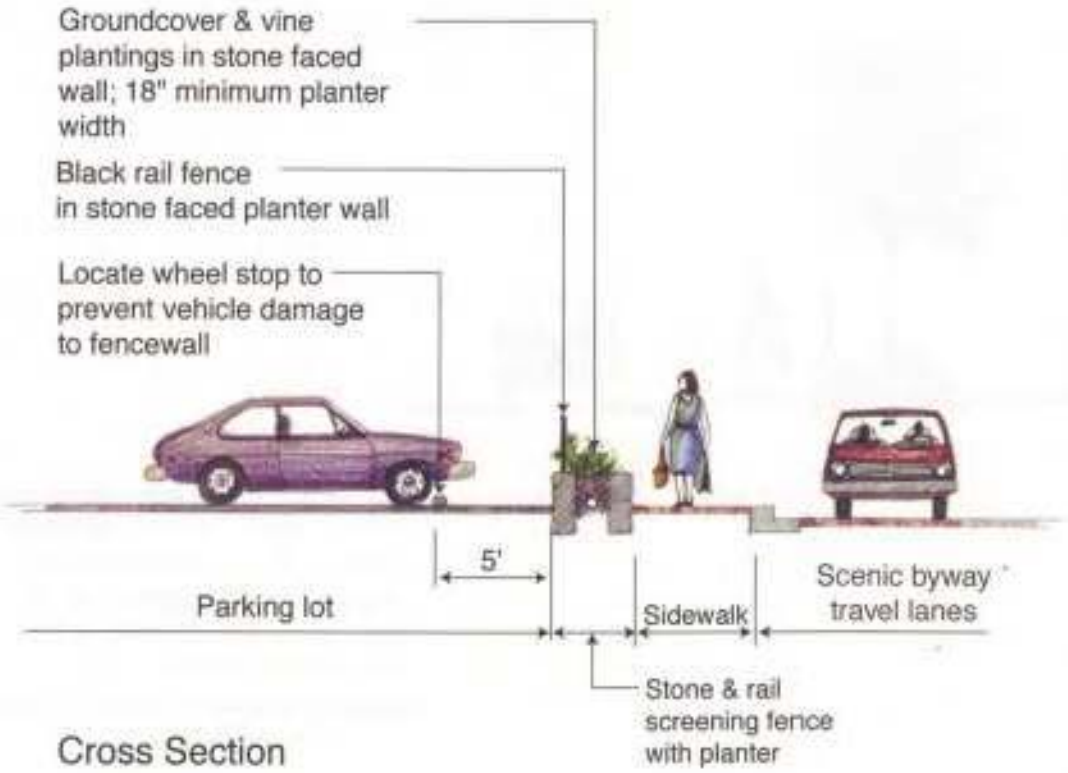
Benefits:
Enhances character of byway;
Minimal impact to adjacent property owners.



Plan
scale: 1/8" = 1'-0"

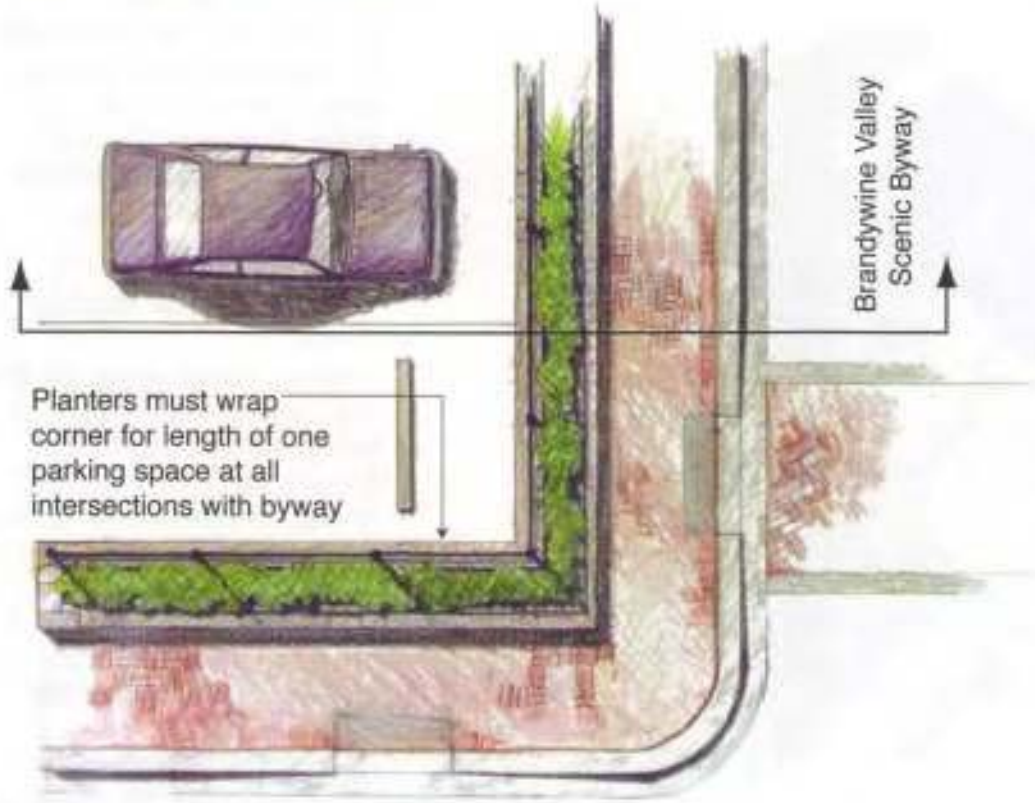
Figure 3. BVSB Parking Lot Screening
Option 2

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005



Cross Section

scale: 1/8" = 1'-0"



Plan

scale: 1/8" = 1'-0"

Description:
This option uses a continuous stone planter in conjunction with a fencewall to screen parking lots and enhance the byway year round. As shown, the groundcover and vine plantings are in the planter located between the sidewalk and parking area.

Where to Use:
At parking areas adjacent to byway that meet the following conditions:
(1) limited r/w available between lot & travel lanes to accommodate continuous planting strip as in option 1
(2)no unused spaces adjacent to byway are available in existing parking lot to accommodate planters as in option 2.

Impact to private parking facility:
Moderate to high. Owners must accommodate planter and fence wall into lot area (approx. width is 42"); and locate wheel stops to prevent damage to fence wall. Note: Location of 42" fence planter inside parking lot property may cause reconfiguration of parking spaces and aisles. At existing facilities that are configured using minimum parking space and aisle dimensions, this could cause reduction in parking spaces available in parking facility. Where this occurs, Option 3b should be used for screening the parking lot.

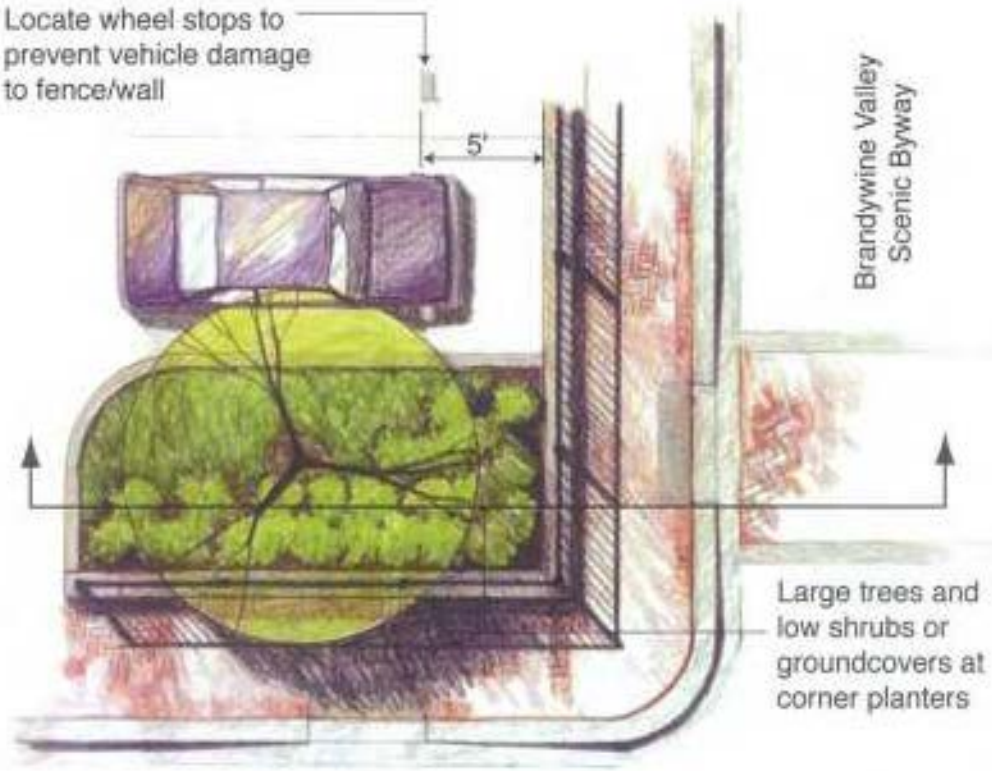
Benefits:
Enhances character of byway; Improves pedestrian experience.

Figure 4. BVSB Parking Lot Screening
Option 3a

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Cross Section

scale: 1/8" = 1'-0"



Plan

scale: 1/8" = 1'-0"

Description:
This option uses the continuous stone faced & black rail fencewall to screen parking lot from Byway. To strengthen screening of parking lot, corner parking spaces are replaced with planters at locations where streets intersect the byway.

Where to Use:
At parking areas adjacent to byway that meet the following conditions:
(1) right-of-way is not available between lot & travel lanes to accommodate continuous planting strip as in Option 1
(2)no unused spaces adjacent to byway are available in existing parking lot to accommodate planters as in Option 2.
And Option 3b can be used as an alternative to Option 3a.

Impact to private parking facility:
Moderate to high.
Owners will need to accommodate fence wall base into lot area (estimated width is 18" max.); locate wheel stops to prevent damage to fence wall; parking spaces at corners of byway & intersecting streets are removed and replaced with planters.

Benefits:
Enhances character of byway
Improves pedestrian experience

Figure 5. BVSB Parking Lot Screening
Option 3b

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Plate 015 Trinity Church, Historical photo

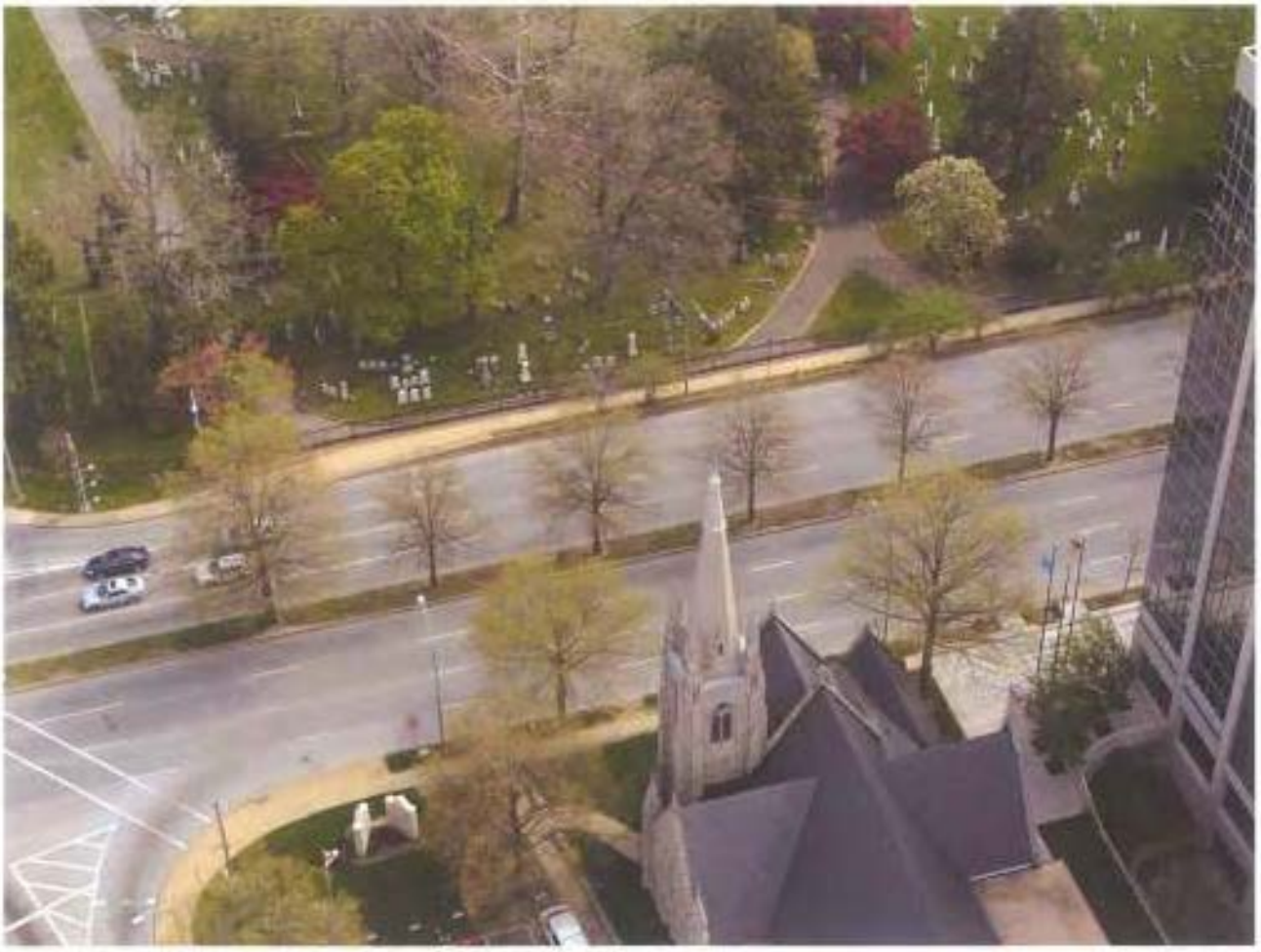

Plate 016 Trinity Church and Delaware Avenue median

Character segment 2

Delaware Avenue Corridor –
Jefferson Street to Harrison Street

Description:

The Delaware Avenue corridor, which crosses I95, is a transitional space between center city and the more typically residential Lower Pennsylvania Avenue segment. A combination of historic buildings with generous lawn spaces, the Brandywine and Wilmington Cemetery, Fountain Plaza Park, and multiple traffic islands contain landscape plantings.

Analysis:

There are many opportunities to increase tree canopy and other plantings in this segment both by using city land and in partnerships with private landowners. At Trinity Church, newly planted street trees shown in this historic photograph (Plate 015) are now complimented by additional trees on church property and in the center median of Delaware avenue, as shown in Plate 016.

Public cemeteries are the earliest form of civic landscapes and historically provide safe harbor for old trees. Plate 017 shows one of Delaware's State Champion trees—a Cedar of Lebanon brought from Palestine in 1830 by James Canet. Two other state champions—a sassafras and a black oak—survive in the cemetery. Today, cemeteries continue to provide opportunities for planting large canopy trees in the city. Even though these trees are growing on private land, the city should regard

Plate 017
Early photo of Cedar of Lebanon in Brandywine and Wilmington Cemetery

Plate 018. Same Cedar of Lebanon, 2004

them as valuable resources and should play an active role in their stewardship. This may mean providing assistance for their maintenance and replacement (Plate 018).

Delaware Children's Theatre is an example of existing open space housing trees that are critical to the tree canopy of Delaware. This intersection of Jackson Street and Delaware Avenue is an extreme example of the conflict between vehicular and pedestrian traffic (Plate 019). Patrons of the Delaware Children's Theatre must park on the north side of Delaware Avenue and cross Delaware Avenue—an unfriendly environment for pedestrians—to enter the theatre.

The Rodney Court Apartment design with its circular drive allows room for plantings off the immediate streetscape (Plate 020).

Fountain Plaza, while having a pleasingly strong design with its evergreen forms, sculptural simplicity supplemented by the Charles Park Statue, and sense of enclosure, suffers from a dramatic lack of use. The poor pedestrian access and a slightly claustrophobic sense induced by the continuous ivy-covered berms add to the uninviting feel of this space (Plate 021, page 29).

The tentative proposal for transportation improvements known as Delaware Avenue Gateway Phase II includes transit, pedestrian and environmental enhancements between Jefferson and Harrison Streets. Portions of this project would make a model landscape demonstration project for the city section of the byway, potentially funded through federal transportation enhancement sources or department of transportation capital improvements budget. Improvements to the Children's Theatre intersection as described above, the adjacent parking lot as illustrated in the previous segment, and enhancement of Fountain Plaza and Columbus Park Plaza, as illustrated and described below, should be incorporated and encouraged as part of the Gateway improvements resulting in a holistic enhancement of the immediate area.

Plate 019 Delaware Avenue intersection at Children's Theater

Plate 020 Rodney Court Apartments

Recommendations:

- Provide adequate root space in sidewalk designs to accommodate and sustain large, long-lived trees on city or byway rights-of-way.
- Pursue cooperative arrangements with adjacent landowners to plant and maintain trees that will increase the overall tree canopy in the city.
- Use crosswalks, landscaped medians and other traffic calming devices to create a pedestrian-friendly, aesthetically enhanced environment.
- Solutions for pedestrian safety and traffic calming currently included in the Delaware Children's Theatre portion of the Delaware Avenue Gateway Initiative proposal should be expanded to include green space improvements as illustrated in Figures 6 and 7 and given high priority as a Transportation Enhancement project.
- Provide greater pedestrian access and incentive for community use of Fountain Plaza. Consider berm reduction in selected areas avoiding damage to existing tree roots. Strategically remove ivy to provide a more inviting frontage at pedestrian access points and greater perceived security and pleasure for sitting areas. Provide topographic relief and maintain perceived enclosure by planting flowering shrubs (such as *Kerria japonica, Duetzia gracilis* 'Nikko'or *Spirea* sp.) and perennials such as (*Geranium* 'Biokovo' and 'Biokovo Karmina' in semicircular sweeps that expand on the sculptural simplicity of the existing serpentine pattern as shown in Figures 8 and 9.

