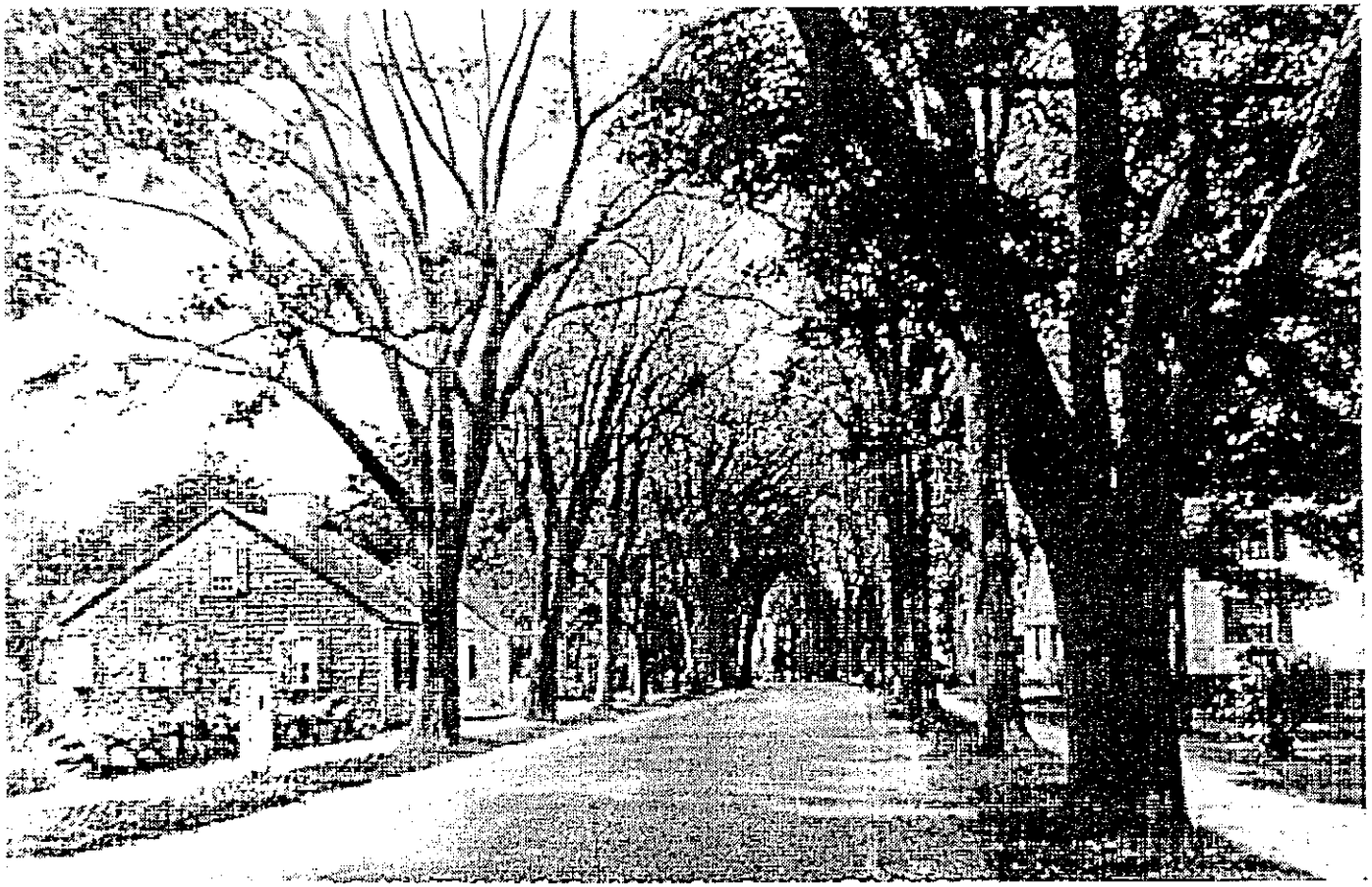
ROUTE 6A VEGETATION MANAGEMENT PLAN

Cape Cod Commission

August, 1995



"The King's Highway,
Cape Cod, Mass."
Early 20th Century Postcard

Route 6A Vegetation Management Plan

Prepared by the

Cape Cod Commission

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in cooperation with

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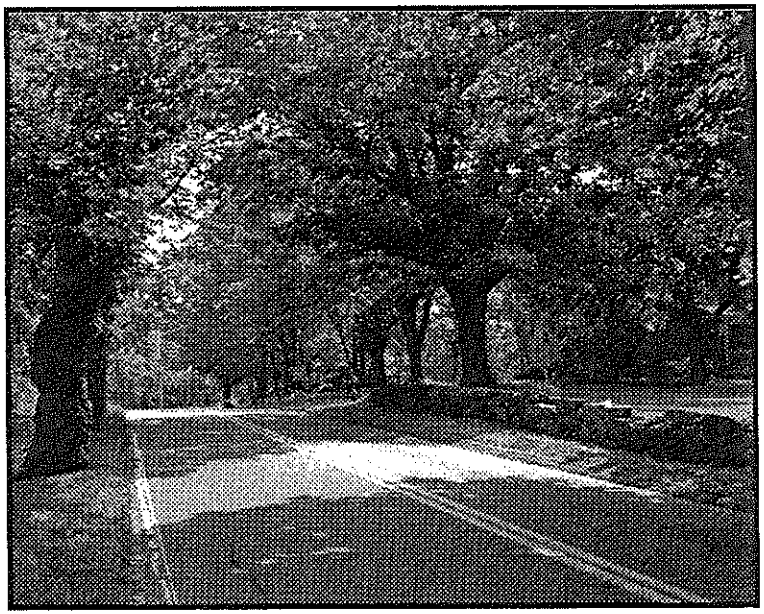

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Executive Summary

INTRODUCTION

•Background•

The 34 miles of state highway that follows the Cape Cod Bay shoreline is known as Route 6A or the Old King's Highway. It developed historically during the 1600's as the major east-west thoroughfare for early settlers on Cape Cod. Hundreds of historic homes and structures, along with scenic vistas of Cape Cod Bay, Sandy Neck barrier beach, numerous salt marshes, and the large number of mature shade trees and stone walls have created a scenic and recreational corridor that is a major tourist attraction today.

Several actions have been taken that recognize and seek to protect the unique nature of the roadway. In 1973, the Old King's Highway Regional Historic District was created. In 1991, Route 6A was designated as a Regional Road with Scenic and Historic Values under Barnstable County's Regional Policy Plan, and in 1992 it was designated a scenic road by the State legislature.

Much of the scenic character of Route 6A is derived from the distinctive and mature tree canopy which creates the strong sense of enclosure along the roadway. Many of these mature trees were planted around the turn of the century or even much earlier and are part of the historic record of the roadway.

As population pressures over the past century have increased, these trees are increasingly subject to environmental stress such as pollution, soil compaction, disease and storm damage. Guidelines for the proper care of the trees along Route 6A do not exist, and few new trees have been planted. Because the majestic tree canopy is a vital component of the overall scenic character of Route 6A, the need to plan for its management is critical.

•Purpose/Goals and Objectives•

In the spring of 1995, under the state of Massachusetts Interim Scenic Byways program, the Cape Cod Commission completed a Corridor Management Plan for Route 6A that recommended the development of a vegetation management plan. The goal of the vegetation management plan is to establish guidelines for maintenance of the existing tree canopy and to recommend locations for new tree planting along the corridor.

Objectives to achieve these goals include the following:

- to identify important existing tree characteristics;
- to evaluate the effectiveness of existing regulations;
- to explore revisions to existing regulations;
- to develop design, planting and maintenance guidelines;
- to identify volunteer organizations who may assist; and
- to explore funding options.

•Characteristics of Route 6A's Vegetation•

The diversity of tree and understory vegetation along Route 6A differs markedly from the dominant pitch pine/scrub oak vegetation commonly found on Cape Cod. This is due to several factors, including the roadway's role in early maritime activities and village center development, favored planting practices of the 19th and early 20th century, and soil types that support the establishment of trees and other vegetation. The climate of Cape Cod and the proximity of Route 6A to the waters of Cape Cod Bay also influence the pattern of vegetation along the roadway.

INVENTORY

•Initial Inventory/Arborist Tree Evaluation•

The overhead tree canopy is the single most important character-defining element of the vegetation along Route 6A. For this reason, the inventories prepared for this plan focus on the location and condition of trees which contribute to this overhead canopy, with other landscape elements such as understory planting noted.

An inventory of trees located within ten feet of the roadway with a

3" diameter at breast height (dbh) was performed in the summer of 1994. Locational maps were produced from this information. This inventory provided information regarding the canopy density at different locations along the route. It was supplemented by a tree evaluation performed in 1995 by a Massachusetts certified arborist that evaluated the condition and maintenance requirements of all trees along the roadway that contribute to the tree canopy along Route 6A. The objectives of this inventory were to determine the location, species, size, relative vigor, presence of pests or disease, and maintenance needs for all tree species.

INVENTORY FINDINGS

•Corridor-wide Findings•

Along the 34 miles of Route 6A, approximately 4100 trees are located within ten feet of the edge of the roadway, with a total of 7498 trees contributing to the overall canopy. Of this total, 500 trees are historic and significant. A total of 121 species and varieties are found along the route. Species diversity is fair; the Acer (Maple) genus, with nine different species ranging from Boxelder to Norway Maple, comprises 29% of the entire population. Norway Maple, as a species, represents 14% of the trees along the route. This monoculture could be at risk if a maple disease were to become a severe problem.

The majority of trees along Route 6A are less than 15" in diameter. However, there are many trees greater than 15" dbh that contribute greatly to the appearance of the corridor. A continued moderate diverse planting program should be initiated so that there is always a supply of smaller trees moving into larger size classes.

Over the years the mature tree canopy has been impacted by pruning to maintain clearance for overhead utility lines. In addition, replacement of trees that have been removed has been limited or nonexistent.

The largest areas without tree canopy include several village centers, "gateways" to the corridor, and areas of strip commercial development.

•Town-by-Town Findings•

Bourne • Approximately a mile in length, this section of the corridor contains very few trees due to the number of commercial businesses and residential uses. Opportunities for replanting include the Sagamore Bridge gateway, Ben Abbey Road, and the Bourne/Sandwich town line.

Sandwich • There are over 800 trees within ten feet of the roadway along this eight-mile portion of Route 6A, creating a medium tree canopy cover. Opportunities for new planting include the Bourne/Sandwich town line, commercial areas, and several intersections with Route 6A.

Barnstable • This nine-mile stretch of Route 6A has a dense or medium tree canopy cover created by over 1200 trees located within ten feet of the roadway. Silver Maples are the predominant species. Because of their close proximity to the roadway edge and the severe impact caused by utility line pruning, many of these trees present a risk to public safety.

Opportunities for new planting include the Sandy Neck Road commercial area, several intersections with Route 6A, street tree planting in Barnstable village, as well as scattered sites in residential areas.

Yarmouth • With approximately 280 trees along a four-mile portion, the tree canopy cover ranges from dense to light. Maples, catalpa, pine and oak species contribute to the overall canopy. Opportunities for new tree planting in Yarmouth include the Yarmouthport village center, the town common at Union Street, small commercial locations, and along private residences.

Dennis • This portion of Route 6A contains almost 400 trees within 10' of the roadway, with a canopy cover ranging from light to very dense. Dennis offers the greatest diversity of tree species of all the towns along Route 6A. Opportunities for new planting include the town lines, the western approach to Dennis village, and commercial sites at the Route 134 intersection.

Brewster • There are over 1000 trees lining this eight-mile stretch

of Route 6A, encompassing very diverse land uses and vegetation. The tree canopy cover ranges from medium to dense, with gaps in the canopy cover located at major road intersections and in areas of commercial development. Opportunities for replanting include Underpass Road and the Brewster/Orleans town line.

Orleans • This 2-1/2 portion of the roadway has very little tree canopy, with only 150 trees. New tree planting could greatly enhance this entire section of Route 6A, with special planting treatments for the highway interchange and the Eastham rotary.

REVIEW AND ANALYSIS OF EXISTING REGULATIONS

•Massachusetts Highway Department Access Permit•

The 34 miles of Route 6A, with the exception of Barnstable Village, is a numbered state highway owned and maintained by the Massachusetts Highway Department (MHD). A permit is required for any alteration or work proposed within the state highway layout, including any tree or shrub planting. There are no standards for tree spacing or species selection which apply to tree planting on Route 6A.

•Scenic Road Legislation/Old King's Highway Historic District Regulations•

In June 1992, the Massachusetts Legislature designated Route 6A as a scenic road. This classification requires that any work done on the roadway that necessitates the cutting or removal of trees, or the demolition or destruction of stone walls, must be approved by the Old King's Highway Regional Historic District Committee (OKHRHDC) or local planning board.

The Old King's Highway regulations do not contain specific landscaping or tree planting guidelines for new development, and review of landscape design issues are inconsistent among town committees. Guidelines are needed to assist the committee in selecting the most appropriate species and sizes for replanting when tree removal is requested by MHD. A provision for review of proposed MHD tree removal work by the local tree warden is also needed.

•Zoning Bylaws/Subdivision Regulations•

Regulations regarding landscaping and screening requirements for new development differ among the seven towns. Most would benefit from updating to include additional front buffer requirements and limitations on the clearing of existing vegetation, as well as a review of subdivision entry planting and road tree planting requirements.

•Public Shade Tree Act•

The Shade Tree Act, M.G.L. Chapter 87, applies to the approximately one-mile portion of Route 6A that is owned by the Town of Barnstable. It gives the municipal tree warden the responsibility for the preservation, care, maintenance and removal of public shade trees. It also gives the tree warden the authority to budget for and plant new shade trees in the public ways or upon adjoining land with the written consent of the owner. Chapter 87 specifies that a public hearing must be held prior to any tree trimming or tree removal work.

•Town of Barnstable Shade Tree Ordinance•

The Town of Barnstable has also recently adopted a shade tree ordinance which applies to the one-mile section of Route 6A with the purpose of regulating the planting, maintenance and removal of vegetation on public property and trees on private property that may cause a hazard to the public.

•MEPA Regulations•

Pursuant to 301 CMR, Section 11.27, the use of any state funds for a project on a Department of Public Works road which includes the cutting of five or more living trees, fourteen inches or more in diameter at breast height, requires the filing of an Environmental Notification Form (ENF).

REVIEW OF EXISTING VEGETATION MANAGEMENT PRACTICES

•Massachusetts Highway Department•

Although the Massachusetts Highway Department (MHD) had a comprehensive annual maintenance program for Route 6A until the mid-1980's, maintenance is now restricted to tree trimming, site distance clearing, and tree removal work. Because no guidelines exist, the MHD uses its discretion, after consulting with the local tree warden, in selecting the size, species and location for any replacement tree planting.

•Commonwealth Electric Company•

The MHD grants an annual permit to Commonwealth Electric Company (ComElectric) which allows ComElectric to maintain overhead utility lines on all state roads within the Commonwealth. Tree trimming for line clearance is part of this yearly contract. Tree trimming specifications are generic to all state roads that ComElectric serves and there are no special provisions for Route 6A.

Most of the overhead utility line tree trimming done for ComElectric is subcontracted out and monitored by a representative of ComElectric. In contrast to MHD specifications for its own subcontractors, individuals subcontracting out ComElectric tree trimming work are required only to be "qualified tree workers", and no standards exist for the minimum qualifications of tree workers.

Although replacement trees are required for all trees removed by ComElectric, the District Highway Director may determine the location of the planting, which may, and does, occur on other state roads. The permit with ComElectric does not specify species, sizes or planting procedures for replacement trees.

•Town of Barnstable•

The Barnstable tree warden has the responsibility for protecting and maintaining all the trees within the public right-of-way along the town owned portion of Route 6A in Barnstable. To date the policy of the tree warden has been to prune when trees pose a public safety hazard, otherwise allowing them to grow naturally. Although the tree warden has a small annual tree planting budget for use town-wide, there is no policy for new tree planting for this portion of Route 6A.

ANALYSIS OF EXISTING VEGETATION MANAGEMENT PRACTICES

•Massachusetts Highway Department/Commonwealth Electric Company•

Concern has been expressed by local officials and residents about the extent and nature of tree trimming practices by the MHD and ComElectric. There is a need for public education concerning current practices by these agencies. The development of specific pruning standards is also recommended.

•Town of Barnstable•

The Barnstable tree warden's policy to allow the trees to grow in close proximity to overhead wires could be tested if a new tree planting program were initiated for this section of the roadway. A tree planting program would also greatly enhance the appearance of this village center.

RECOMMENDATIONS

•Preservation and Maintenance of Existing Vegetation•

The establishment of a comprehensive preventive maintenance program to be undertaken by the Massachusetts Highway Department, Commonwealth Electric Company, the Town of Barnstable and private property owners will result in healthier, more attractive trees and reduced maintenance costs for all parties involved. The recommended maintenance program includes:

- Appropriate pruning techniques;

•Regular tree maintenance, including structural supports, fertilization, root collar care, and integrated pest management;
•Public education efforts;
•A specialized annual permit with ComElectric;
•Recognition programs for tree protection by public utilities;
•Vista pruning; and
•Special recognition for "champion" trees.

•Tree Replacement Program•

Because trees are slow-growing, replacement planting of hazardous trees or those lost due to storms and disease should be initiated to protect 6A's distinctive tree canopy. When selecting locations for replanting, MHD specifications should be revised to require replanting on Route 6A when trees are removed. It is also recommended that a minimum tree size of 3" dbh be planted and a list of recommended trees be followed by Massachusetts Highway Department.

In order to assure the continuation of genetic material from historic or significant trees, the establishment of a regional nursery which includes tree seedlings currently growing adjacent to or under these historic trees is recommended.

•New Tree Planting Program•

The initial inventory prepared for this study identified locations that could be enhanced by new tree planting. In addition to these priority locations, numerous opportunities exist for the planting of individual trees. A Street Tree Advisory Board should be established to help coordinate a tree planting program for the entire Route 6A corridor and other locations.

•Recommended Revisions to Regulations and Procedures•

Old King's Highway Historic District Committee

•The review of development projects by the Old King's Highway Regional Historic District Committee could be strengthened by establishing guidelines for new tree planting along Route 6A, particularly for commercial and residential subdivisions.
•A Memorandum of Understanding (MOU) should be developed between the Old King's Highway Committee and/or the planning board in each town and the Massachusetts Highway Department District 5 office to clarify the purpose and extent of tree trimming or tree removal by the MHD.

Town Zoning Bylaws and Subdivision Regulations

•Individual towns along Route 6A should strengthen their landscaping requirements for proposed development on Route 6A.
•The local tree warden should be included in the site plan review process for development projects along the corridor.

DESIGN GUIDELINES FOR NEW PLANTING

•Reinforcing the Linear Corridor•

Planted trees and hedgerows play a key role in emphasizing the sense of enclosure and the winding nature of Route 6A. New plantings should reinforce this linear effect as follows:

•*Regularly spaced tree planting.*
•*Hedges* planted in locations with limited planting areas.
•*Hedges and trees* used in combination.
•*Other plant materials* such as bulbs, perennials, or shrubs planted in drifts or masses.

•Planting Under Utility Lines•

Overhead utility lines present significant constraints on new tree planting. To minimize conflicts while maintaining a sense of enclosure, planting hedges and trees whose mature height is less than 30 feet is recommended under utilities. Medium and large trees may be planted behind utility lines provided that adequate separation is maintained.

•Transition Areas•

Areas where a change of land use or scale of development occur are called transition areas. The transition area from residential land use to commercial or densely developed village centers can be improved by creating a well defined village streetscape. The transition areas at town lines can be planted to reinforce the community identity of the two towns. The roadways that intersect with Route 6A create gateways or entrances to the corridor, and may be enhanced by plantings.

•Town Commons•

As areas of special historical and cultural significance, town commons and greens may be preserved and enhanced by new plantings. Simple, traditional tree planting helps to provide a unified design or a visual focus for a common. Turf areas are recommended not only for visual effect, but for recreational purposes as well. If paving is required for pedestrian usage, it is recommended that traditional, high quality materials be utilized. Hedges, walls and fences help to define a common, direct pedestrians, and provide safety in locations with high traffic. Site furnishings should complement other design elements. Ornamental features provide a visual focus and should be based on the historic or cultural significance of the green.

•Commercial Areas•

Commercial areas and large-scale commercial developments often lack street tree plantings or other landscape treatments. To screen new commercial development from the roadway, towns should consider increasing buffer requirements where appropriate. In parking lots, towns should also consider increasing the ratio of trees to parking spaces. The site drive to new commercial development should also be planted to create a sense of arrival.

•Residential Subdivisions•

At the point of intersection with Route 6A, subdivision roadways have an impact on the character of the corridor. Entry plantings should reflect the historic character of Route 6A, and should utilize any boulders uncovered in construction for use in stone walls or entry plantings. Existing vegetation should be retained whenever possible to buffer the subdivision from Route 6A.

•Roadway Appurtenances•

Plant materials can be used to soften and blend inconsistent design elements into the surrounding landscape. Steel guardrails, drainage swales, and chain link fencing may be softened by vines, groundcovers, or shrubs.

RECOMMENDED PLANTS AND PLANTING PROCEDURES

•Planting Specifications•

This section provides the technical information needed for the proper installation of plant materials along Route 6A. The site should be carefully analyzed before planting so that plant material may be matched to the site conditions. The highest quality plant material should always be used, and species diversity in any one area should be maintained. This section contains information on:

- •Plant selection
- •Planting hole preparation
- •Planting procedures
- •Staking
- •Irrigation
- •Tree wrapping
- •Pruning established tree
- •Soil salt levels
- •Tree protection during construction
- •Tree lawn width
- •Soil compaction after planting
- •Mulching
- •Applying Fertilizer
- •Pruning young trees
- •Pruning hedges
- •Recommended plant materials

IMPLEMENTATION

Potential strategies to accomplish the major recommendations contained within the Route 6A Vegetation Management Plan include:

•Creating a Street Tree Advisory Board consisting of professionals, local officials, public agencies, and volunteers to assist in implementation of the Vegetation Management Plan;
•Developing a long-term maintenance program for the trees along Route 6A;
•Implementing a public education program focusing on phased removal of hazardous trees and tree diseases;
•Developing a regional nursery as a long-term source of replacement trees for Route 6;
•Planting new trees in the priority areas identified in the Vegetation Management Plan, including gateways and village centers;
•Documenting historic planting patterns, including trees, shrubs, hedges, and perennials; and
•Technical assistance by the Cape Cod Commission in the development of Memorandums of Understanding (MOU's), community education programs, and revisions to town by-laws which reflect the recommendations contained in the Vegetation Management Plan.