Plate 021 Fountain Plaza

NOTES:

Drawing based on Orth-Rodger's Conceptual Design (2002)

Barrier curb required to locate street trees

Concept below assumes application of AASHTO Urban Street Clear Zones

Figure 6. Children's Theatre

Illustrative plan

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

MATCHLINE

Existing plantings

Parking lot screening typology Figure 5, option 3B shown

Existing driveway

Create planter with barrier curb in unused asphalt area to improve pedestrian refuge for crossing 7 lane road

Match existing plantings in median on north side

Children's Theatre

Brick/concrete pavers for sidewalks and crosswalks to visually distinguish pedestrian areas from roadway

Existing trees and plantings

Create bulbouts w/planters in unused asphalt areas to:
reduce crossing distance for pedestrians and visually enclose Byway and narrow the look and feel of the road with large tree plantings

Use groundcovers only and trees (where possible) at planters near crosswalks to maintain clear visibility of pedestrians.
groundcover max. height=18"

north

0 25 50

scale 1"=50'-0"

Figure 7. Children's Theatre Perspective

Sketch looking south

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Figure 8. Fountain Plaza

Illustrative plan

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

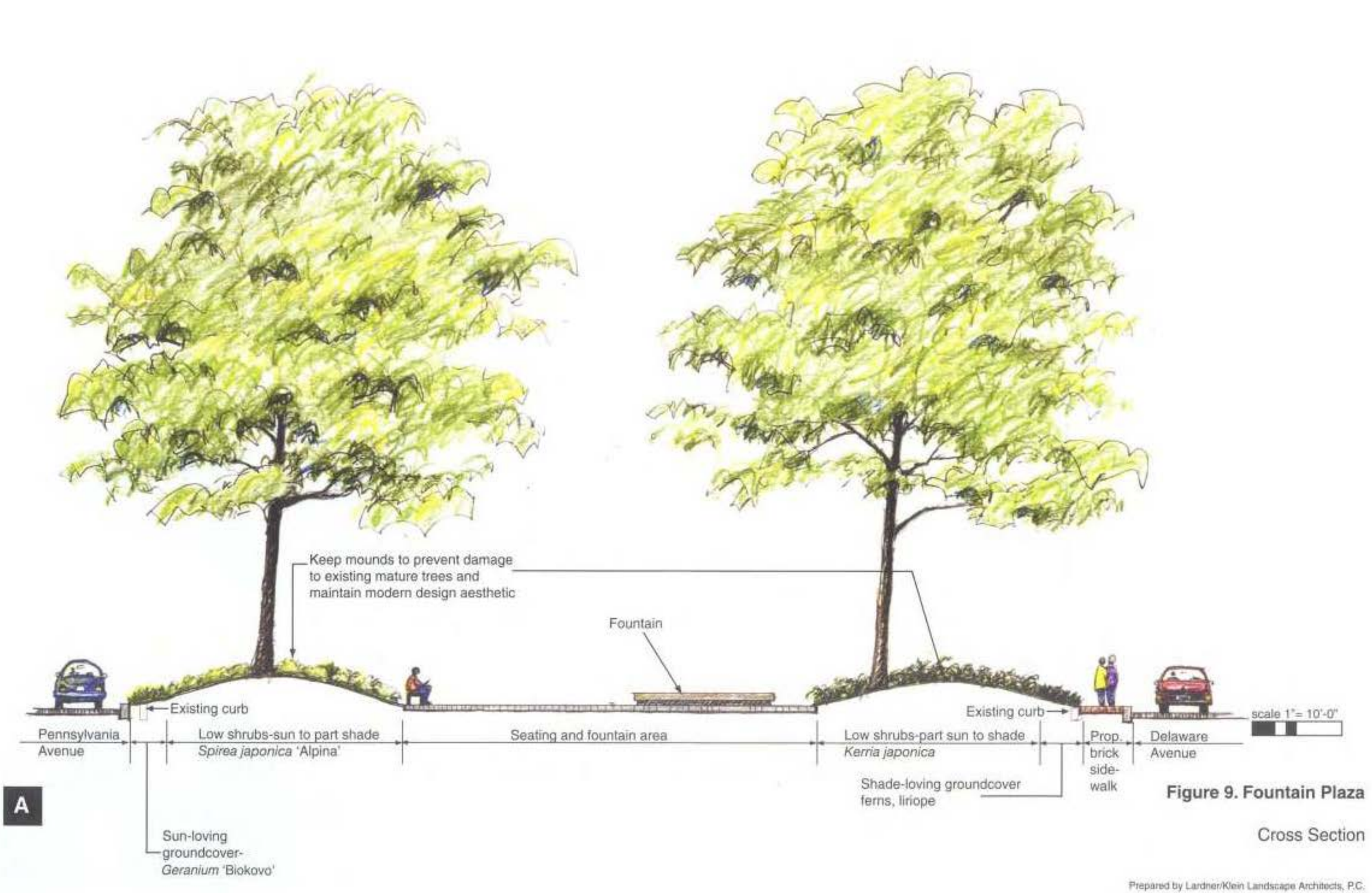

Figure 9. Fountain Plaza

Cross Section

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February 2005

Character segment 3

Lower Pennsylvania Avenue –
Harrison Street to Clayton Street

Description:

This segment is characterized by a number of churches and residences, both single-family units and apartment complexes.

Analysis:

With the exception of the Columbus Park Plaza, there is little opportunity to add to tree plantings on public rights-of-way. As in the Delaware Avenue Corridor segment, there are opportunities to increase tree canopy and other plantings through partnerships with private landowners.

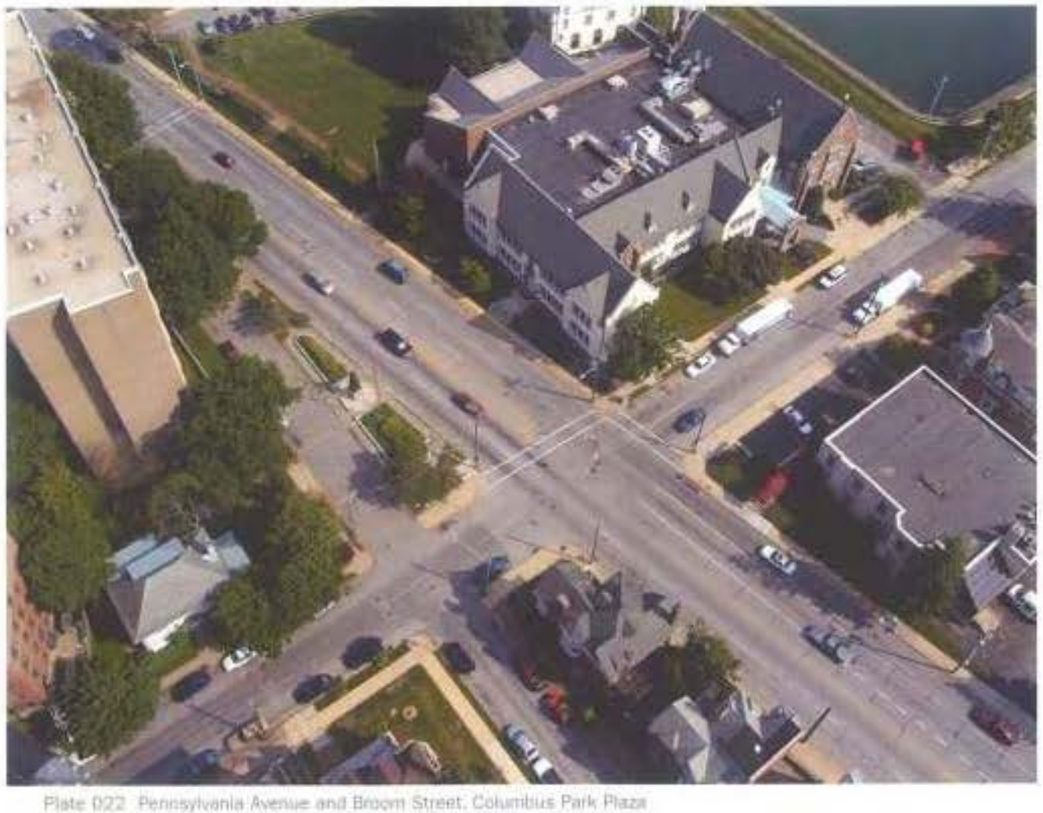


Plate 022 Pennsylvania Avenue and Broom Street, Columbus Park Plaza

Plate 023
Columbus Park Plaza, 2004

Plate 024
Ailanthus at Rodney Street and Pennsylvania Avenue

The Columbus Park Plaza is a narrow strip of land situated between Pennsylvania Avenue and an extension of 13th Street (Plate 022). This section of street was deeded over to Luther Towers, the adjacent property owner, who was in the process of constructing a new driveway at press time. The appeal and usefulness of this plaza would be greatly enhanced if the new driveway were incorporated into a holistic renovation of the space with emphasis on the green elements. The existing park space is planted with inappropriate species pruned into unattractive shapes. The sidewalk is discontinuous and pedestrian traffic has worn a path in the turf (Plate 023). Renovating the park space would provide great opportunity to rectify this situation.

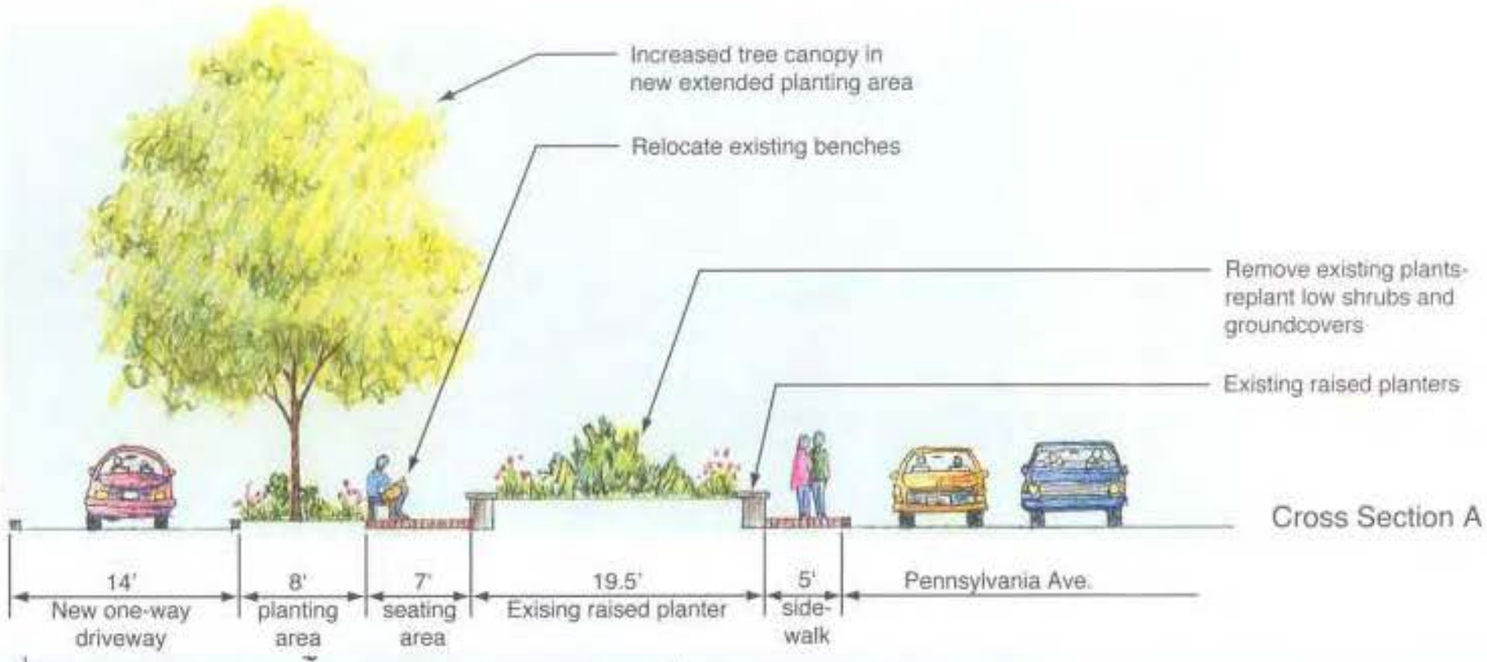
Recommendations:

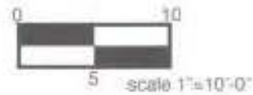
- Recommend removal and replacement of invasive species on private property such as this large tree-of-heaven (*Ailanthus altissima*) on the southwest corner of Rodney Street and Route 52 (Plate 024). An invasive plant can be defined as one that quickly overwhelms and displaces existing native plants by reducing the availability of light, water, nutrients and space. They have few, if any, natural controls to keep them in check. Trees like this tree-of-heaven represent a huge repository of seed that has the potential to invade unmaintained open spaces in the city.
- Renovate landscape planting at Columbus Plaza. Redesign paving to address pedestrian traffic and integrate ongoing surface renovations adjacent to Luther Towers into plaza space improvements (Figure 10).

Figure 10. Columbus Square

Illustrative cross section and plan

Prepared by Lardner/Klein Landscape Architects, P.C.
March 2005





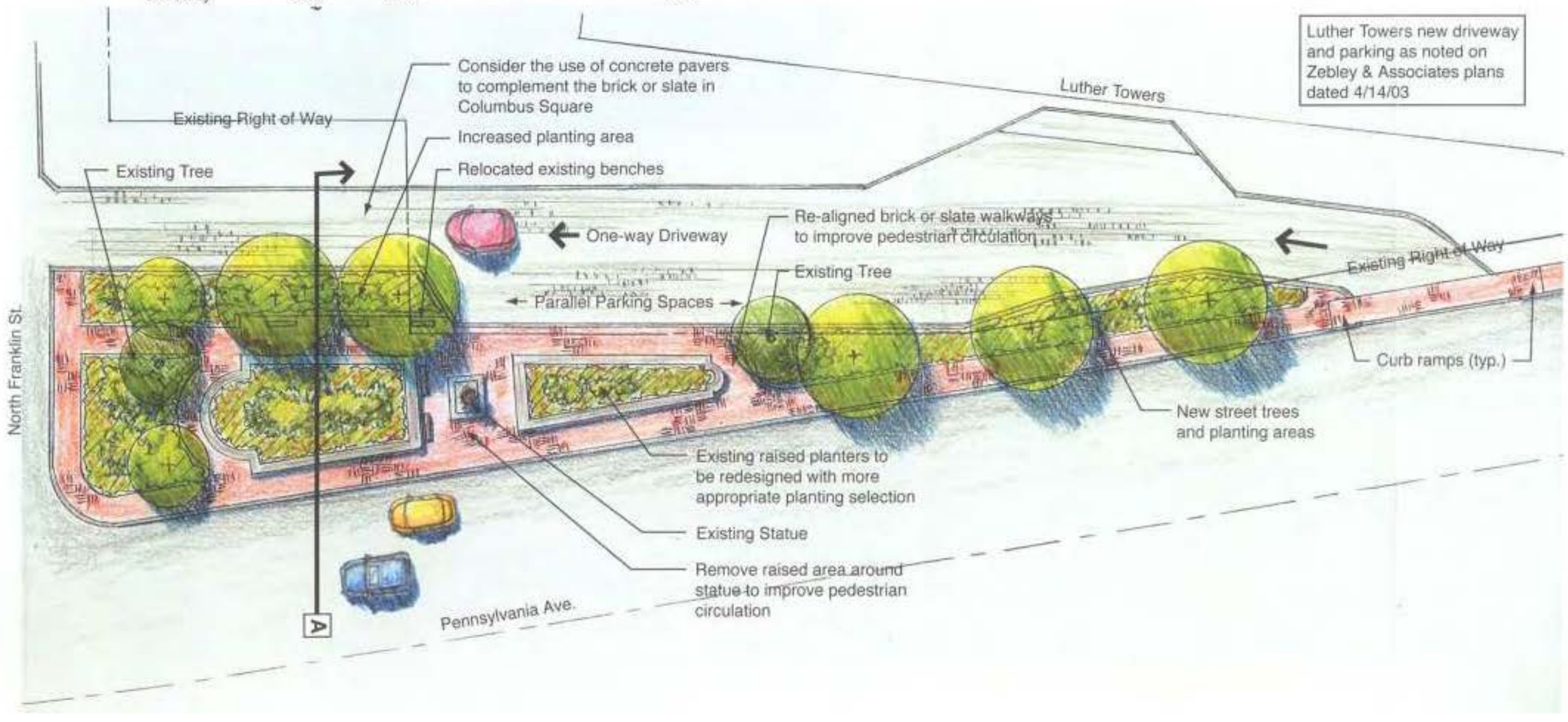


Plate 025: Intersection of Dupont Street and Pennsylvania Avenue

Character segment 4

Union Park – Clayton Street to Bancroft Parkway

Description:

Union Park is the most commercial section of Route 52. Sign and business visibility is of highest priority to land owners and occupants. The built environment can still be pleasing with attention to attractive building facades and maintenance. Due to the commercial nature of this section, a complete wall of canopy and flowering trees is not possible; but container plantings and strategically placed trees could significantly enhance the area.

Plate 026
Northbound Pennsylvania at Clayton Street

Analysis:

Due to the positions of overhead wires and new car displays close to the sidewalk there are few opportunities to plant tall-growing shade trees in this segment. Small flowering trees offer the best opportunity to soften this landscape and add seasonal interest (Plate 027). Sturdy trees, such as Donald Wyman crabapples are preferable to Callery pears, which are predisposed to weak limbs and breakage.

The Union Street intersection is currently unsafe for pedestrian traffic. The south-facing slope along Pennsylvania Avenue immediately to the east of the CSX overpass is barren and presents a great opportunity for attractive vegetation. This is one of the few places in the segment that would accommodate tall-growing shade trees (Plate 028).

Plate 027
Typical new car lot on Pennsylvania Avenue

Plate 028 CSX railroad overpass at Pennsylvania Avenue

Plate 029 Bancroft Parkway at Pennsylvania Avenue

The majestic character of large canopy oaks defines Bancroft Parkway (Plate 029). This parkway invites tangents from travel along Route 52. It encourages the traveler to explore more of Wilmington. Bancroft Parkway should be protected and preserved. The trees in this parkway are a fragile biological resource. Any type of disturbance or construction activity, such as utility trenching could have disastrous results on tree survival (Plate 030).

Recommendations:

- Encourage the planting of small flowering trees and replace undesirable species (such as Callery pear) with appropriate street trees (City of Wilmington Recommended Street Tree List, Appendix B).
- Use container plantings to soften the landscape where appropriate.
- Explore the potential for addition of crosswalks, landscaped medians and other traffic calming devices to improve the safety and appeal for pedestrians at the Union Street intersection. Develop concepts for improvements in concert with adjacent sections of the byway to achieve consistency and a unifying character throughout the urban Wilmington section.
- Develop a planting plan for the south-facing slope along Pennsylvania Avenue immediately to the east of the CSX overpass that includes ground cover plantings and tall-growing shade trees where appropriate (Figure 11, page 43).
- Develop a maintenance policy for Bancroft Parkway that includes maintenance and protection of existing oaks and replanting of oaks as needed (Figures 12a and 12b, pages 44 and 45).

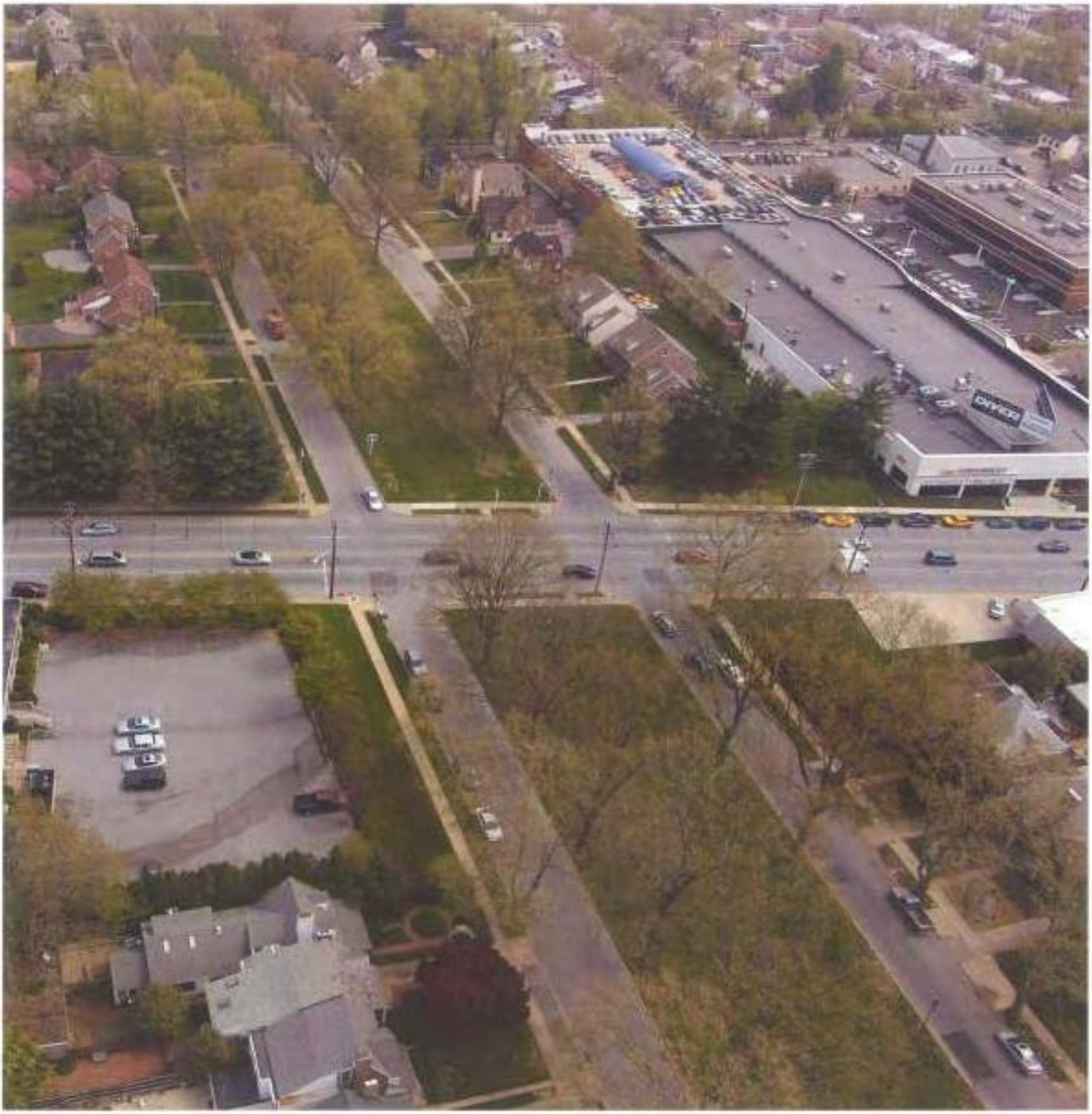


Plate 030 Bancroft Parkway

Small evergreen tree groupings to screen buildings beyond railroad tracks.
ex: *Juniperus virginiana* 'Emerald Sentinel' and *Myrica pennsylvanica*

Plant tall deciduous trees with upright form in groupings to avoid conflict with adjacent utilities. ex: *Carpinus betulus* 'Fastigata'

Keep existing deciduous trees

Replace existing *Ailanthus* tree with tall growing shade tree

Trailing groundcover such as *Rhus aromatica* 'Gro Low' or *Itea virginica*

Flowering and evergreen groundcover mix

Medium-large deciduous shrub mass such as *Aronia arbutifolia* 'Brilliantissima'

Figure 11. B&O Crossing

Above: View of crossing with proposed plantings
At left: Existing view of crossing

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Figure 12a. Bancroft Parkway Tree Allee
Infill Replacement Tree Recommendations
Example Block: Pennsylvania Ave. to 14th St.