POTENTIAL SOURCES OF FUNDING

Potential sources of funding for implementation of the Vegetation Management Plan are explored, including:

•America the Beautiful Act of 1990 offers funding for both public and private sector urban and community forest programs, including new tree planting.

•The National Tree Trust supports local volunteer groups in the education of children about the value of trees, as well as growing, planting and maintaining trees in rural communities, urban areas, and along the nation's highways.

•MASS ReLeaf offers funding to towns, local businesses, and volunteer organizations to purchase and plant new trees.

Introduction

BACKGROUND

Route 6A, known as the Old King's Highway, consists of approximately 34 miles of state highway that extends along the Cape Cod Bay shoreline, from the village of Sagamore in Bourne to the U.S. Highway Route 6 rotary in Orleans. The roadway developed as the major east-west thoroughfare for early settlers on Cape Cod during the 1600's, with residences, farms and small villages later established during the agricultural period of the 17th and 18th centuries.

Today, hundreds of early homes and other historic structures still line the highway. Scenic vistas of Cape Cod Bay, Sandy Neck barrier beach and numerous salt marshes are found in many locations along the Route 6A corridor. A large number of mature shade trees and stone walls exist along the roadway, reflecting 18th and 19th century landscape plantings and agricultural uses. The roadway is a major tourist attraction due to its scenic attributes, and is a major recreational resource as well, providing access to a large number of visitor amenities both on and directly adjacent to the corridor.

In 1973, the Old King's Highway Regional Historic District was created. The district included the entire area north of Route 6 from Bourne to Orleans, with Route 6A forming its backbone. Route 6A was also designated as a Regional Road with Scenic and Historic Values in 1991 under Barnstable County's *Regional Policy Plan.* As a further effort to protect its unique resources, Route 6A was designated a scenic road by the State legislature in 1992.

The distinctive and mature tree canopy which lines many sections of Route 6A has contributed greatly to its scenic character. The dense canopy provides a sense of enclosure along the roadway, with a variety of species unmatched elsewhere on Cape Cod. Many of these mature trees were planted around the turn of the century as a part of early shade tree planting programs. Other

trees represent a significant part of Cape Cod history. For example, there is evidence to suggest that acorns from some mature trees, in particular the English and Post Oak, were originally brought to the Cape from Europe and the southern United States in ships as packing material. From species like Black Gum and American Elm that are a part of native American history, to imported trees like Chinese Quince and Zelkova that are a part of our colonial history, Route 6A trees are very unique and deserve proper care.

This tree canopy has endured more than a century of transformation and intervention as Route 6A evolved into its current use and form. Existing trees are now subject to urban conditions such as pollution and soil compaction, and many specimens like the American Elm have been lost due to Dutch elm disease and storm damage. Few new trees have been planted to replace the maturing tree canopy. Despite its designation as a scenic road, guidelines for the proper care and enhancement of this majestic tree canopy currently do not exist. Because trees grow slowly, the need to plan for management of this resource is critical to maintaining this key component of Route 6A's scenic character.

PURPOSE/GOALS AND OBJECTIVES

Under the State of Massachusetts Interim Scenic Byways program, the Cape Cod Commission completed a Corridor Management Plan for Route 6A in Spring 1995. The purpose of this plan was to guide the protection of the corridor's unique historic, scenic and environmental resources while addressing necessary transportation and safety issues. One of the key scenic resources identified in the Corridor Management Plan was the existing tree canopy. The Corridor Management Plan recommended the development of a vegetation management plan for Route 6A.

The goal of the vegetation management plan is to establish guidelines for the care and maintenance of the existing tree canopy, and to make recommendations for new tree planting locations along the corridor. An additional goal is to develop a methodology which may be applied to vegetation management efforts for other scenic roads.

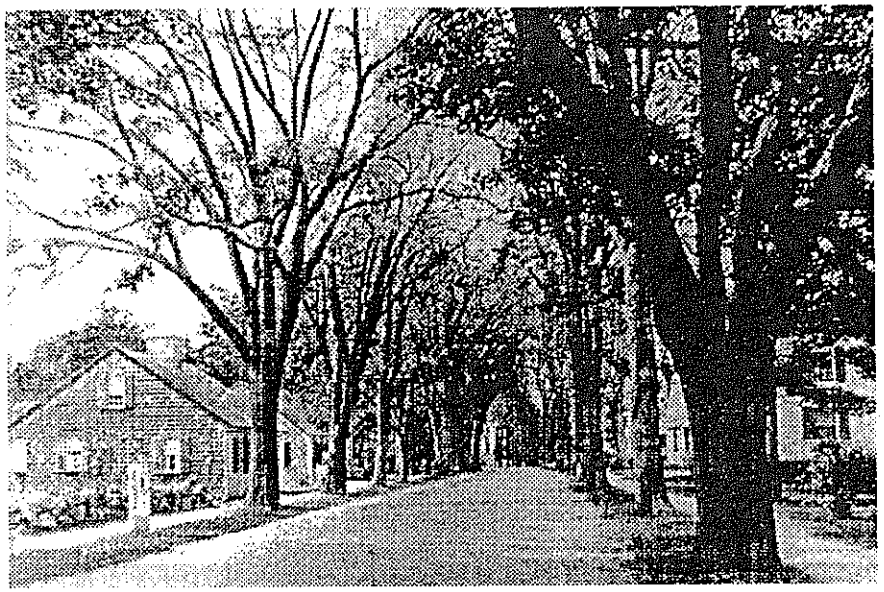
To achieve these goals, objectives for the vegetation management plan for Route 6A include the following:

- to identify important existing tree characteristics including tree location, sizes and species, canopy density, and condition;
- to evaluate the effectiveness of existing regulations in preserving and enhancing the tree canopy;
- to develop design, planting and maintenance guidelines for existing and future tree planting;
- to explore revisions to existing regulations designed to protect and enhance existing trees on Route 6A;
- to identify volunteer organizations to assist in tree canopy protection and future tree planting;
- to explore funding options for future tree planting and tree maintenance.

The Vegetation Management Plan was developed for use by both the professional and the layman. The Plan explores the key issues involved in the preservation and enhancement of vegetation along the Route 6A corridor for all parties who have an interest in its management.

CHARACTERISTICS OF ROUTE 6A's VEGETATION

The variety of tree and understory vegetation along Route 6A stands in sharp contrast to the dominant pitch pine/scrub oak vegetation commonly found on Cape Cod. This distinction is due in part to the roadway's role in early maritime activities and village center development, as well as favored planting practices of the 19th and early 20th century. For example, majestic elm trees once lined the streets of many village centers, most notably Yarmouthport. These trees were elegant memorials to seafarers who planted them (Chamberlain, p. 166). The foresight of Amos Otis, a genealogist, historian, and prominent citizen of Yarmouth, created the "arboreal tracery of Yarmouth" by planting elm trees along the Main Street in the mid-eighteenth century (E.G. Perry).



Postcard of early 20th century Yarmouthport

Other trees, like a 42" English Oak in Yarmouth and a row of Catalpa trees in Dennis, represent a significant part of Cape Cod history.

In addition, some of the landforms and soil types formed by the recessional moraine along Route 6A favor the establishment of trees and other vegetation which is not viable in the sandy and excessively drained soils typically found on Cape Cod. The map on page 10 illustrates the general soil characteristics for Route 6A based on soil types and geologic information:

- Type 1 - very deep, excessively drained and well drained, sandy and loamy soils. Abundant very fine sand, sand, silt, clay, gravel, and till.

- Type 2 - very deep, excessively and moderately well drained sandy and clayey soils. Includes some fine to very fine sand, gravely sand, silt and clay, with scattered boulders.

- Type 3 - very deep, very poorly drained peat soils in tidal marshes that are flooded daily by salt water, also including some freshwater marsh and swamp deposits. Decaying salt marsh plants, mixed with sand, silt, and clay.

These soil types resulted in a wide variety of native and introduced species which were adaptable to Route 6A, such as Tupelos which line the edge of the roadway in Sandwich adjacent to wetlands, stands of Black Locust which were planted in the 1800's for reforestation purposes, and magnificent specimens of European beech, Zelkova and Horse Chestnut in Barnstable.

Cape Cod's climate and the proximity of Route 6A to Cape Cod Bay also influence the pattern of vegetation along the roadway. Overall, the Cape's climate differs from the mainland in being warmer in the winter and cooler in summer. Fall temperatures are typically mild and spring is cool and late. In winter the ground is frequently but not continuously covered with snow. Precipitation averages about 40 inches per year and is very evenly distributed across the Cape. Nearly 50% of this amount falls during the summer months. The Cape is also prone to hurricanes and severe winter storms moving northeastward along the coast. Prevailing winds, however, are from the northwest. These factors contribute to the Cape's location in the Zone 6 hardiness zone, which allows for a greater variety of potential species than most inland locations in the Commonwealth.

GLOSSARY OF TERMS

The following is a list of terms found throughout this document. Except where specifically defined herein, all words in the "Route 6A Vegetation Management Plan" carry their customary meanings.

Arborist - a professional who possesses the technical competence through experience and related training to provide for or supervise the management of trees and other woody plants in the residential, commercial and public landscape.

Route 6A Scenic Byways Program
Major Soil Types

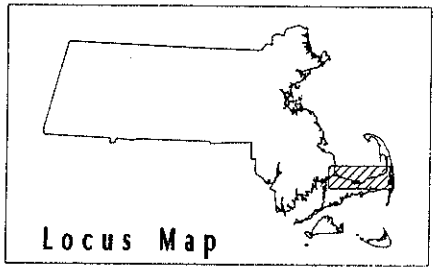
Plot file created on March 10, 1995

MAJOR SOIL TYPES

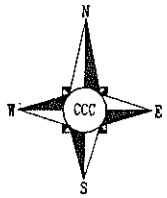
1 - very deep, excessively drained and well drained, sandy and loamy soils. Abundant very fine sand, sand, silt, clay, gravel, and till.

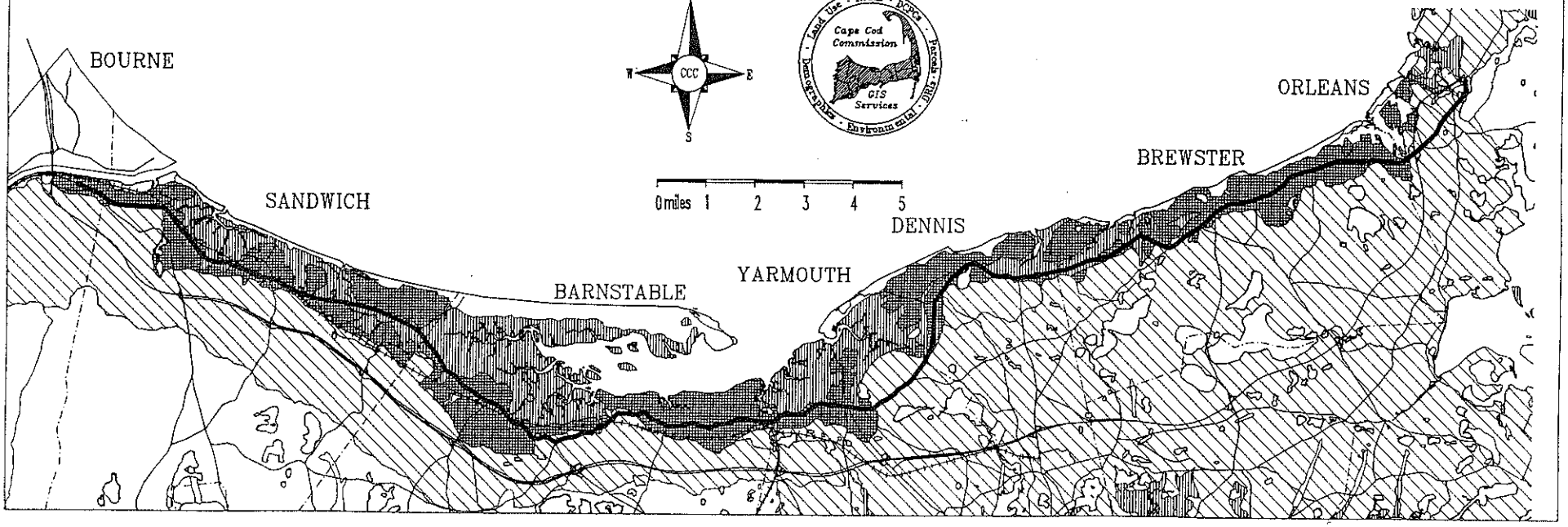
2 - very deep, excessively and moderately well drained sandy and clayey soils. Includes some fine to very fine sand, gravely sand, silt and clay. Scattered boulders.

3 - very deep, very poorly drained peat soils in tidal marshes that are flooded daily by salt water, also including some freshwater marsh and swamp deposits. Decaying salt marsh plants, mixed with sand, silt, and clay.



Route 6A
Major Road





Buffer - vegetation between the road edge and the closest manmade structure, such as a house, parking lot or storefront. Buffers are frequently used for screening purposes or for softening views.

Canopy density - the amount of ground covered by the shadows of tree leaves. *Dense canopy* is created where the tree branching and leaf pattern from both sides of the road create a sense of enclosure or a tunnel effect. Mature trees with dense leaf massing such as maples, lindens, and butternuts often create a dense canopy cover. *Medium canopy* is created where the roadway is not densely shaded but not open. This is often seen when one side of the road either has a small number of trees or smaller species, or where serious impacts from utility line pruning exist. On Route 6A, a typical medium canopy cover is created by species such as black locust, tupelo and oak. *Light canopy* is created where the leaf pattern does not provide shadows over the roadway. This condition can be created by certain species such as pine, whose needles and branching habit do not create canopy coverage. An open canopy condition is created by wetlands and marshes which have significant shrub and wetland vegetation along the edge of the roadway. *No canopy* is created in areas where there are no trees due to existing infrastructure and development, wider road widths, marshes or other wetlands.

Central leader - the dominant upright stem of a tree, usually the main trunk.

Enclosure - the effect of being surrounded by vegetation or other natural or built elements.

Gateway - key entrances to the Route 6A corridor; located at town lines, major intersections and village centers.

Genus - A group of similar or closely related species. The genus name is the first name in the scientific (Latin) name for a particular species.

Heading - cutting a currently growing or one year old shoot back to a bud, or cutting an older branch or stem back to a stub or lateral branch not sufficiently large enough to assume the terminal role. Heading should rarely be used on mature trees.

Hedgerow - a row of shrubs, possibly mixed with trees, usually located along the roadway edge or along property lines.

Lateral - a branch or twig growing from a parent branch or stem.

Limb - same as branch, but larger and more prominent.

Necrosis - death of localized cells within a living organism; the appearance of small areas of dead tissue surrounded by living tissue.

Recessional moraine - the accumulation of stones and soil left behind as the glaciers retreated.

Root collar - the lower area of the trunk, including the trunk flare.

Rootzone - the growing area in which roots are located.

Shaping - the removal of limbs and branches in order to restore the natural symmetry of the tree after up-branching has caused distortion.

Streetscape - a concentration of natural and built elements, such as curbs, fences, walls and hedgerows, buildings and street trees, found along streets and roadways.

Terminal leader - a dominant upright stem, usually the main trunk. There can be several leaders in one tree.

Thinning - the removal of a lateral branch at its point of origin or the shortening of a branch by cutting to a lateral large enough to assume the terminal role.

Tree lawn - the growing area in which trees are planted, such as the area between the sidewalk and road edge, or planting beds located within parking lots.

Trimming, drop crotch method - *top trimming or topping* consists of cutting back portions of the upper crown of a tree. The main

leader or leaders are cut back to a lateral, which should be at least one-third the diameter of the limb being removed. *Side trimming* consists of cutting back or removing side branches that threaten the conductors on trees that are growing adjacent to power lines. *Overhang trimming and under trimming* consists of removing limbs beneath the tree crown to allow wires to pass below the tree crown. *Through trimming* consists of removing branches within the crown to allow power lines to pass through the tree.

Trunk flare - the portion of the trunk located just above the juncture of the trunk and roots.

Understory - the lowest layer of trees in a forest; the layer between the overstory tree layer and the shrub layer.

Up-branching - the removal of limbs and branches which overhang onto the state highway layout from ground level to a certain vertical distance above the ground.

Vigor - vitality, strength, or robustness; the degree of health and healthy growth exhibited by an organism.

Inventory

INTRODUCTION

Street tree inventories are typically completed for urban settings within a single community. In these cases, data collection often consists of identifying individual street trees which are planted at regular intervals. Data collection for Route 6A differs from a standard street tree inventory in several ways: the roadway traverses seven towns through both developed and rural settings. Vegetation patterns adjacent to the roadway vary from planted shade trees and hedgerows, to remnant woodlands and wetland vegetation. While all of these vegetation types contribute to the scenic character of Route 6A, the overhead tree canopy is the single most important character-defining element of Route 6A vegetation. For this reason, inventories prepared for this plan focus on the location and condition of trees which contribute to this overhead canopy. Other landscape elements, such as understory planting, are also noted.

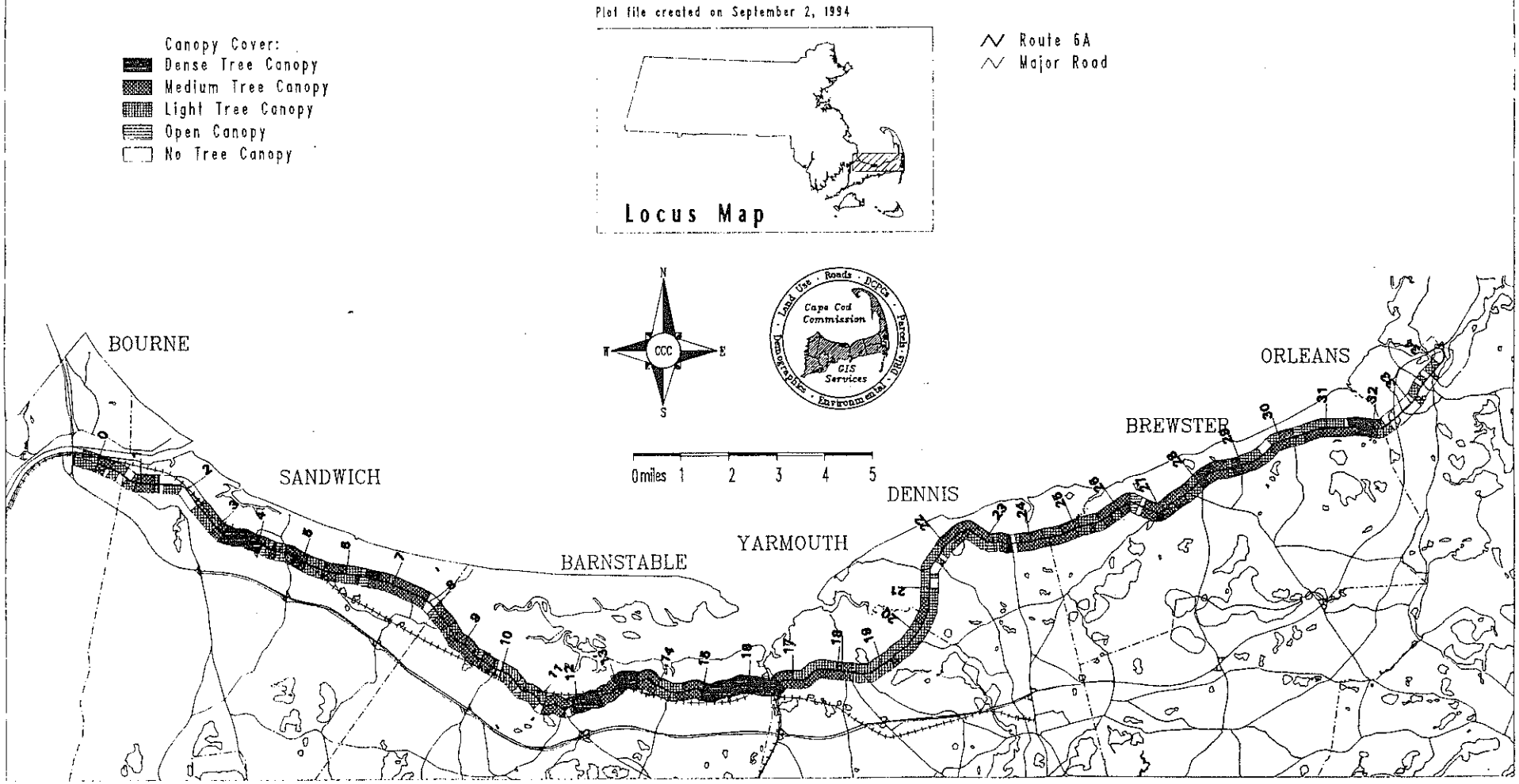
INITIAL INVENTORY

Inventory data collected for this plan begins in Bourne at the Sagamore Bridge overpass with Route 6A and ends at the U.S. Highway Route 6 rotary in Orleans. An initial inventory was completed in 1994 for all trees greater than 3" diameter at breast height (dbh) within ten feet of the edge of pavement. The 3" dbh size was selected as a minimum size based on the definition of a tree by Michael Dirr, noted tree expert and author of Manual of Woody Landscape Plants, as "a woody plant with an erect perennial trunk at least 3" in diameter at breast height, which has a distinct head (or crown of foliage), at least one main stem, and grows to a minimum height of at least 13 feet." Trunk diameter was estimated visually.

Data collected included *tree species, general location* by tenth of a mile, the *size of the species* within three categories (3-12" dbh, 12-24" dbh, or 24"+ dbh), *general condition*, and the *canopy density* created by these species. The inventory also noted existing land use, the location of sidewalks and utility lines, and the presence or absence of understory vegetation. This information provided baseline data to assist in determining locations for future tree planting. In addition, the focus on trees within ten feet of the edge of pavement could be used as a tool in approximating the number of trees which would be most affected by alterations to the roadway.

Upon completion of this initial inventory, the data was tabulated and a corridor-wide map was prepared (see Tree Canopy Density map page 13). The corridor-wide map illustrates canopy density by tenth-mile segments along the scenic byway, as well as tree counts/mile, dominant species and other pertinent information. Individual town maps display more specific information such as tree counts per mile and dominant tree species per mile. These maps are included in the analysis of each town below. Also see *Appendix* for additional information.