Illustrative plan

Prepared by Lardner/Klein Landscape Architects, P.C.
March 2005

General Notes:
Proposed trees shown here are located to fill-in currently vacant allee planting areas.

Apply location and tree species recommendations below to infill tree plantings and future replacement tree plantings.

Location & Spacing:
Locate new infill trees to achieve a spacing of approximately 40'-60' between tree in allee; for example, where two existing trees are spaced 80' apart add one infill tree between the two existing trees.

Tree Species:
Infill trees should be a mix of white and red oak species.

White oak species should comprise over 80% of the mix, while red oak species should be less than 20% of the mix.

In example infill plan shown here, 16 trees are proposed; 13 of the trees should be white oak and 3 should be red oak species.

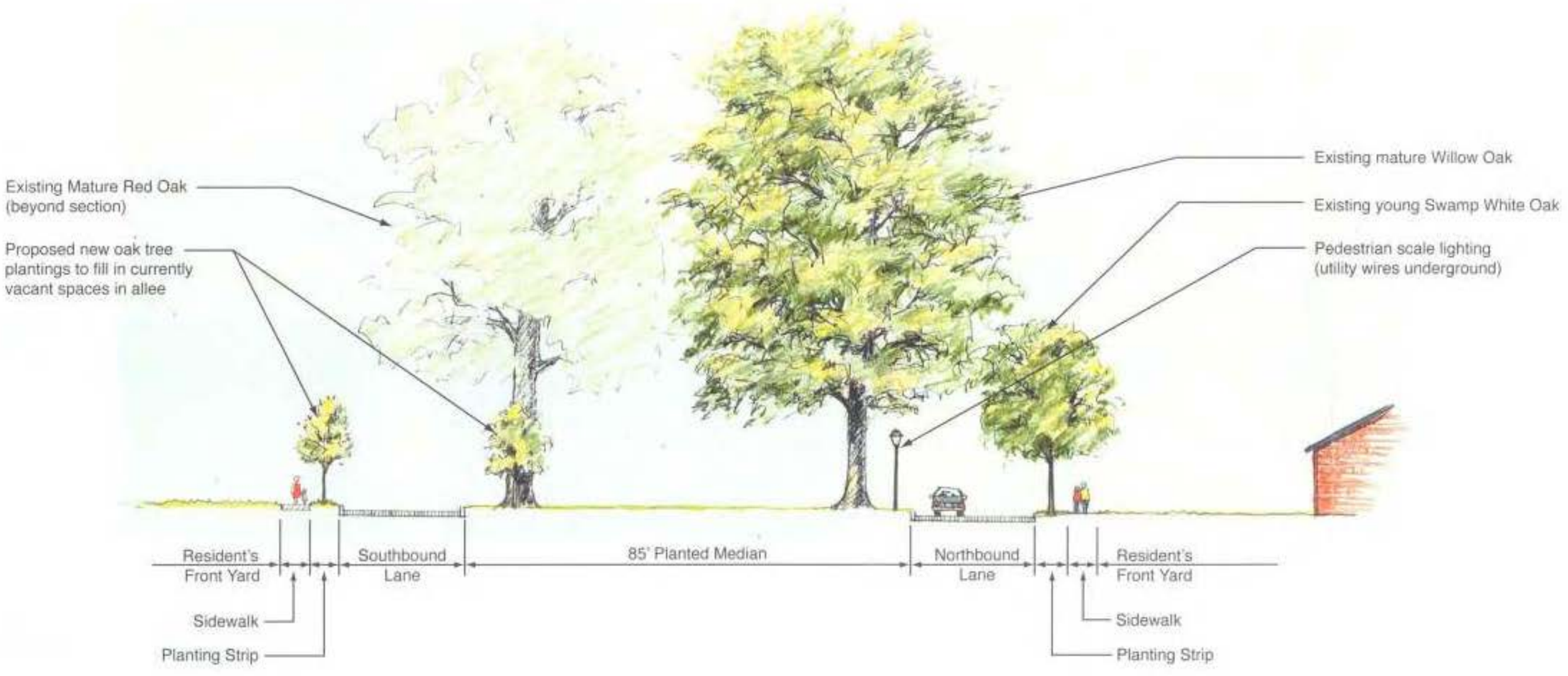
White oak species mix should include Quercus imbricaria, Q. macrocarpa, and Q. bicolor.

Red oak species mix should include Q. rubra, Q. phellos, and Q. palustris.

Figure 12b. Bancroft Parkway Tree Allee
Infill Replacement Tree Recommendations
Example Block: Pennsylvania Ave. to 14th St.

Illustrative cross section

Prepared by Lardner/Klein Landscape Architects, P.C.
March 2005



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Character segment 5

Wawaset Park and Rockford Park –
Bancroft Parkway to Greenhill Avenue and to Rising Sun Lane

Description:

While still considered part of the City of Wilmington section of the byway, the Wawaset Park and Rockford Park character segment contains mixed land use applications including several estates with large open lawns and plantings.

Analysis:

Gingkos planted in front of the Devon contribute to the appearance of a continuous woodland corridor (Plate 031).

Trees at Gibraltar, although planted 30-40 feet away from the road, add to motorists' sense of an urban canopy. However, management plans should be in place to ensure that such trees do not develop low limbs hanging over the road in the direct path of passing trucks and other tall vehicles (Plate 032).

Plate 031
Gingko street trees on Pennsylvania Avenue

Plate 032
Trees over Pennsylvania Avenue

Gibraltar contains a unique collection of mature horticultural specimens. This original Marian Coffin landscape design, with some renovation through the years, has a significant impact on the aesthetics of the 52 Scenic Byway. The six-foot-high wall allows motorists a glimpse of horticultural richness lying within (Plate 033).

Plate 033 Stone wall at Gibraltar

Crossings at several schools in this segment are inadequate to meet pedestrian needs. The Tower Hill overpass meets some of the crossing demand for school events, but its location and elevated nature make it an inconvenient choice for pedestrians wishing to cross Pennsylvania Avenue at Rising Sun Lane (Plate 034). Significant improvements to this intersection have accommodated buses and their passengers. While the pedestrian volume indicates addition of crosswalks, the narrow width of the current road configuration prevents the use of traditional traffic calming and safety measures such as bump out or center median islands. The wider road surface at A.I. duPont Middle School, in segment 6, may be more conducive to standard traffic calming measures.

Recommendations:

- Maintain and manage tree canopy at Gibraltar to be compatible with corridor traffic. Remove low limbs extending out over the travel lanes.
- Install traffic islands to reduce the perceived road width and calm traffic. Use vegetation when islands are large enough to accommodate plantings (at least 3 feet or wider).

Plate 034 Tower Hill pedestrian overpass on Pennsylvania Avenue

Kennett Pike (Route 52)

North of Wilmington's corporate boundary, Route 52 becomes known as Kennett Pike, reflecting the roadway's historic 19th century turnpike use. The Kennett Pike section of the byway is divided into six character area segments as the byway transitions from urban, to suburban, to rural-suburban character. The landscape alternates between woodlands or forested sections and open pastoral fields, and this balance is essential to the overall character of the byway.

Design goals:

- Frame attractive views/structures with plantings.
- Identify and promote specific open pastoral viewsheds.
- Plant tall-growing shade trees to maintain and enhance the woodland character of villages.
- Keep new plantings consistent with the unique Brandywine Valley character.
- Select suitable vegetation considering environmental conditions and utility conflicts.
- Optimize the potential of landscape elements to calm traffic and increase pedestrian safety, especially at crosswalks.
- Calm traffic on Route 52 in village sections using techniques such as: reducing road width and/or designing plantings to create environments that alert drivers to the need for caution, expanding medians and crosswalk combinations, expanding and designating bike lanes, and considering use of traffic circles.
- Work with property owners to screen and beautify existing and future parking lots along the byway with plantings of trees and shrubs, fences and partial walls. Utilize ideas for tree and buffer plantings as illustrated in Figures 2, 3, 4 and 5.
- Preserve and enhance existing planted hedgerows.
- Limit roadside signage to that consistent with the character of a rural byway.

Management goals:

- Promote a model that discourages the retention and new planting of invasive species such as privet (*Ligustrum* sp.).
- Create a replacement strategy for existing tree corridors, balancing aesthetic unity and species diversity.
- Inventory, recognize and preserve notable specimen trees.
- Manage existing tall-growing shade trees to reduce conflict with utility lines. (see sidebar, page 51)

Plate 035

Plate 036
Zelkova trees at Goodstay Center

Plate 037
Disfigured tree on Pennsylvania Avenue

Character segment 6

University of Delaware Goodstay Center –
Greenhill Avenue to Route 141

Description:

This character segment is dominated by large facilities including The University of Delaware Goodstay Center, A.I duPont Middle School, Tower Hill School athletic fields and St. Joseph's on the Brandywine. Very few buildings border the road; most are set back in large lawns and open spaces that are open to the view from the road. Westover Hills is typical of residential development in this segment, characterized by mature tree canopies.

Analysis:

The north side of Greenhill Avenue is bordered by an overgrown evergreen screen and the remnants of what was once a continuous row of tall-growing shade trees (oaks, plate 048, page 55). Many of the evergreens are declining and no longer provide screening for the athletic field at automobile height. The tall evergreens now prevent motorists from seeing the larger scenic view.

Mature plantings at Goodstay Center contribute significantly to the appearance of the byway. Some specimens are planted at great distance, but are visible to motorists. A row of trees (zelkova and other deciduous species) is set back just far enough from the roadway to avoid conflict with utility lines yet provides a pleasant green canopy that helps shade the sidewalk (Plate 036). In contrast, this tree planted directly under the utility lines (Plate 037) has required pruning resulting in an unattractive appearance.

Utility lines and poles are an unsightly component of the byway. While they are ubiquitous elements in the historic landscape, they are incompatible with tall-growing shade trees.

The following solutions and compromises are suggested to address utility line/tree conflicts.

- Placing electrical utility lines underground potentially offers the greatest freedom for the planting of tall-growing shade trees. However, the process of moving lines underground requires extensive trenching, which may damage or destroy any existing trees. Although this is an ideal long-term solution, it is the most expensive in the short term. Due to high costs, it is only practical in select sections of the byway.

- 'Bundling' utilities or combining multiple lines on to a single set of poles can effectively reduce the impact of overhead utility lines on the landscape. In cases where lines exist on both sides of the corridor, one side can be cleared of poles and lines to allow tall-growing shade trees and improved vistas.

- Judicious pruning in some cases can allow tall-growing shade trees and electrical utility lines to coexist without destroying the shape and form of the trees.

- The service life of existing trees growing directly underneath electrical utility lines may be increased by a combination of pollarding and the use of chemical growth retardants (see Plate 038, page 52). This will necessarily compromise the tree's form.

- When the right-of-way is wide enough or there is a coordinated effort with private land owners, trees may be planted far enough away from the road to allow for full growth without conflicting with electrical utility lines. This approach may be most successful with trees that have a naturally narrow upright stature.

- When none of the above options are practical, lower growing trees can be planted.

Plate 038 London Plane trees treated with growth retardant and pruned for utility line clearance.

Plate 039
Stone wall by Marian Coffin on Tower Hill School property

Plate 040
Leyland cypress hedge at St. Joseph's Church

At the corner of Westover Road and Route 52, London plane trees have been topped for decades to avoid conflict with utility lines. Though this practice is typically costly and detrimental to trees' long-term survival, recent developments in the use of growth hormones have reduced pruning maintenance while extending the trees' useful life (Plate 038).

Property adjacent to Tower Hill School includes a stone wall designed by renowned landscape architect, Marian Coffin, which is readily visible from the road. It is a valuable and attractive reminder of the duPont estate era (Plate 039).

The continuous row of Leyland cypress planted to screen St. Joseph's church property and cemetery from Route 52 will eventually result in an oppressive wall that diminishes the experience of the byway. The church and the byway would be better served by intermittent plantings of deciduous flowering and tall-growing shade trees and better-adapted evergeen trees that would create a psychological screen without completely separating the two landscapes (Plate 040). Leyland cypress is a poor choice for screening in this area. These short-lived trees frequently suffer from winter desiccation, are prone to insect and disease damage, and develop inadequate root systems that often result in lodging or toppling (Plate 041).

Plate 041 Leyland cypress, leaning due to inadequate root system

Plate 042
Kennett Pike, ca. 1919

Plate 043
Aerial photos of Westover Hills taken 75 years apart depicting dramatic tree canopy growth. Note Dupont Road on lower left.

Plate 045
London Plane tree canopy over Berkley Road

Plate 044

The open, rural appearance of the landscape as shown in historic photos from the early 1900s (Plate 042) is the result of 150 years of agriculture that removed deciduous woodlands, once the dominant vegetation of the region. Built on former farmland shown at top left, Westover Hills was originally treeless. Landowners planted large-growing trees, already in evidence in this 1930 photo (Plate 043). Seventy-five years later, the elegant, tree-lined streets have become essential to the character of this neighborhood (Plate 044, Plate 045).

In the estate era of the early 1900s, hedges were used to define property lines. Seen in both historic and current images (Plate 046, Plate 047) this hedge of common privet, *Ligustrum vulgare*, is an example. Such hedges along Route 52 are an important historic aesthetic element to maintain. The traditional species used for these hedges, the common privet, is increasingly recognized for its potential to invade and disrupt the ecological balance of natural areas in northern Delaware. Privet should be replaced whenever possible with a non-invasive hedge species. Reducing the seed source will help protect local habitats adjacent to the byway.

Plate 046
Traditional roadside hedge on Kennett Pike, ca. 1919

Plate 047 Roadside hedge on Kennett Pike, 2004

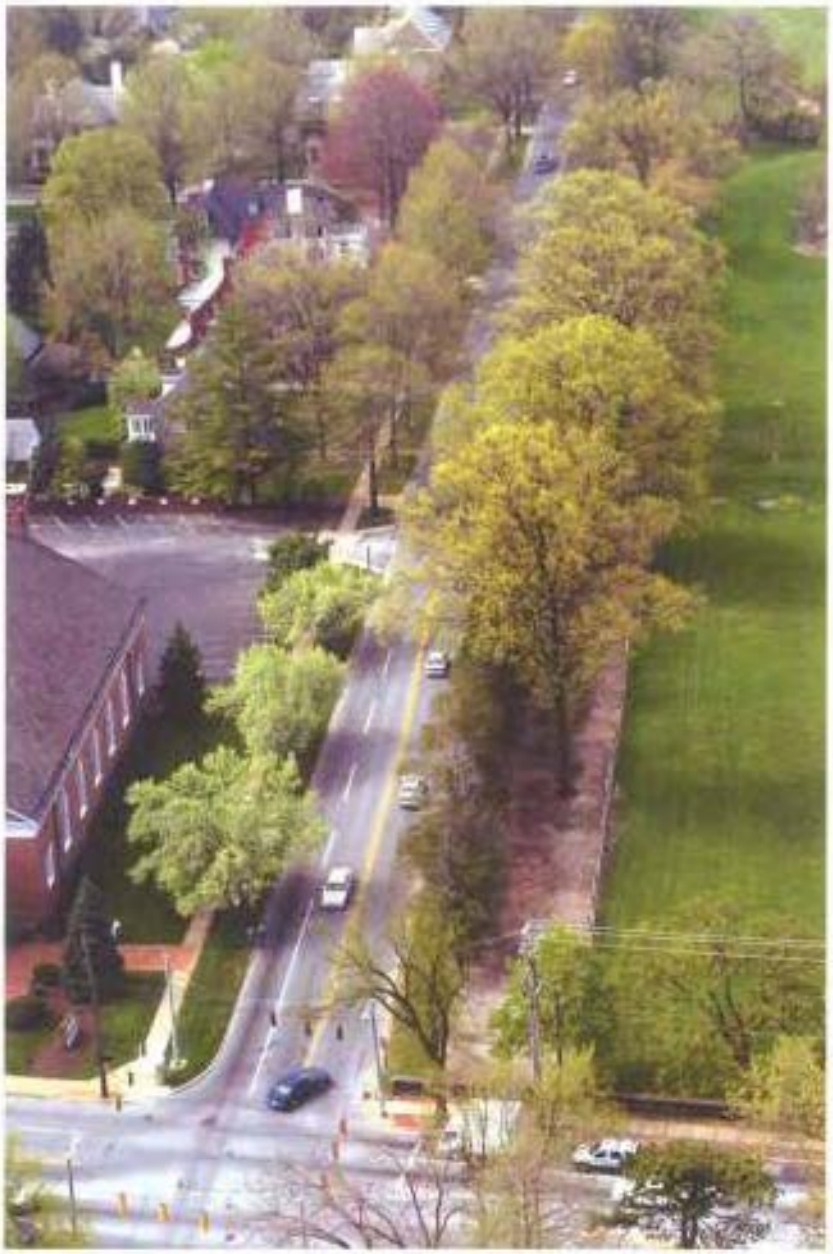

Plate 048 Double row of trees adjacent to athletic field

Plate 049
Interchange at Route 141 and Kennett Pike

Plate 050
Enclosed deciduous section of Kennett Pike

Recommendations:

- Fill in the missing oaks along Greenhill Avenue at Pennsylvania Avenue and remove the declining evergreens in the first block opposite Greenhill Presbyterian Church (Plate 048, page 55).
- Plant tall-growing, shade trees to enhance the forested character of the byway where appropriate, for example: *Quercus bicolor, Quercus coccinea, Nyssa sylvatica, Carya ovata,* and *Gymnocladus dioicus*. Site trees far enough from the roadway to avoid conflict with utility lines.
- Underscore the importance of preserving and maintaining the Marian Coffin stone wall in any future development of the property owned by Tower Hill School.
- Incorporate a safe pedestrian crossing at A.I. duPont Middle School as shown on Figures 13, 14, and 15 (pages 57-59) into the DelDOT enhancement project in progress for this section of the byway from Dupont Road to Hopeton Road including bridge and parking area renovations. Review parking renovations to include appropriate screening and green infrastructure enhancements as per Figures 2-5, pages 20-23.
- Replace leyland cypress hedge with mixed plantings of deciduous and better-adapted evergeen trees that will create a psychological screen without completely separating the two landscapes (Figures 16 and 17, pages 60 and 61).
- Retain open views (Plate 049) along the byway to evoke an agrarian past; as well as densely vegetated, enclosed sections reflective of the original deciduous woodlands (Plate 050).
- Encourage the use of noninvasive alternatives such as *Myrica pensylvanica, Aronia arbutifolia, Viburnum prunifolium, Forsythia* x *intermedia, Abelia grandiflora and Spiraea* spp. to privet whenever opportunities present themselves to replace existing hedges.