Route 6A Scenic Byways Program
Tree Canopy Density



ARBORIST TREE EVALUATION

Route 6A can be characterized by both large and small shade trees which create an attractive canopy for the roadway. These trees co-exist with other species on private property that meld into a well-defined landscape along the road. In June 1995, the Commission engaged Bartlett Tree Experts of Osterville, MA, a Massachusetts Certified Arborist, to complete an evaluation of the condition and maintenance requirements for all trees which contribute to the canopy along Route 6A, both now and in the future. The objectives for this evaluation were to determine the location, species, size, relative vigor, presence of pests and maintenance needs for all contributing trees, as well as to determine the total monetary value of the tree population. This information was necessary to develop a proactive tree management program to maximize tree health, longevity and appearance, to maximize the health and aesthetics of the Route 6A corridor by encouraging future tree diversity, and to minimize liabilities associated with trees which present an unreasonable risk to public safety.

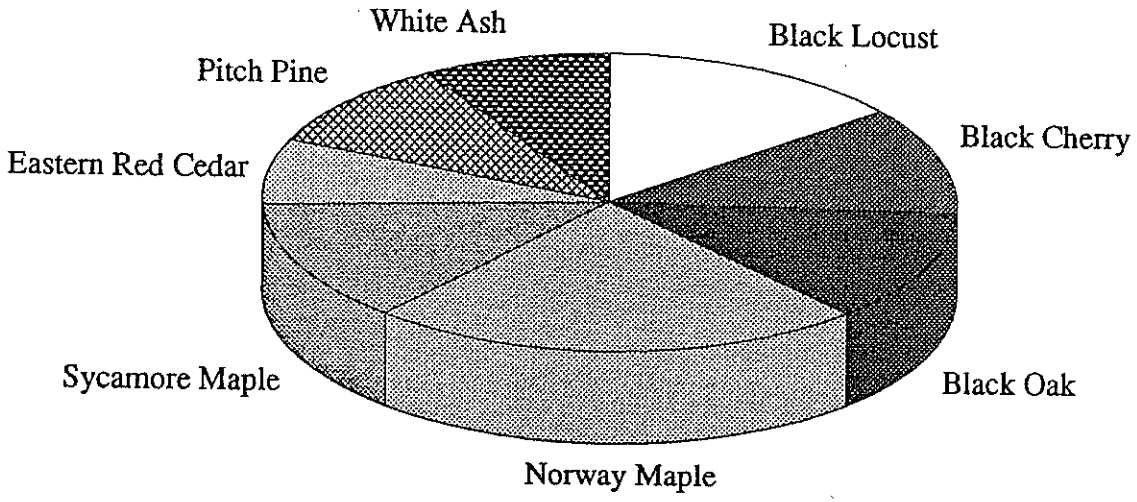
Data collected included *tree location and species, diameter at breast height, tree height, and condition/vigor.* Soil samples were randomly obtained from each town along the corridor and analyzed for a number of factors. Each tree was assessed for pests, cultural and environmental disorders. Tree maintenance requirements were also identified. See *Appendix* for additional information.

Inventory Findings

CORRIDOR-WIDE FINDINGS

From Bourne to Orleans, approximately 4100 trees are located within ten feet of the edge of pavement on Route 6A, with a total of 7498 trees which contribute to the overall canopy. Based on the Trunk Formula Method Form developed by the Council of Tree & Landscape Appraisers, the total tree population is valued at $18,335,246.00. Of this total, 500 trees, or approximately 6% of the population, are historic and significant individuals. A total of 121 species and varieties are found along the route. The dominant species vary along the roadway, with the most common tree species being the following:

Most Common Tree Species



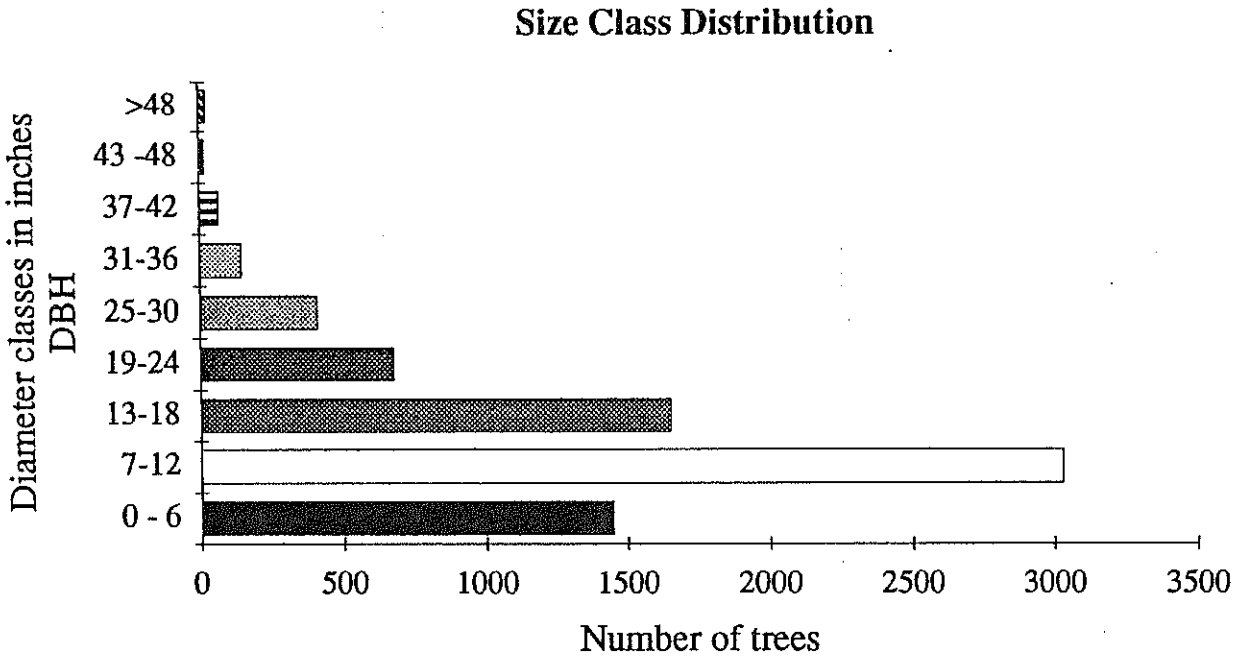
Species diversity is fair. The *Acer* (Maple) genus, with nine different species ranging from Boxelder to Norway Maple, comprises 29% of the entire population. Norway Maple, as a species, represents 14% of the trees along the route. This monoculture could be at risk if a maple disease such as verticillium wilt or an insect like thrips were to become a severe problem.

Trees are generally in good condition, with a total of 678 trees identified by Bartlett Tree Experts as declining or not contributing to the appearance of the corridor. Of this total, 366 trees were found to be hazardous or representing an unreasonable risk to users of the corridor. Specific maintenance needs such as pruning, structural supports, and fertilization, root collar care, and pest management were also identified.

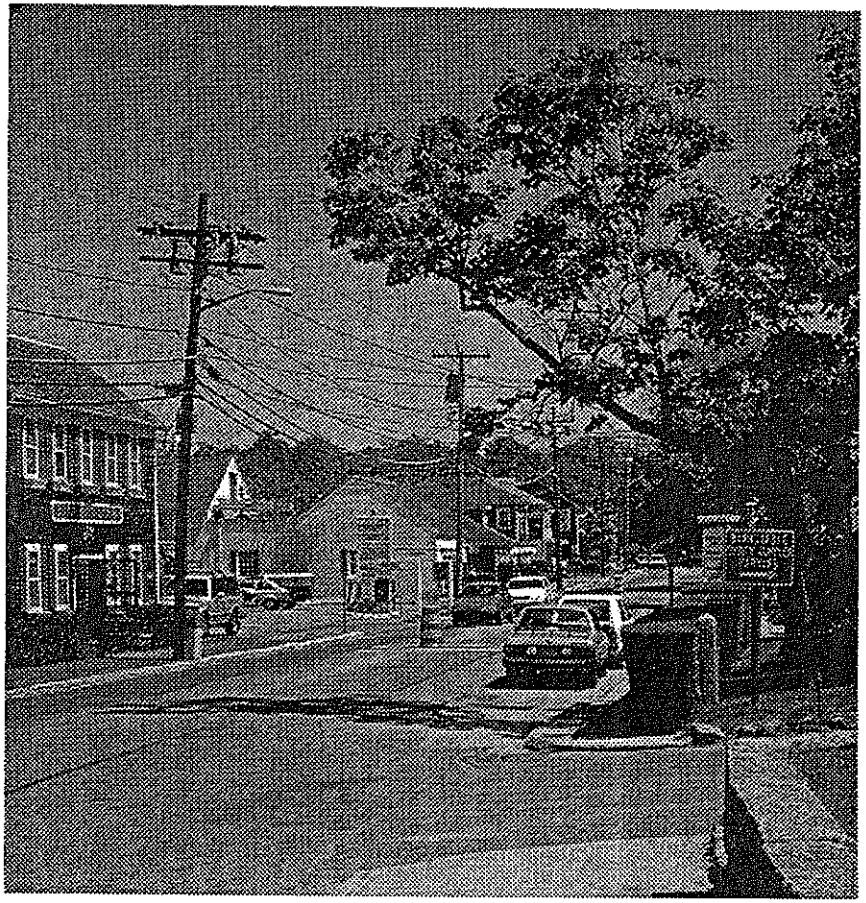
The majority of trees along Route 6A are less than 15" in diameter. However, there are many trees greater than 15" dbh that contribute greatly to the appearance of the corridor.

It will be important to provide care to all trees over 15" dbh to extend their life expectancy at least until the trees in the 3-15" range mature. A continued moderate diverse planting program should be initiated so that there is always a supply of smaller trees moving into larger size classes.

The quantity of specimen and historic trees found along Route 6A warrants their protection and enhancement through the development of a tree care and replacement planting program. To date, there has been little effort to replace trees when removal is necessary due to disease or storm damage. In addition, pruning to maintain clearance for overhead utility lines has impacted the mature tree canopy. The result is that the majestic tree canopy which gives Route 6A much of its scenic beauty will eventually be lost if a tree maintenance and planting program is not undertaken.



The largest areas without tree canopy occur in village centers, at the "gateways" to the corridor, and areas of strip commercial development. As noted earlier, photographic records indicate that many of these historic villages along Route 6A were once tree-lined with majestic canopies of elms and other species. Dutch elm disease and incremental development in these village centers has reduced or eliminated the canopy over time.



Barnstable Village could benefit from tree planting

These areas should be considered as priorities for replanting along the corridor.

TOWN-BY-TOWN FINDINGS

Bourne • Route 6A in Bourne is approximately a mile in length and consists primarily of commercial businesses and scattered residential uses. There are very few trees along this mile. In particular, the gateway to the corridor at the Sagamore Bridge consists of numerous small businesses with expansive curb cuts which preclude tree planting. The landscape becomes more residential as it proceeds into Sandwich, and also becomes more tree-lined. The predominant street tree is Black Locust, with Norway and Sycamore Maples set further back from the roadway.