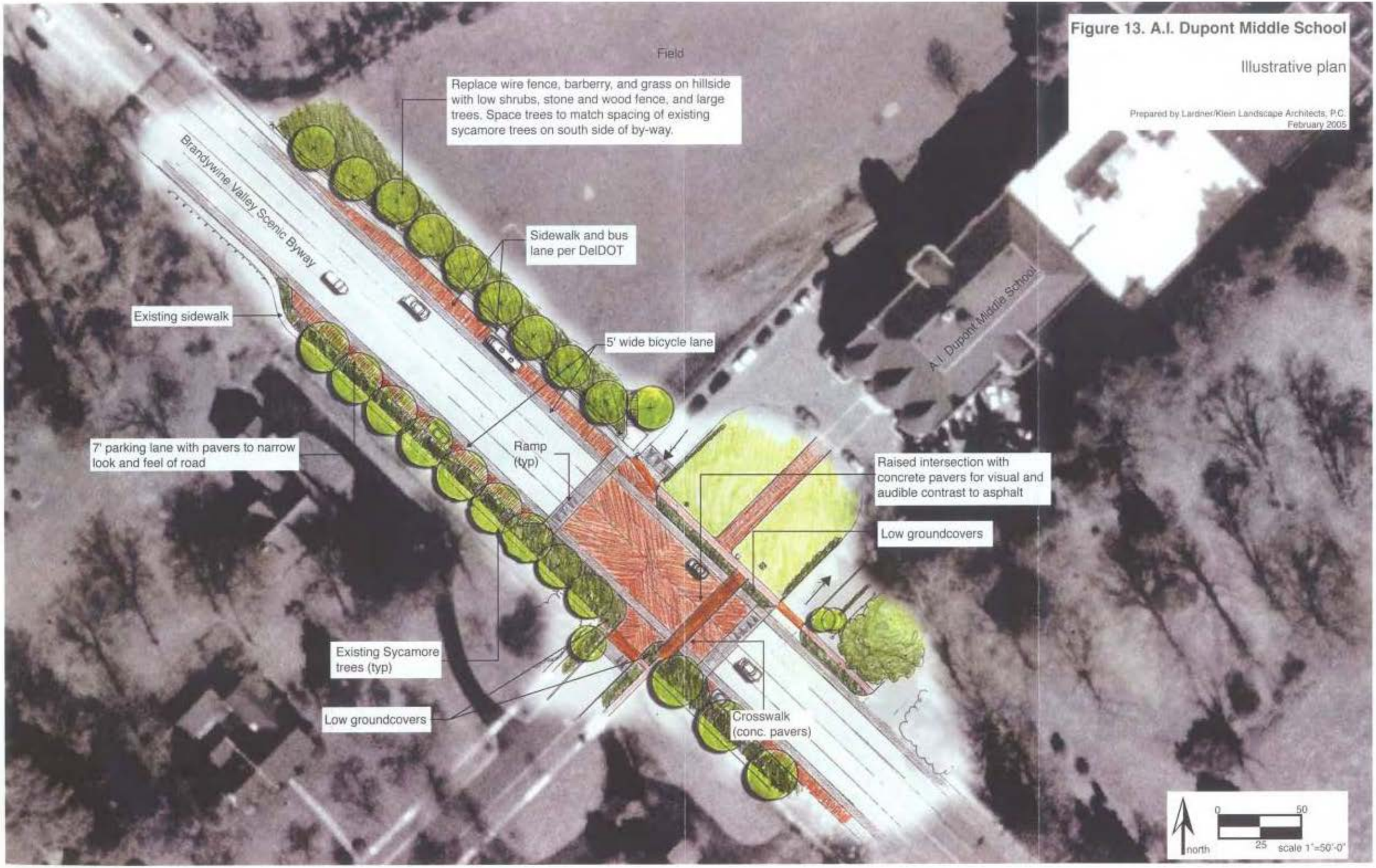

Figure 13. A.I. Dupont Middle School

Illustrative plan

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Color and texture of bicycle lanes, raised intersection components, ramps and on-street parking to visually and audibly contrast with asphalt travel lanes.

Figure 14. A.I. Dupont Middle School

Perspective looking east

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Figure 15. A.I. Dupont Middle School

Perspective looking west

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

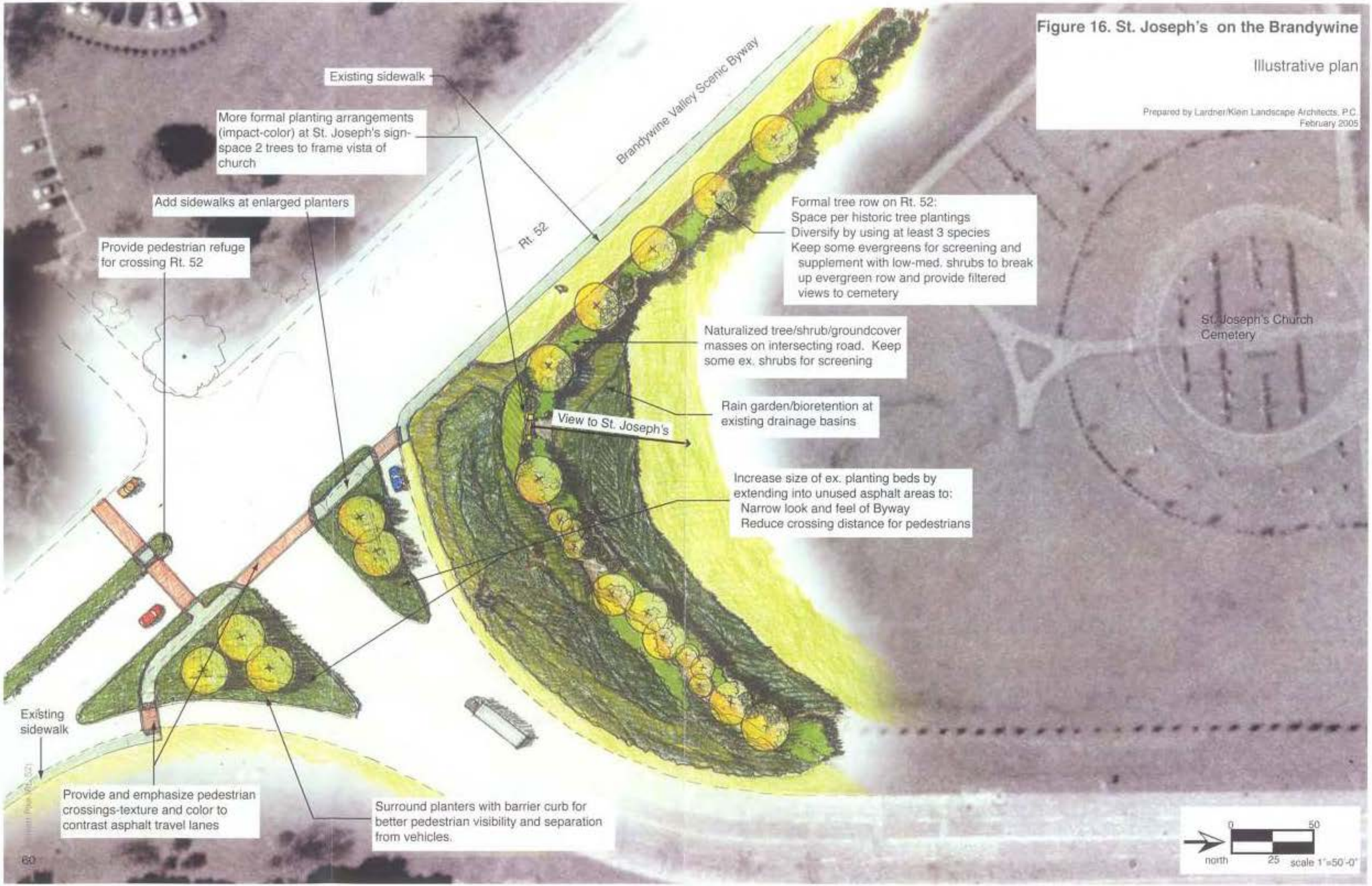
Figure 16. St. Joseph's on the Brandywine
Illustrative plan
Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005
Existing sidewalk
More formal planting arrangements (impact-color) at St. Joseph's sign-space 2 trees to frame vista of church
Add sidewalks at enlarged planters
Provide pedestrian refuge for crossing Rt. 52
Brandywine Valley Scenic Byway
Rt. 52
Formal tree row on Rt. 52:
Space per historic tree plantings
Diversify by using at least 3 species
Keep some evergreens for screening and supplement with low-med. shrubs to break up evergreen row and provide filtered views to cemetery
St. Joseph's Church Cemetery
Naturalized tree/shrub/groundcover masses on intersecting road. Keep some ex. shrubs for screening
Rain garden/bioretention at existing drainage basins
View to St. Joseph's
Increase size of ex. planting beds by extending into unused asphalt areas to:
Narrow look and feel of Byway
Reduce crossing distance for pedestrians
Existing sidewalk
Provide and emphasize pedestrian crossings-texture and color to contrast asphalt travel lanes
Surround planters with barrier curb for better pedestrian visibility and separation from vehicles.
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north
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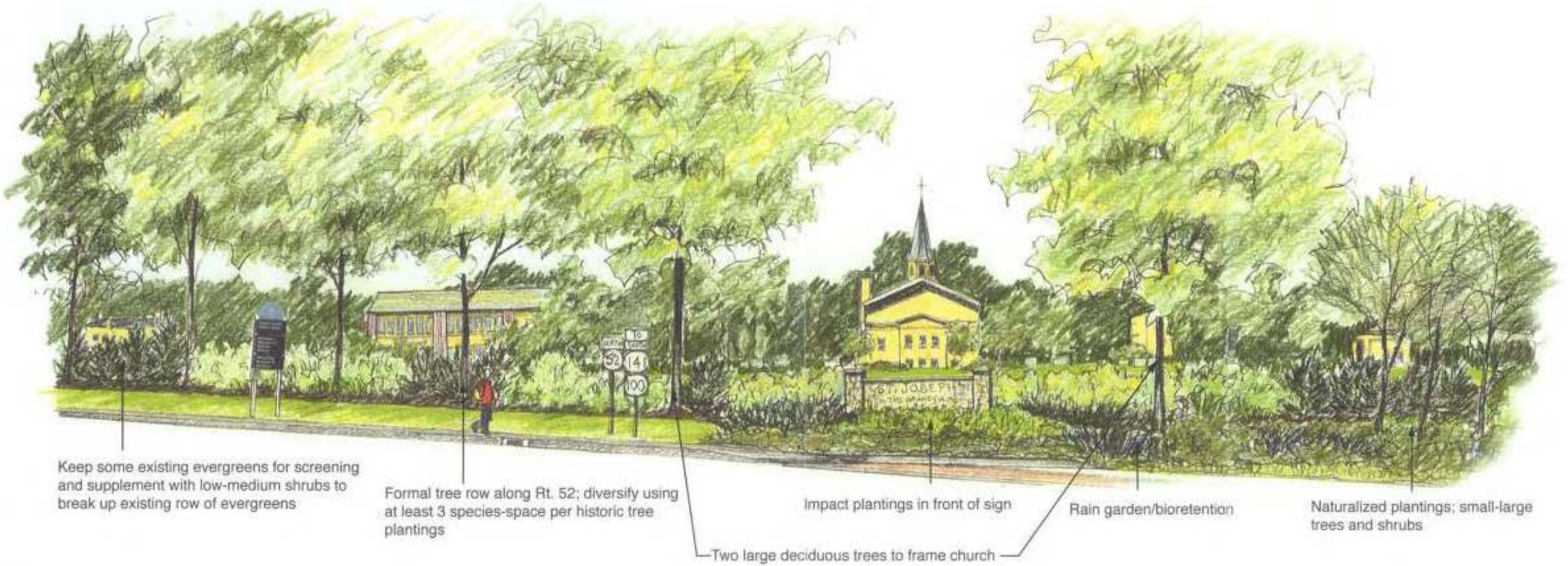


Figure 17. St. Joseph's on the Brandywine

Perspective looking north towards church from Byway

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Plate 051 Greenville Center

Character segment 7

Greenville – Route 141 to Brook Valley Road

Description:

The village section is dominated by Greenville Center, a shopping facility fashioned after a European Plaza design, intended to be attractive from all sides (Plate 051), mixed with office complexes, historic homes and residential retirement facilities. A wall of green vegetation screens large residences from the byway (Plate 052).

Analysis:

Planted medians (Plate 053), granite curbs and pavers (Plate 054), and patterned crosswalks (Plate 055) have provided effective traffic calming in Greenville. These enhancements create a sense of pedestrian scale and safety (Plate 056).

The evergreen screen around Al du Pont High School field is no longer functional. The planted zelkovas won't perform the screening function. While the open space from athletic fields is a potentially desirable view, some sections of the existing chain link

Plate 052
Approaching Greenville Center

Plate 053

Plate 054

Plate 055

Plate 056

Plate 057 A. I. du Pont High School athletic fields

fence are unattractive and obscure the view. During March 2004, most of the fence was replaced with a new chain link fence. An attractive black fence was placed at the corner of Route 52 and Hillside Road. The old chain link fence remains in a section directly behind the high school bleachers (Plate 057).

The aesthetic quality of the Village of Greenville would be greatly enhanced by placing utility lines underground. Trees like this sugar maple would be able to grow to their mature size and grandeur (Plate 058).

The loss of even a single mature tree can dramatically reduce the aesthetic quality of a section of roadway (Plate 059). Although this large elm was lost during the construction process, parking lot expansion at the corner of Kennett Pike and Buck Road resulted in new opportunities to plant tall-growing shade trees, screening and beautification plantings. Screening is designed to prevent headlight glare from impacting the surrounding residential and commercial environment.

Plate 058 Sugar maple compromised by utility line pruning

Recommendations:

- Replace the remaining chain link fence with an attractive alternative behind the A.I. du Pont High School bleachers. Remove invasive species along the fence.
- Place utility lines in this segment underground (Figure 18).
- Plant tall-growing shade trees that can be limbed up for maximized commercial visibility and enhanced village character.
- When new building and renovations occur, take every opportunity to incorporate trees, shrubs and green spaces. To create a pleasant atmosphere for the shopping district plant tall-growing shade trees adjacent to the parking lot on the corner of Kennett Pike and Buck Road.
- Buffer parking lot with roadside plantings and/or structures to beautify and screen other properties and traveling motorists from headlights (see Figures 2-5, pages 20-23).

Plate 059 Lost mature elm at Buck Road and Kennett Pike

Above:
Existing view of sugar maple with above ground utilities.

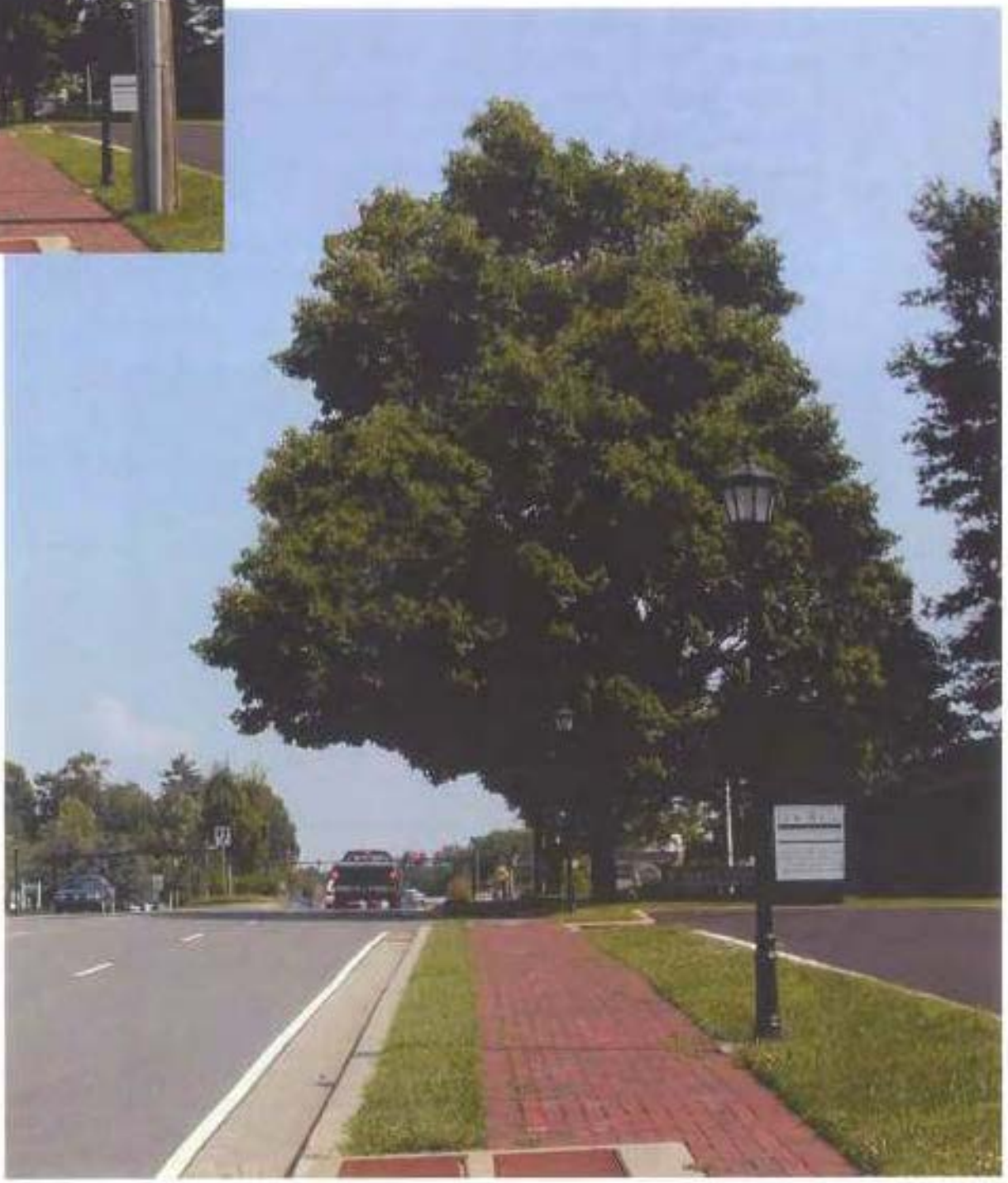


Figure 18. Village of Greenville

Photo simulation of sugar maple growth after utilities are placed underground

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Character segment 8

Winterthur – Brook Valley Road to Old Kennett Road

Description:

This segment is dominated by Winterthur Museum and Gardens. Large estates contain alternating open pastoral views and screened wooded sections.

Analysis:

Planted in the early 1900s by Eugene du Pont, European larches, *Larix decidua*, line the west side of the byway in the first portion of this segment. Climbing, choking vines have significantly diminished the trees' form and health (Plate 060). This is the result of inadequate ground layer maintenance. Planted at the rear edge of the right-of-way and pyramidal in nature, the larches could have (with proper maintenance) created a soft-textured screen compatible with utility lines. Since this photo, property owners are working diligently toward removing the curtain of vines, blocking what would be high quality views such as the twin lakes estates. Other significant sections of the byway (for example: directly across from Winterthur (Plate 061) and a section just north of the Delaware Museum of Natural History) are overgrown with invasive vines and shrubs.

Plate 060 Vines blocking Twin Lakes view shed, 2004

Plate 061 Roadside vegetation overwhelmed by invasive exotic growth

Plate 062
Kennett Pike through Winterthur, ca. 1919

Plate 063
Forsythia hedge along Kennett Pike

Winterthur, The Delaware Museum of Natural History, and The Methodist County House, all with fields adjacent to the roadway, are fine examples of the retention of a sense of rural open space consistent with the original character of the roadway (Plate 062).

Forsythia shrub rows are a frequent element along the Route 52 and Route 100 scenic byway. Perhaps overused, this perennially popular hedge has the advantage of being durable and noninvasive. The way-finding sign is typical of the style currently in use along the scenic byway and throughout the Delaware Valley (Plate 063).

The landscape of Winterthur Museum and Gardens was developed by Henry Francis du Pont in the 1920s with design assistance from Marian Coffin. While many of the trees in this 1916 photograph of the original Winterthur gatehouse no longer exist (Plate 064, left), the stately shade trees (sycamores and oaks) in this current photograph maintain the integrity of the estate's former main entrance (Plate 064, right).

Plate 064 Winterthur entrance gate, ca. 1919 and today

The hedge that lines the Winterthur estate is pruned and clipped resulting in small leaves that look like privet. In fact, the hedge is comprised of osage orange, *Maclura pomifera*, a much coarser plant in its typical form and a plant that is rarely if ever used as hedging material (Plate 065). Due to its long tenure, this hedge is recognized as a venerable historic symbol of the estate.

Trees set in grasses maintained at meadow height contribute to the rural sense of Winterthur's peripheral landscape while the neatly mowed edge presents a carefully maintained look to passing motorists (Plate 066).