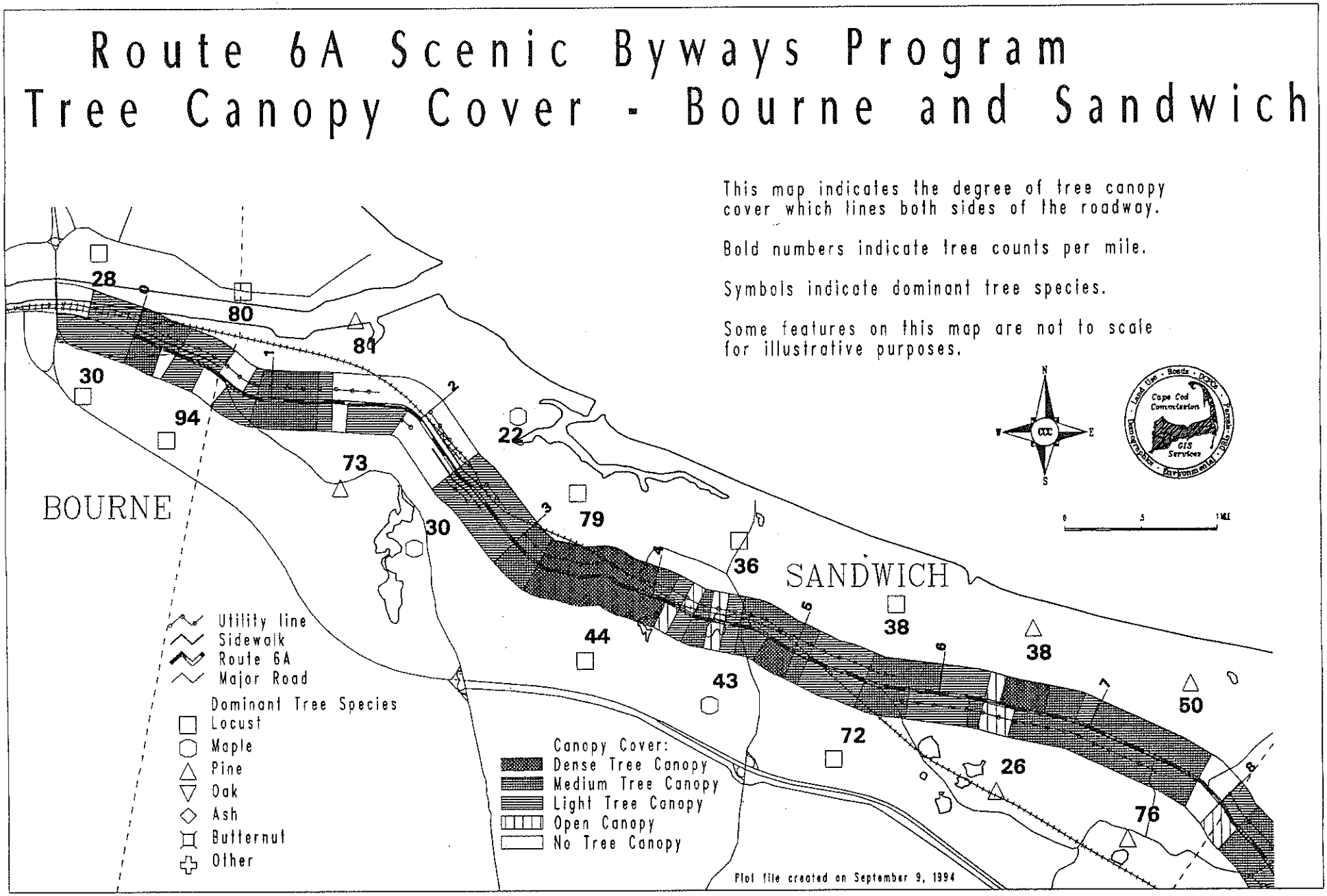
Opportunities for new planting include the Sagamore Bridge gateway, Ben Abbey Road, and the Bourne/Sandwich town line.

Sandwich • Route 6A in Sandwich consists of eight miles of the 34-mile length of the scenic byway, or 25% of the entire route. There are over 800 trees in Sandwich within ten feet of the roadway edge, which accounts for about 21% of the total tree cover along the corridor. The majority of the Sandwich portion of the roadway has a *medium* tree canopy cover. Black locust is the predominant tree in Sandwich, many of which are well over 6 feet in diameter. Although the typical branching pattern of this tree does not typically create a dense canopy cover, the proximity of the trees to the edge of the roadway creates the effect of a dense canopy. The majority of the black locust tree canopy is found from miles 3-5.

Cranberry bogs also line a few stretches of the roadway. Vegetation associated with the bogs consists of dense understory, mostly black cherry and viburnums.

Limitations to future tree planting in Sandwich include existing sidewalks and overhead utilities. Most sidewalks are directly adjacent to the roadway edge and without a grass strip, although new street trees have been planted beyond the sidewalk in a few locations. Overhead utilities also limit tree selection, with the exception of portions of mile 1, the only section of Route 6A without overhead utilities.

Opportunities for new planting include the Bourne/Sandwich


Route 6A Scenic Byways Program
Tree Canopy Cover - Bourne and Sandwich
This map indicates the degree of tree canopy cover which lines both sides of the roadway.
Bold numbers indicate tree counts per mile.
Symbols indicate dominant tree species.
Some features on this map are not to scale for illustrative purposes.
BOURNE
SANDWICH
28
80
84
30
94
73
22
30
79
36
44
43
38
38
50
72
26
76
Utility line
Sidewalk
Route 6A
Major Road
Dominant Tree Species
Locust
Maple
Pine
Oak
Ash
Butternut
Other
Canopy Cover:
Dense Tree Canopy
Medium Tree Canopy
Light Tree Canopy
Open Canopy
No Tree Canopy
Plot file created on September 9, 1994

town line, commercial areas, and several intersections with Route 6A such as Tupper Road, Jarvis Street, and Quaker Meetinghouse Road.

Barnstable • Distinguished by its older and historic homes, Barnstable is easily identified along Route 6A by the vast quantities of distinctive silver maples. These massive specimens, some towering well over 100 feet in height and over five feet dbh, line most of the nine-mile stretch of Route 6A in Barnstable. The only exception is the village center at mile 14, which contains a limited number of flowering and shade trees. There are over 1200 trees within ten feet of the road edge along the nine-mile portion of Route 6A in Barnstable, or 30% of the total tree count along Route 6A. This translates to an average tree spacing of 25 feet.

The majority of Barnstable has either a dense or medium canopy cover created by the weeping branching pattern of the silver maples. Most of the silver maples are planted very close to the road, and many have been marred by automobiles. Because of the weeping branching pattern and the v-shaped trunk that characterizes mature silver maples, utility line pruning in Barnstable has seriously affected the tree canopy. Many of the trees have been drastically pruned to the point of deformity and present a risk to public safety.

Opportunities for new planting include the Sandy Neck Road commercial area, several intersections with Route 6A, and street tree planting in Barnstable village, as well as scattered sites in residential areas such as Tonela Lane. New tree planting, however, will probably have to take place on private property.

Yarmouth • Route 6A in Yarmouth was once lined with American Elms, yet few survive. The loss of these trees has seriously affected the canopy in Yarmouth. The western section of Route 6A in Yarmouth from the Barnstable town line has a particularly dense canopy provided by silver maples. The canopy becomes rather light in the Yarmouthport village center. From the village center eastbound, the canopy consists primarily of younger maples that are about 20-30 feet in height and set back from the roadway. Catalpa are also common. The eastern portion of Yarmouthport to the Dennis town line changes to a pine and oak canopy cover, which creates a lighter canopy than the maples provide.

There are approximately 280 trees in Yarmouth along a 4 mile portion of Route 6A. The average spacing between trees is approximately 14 feet. Yarmouth's four miles of Route 6A account for 11% of the roadway, yet the tree cover accounts for only 7% of the total tree cover along the road.

The character of the Yarmouthport village center would be enhanced with the addition of street trees. However, curb cuts and roadside parking act as constraints to any tree planting in this area. In addition, the town common at Union Street, which also serves as a gateway to Route 6A, may be enhanced by additional tree planting. Additional areas to consider for new tree planting include small commercial locations at Weir Road and opposite the Fiddler's Green plaza, as well as residences opposite King's Way.

Dennis • Of all the towns along Route 6A, the town of Dennis contains the greatest diversity of tree species. The western portion is primarily pines and oaks, which in some cases create no canopy, and in other places displays a light canopy cover. The Tobey Farm area consists of primarily Catalpa and English Oak. The Dennis village center, around mile 21, contains very little tree canopy as a result of road intersections and curb cuts.

Once the land use changes to residential, the tree cover increases, with a very dense canopy around the Scargo Lake area at mile 22. Much of this canopy is created by norway and sycamore maples and tupelos. Dense understory throughout this area adds to a sense of enclosure while traveling along this section of Route 6A. An additional gap in the canopy occurs at the intersection of Route 134/Route 6A, which contains a small commercial center. After this point, the predominately maple tree cover provides a medium canopy cover.

In total, there are almost 400 trees in Dennis, or 9% of the total tree cover along Route 6A, yet the roadway accounts for 11% of the entire stretch of this corridor. The average spacing of trees along the four miles in Dennis is 18 feet.

Route 6A Scenic Byways Program
Tree Canopy Cover - Barnstable

This map indicates the degree of tree canopy cover which lines both sides of the roadway.

Bold numbers indicate tree counts per mile.

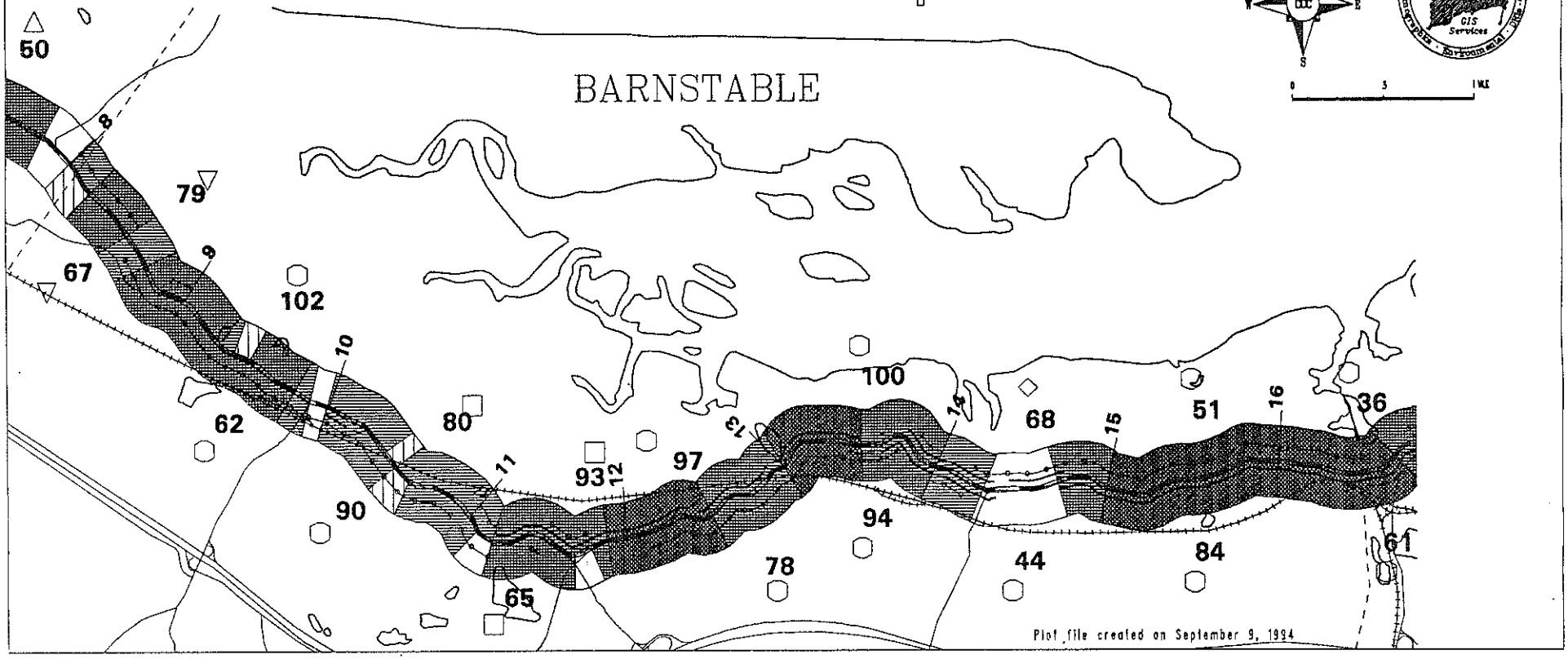
Symbols indicate dominant tree species.

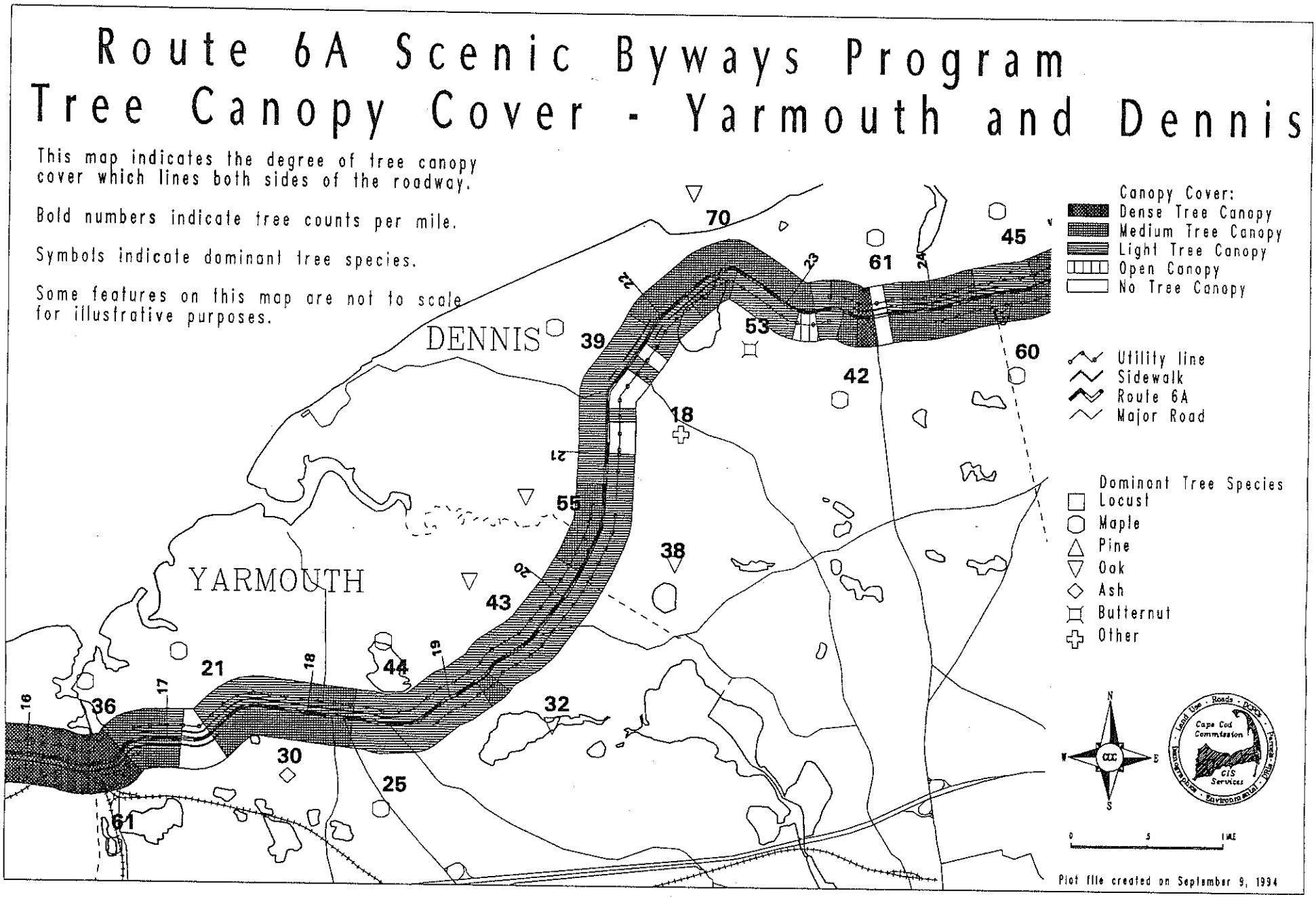
Some features on this map are not to scale for illustrative purposes.

Canopy Cover:
- Dense Tree Canopy
- Medium Tree Canopy
- Light Tree Canopy
- Open Canopy
- No Tree Canopy

Dominant Tree Species
- Locust
- Maple
- Pine
- Oak
- Ash
- Butternut
- Other

- Utility line
- Sidewalk
- Route 6A
- Major Road




Route 6A Scenic Byways Program
Tree Canopy Cover - Yarmouth and Dennis
This map indicates the degree of tree canopy cover which lines both sides of the roadway.
Bold numbers indicate tree counts per mile.
Symbols indicate dominant tree species.
Some features on this map are not to scale for illustrative purposes.
DENNIS
YARMOUTH
Canopy Cover:
Dense Tree Canopy
Medium Tree Canopy
Light Tree Canopy
Open Canopy
No Tree Canopy
Utility line
Sidewalk
Route 6A
Major Road
Dominant Tree Species
Locust
Maple
Pine
Oak
Ash
Butternut
Other
Cape Cod Commission
GIS Services
Plot file created on September 9, 1994

Opportunities for new planting include the town lines, the western approach to Dennis village, and commercial sites at the Route 134 intersection.

Brewster • The eight-mile stretch of Route 6A in Brewster contains very diverse land uses and vegetation. In the western portion, wetlands and marshes result in tupelos, ashes, and maples dominating the tree canopy. Vegetation then changes to a dense maple canopy. Pavement width and numerous curb cuts have resulted in a lack of tree canopy in portions of miles 29-30 in the village portion of the town. Outside of the village center, a few nice groves of large butternuts tower over Route 6A. Finally, a large section of mile 31 contains a mature pine and oak forest which creates a medium canopy in the eastern section of Brewster.

The gaps in the tree canopy in Brewster again are found in the village center and at the major road intersections along Route 6A. In all, Brewster has over 1000 trees lining Route 6A, for an average spacing of 24 feet. The trees account for 24% of the total tree cover along Route 6A, with eight miles of the road representing approximately 22% of the entire corridor. Opportunities for new tree planting include Underpass Road and the Brewster/Orleans town line.

Orleans • Because of the primarily commercial land use on this section of Route 6A and several major road intersections, including the U.S. Route 6 exit 12 ramps, this section of roadway has very little tree canopy. There are only about 150 trees in the 2-1/2 mile stretch of Orleans. The predominant tree species is maple. In the center of town at mile 33 there are a few old elms, although not directly adjacent to the roadway. It is likely that this village, like many others, was once lined with elm trees.

The scenic quality of this 2-1/2 mile section of Route 6A could be greatly enhanced through a tree planting program, as well as possible special planting treatments at the highway interchange and the Eastham rotary. However, existing sidewalks and overhead utilities present limitations to planting trees in some locations.

Review and Analysis of Existing Regulations

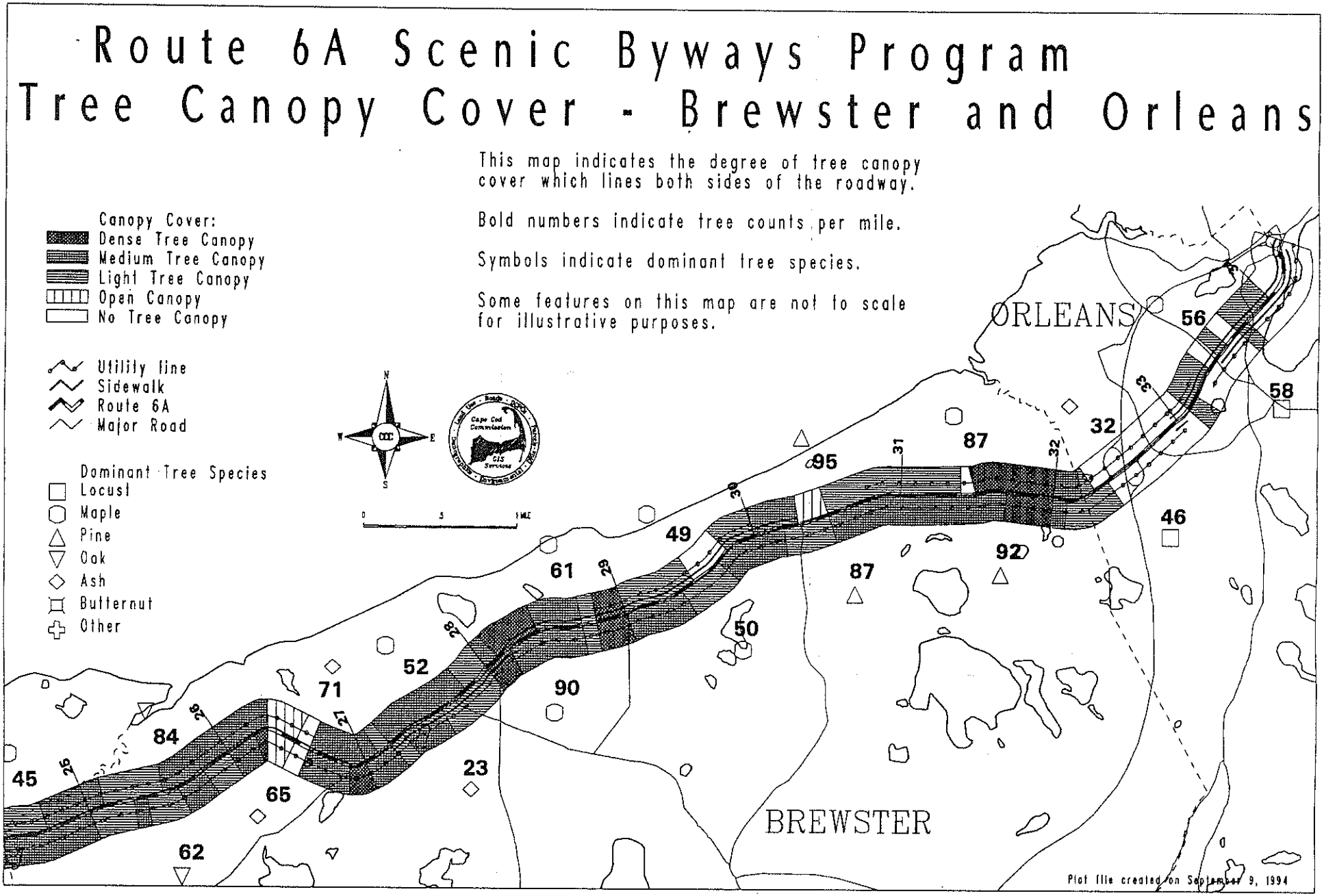
MASSACHUSETTS HIGHWAY DEPARTMENT ACCESS PERMIT

With the exception of the Barnstable section of the roadway, the 34-mile Route 6A corridor is a numbered state highway owned and maintained by the Massachusetts Highway Department (MHD). Any alteration or work proposed within the state highway layout requires a permit to access the state highway issued through the MHD under M.G.L. Chapter 81, Section 21. Included in the definition of access is "any physical work performed within the State Highway Layout." This definition would therefore apply to any tree or shrub planting proposed within the right-of-way.