Recommendations:

- Reduce road width and/or design plantings to create environments that alert drivers to the need for caution upon approach to Greenville (Figures 19, and 20, pages 71 and 72).
- Remove larch trees choked with invasive vines from Brook Valley Road to Campbell Road (Route 82) and replace with a combination of filtered and opaque screen plantings (Figures 21 and 22, pages 72 and 74).
- Promote the retention of views into open space as Route 52 passes Winterthur, The Delaware Museum of Natural History, and The Methodist County House.
- Remove invasive plants on rights-of-way throughout this segment and develop long-term invasive plant management plans.
- Limit roadside signage to that consistent with the character of a rural byway.

Plate 065 Osage orange hedge at Winterthur

Plate 066 Winterthur estate meadow

Figure 19. Approaching Greenville

Illustrative plan

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Figure 20. Approaching Greenville

Perspective

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

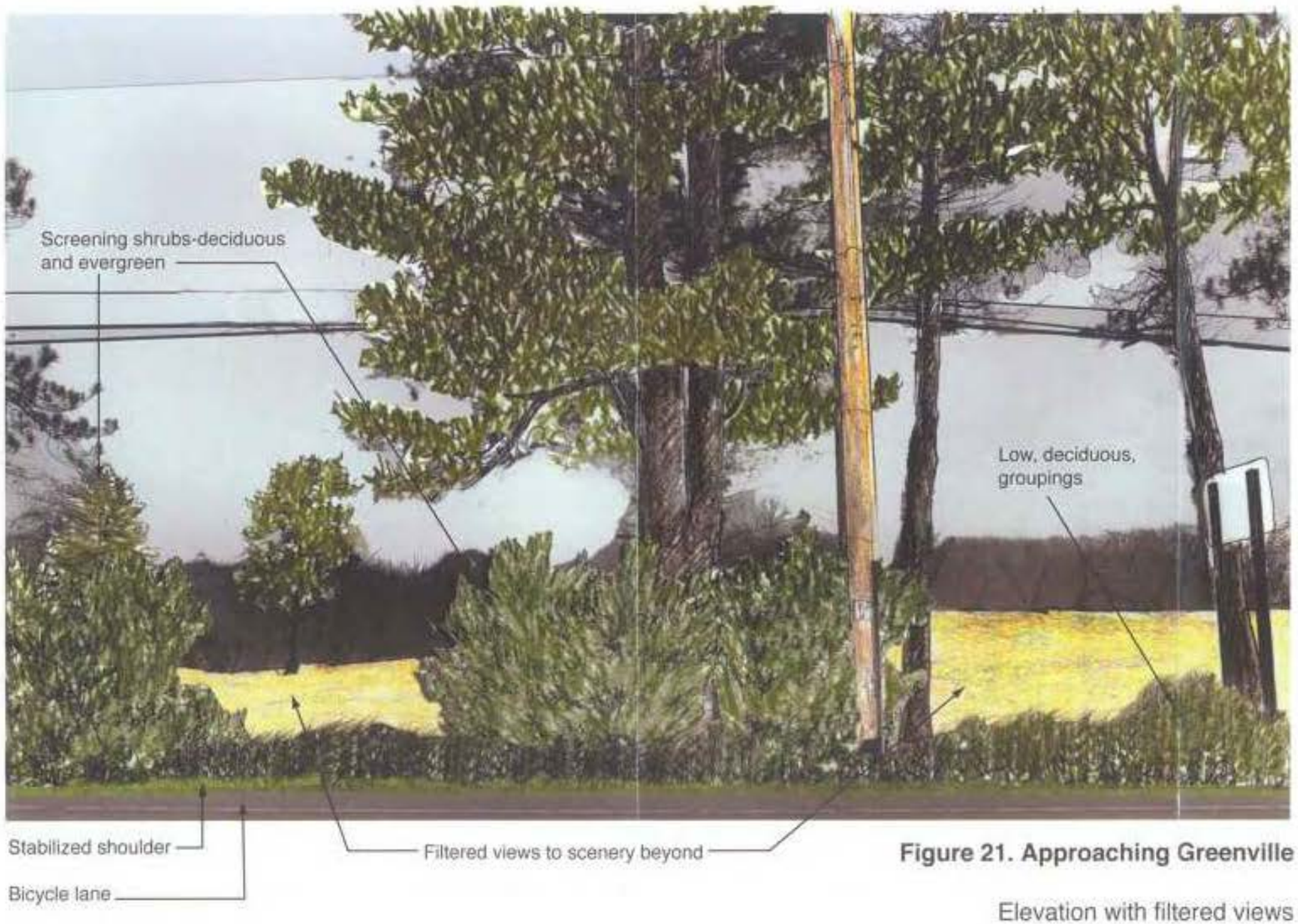


Figure 21. Approaching Greenville

Elevation with filtered views

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Figure 22. Approaching Greenville

Elevation with full screening

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Character segment 9

Lower Brandywine Presbyterian Church – Old Kennett Road to 1/8th mile south of Center Meeting Road

Description:

Dense vegetation lines the majority of the roadway in this segment. It is a mix of large residential properties set back from the road and historic farmsteads. The presence of historic barns provides a rural feel (Plate 067).

Analysis:

The Lower Brandywine Presbyterian Church cemetery is lined with a row of weeping cherries. This dramatic planting was identified as comprising a "high quality view" in the 1987 Brandywine Valley Scenic River and Highway Study. Although the trees are showing signs of decline, they have a number of years of useful life remaining (Plate 068).

Plate 068. Historic weeping cherries at the Lower Brandywine Presbyterian Church cemetery

Plate 067. Historic barn on Kennett Pike

Plate 069
River birch on Kennett Pike

Plate 070
Linden trees on Kennett Pike

Provided time and a suitable setting the Delaware native river birch, *Betula nigra*, can attain significant size and contribute to roadside canopy (Plate 069).

Judge Percy Nields' lindens, planted in the 1920's, (Plate 070) constitute one of the significant signatures of this section of scenic byway. Although the trees are currently in good health, the importance of this grand sweep warrants plans for their ultimate replacement. Private land owners are providing the necessary invasive plant control in some sections of this character segment (Plate 071).

The Jefferis-Carpenter-Lippincott House, south of Centreville on the west side of the scenic byway, has a low stone retaining wall running parallel to the roadway. Majestic trees planted in the mid 1800s, including a champion basswood, can be glimpsed from the byway (Plate 072).

Plate 071
Invasive plant control along Kennett Pike

Plate 072
Jefferis-Carpenter-Lippincott House along Kennett Pike

Recommendations:

- Plant *Prunus subhirtella pendula* along the right-of-way in front of Lower Brandywine Presbyterian Church cemetery when existing trees decline to the point at which they are no longer attractive (Plate 073).
- Plant medium-sized trees such as river birch (*Betala nigra*) to contribute to roadside canopy.
- Remove invasive plants on rights-of-way throughout this segment.

Plate 073 Lower Brandywine Presbyterian Church cemetery

Plate 075 Centreville Village

Character segment 10

Village of Centreville – 1/8th mile south of Twaddell Mill Road to Snuff Mill Road

Description:

Shops, historic residences and sidewalks immediately adjacent to the scenic byway characterize the Village of Centreville. The presence of large canopy trees, such as the plane trees in Canby Grove Park, adds to the quaint historical ambience (Plate 074). When trees are fewer, the roadway becomes the dominant feature (Plate 075).

Plate 074 London Plane trees in Canby Grove Park

Plate 076: Kennett Pike through Centreville Village, ca. 1919

Analysis:

As documented in this 1919 photograph, overhead utility lines have been in conflict with Centreville street trees for nearly a century (Plate 076). As in Greenville, the aesthetic quality of the Village of Centreville would be greatly enhanced by placing utility lines underground. Freed from constraining overhead wires, tall-growing shade trees would develop natural form and mature size. The charm and tranquility of a canopy-covered street would help to restore the ambience of the village in a pre-electric age, and would lessen the impact of the widened roadway.

Plate 077
Norway maples on Centreville roadside

Although Norway maples have been planted as street trees since the earliest years of the village, time has proven them to be invasive exotics that have a detrimental effect on open spaces. They seed in densely and exclude other vegetation (Plate 077).

Through-traffic on Kennett Pike threatens the safety of pedestrians, bicyclists and local retail activity. One of the greatest problems is the tendency for through-vehicles to enter pedestrian and bicycle lanes when traffic is backed up. Containers have been placed on the shoulder behind white bumper blocks in an attempt to minimize this practice; however, inconsistencies in lane markings create confusion and the containers have not functioned satisfactorily (Plate 078, Plate 079). DelDOT is currently working on a permanant traffic calming solution with the community and the recommendations from this process should be considered in these pedestrian enhancements.

Gateway medians at the north and south end of the Village of Centreville were installed for traffic calming in early 2003. The minute scale and complexity of the median plantings is out of keeping with the larger scale and historic simplicity of a rural village (Plate 080). As currently planted, the medians are filled with pfitzer juniper and boxwood growing under zelkova trees. Many of the plants died through

Plate 078
Gateway median

Plate 079
Temporary traffic calming planter

Plate 080 Gateway median

Plate 081 Gateway median

the winter of 2003/2004 (Plate 081). Pfitzer junipers will grow too large for a small median planting and boxwood are not tolerant of the harsh conditions found in a roadside median. Zelkova trees are not in keeping with the historic tradition of Centreville. The medians should be planted simply.

Recommendations:

- Place utility lines in this segment underground.
- Plant tall-growing shade trees for enhanced village character.
- Include vegetation in the solution for traffic/bicycle/pedestrian conflict. Explore creative alternatives to containers and bumper blocks such as divider islands with low maintenance plantings.
- Gradually remove all Norway maple trees and replace them with more desirable street trees with a majestic form and stature such as oaks.
- Redesign gateway median plantings at the north and south ends of the Village. Simplify the planting palette. The ground layer should be comprised of one continuous low-growing plant, such as *Deutzia gracilis* 'Nikko'. Trees should be selected from the regional historic palette, such as red maple or scarlet oak.

Character segment 11

North of Centerville – Snuff Mill Road
to Delaware State Line

Description:

This is a rural/residential segment with open pastoral views to the west. Large trees dominate sections of the eastern side of the byway.

Analysis:

The openness of these pastoral landscapes is a critical element that should be preserved in highly developed northern Delaware. Rows of trees along the scenic byway provide a filtered view in which the motorist catches glimpses of open fields. White pines, which become open with age, are effective for this type of framing (Plate 082). Some open sections of right-of-way have been overtaken by invasive shrubs and vines (Plate 083). Evergreen trees, such as this row of Chamaecyparis, offer a denser cover with a more restricted view but also provide shade, which discourages invasive shrub and vine growth.

Plate 082 Kennett Pike north of Centreville Village

Plate 083 North gateway to Centreville Village

The Centreville School occupies a significant portion of the north end of this segment including a recent purchase of the nearby Line House, an 1800 historic tavern/inn built on the Pennsylvania-Delaware state line. Recent renovations to the entrance and parking for the Centreville School have included sensitive screen plantings, landscape berm construction and tree preservation while preserving open view's to the school's sheep pastures. Additional enhancements of the Centreville School properties such as entrance plantings, signage, invasive plant management, and screen plantings should be consistent with the character of the byway and was chosen as a model demonstration landscape project (Figure 23).

Old fence lines marked with straight rows of wild cherries, locusts, multiflora rose, mulberry and honeysuckle are historic remnants. The true invasive threats in these fencerows should be identified and removed while the innocuous plants such as osage orange and wild cherry could be preserved as a desirable historical feature (Plate 084).

Plate 084 Kennett Pike south from the state line near the Line House, ca. 1919

Figure 23. Entry at Centreville School
Perspective looking south

Prepared by Lardner/Klein Landscape Architects, P.C.
June 2005

This segment includes a number of majestic tree specimens that warrant notation and preservation (Appendix C). An old London plane tree next to a post and board fence adjacent to the Oberod Conference Center and a sugar maple with brilliant yellow-orange fall color just north of Snuff Mill Road on the east side of the byway are two such specimens (Plate 085 and Plate 086).

Recommendations:

- Remove invasive species (such as multiflora rose, honeysuckle, bittersweet) that have grown up in fencerows and right-of-ways along Route 52. Develop ongoing management plans to discourage invasive species and encourage or replant appropriate plants.
- Encourage continued removal of invasive species on private property along the scenic byway.
- Remove stockade-type fencing adjacent to the Line House to further enhance the open landscape views.

Plate 085
London Plane near state line

Plate 086
Sugar maple on northbound Kennett Pike

Montchanin Road (Route 100)

Though the byway has portions in two states–Pennsylvania and Delaware–it is experienced as one continuum, connecting Brandywine Valley historic sites including Hagley, Winterthur, Longwood Gardens, and the Brandywine River Museum. The Pennsylvania portion completes a northern loop connecting Routes 52 and 100 via Route 1.

The Montchanin Road section of the byway follows Route 100 southward from the Delaware-Pennsylvania state line to its intersection with Kennett Pike (Route 52) just south of Greenville. Running north/south, the track of the original Wilmington and Northern Railroad is often in view as it winds across the byway. Though currently used exclusively for freight under lease to the Brandywine Valley Railroad, this rail line is an important transportation right-of-way that could some day be used to share the burden of commuter traffic with the Routes 100 and 52 automobile routes (Plate 087).

Route 100 is a low-lying, winding scenic rural road with wooded residential lots and is characterized by a mix of enclosed, forested natural areas and expanses of open, agrarian landscapes. This section of the byway is comprised of four character area segments.

Plate 087 Former Winterthur train station on the Wilmington and Northern railroad

Design goals:

- Keep existing woodland edge close to the road (without shoulders) to maintain the meandering rural character of the byway.
- Plan drainage solutions to preserve the character of the roadway; seek alternatives to unsightly rip-rap.
- Identify and screen undesirable views (such as rubble mound, see Plate 107); keep desirable views open and framed.
- Keep new plantings consistent with the rural character of this section of the Scenic Byway landscape.
- Design development entrances to respect the character of the byway working with a scale and a palette of materials appropriate for a rural, agrarian corridor in this region.
- Limit roadside signage to that consistent with the character of a rural byway.

Management goals:

- Monitor woodland edge for invasive plants; control and manage as needed.
- Maintain inventory and recognize and preserve notable specimen trees (Appendix 3).

Plate 088 Montachanin Road from south of Center Meeting Road intersection

Plate 089
Working farm near Center Meeting Road intersection

Character segment 12

State Line to Center Meeting Road

Description:

This section of Montchanin Road runs through still-working farms, healthy forest regrowth and large lot residential properties (Plate 088, Plate 089). A portion of this segment is flanked by protected natural areas, such as the Flint Woods. Inaccessible sloping terrain has kept this land relatively undisturbed for over 150 years. Forest regrowth along parts of Route 100 occurred in an era without today's invasive exotic pressure, which is another reason why these forests are relatively healthy. More recent regrowth is often overgrown with invasive plant species, especially along sunny, disturbed edges. These plants often encroach upon the roadway (Plate 090).

Analysis:

The Smith Bridge Road intersection is highlighted in the 1987 Brandywine Valley Scenic River and Highway Study "as perhaps the most visually significant crossroads landscape of the entire area; this juncture features a wealth of field, forest, swampland, large trees, stone bridges, and old buildings and barns" (Plate 091).

Recommendations:

- Remove invasive species (such as multiflora rose, honeysuckle, bittersweet, and autumn olive) that have grown up along the right-of-way on Montchanin Road and replace with appropriate plant species where needed to prevent erosion and sedimentation problems and regrowth of invasive species.

Plate 090 Section of Montchanin Road choked with invasive plants

Plate 091 Center Meeting Road/ Smiths Bridge Road intersection with Montchanin Road at top

Plate 092 Working farm near Center Meeting Road intersection

Character segment 13

Center Meeting Road to Guyencourt Road

Description:

Characterized as wooded/rural residential, this segment contains both wooded sections and open farmland. Barns, cornfields and grazing cattle give the roadway an agricultural feel (Plate 092).

Analysis:

Rich native vegetation prevails in healthy woodland sections. Trees that grow right up to the edge of the road with almost no shoulder provide an intimate "back road" character (Plate 093). The lack of shoulders and curving nature of the roadway helps moderate speed on this section of Montchanin Road, allowing travelers to enjoy the many beautiful vistas (Plate 094).

This segment is also flanked by protected natural areas, such as the Jenny duPont Woods, that have been relatively undisturbed for over 150 years.

A few negative features detract from the desirable character of the byway in this segment. A stream adjacent to the roadway, south of Center Meeting Road, is eroding due to lack of vegetation or other bank-stabilizing structure. Metal guardrail and ugly concrete bridge abutments mar the scenic beauty of the stream, adjacent pond and pastoral view shed (Plate 095).

Plate 093
Montchanin Road with little to no shoulder

Plate 094
Curved section of Montchanin Road

Recommendations:

- Explore sensitive solutions to erosion problems, such as on the stream bank adjacent to the roadway located 1/8th mile south of Center Meeting Road intersection (Figure 24). Use planting design appropriate for riparian buffers, while preserving the scenic view with low shrubs and herbaceous plants such as native sedges and rushes.
- Enhance the beauty of safety features along the roadway, such as replacing metal guardrail with attractive guardrail and adding a stone face on bridge abutments (Figure 24).

Plate 095 Opportunities for visual and environmental enhancements along Montchanin Road

Technical reference:
FISRWG (10/1998). Stream Corridor Restoration: Principles, Processes and Practices. By the Federal Interagency Stream Restoration Working Program Group (FISRWG)(15 Federal agencies of the US gov't). GPO Item No. 0120-A; SuDocs No. 57.6/2:EN 3/PT.653. ISBN: 0934213-59-3.

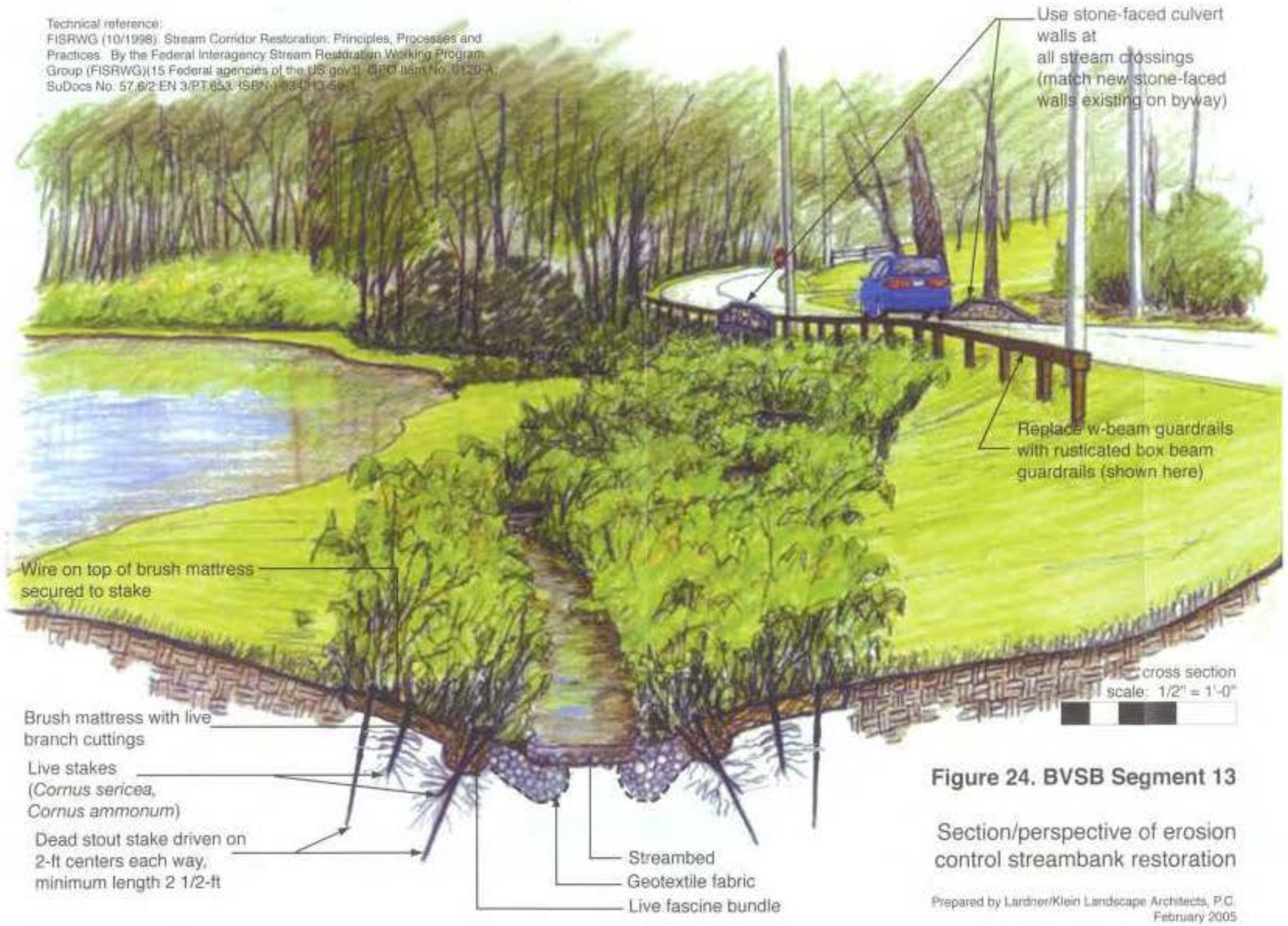


Figure 24. BVSB Segment 13

Section/perspective of erosion control streambank restoration

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

Plate 096
Intersection of Route 92 with Montchanin Road at Adams Dam

Plate 097

Character segment 14

Brandywine Creek Sate Park

Description:

As Montchanin Road passes under the Wilmington and Northern Railroad Bridge the character transitions from a closed wooded landscape to the long-distance views of an open rolling landscape. This segment includes almost 2000 acres of woodland and farmland preserved under conservation easements, land trust holdings and state park ownership. Wetlands are adjacent to the road and the roadside contains desirable intact plant communities. Many hedgerows bordering sunny fields and meadows are severely compromised by the incursion of invasive exotic plants.

Plate 098 Wilmington and Northern railroad overpass

Analysis:

The Wilmington and Northern Railroad Bridge, while rusted and marked with graffiti, represents a significant historical feature of the roadway and serves to calm traffic (Plate 098). Grade level railroad crossings are an historical part of the Montchanin Road Scenic Byway as illustrated by this early 1900s photo of a crossing on Montchanin Road (Plate 099). Although the crossing has been modified, other grade level crossings remain in service, keeping up tradition and serving as traffic slowing devices (Plate 100, Plate 101). While attractive and historically significant, the railroad is another transportation corridor acting as a disseminator of invasives. That disturbance has resulted in a population of invasive plants requiring control to maintain the natural beauty of the corridor (Plate 102).

Early 1900's and 2004 railroad crossings of Montchanin Road

Plate 099

Plate 100

Plate 101

Plate 102
Wilmington and Northern railroad and its right-of-way

Plate 104
White oaks

The intersection of Montchanin Road with Thompson's Bridge and Adam's Dam roads is heavily trafficked but also quite beautiful, featuring stone wall reproductions, split rail fences, a stone bridge, Adam's Dam and pond, and pastoral views (Plate 103). The 1987 Brandywine Valley Scenic River and Highway Study identified this area as "one of the most powerful and visually significant landforms in all of Delaware—the Great Breadloaf Hill opposite the Adam's Dam Road intersection." Majestic white oaks are significant features of this dramatic landscape that includes a variety of stately mature trees (Plate 104). Stone walls have a long heritage in the area with a beautiful old stone wall remaining on Thompson's Bridge Road adjacent to Brandywine Creek State Park several hundred yards off the scenic byway (Plate 105). A new stone wall was built as part of the Adam's Dam Road intersection improvements. Four-way stop signs regulate traffic at this intersection well.

Turf pavers were added to this intersection with the intent to provide safe traversable shoulder spaces while maintaining a narrow look and feel. Turf is not currently growing in these pavers. It is possible that the turf pavers were not installed properly (Plate 106). A proliferation of road signs detracts from the scenic viewshed (Plate 103).

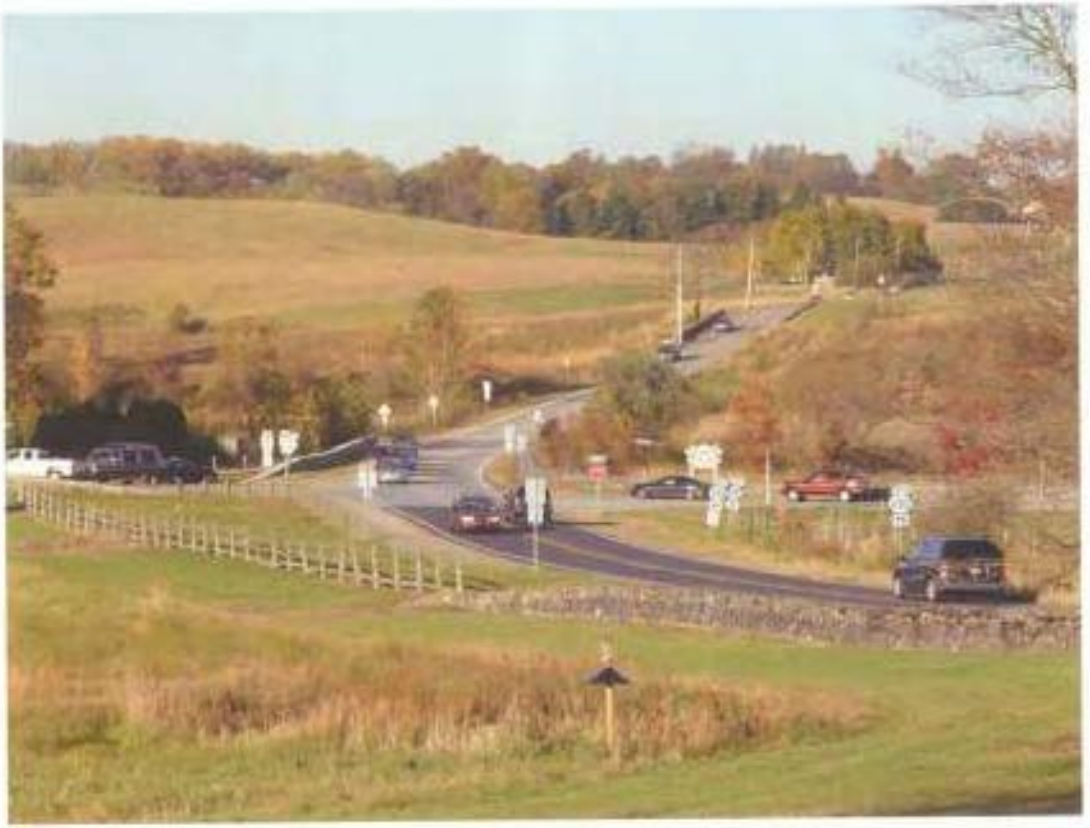


Plate 103 Intersection of Route 92 with Montchanin Road at Adams Dam

Plate 105
Historical stone wall

Plate 106
Shoulder at Montchanin Road / Route 92 intersection

Plate 107 Rubble mound from the air

A huge rubble mound dominates the northeast corner of the northern intersection of Adam's Dam and Montchanin roads. Invasive plants partially screen this artificially created, undesirable element (Plate 107).

Recommendations:

- Investigate alternatives to existing turf pavers at Montchanin, Adam's Dam and Thompson Bridge roads to achieve the look of a small scale, narrow intersection (Figure 25).
- Screen rubble mound by removing invasive species and planting a mixture of tall-growing shade trees and eastern red cedars well beyond utility lines.
- Consolidate highway signage at intersection of Rt. 100 and 92 (see Plate 103).

View of existing shoulders

*Sub-base and Biaxial Geogrid requirement depends on CBR (California bearing ratio) strength of subgrade. If CBR>12% these components will not be required.

Figure 25. Shoulders near Brandywine Creek State Park

Cross section and photo simulation of vegetated shoulders stabilized with Netlon® Advanced Turf System or similar product

Prepared by Lardner/Klein Landscape Architects, P.C.
February 2005

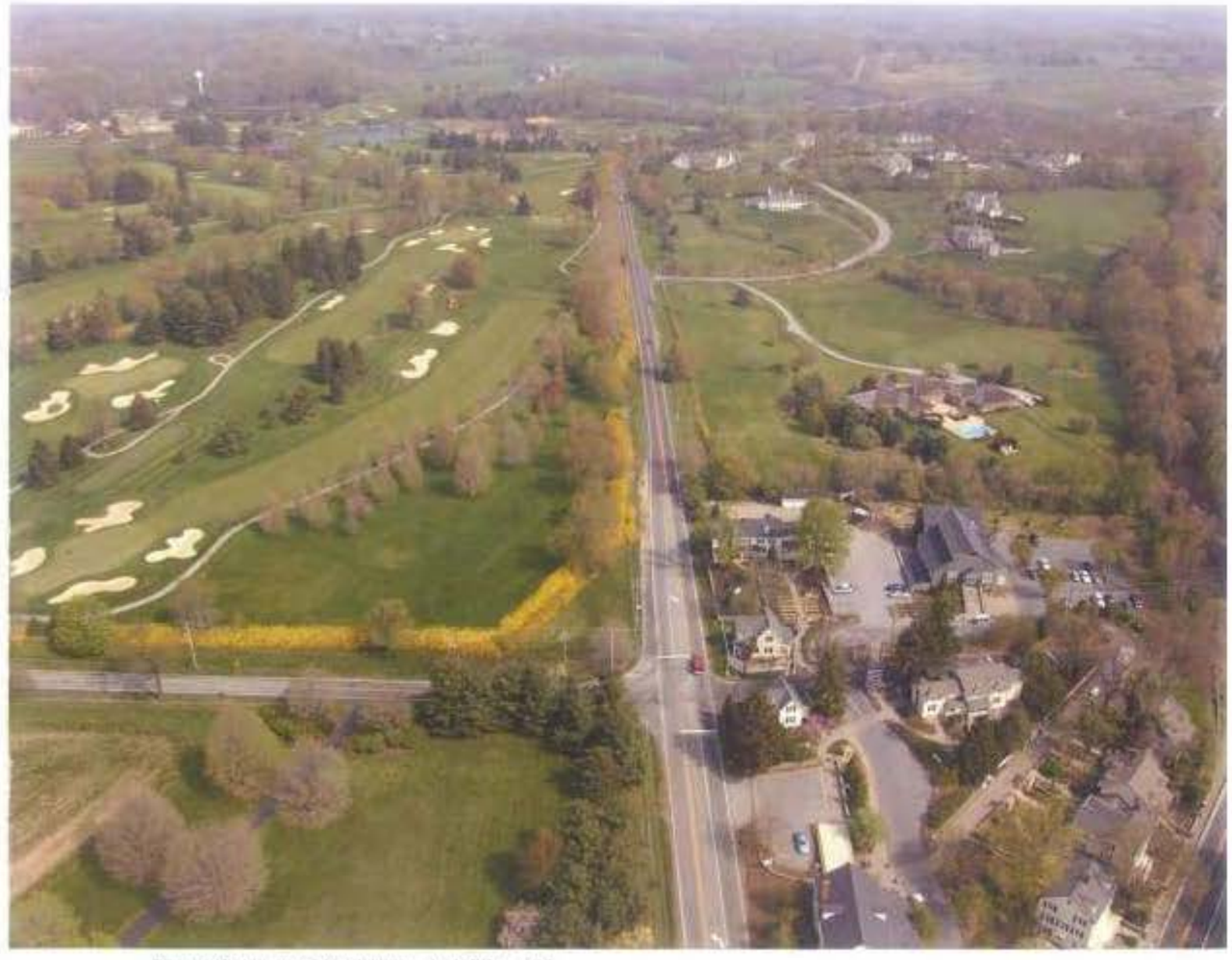


Plate 108 Village of Montcharvin along Route 100

Character segment 15

Village of Montchanin

Description:

Gently rolling farmland, large estates and the historic crossroads at the Village of Montchanin characterize this segment.

Analysis:

Historically, trees lining roadway sections and private lanes exhibited considerable diversity, as can be seen is this 1870 image of DuPont's Lane (now Buck Road) (Plate 109). Respecting this tradition, Summit Lane, the entrance road to Stoney Run development, has been planted with seedling red maples. The trees have a variety of habits and colors resulting in greater diversity, both visual and biological, than would result from a uniform planting of a cultivar such as 'Red Sunset' or 'October Glory' (Plate 110).

Plate 109
DuPont's Lane, ca. 1870

Plate 110 Entrance to Stoney Run development from Montchanin Road

Plate 111
Dense evergreen screen (on left) along Montchanin Road

Plate 112
Deciduous trees allowing views into meadow adjacent to Montchanin Road

If both sides of the Montchanin Road byway were screened with evergreen trees (as visible on the left, Plate 111), the experience would be uninteresting and somewhat claustrophobic. Deciduous trees, especially if limbed high, offer a creative alternative. They preserve vistas for travelers yet provide a sense of enclosure and privacy for residential landowners (Plate 112).

Recommendations:

- Design plantings at development entrances to be consistent with the simplicity and historical character of the byway (see Plate 110).
- Plant tall-growing shade trees that provide enclosure yet preserve vistas, as new developments are built along Montchanin Road.

Winterthur station & Adams Dam intersection

Appendix 1

From the 1998 ASLA/American Society of Landscape Architects) Annual Meeting Proceedings, 183-185.

Structural Soil:
An Innovative Medium Under pavement that Improves Street Tree Vigor

Nina Bassuk, Director and Professor Urban Horticulture Institute, Cornell University, Ithaca, NY
Jason Grabosky, Urban Horticulture Institute, Cornell University, Ithaca, NY
Peter Trowbridge, FASLA, Professor Landscape Architecture, Cornell University, Ithaca, NY
James Urban, FASLA, James Urban and Associates, Annapolis, MD

Introduction

The major impediment to establishing trees in paved urban areas is the lack of an adequate volume of soil for tree root growth. Soils under pavements are highly compacted to meet load-bearing requirements and engineering standards. This often stops roots from growing, causing them to be contained within a very small useable volume of soil without adequate water, nutrients or oxygen. Subsequently, urban trees with most of their roots under pavement grow poorly and die prematurely. It is estimated that an urban tree in this type of setting lives for an average of only 7-10 years, where we could expect 50 or more years with better soil conditions. Those trees that do survive within such pavement designs often interfere with pavement integrity. Older established trees may cause pavement failure when roots grow directly below the pavement and expand with age. Displacement of pavement can create a tripping hazard. As a result, the potential for legal liability compounds expenses associated with pavement structural repairs. Moreover, pavement repairs which can significantly damage tree roots often result in tree decline and death.

The problems as outlined above do not necessarily lie with the tree installation but with the material below the pavement in which the tree is expected to grow. New techniques for meeting the often opposing needs of the tree and engineering standards are needed. One new tool for urban tree establishment is the redesign of the entire pavement profile to meet the load-bearing requirement for structurally sound pavement installation while encouraging deep root growth away from the pavement surface. The new pavement substrate, called 'structural soil', has been developed and tested so that it can be compacted to meet engineering requirements for paved surfaces, yet possess qualities that allow roots to grow freely, under and away from the pavement, thereby reducing sidewalk heaving from tree roots.

Convential Tree Pits are Designed for Failure

Looking at a typical street tree pit detail, it is evident that it disrupts the layered pavement system. In a sidewalk pavement profile, a properly compacted subgrade of existing material often is largely impermeable to root growth and water infiltration and significantly reduces drainage if large percentages of sand are not present. Above the subgrade there is usually a structural granular base material. To maintain a stable pavement surface the base material is well compacted and possesses high bearing strength. This is why a gravel or sand material containing little silt or clay is usually specified and compacted to 95% Proctor density (AASHTO T-99). The base layer is granular material with no appreciable plant available moisture or nutrient holding capacity. Subsequently, the pavement surrounding the tree pit is designed to repel or move water away, not hold it, since water just below the pavement can cause pavement failure. Acknowledging that; the above generalizations do not account for all of the challenges below the pavement for trees, it is no mystery why trees are often doomed to failure before they are even planted.

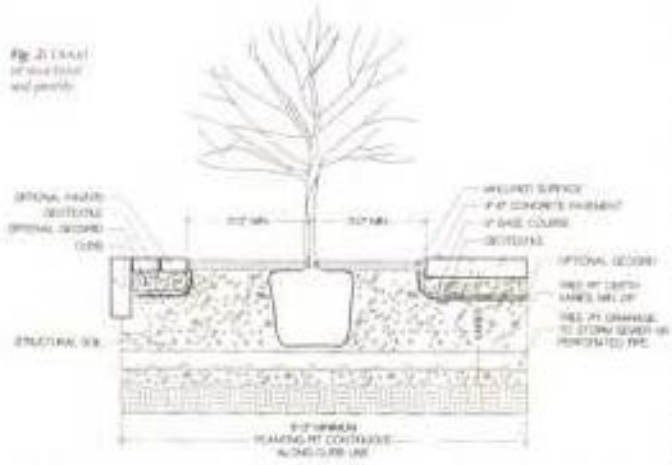
The subgrade and granular base course materials are usually compacted to levels associated with root impedance. Given the poor drainage below the base course, the tree often experiences a largely saturated planting soil. Designed tree pit drainage can relieve soil saturation, but does nothing to relieve the physical impedance of the material below the pavement which physically stops root growth.

A New System to Integrate Trees and Pavement

'Structural soil' is a designed medium which can meet or exceed pavement design and installation requirements while remaining root penetrable and supportive of tree growth. Cornell's Urban Horticulture Institute, has been testing a series of materials over the past five years focused on characterizing their engineering as well as horticultural properties. The materials tested are gap-graded gravels which are made up of crushed stone, clay loam, and a hydrogel stabilizing agent. The materials can be compacted to meet all relevant pavement design requirements yet allow for sustainable root growth. The new system essentially forms a rigid, load-bearing stone lattice and partially fills the lattice voids with soil (Figure 1). Structural soil provides a continuous base course under pavements while

Fig. 1: *The stone lattice bears loading while the soil particle partially fills the lattice voids.*

providing a material for tree root growth. This shifts designing away from individual tree pits to an integrated, root penetrable, high-strength pavement system.



This system consists of a four to six inch rigid pavement surface, with a pavement opening large enough to accommodate a forty year or older tree (Figure 2) . The opening could also consist of concentric rings of interlocking pavers designed for removal as the buttress roots meet them. Below that, a conventional base course could be installed and compacted with the material meeting normal regional pavement specifications for the traffic they are expected to experience. The base course would act as a root exclusion zone from the pavement surface. Although field tests show that tree roots naturally tend to grow away from the pavement surface in structural soil. A geotextile could segregate the base course of the pavement from the structural soil. The gap-graded, structural soil material has been shown to allow root penetration when compacted. This material would be compacted to not less than 95% Proctor density (AASHTO T-99) and possess a California Bearing Ratio greater than 40 (Grabosky and Bassuk 1995,1996). The structural soil thickness would depend on the designed depth to subgrade or to a preferred depth of 30 inches. This depth of excavation is negotiable, but a 24 inch minimum is encouraged for the rooting zone. The subgrade should be excavated to parallel the finished grade. Under-drainage conforming to approved engineering standards for a given region must be provided beneath the structural soil material.

The structural soil material is designed as follows. The three components of the structural soil are mixed in the following proportions by weight, crushed stone: 100; clay loam: 20; hydrogel: 0.03. Total moisture at mixing should be 10% (AASHTO T-99 optimum moisture).

Crushed stone (granite or limestone) should be narrowly graded from 3/4 -1 1/2 inch, highly angular with no fines. The clay loam should conform to the USDA soil classification system (gravel<5%, sand 25-30%, silt 20-40%, clay 25-40%). Organic matter should range between 2% and 5%. The hydrogel, a potassium propenoate-propenamide copolymer is added in a small amount to act as a tackifier, preventing separation of the stone and soil during mixing and installation. Mixing can be done on a paved surface using front end loaders. Typically the stone is spread in a layer, the dry hydrogel is spread evenly on top and the screened moist loam is the top layer. The entire pile is turned and mixed until a uniform blend is produced. The structural soil is then installed and compacted in 6 inch lifts.

In a street tree installation of such a structural soil, the potential rooting zone could extend from building face to curb, running the entire length of the street. This would ensure an adequate volume of soil to meet the long term needs of the tree. Where this entire excavation is not feasible, a trench, running continuous and parallel to the curb, eight feet wide and three feet deep would be minimally adequate for continuous street tree planting.

There will be a need to ensure moisture recharge and free gas exchange throughout the root zone. The challenge may be met by the installation of a three dimensional geo-composite (a geo-grid wrapped in textile one inch thick by eight inches wide) which could be laid above the structural soil as spokes radiating from the trunk flair opening. This is currently in the testing stage. Other pervious surface treatments could also provide additional moisture recharge, as could traditional irrigation.

When compared to existing practice, additional drainage systems, and the redesigned structural soil layer represent additional costs to a project. The addition of the proposed structural soil necessitates deeper excavation of the site which also may be costly. In some regions this excavation is a matter of standard practice. However, this process might best be suited for new construction and infrastructure replacement or repair, since the cost of deep excavation is already incurred.

The Urban Horticulture Institute continues to work on refining the specification for producing a structural soil material to make the system cost effective. It is patent pending and will be sold with the trademark 'CU-Soil' to insure quality control. Testing over five years has demonstrated that stabilized, gap-graded structural soil materials can meet this need while allowing rapid root penetration. Several working installations have been completed in Ithaca, NY, New York City, NY, Cincinnati, OH, Cambridge, MA and elsewhere. To date, the focus has been on the use of these mixes to greatly expand the potential rooting volume under pavement. It appears that an added advantage of using a structural soil is its ability to allow roots to grow away from the pavement surface, thus reducing the potential for sidewalk heaving as well as providing for healthier, long-lived trees.

Grabosky, J. and Bassuk, N. "A New Urban Tree Soil to Safely Increase Rooting Volumes Under Sidewalks", 1995, Journal of Arboriculture 21(4), 197-201. Grabosky, J. and Bassuk, N. "Testing of Structural Urban Tree Soil Materials for Use Under Pavement to Increase Street Tree Rooting Volumes", 1996, Journal of Arboriculture 22(6), 255-263.

DELAWARE CENTER FOR HORTICULTURE
Cultivating a greener community

RECOMMENDED URBAN STREET TREES
WILMINGTON, DE AREA

SMALL TREES, SUITABLE NEAR OVERHEAD UTILITY WIRES (>10')

SCIENTIFIC NAME	COMMON NAME	TIME OF TRANSPLANTING:

Acer buergerianum **Trident Maple** Spring or Fall
20-25 ft, rounded. Zone 5-8. Withstands drought and infertile soils and various temperatures. Exfoliating bark is quite striking, coloring gray, orange, and brown. Yellow and red in fall.

Acer campestre **Hedge Maple** Spring or Fall
25-35 ft, rounded. Zone 5a-8b. Tolerates wide range of conditions including high soil pH and drought. Relatively pest-free. Moderate-good soil salt tolerance. Yellowish leaves drop late in fall.

Acer ginnala **Amur Maple** Spring or Fall
15-18 ft, rounded. Zone 3-8. Excellent tolerance to dry and alkaline soils. One of the most cold hardy and highly adaptable maples. Variable fall color.

Acer griseum **Paperbark Maple** Spring or Fall
20-30 ft, rounded. Zone 4-8. Extremely tolerant of well-drained acid or alkaline clay soils. No two specimens are exactly alike. Reddish brown exfoliating bark. Brilliant red in fall.

Acer triflorum **Three-flower Maple** Spring or Fall
20-30 ft, rounded. Zone 4-8. Prefers moist, acidic, well drained soils in sun to part shade. Opposite, trifoliate leaves.

Acer truncatum **Shantung Maple** Spring or Fall
20-25 ft, rounded. Zone 4-8. Tolerant of acid, alkaline and dry soils. Yellow flowers emerge before leaves. Variable fall color.

****Aesculus x carnea*** **Red Horsechestnut** Spring or Fall
30-50 ft, rounded. Zone 4-7. Prefers moist, deep, well-drained soils, but is widely adaptable to soil types. Susceptible to a blight that causes browning of the leaves. Spectacular rose-red flower effect.

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* unproven urban tolerance – proven in urban park applications but suggest maximized soil space

Carpinus caroliniana **American Hornbeam** Spring
25-35 ft, rounded, spreading. Zone 3b-9a. Prefers shaded, moist soils but will tolerate some intermittent drought as well as high pH soil. Good orange-red fall color.

Chionanthus retusus **Chinese Fringetree** Spring or Fall
15-25 ft, rounded. Zone 5-8. Extremely easy to grow. Withstands acid or high pH, sandy loam or clay soils. Prospers in sun, but withstands part shade. Early summer white flower clusters.

Cornus mas **Corneliancherry Dogwood** Spring or Fall
20-25 ft, oval-rounded. Zone 4-8. Tolerates acid and high pH, as well as heavy clay soils, better than any dogwood. Bright yellow flowers in March and cherry-red fruit in June and July.

Cornus officianalis **Japanese Cornel Dogwood** Spring or Fall
20-25 ft, oval. Zone 4-8. Similar to *Cornus mas*, although it flowers earlier and the fruit ripen later. Exfoliating bark in gray, orange and brown.

Cotinus obovatus **American Smoketree** Spring or Fall
20-30 ft, oval-rounded. Zone 4-8. Scaly gray-black bark. Brilliant fall color, no two trees alike.

Crataegus viridis **Winter King Hawthorn** Spring
'Winter King'
20-30 ft, oval. Zone 5a-9a. White flowers, red persistent fruit. Tolerant of wide range of soil types including high soil pH. Exfoliating bark in gray, green, and orangish brown.

Koelreuteria paniculata **Panicled Goldenrain Tree** Spring
30-40 ft, rounded. Zone 5b-9a. Tolerates drought, heat, wind, alkaline soil and salt. Extremely fast growing in moist, well-drained soils. Mid-summer yellow flower clusters. Specify straight trunk and good branch structure or tag at nursery.

Maackia amurensis **Amur Maackia** Spring or Fall
20-30 ft, rounded. Zone 4-7. Performs best in loose, acid or alkaline, well-drained soils. Amber-colored bark peels with age into loose flakes. Leaves are made up of 5-7 leaflets and die off green. Summer white, pealike flower clusters.

***Magnolia* 'Galaxy'** **Hybrid Magnolia** Spring or Fall
25-30 ft, pyramidal. Zone 5-8. Pinkish purple flowers open in April. Mildew can be a problem in moist, humid climates. Develops water sprouts.

***Malus* 'Donald Wyman'** **Malus Cultivar** Spring
25 ft, rounded. Highly resistant. Alternating cycles of heavy and light flowering. Rich red buds that unfurl to white flowers. Glossy bright red fruit persist into winter.

Ostrya virginiana **American Hophornbeam** Spring
25-40 ft, pyramidal to rounded. Zone 4-9. Tolerates dry, acid and higher pH soils. Prospers in full sun and is also a good understory tree. Grayish brown exfoliating bark.

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***Prunus x incam* 'Okame'** **Okame Cherry** Spring
20-30 ft, vase-shaped to rounded. Zone 5-8. Excellent heat and cold tolerance. Rich pink flowers appear before the leaves. Bronzy red fall color.

***Prunus subhirtella* 'Autumnalis'** **Flowering Cherry** Spring
20-40 ft, upright to rounded. Zone 4-8. Tolerant of heat. Pinkish white flowers in fall and spring. One of the longest lived flowering cherries.

Syringa reticulata **Japanese Tree Lilac** Spring or Fall
20-30 ft, oval to rounded. Zone 3a-7b. Summer white flower clusters. Transplants readily. Relatively pest-free.

MEDIUM TO LARGE TREES, NOT SUITABLE NEAR OVERHEAD UTILITIES

Acer rubrum **Red Maple** Spring or Fall
40-70 ft. Zone 3b-9a. Acid, moist soils a necessity. Sensitive to salt and drought. Should be used with caution only in sites with little environmental stress. Tree should be specified as 'own rooted', as graft incompatibility can be a problem. Superior cultivars for form and fall color are available. Colorful tree year round.

Acer saccharum **Sugar Maple** Spring or Fall
'Green Mountain'
'Legacy'
60-80 ft, oval. Sensitive to road salt, heat, compaction and drought. Brilliant variable fall color. 'Legacy' is reported as the toughest of the cultivars.

Betula nigra **River Birch** Spring or Fall
'Heritage'
40-70 ft, oval. Zone 4a-9a. Prefers acid, moist soils - but adaptable. Resistant to bronze birch borer. Exfoliating pinkish white bark. 'Heritage' has superior vigor, larger leaves and greater resistance to leaf spot.

Carpinus betulus **European Hornbeam** Spring or Fall
'Fastigiata'
40-60 ft, pyramidal-oval. Zone 5a-7a. Tolerates drought, heavy soil and wide soil pH range. Intolerant of soil salt. Pest-free. 'Fastigiata' grows 30-40 ft.

Celtis laevigata **Sugar Hackberry** Spring
40-50 ft, upright. Zone 5-9. Tolerates full sun or light shade, wet to dry sites, compaction, salt and pollution. Lemon yellow leaves in fall. Select straight trunked trees.

Celtis occidentalis **Common Hackberry** Spring
40-60 ft, upright. Zone 3-9. Tolerates light shade, wide range of soils, salt and pollution. Susceptible to nipple gall on leaves, powdery mildew and leaf spots. Reasonable choice where few trees will prosper.

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Cercidiphyllum japonicum **Katsura Tree** Spring or Fall
40-60 ft, pyramidal to globose. Zone 5a-9a. Suffers from drought and compacted soils. Relatively pest-free. Prefers full sun and rich, moist soil. Yellow to apricot-orange in fall.

****Cladrastis kentukea*** **American Yellowwood** Spring or Fall
30-50 ft, broad-rounded. Zone 4-8. Best growth occurs in high pH soils, but adapts to low pH soils. Early summer cream-colored flower clusters.

Corylus colurna **Turkish Filbert** Spring or Fall
40-60 ft, pyramidal to oval. Zone 4-7. Grows in variety of soils and, once established, displays excellent drought tolerance. Lackluster yellow to purple in fall. Exfoliating bark.

Fraxinus americana **White Ash** Spring or Fall
50-80 ft, oval. Zone 3-9. Performs best in deep, moist, well-drained soils of varying pH. Scale and borer can be problems. Sensitive to drought. Splendid large shade tree. Requires large area.

Fraxinus pennsylvanica **Green Ash** Spring or Fall
40-60 ft, oval to rounded. Zone 3-9. Excellent tolerance of heat and cold, wet and dry soils, and high pH environments. May contract borer and scale. Yellow fall color.

***Ginkgo biloba* (male)** **Ginkgo** Spring or Fall
50-80 ft, variable and irregular. Zone 4b-8b. Narrow upright cultivars available. Tolerates high soil pH, salt and drought. Pest-free. Unique fan-shaped leaves. Yellow fall color.

Gleditsia triacanthos* var. *inermis **Thornless Common Honeylocust** Spring or Fall
30-70 ft, broad oval. Zone 4-9. Very adaptable to soils, and displays excellent salt tolerance. Produces 7-8" long pods, less on certain cultivars. Rich golden yellow fall color.

Gymnocladus dioica **Kentucky Coffeetree** Spring or Fall
50-75 ft, irregular oval. Zone 4-8. Tolerates drought, alkaline soil and salt. Pest-free. Grass grows well underneath. Distinctive curled ridges on gray brown bark. Yellow fall color.

Liquidambar styraciflua **Sweetgum** Spring
'Rotundiloba'
50-75 ft, pyramidal to oval. Zone 5b-9a. Best on moist, sunny sites, does not tolerate high pH soils. Northern seed source recommended. Brilliant variable fall color. 'Rotundiloba' has a purple-burgundy fall color and is reportedly seedless.

****Liriodendron tulipifera*** **Tulip Tree** Spring
70-90 ft, oval-rounded. Zone 4-9. Requires large area. Susceptible to drought. Unique leaf shape, conelike fruit, and tulip-shaped flowers make this tree easily identifiable as well as giving it year-round interest.

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Magnolia x brooklynensis **Hybrid Magnolia** Spring or Fall
'Yellow Bird'
30-50 ft, pyramidal. Large, intense yellow flowers are produced with the leaves.

Metasequoia glyptostroboides **Dawn Redwood** Spring or Fall
65-90 ft, pyramidal. Zone 5b-9a. Deciduous conifer. Prefers full sun and acid soil. Lower branches need to be removed for street side use. Requires large area. Orangish brown fall color.

Platanus x acerifolia **London Planetree** Spring or Fall
70-90 ft, broad oval. Zone 5b-9a.Tolerates compacted soils, drought, salt and varying pH. Resistant to anthracnose. Requires large area. Cream- to olive-colored bark. Yellow-brown fall color.

Prunus sargentii **Sargent Cherry** Spring
'Columnaris'
20-35 ft, vase-shaped. Zone 5a-9a. 'Columnaris' is considered one of the best cherries for streetside use. Prefers well-drained acid soil and full sun. Pink flowers open before leaves in spring, followed by purple-black fruit in summer. Bronze-red fall color.

Quercus acutissima **Sawtooth Oak** Spring
40-50 ft, pyramidal to broad rounded. Zone 5b or 6a-9a. Tolerates city conditions, including dry soils. Reasonably pest-free. Transplants more readily and is suited to smaller spaces than most oaks.

Quercus bicolor **Swamp White Oak** Spring
50-80 ft, pyramidal to rounded. Zone 3-8. Easier to transplant than other white oaks. Tolerates drought, salt and soil compaction in urban environments.

****Quercus imbricaria*** **Shingle Oak** Spring
40-65 ft, pyramidal to rounded. Zone 4-7. Leaves persist into winter and are atypical of oaks (not lobed). Tolerates city conditions. Variable fall color.

Quercus palustris **Pin Oak** Spring or Fall
50-70 ft, pyramidal to oval. Zone 5a-8b. Tolerates a wide range of soils. Prefers acid soil free of limestone, and full sun. Salt tolerance is moderate. Tolerates intermittent drought. Red fall color.

Quercus phellos **Willow Oak** Spring
55-75 ft, pyramidal to oval. Zone 6a-9a. Prefers acid soil and full sun. Withstands temporary flooding and dry soils. Yellow-brown to red fall color.

Quercus rubra **Northern Red Oak** Spring
60-80 ft, rounded. Zone 3b-9a. Tolerates urban conditions along streets with heavy traffic. Red to golden brown fall color.

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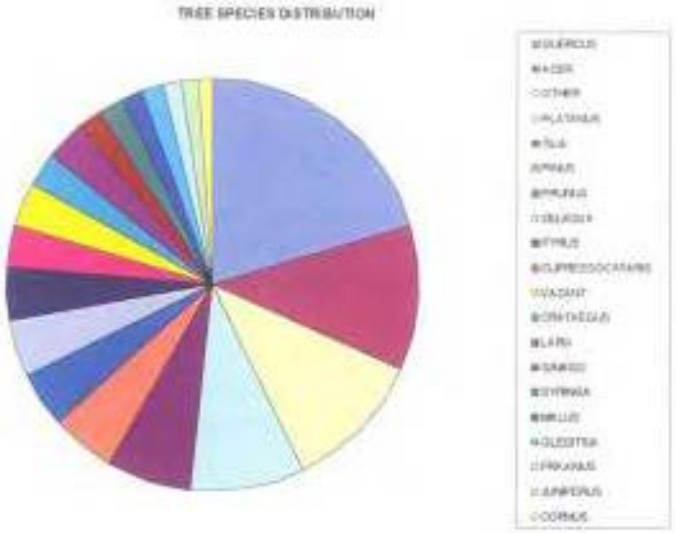
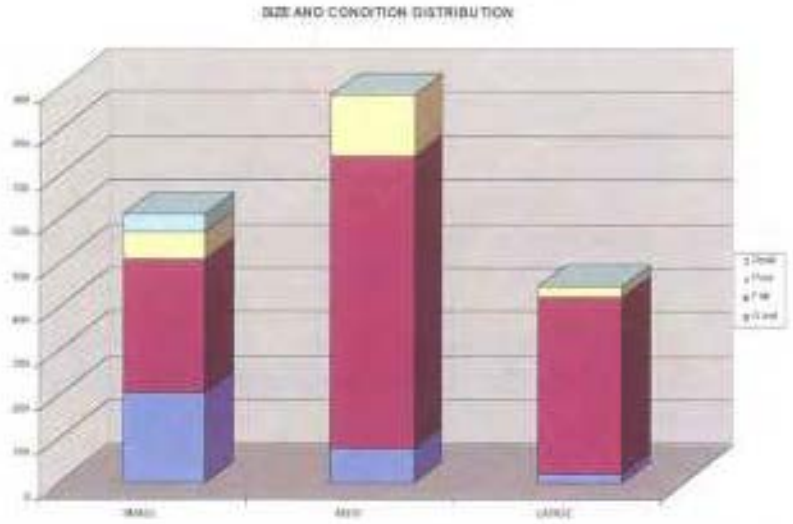
Appendix 3

Tree Inventory and Maps
Tree Species Distribution and Condition
for Brandywine Valley Scenic Byway

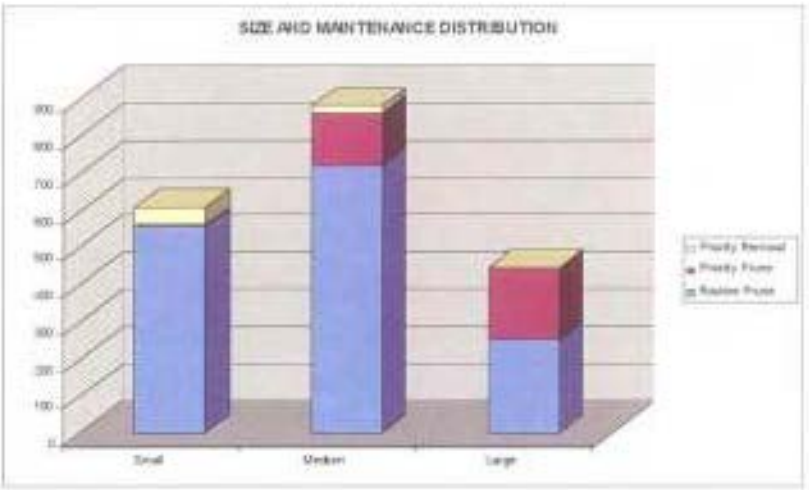
The following lists and maps represent an inventory of measured trees within a one-hundred foot buffer on either side of the Brandywine Valley Scenic Byway. They range from municipal street trees, to private trees, to public park trees. Not all trees within the right of way were documented as many were considered invasive or undesirable and are identified as undesirable tree groupings on the map.



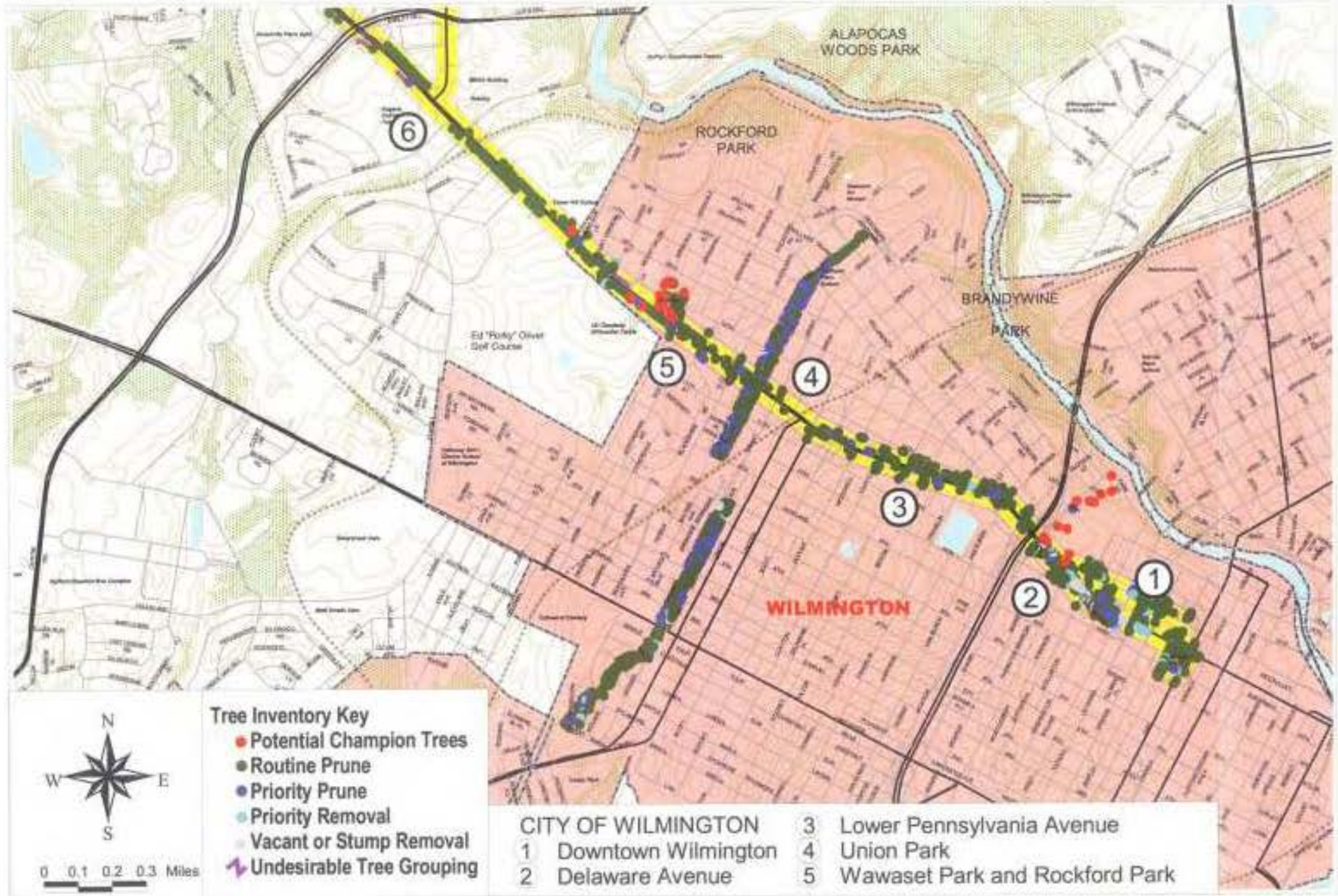
Oak, Maple and London Plane are the dominant desirable species but even at 20%, 11% and 9% of the total population respectively, there does exist a broad diversity of over one hundred species with a high percentage of large, relatively healthy trees.



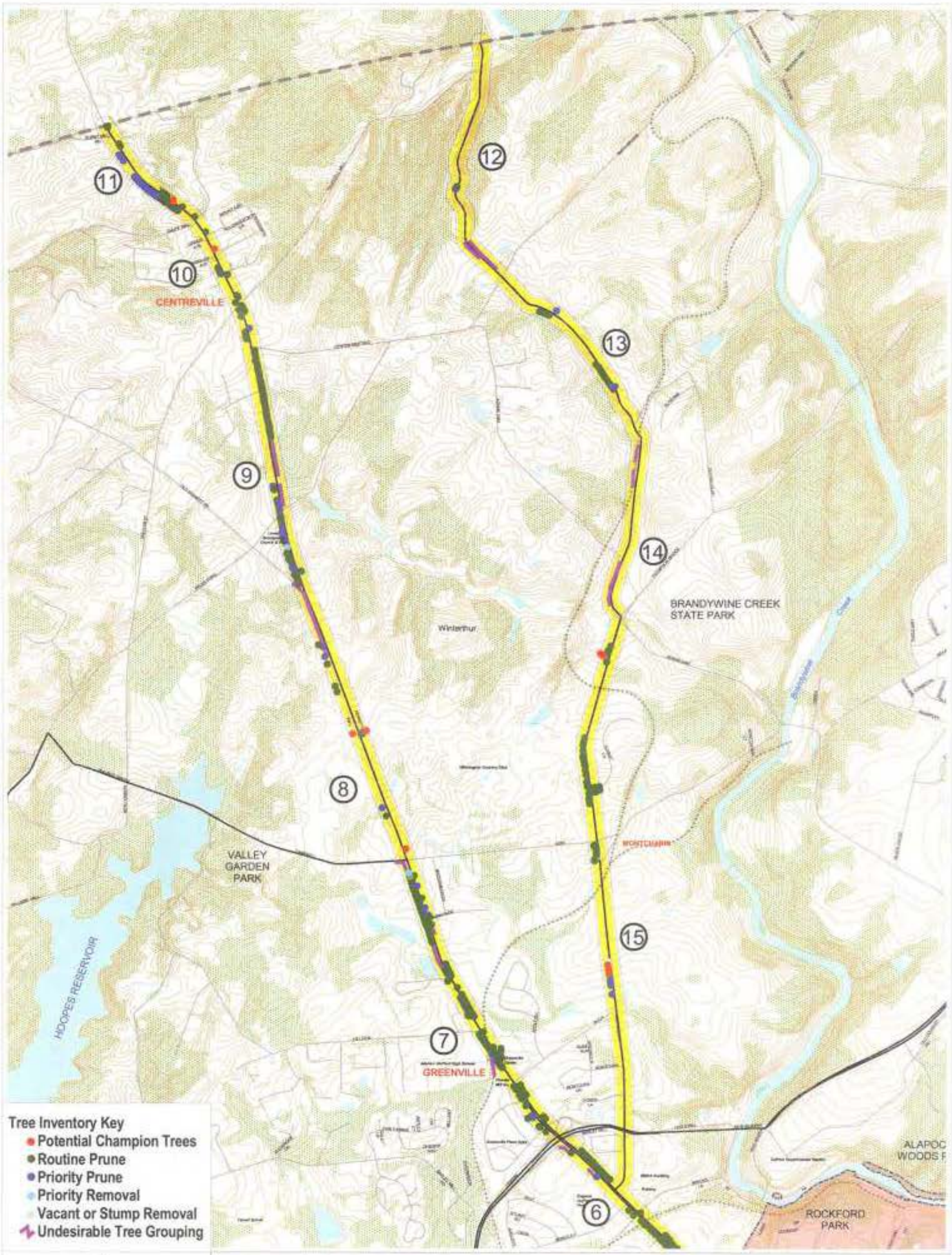
As suggested in The Street Tree Inventory and Management Plan for the City of Wilmington, Delaware (2002), typical size distribution for an inventory should fall close to 20-60-20, where 20% of trees should be small (having diameters of 6" or less), 60% should be medium (having diameters between 7" and 24"), and 20% should be large (having diameters of 25" or greater). The current ratio for Brandywine Valley Scenic Byway is 33-45-22.



Maintenance requirement data collected May-July 2005. Priority removal refers to trees that are an immediate or potential risk, as well as trees that necessitate removal for aesthetic reasons. Priority prune refers to trees that have broken or dead limbs two inches or more in diameter. Routine prune includes routine large tree prune, routine small tree prune, as well as training prune for trees less than six inches in diameter.



BRANDYWINE VALLEY SCENIC BYWAY
Wilmington Trees



KENNETT PIKE (ROUTE 52)

6 Goodstay Conference Center
7 Greenville
8 Winterthur
9 Lower Brandywine Presb. Church
10 Village of Centreville
11 North of Centreville

MONTCHANIN ROAD (ROUTE 100)

12 State Line to Center Meeting Road
13 Center Meeting Road to Guyencourt Road
14 Brandywine Creek State Park
15 Village of Montchanin

BRANDYWINE VALLEY SCENIC BYWAY
Kennett Pike and Montchanin Road Tree Inventory

Significant Trees on the Brandywine Scenic Byway

Significant trees are particularly beneficial to the environment because they offer shade, wind reduction, noise abatement, pollution abatement, wildlife habitat and natural beauty at a level geometrically proportionate to size. Mature trees, over twenty-four inches, have twenty to fifty times greater pollution mitigation capacity than young or small ornamental scale trees (Nowak, 1994) [Atmospheric carbon dioxide reduction by Chicago's urban forest. In: McPherson et al (eds.) Chicago's Urban Forest: Results of the Chicago Urban Forest Climate Project. USDA Forest Service GTR-NE-186]. This list represents the extensive number of large trees that are champions or potential champions on the Brandywine Valley Scenic Byway. Over 22% of all the measured trees on the byway were greater than 24 inches and classified as large trees. Champion trees are scored according to their circumference (CBH), height (HT) and average crown spread (CRWN). One point is given for each inch of circumference, one point for each foot of height, and one point for each four feet of crown spread. They are classified within their individual species according to the total score.

Location	Street	Spp	Notes	Large Tree Score	Champ Of Spp
B&W Cemetery	Delaware Ave	*Aesculus hippocastanum*	Potential:Cbh 97;Ht 55;Crwn 47	164	215
B&W Cemetery	Delaware Ave	*Carya cordiformis*	Champ:Cbh 102,Ht 87,Crwn 70	207	238
B&W Cemetery	Delaware Ave	*Cedrus libani*	Champ:Cbh 138,Ht 60,Crwn 71	216	***
B&W Cemetery	Delaware Ave	*Cornus florida*	Potential:Cbh 69;Ht 30;Crwn 44	110	95
B&W Cemetery	Delaware Ave	*Fagus sylvatica*	Potential:Cbh 158;Ht 96;Crwn 85	275	305
B&W Cemetery	Delaware Ave	*Franklinia alatamaha*	Potential:Cbh 25		***
B&W Cemetery	Delaware Ave	*Liquidambar styraciflua*	Champ:Cbh 126,Ht 85,Crwn 92	234	***
B&W Cemetery	Delaware Ave	*Magnolia acuminata*	Potential:Cbh 135;Ht 80;Crwn 75	234	311
B&W Cemetery	Delaware Ave	*Pinus strobus*	Champ:Cbh 137,Ht 115,Crwn 80	272	***
B&W Cemetery	Delaware Ave	*Quercus palustris*	Champ:Cbh 148,Ht 98,Crwn 98	271	***
B&W Cemetery	Delaware Ave	*Quercus velutina*	Champ:Cbh 208;Ht 141;Crwn 54	363	***
B&W Cemetery	Delaware Ave	*Sassafras albidum*	Champ:Cbh 152,Ht 55,Crwn 41	217	***
B&W Cemetery	Delaware Ave	*Thuja occidentalis*	Champ:Cbh 63;Ht 69;Crwn 15	136	***
B&W Cemetery	Delaware Ave	*Tsuga candensis*	Champ:Cbh 108,Ht 86,Crwn 61	209	***
	Red Oak Rd	*Quercus alba*	Potential:Cbh 174;Ht 70;Crwn116	273	389
Gibraltar	Greenhill Ave	*Aesculus hippocastanum*	Potential:Cbh 96;Ht 89;Crwn 60	200	215
Gibraltar	Greenhill Ave	*Fagus grandifolia*	Potential:Cbh 195;Ht 78;Crwn 81	293	355
Gibraltar	Greenhill Ave	*Gymnocladus dioicus*	Potential:Cbh 104;Ht 89;Crwn 54	207	247
Gibraltar	Greenhill Ave	*Gymnocladus dioicus*	Potential:Cbh 104;Ht 100;Crwn 48	216	247
Gibraltar	Greenhill Ave	*Quercus macrocarpa*	Potential:Cbh 104;Ht 61;Crwn 60	180	209
Gibraltar	Greenhill Ave	*Quercus palustris*	Potential:Cbh 130;Ht 100;Crwn 85	251	274

Location	Street	Spp	Notes	Large Tree Score	Champ Of Spp
Gibraltar	Greenhill Ave	*Quercus palustris*	Potential:Cbh 150;Ht 85;Crwn 78;Highest Cbh	255	274
Gibraltar	Greenhill Ave	*Quercus phellos*	Potential:Cbh 152;Ht 98;Crwn 73	268	364
Ud Goodstay	Pennsylvania Ave	*Quercus rubra*	Potential:Cbh 134;Ht 97;Crwn 83	252	306
Ud Goodstay	Pennsylvania Ave	*Ulmus glabra*	Potential:Cbh 179;Ht 98;Crwn 69	294	***
Tower Hill School	Kennett Pike	*Aesculus hippocastanum*	Potential:Cbh 113;Ht 58;Crwn 60;Highest Cbh	186	215
	Kennett Pike	*Magnolia acuminata*	Potential:Cbh 173;Ht 96, Crwn 58	284	311
Winterthur	Kennett Pike	*Sophora japonica*	Potential:Cbh 162;Ht 65;Crwn 69	244	***
Winterthur	Kennett Pike	*Asimina triloba*	Champ:Cbh 25;Ht 27;Crwn 11	65	***
Winterthur	Kennett Pike	*Betula lenta*	Champ:Cbh 57;Ht 52;Crwn 25	115	***
Winterthur	Kennett Pike	*Cornus controversa*	Champ:Cbh 74;Ht 43;Crwn 32	125	***
Winterthur	Kennett Pike	*Juglans nigra*	Champ:Cbh 132;Ht 110;Crwn 33	250	316
Winterthur	Kennett Pike	*Liriodendron tulipifera*	Champ:Cbh 223;Ht 151;Crwn 60	389	410
Winterthur	Kennett Pike	*Liriodendron tulipifera*	Champ:Cbh 207;Ht 187;Crwn 63	410	***
Winterthur	Kennett Pike	*Metasequoia glyptostroboides*	Champ:Cbh 179;Ht 99;Crwn 33	285	***
Winterthur	Kennett Pike	*Picea abies*	Champ:Cbh 93;Ht 101;Crwn 28	201	203
Winterthur	Kennett Pike	*Pinus wallichina*	Champ:Cbh 165;Ht 80;Crwn 38	255	***
Winterthur	Kennett Pike	*Platanus acerifolia*	Champ:Cbh 217;Ht 95;Crwn 93	330	***
Winterthur	Kennett Pike	*Robinia pseudoacacia*	Champ:Cbh 143;Ht 90;Crwn 22	239	256
Wilm. Country Club	Kennett Pike	*Aesculus hippocastanum*	Champ:Cbh 135,Ht 64;Crwn 35	208	215
Wilm. Country Club	Kennett Pike	*Magnolia acuminata*	Champ:Cbh 163;Ht 94;Crwn 65	273	311
Wilm. Country Club	Kennett Pike	*Picea pungens*	Champ:Cbh 71;Ht 60;Crwn 22	137	***
Wilm. Country Club	Kennett Pike	*Prunus serotina*	Champ:Cbh 228;Ht 80;Crwn 29	315	***
Methodist Country Home	Kennett Pike	*Acer saccharum*	Potential:Cbh 180;Ht 79;Crwn 110	287	286
Carpenter/Lippencott House- Centerville	Kennett Pike	*Acer platanoides*	Champ:Cbh 175;Ht 68;Crwn 76	262	***
Carpenter/Lippencott House- Centerville	Kennett Pike	*Tilia americana*	Champ:Cbh 139;Ht 90; Crwn 46	238	323
Carpenter/Lippencott House- Centerville	Kennett Pike	*Tilia americana*	Champ:Cbh 133;Ht 101;Crwn 58	249	323
	Kennett Pike	*Fraxinus pennsylvanica*	Potential:Cbh 141;Ht 94;Crwn 53	248	303
Winterthur	Montchanin Rd	*Liriodendron tulipifera*	Potential:Cbh 248;Ht 141;Crwn 81	409	410
Winterthur	Montchanin Rd	*Nyssa sylvatica*	Potential:Cbh 110;Ht 80;Crwn 42	201	280

Location	Street	Spp	Notes	Large Tree Score	Champ Of Spp
Winterthur	Montchanin Rd	*Quercus alba*	Potential:Cbh 170;Ht 124;Crwn 64	310	389
	Montchanin Rd	*Quercus palistrus*	Potential:Cbh 129		274
	Montchanin Rd	*Quercus palustris*	Potential:Cbh 129		274
	Montchanin Rd	*Quercus palustris*	Potential:Cbh 132		274
Hagley	Buck Rd	*Acer negundo*	Champ:Cbh 128;Ht 45;Crwn 50	186	254
Hagley	Buck Rd	*Acer saccharum*	Champ:Cbh 148;Ht 119;Crwn 77	286	***
Hagley	Buck Rd	*Aesculus octrandra*	Champ:Cbh 124;Ht 100;Crwn 66	241	***
Hagley	Buck Rd	*Aesculus x dupontii*	Champ:Cbh 134;Ht 79;Crwn 53	226	***
Hagley	Buck Rd	*Asimina triloba*	Champ:Cbh 20;Ht 35;Crwn 23	61	65
Hagley	Buck Rd	*Carpinus caroliniana*	Champ:Cbh 33;Ht 28;Crwn 25	67	104
Hagley	Buck Rd	*Carya cordiformis*	Champ:Cbh 95;Ht 106;Crwn 55	215	238
Hagley	Buck Rd	*Catalpa bignonioides*	Champ:Cbh 97;Ht 53;Crwn 32	158	***
Hagley	Buck Rd	*Cercis canadensis*	Champ:Cbh 60;Ht 42;Crwn 27	109	***
Hagley	Buck Rd	*Cornus florida*	Champ:Cbh 39;Ht 25;Crwn 45	75	95
Hagley	Buck Rd	*Fraxinus americana*	Champ:Cbh 165;Ht 156;Crwn 86	343	***
Hagley	Buck Rd	*Fraxinus pennsylvanica*	Champ:Cbh 147;Ht 118;Crwn 58	279	303
Hagley	Buck Rd	*Fraxinus pennsylvanica*	Champ:Cbh 146;Ht 135;Crwn 87	303	***
Hagley	Buck Rd	*Juglans cinerea*	Champ:Cbh 58;Ht 60;Crwn 54	132	222
Hagley	Buck Rd	*Maclura pomifera*	Champ:Cbh 284;Ht 81;Crwn 86	387	***
Hagley	Buck Rd	*Magnolia soulangeana*	Champ:Cbh 57;Ht 31;Crwn 30	96	***
Hagley	Buck Rd	*Magnolia tripetala*	Champ:Cbh 67;Ht 46;Crwn 28	120	***
Hagley	Buck Rd	*Picea abies*	Champ:Cbh 99;Ht 95;Crwn 33	202	203
Hagley	Buck Rd	*Pinus nigra*	Champ:Cbh 50;Ht 42;Crwn 19	97	165
Hagley	Buck Rd	*Prunus avium*	Champ:Cbh 102;Ht 75;Crwn 48	189	230
Hagley	Buck Rd	*Quercus macrocarpa*	Champ:Cbh 92;Ht 83;Crwn 36	184	209
Hagley	Buck Rd	*Quercus marilandica*	Champ:Cbh 38;Ht 80;Crwn 19	123	***
Hagley	Buck Rd	*Robinia pseudoacacia*	Champ:Cbh 102;Ht 109;Crwn 39	221	256
Hagley	Buck Rd	*Salix nigra*	Champ:Cbh 26;Ht 20;Crwn 17	50	***
Hagley	Buck Rd	*Sequoiadendron giganteum*	Champ:Cbh 145;Ht 69;Crwn 39	224	***
Hagley	Buck Rd	*Ulmus rubra*	Champ:Cbh 93;Ht 91;Crwn 28	191	***

Appendix 4 Plate Descriptions

Cover	Aerial view of Winterthur property
Plate intro1	Aerial view of Route 100/92 intersection
Plate intro2	London plane tree-lined Berkley Road
Plate 001	Pennsylvania Avenue leading into Wilmington
Plate 002	Aerial of Rodney Square
Plate 003	Aerial of H. B. du Pont Plaza
Plate 004	Historical postcard of Rodney Square
Plate 005	Rodney Square, winter 2003
Plate 006	Historical postcard of Rodney Square
Plate 007	Tree pit conditions at Rodney Square
Plate 008	Tree pit conditions on 11th Street
Plate 009	Historical photo of triangle medians at 11th, 12th and Washington Streets
Plate 010	Aerial view of H. B. du Pont plaza at 11th, 12th and Washington Streets
Plate 011	H. B. du Pont Plaza from ground level
Plate 012	Summer phlox (*Phlox paniculata* 'Robert Poore')
Plate 013	*Chrysanthemum* 'Sheffield Pink'
Plate 014	Planting opportunity at H. B. du Pont Plaza
Plate 015	Historical photo of Trinity Church
Plate 016	Aerial view of Brandywine and Wilmington Cemetery and Delaware Avenue median in front of Trinity Church
Plate 017	Historical photo of Brandywine and Wilmington Cemetery gates and Cedar of Lebanon
Plate 018	2004 photo of Cedar of Lebanon at the Brandywine and Wilmington Cemetery gates
Plate 019	Delaware Avenue intersection at the Children's Theater
Plate 020	Semi-circular entry at Rodney Court Apartments
Plate 021	Ivy-covered berms at Fountain Plaza
Plate 022	Aerial view of Columbus Park Plaza at intersection of Pennsylvania Avenue and Broom Street
Plate 023	Columbus Park Plaza from ground level
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