The MHD District 5 office located in Taunton, MA issues state highway access permits for any work proposed within the Route 6A layout. Applicants are required to submit a completed application and plan drawn at a scale of 1"=40' for any proposed work. Processing of state highway access permits typically takes about two weeks time. There are no standards for tree spacing or species selection which apply specifically to tree planting within the Route 6A state highway layout.

SCENIC ROAD LEGISLATION/OLD KING'S HIGHWAY HISTORIC DISTRICT REGULATIONS

Route 6A was designated as a scenic road in June 1992 by the Massachusetts Legislature. This designation requires the prior consent of the Old King's Highway Historic District Committee (OKHHDC) or local planning board before doing any repair, maintenance, reconstruction or paving of the road that involves cutting or removal of trees or demolition or destruction of stone walls. It is uncertain whether Old King's Highway regulations protect the tall hedgerows that line many portions of the roadway and provide a canopy effect similar to mature trees in many locations. The Old King's Highway regulations do not contain


Route 6A Scenic Byways Program
Tree Canopy Cover - Brewster and Orleans
This map indicates the degree of tree canopy cover which lines both sides of the roadway.
Bold numbers indicate tree counts per mile.
Symbols indicate dominant tree species.
Some features on this map are not to scale for illustrative purposes.
Canopy Cover:
Dense Tree Canopy
Medium Tree Canopy
Light Tree Canopy
Open Canopy
No Tree Canopy
Utility line
Sidewalk
Route 6A
Major Road
Dominant Tree Species
Locust
Maple
Pine
Oak
Ash
Butternut
Other
ORLEANS
BREWSTER
Plot file created on September 9, 1994

specific landscaping or tree planting requirements for new development, although a District Committee may request that a landscape plan be included before issuing a Certificate of Appropriateness. Review of landscape design issues, however, is inconsistent among the town committees.

No guidelines are available to these boards and committees to assist them in selecting the most appropriate species and sizes for replanting when tree removal is requested by the MHD. A provision for review of proposed MHD tree removal work by the local tree warden is also needed.

ZONING BYLAWS/SUBDIVISION REGULATIONS

The seven communities along Route 6A differ somewhat in their approach to landscaping and screening requirements. Most towns prescribe the number and size of new trees required in parking lots. However, less than half limit the clearing of existing vegetation. About half of the towns specify the types of plantings that may be used for screening. Brewster's Corridor Overlay Protection District provides for additional front landscaped buffers including tree planting on Route 6A. Most of the towns would benefit from an updating of landscaping requirements for development on Route 6A in order to require additional front buffers and limitations on the clearing of existing vegetation to maintain the scenic character of the roadway.

Subdivision rules and regulations generally contain tree planting requirements. Subdivision roadways will have an impact on the character of the corridor where they intersect with Route 6A. Therefore, a review of entry planting requirements and subdivision road tree planting requirements by the towns would be valuable.

PUBLIC SHADE TREE ACT

M.G.L. Chapter 87, the Shade Tree Act, applies only to the one-mile section of Route 6A which is owned by the Town of Barnstable. The Shade Tree Act was enacted for the purpose of managing existing tree canopies along public roadways for public enjoyment. This Act gives the municipal tree warden responsibility for the care, maintenance and removal, when necessary, of public shade trees as well as enforcement of the law for their preservation. Exceptions to this law are trees in public parks and those within the state highway layout. For more information on this Act, see *Appendix.*

Section 3 of Chapter 87 requires that trees may generally be removed only by the tree warden and not without holding a public hearing prior to any tree trimming or tree removal. The exceptions to this requirement are for suppression of gypsy moth or Dutch Elm disease, the trimming or removal of trees and shrubs less than 1-1/2" in diameter, or removal of those trees or shrubs which are deemed to be a public safety hazard. Section 7 of Chapter 87 also gives the tree warden the authority to budget for and plant new shade trees in the public ways or upon adjoining land, at a distance up to twenty feet from the public ways, upon written consent of the owner.

TOWN OF BARNSTABLE SHADE TREE ORDINANCE

The Town of Barnstable also has a shade tree ordinance which applies to the town-owned section of Route 6A. The purpose of this ordinance, adopted in 1994, is to regulate the planting, maintenance and removal of trees, shrubs and other plants on public property and trees on private property that may cause a hazard to the public. For more information on this ordinance, see *Appendix.* The ordinance specifies that the tree warden shall develop a comprehensive plan for the care, planting and preservation of trees and shrubs within the town's jurisdiction. This plan, which is currently underway, will include a list of desirable street trees, recommended spacing and planting for special situations. The plan will also include guidelines for trimming street trees by utility companies and planting specifications.

MEPA REGULATIONS

Pursuant to 301 CMR, Section 11.27, the use of any state funds for a project on a Department of Public Works road which includes the cutting of five or more living trees, fourteen inches or more in diameter at breast height, requires the filing of an Environmental Notification Form (ENF). Therefore, either the MHD or

ComElectric would be required to file an ENF if this threshold was met. Under the MEPA regulations, the ENF presents the proponent's initial assessment of the potential impacts of a project and the sources for such assessment(s). The ENF is circulated to reviewing agencies and interested persons for review and comment.

Review of Existing Vegetation Management Practices

MASSACHUSETTS HIGHWAY DEPARTMENT

Up until the mid-1980's, the Massachusetts Highway Department (the MHD) had an annual maintenance program for Route 6A which included fertilization, tree trimming, pest management and tree planting (see *Appendix* for calendar of previous annual programs). This work was completed by MHD personnel under the supervision of a certified tree surgeon. Today, vegetation maintenance is limited to tree trimming, site distance clearing, and tree removal work on Route 6A. The MHD does not currently have a budget for tree planting on Route 6A. Tree maintenance is now completed by a contractor with oversight by the MHD. MHD specifications state that all tree trimming work be performed or supervised by a certified tree surgeon or arborist. These specifications, however, do not apply to tree trimming work performed by Commonwealth Electric Company (see below).

Sight Distance Clearing • According to contract documents provided by the MHD, the intent of safety sight distance clearing is to remove vegetative growth that hinders and/or restricts the safety sight distance to provide a safe stopping distance and to increase visibility for traffic signs. Sight distance clearing includes removal of designated trees, brush and plant material, tree up-branching and shaping, and removal of all dead, dying and broken limbs and branches within the state highway layout. Up-branching to maintain vehicular vertical clearance has been reduced to a minimum of 15 feet for Route 6A as compared to a 20-foot minimum for other state highways in the Commonwealth.

Tree Removal • Trees which may require removal due to disease, storm damage or other causes are reported on a case-by-case basis to the MHD District 5 office in Taunton, MA, which in turn notifies the tree surgeon supervising maintenance work on Route 6A. Based on a field inspection, the tree surgeon determines whether removal is necessary. Due to its designation as a scenic road, removal of any tree on Route 6A requires the prior consent of the Old King's Highway Historic District Committee or Planning Board in each community. When tree removal is required, replacement tree planting is carried out by the MHD after consulting with the local tree warden for species recommendations. However, the Department uses its discretion in selecting the size, species and location for replacement planting. There are currently no guidelines in place to assist the MHD in species selection, size or planting practices along Route 6A.

COMMONWEALTH ELECTRIC COMPANY

The MHD grants an annual permit to Commonwealth Electric Company (ComElectric) which allows ComElectric to maintain overhead utility lines on all state roads within the Commonwealth. Besides routine maintenance of the associated lines, tree trimming to maintain line clearance is part of this yearly contract. There are no special provisions in the permit for Route 6A, which is the only state scenic road that ComElectric maintains. Tree trimming along the corridor is completed on an approximately three year cycle. Guidelines for trimming are designed to provide clearance for conductors and wires to protect them from wind, rain, heavy snow, and ice. Tree trimming specifications to maintain clearance for overhead lines are generic to all state roads that ComElectric services. Illustrations for "Desirable" and "Undesirable" clearances are included in tree trimming specifications, although measurements for these clearances are not provided and graphic illustrations lack clarity (see *Appendix*).

The majority of overhead utility line tree trimming work is subcontracted out and monitored by a representative of ComElectric. The permit requires that ComElectric provide the MHD District

Highway Director with 48-hours notice before any tree trimming work commences. The permit does not state, however, that local officials will be notified of either tree trimming or tree removal work by ComElectric. The permit also states that "only qualified tree workers" are allowed to conduct tree trimming operations. However, no specific standards for employee qualifications are provided. Contrary to MHD specifications for its own subcontractors, the permit does not require that ComElectric or its subcontractors have a Massachusetts certified arborist supervise the tree trimming work performed.

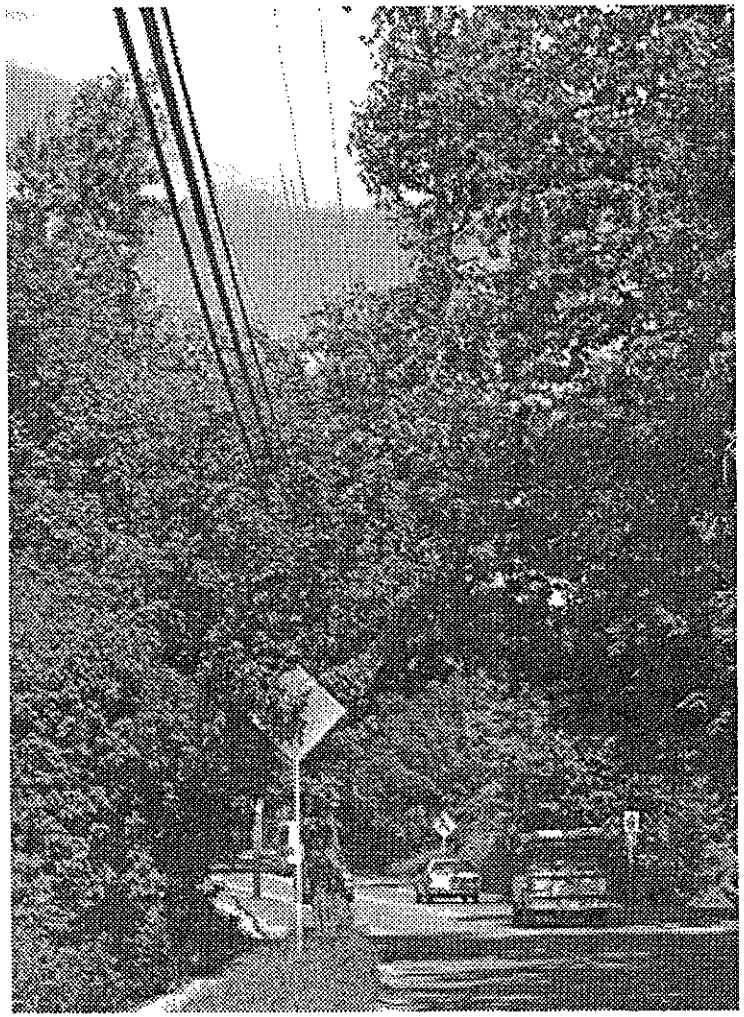
Four general types of trimming are specified by ComElectric using the drop-crotch method: top, side, under or overhang, and through trimming. Depending on the proximity of the tree to the wires, one or more of the above methods may be employed. Through trimming is the most common form of tree trimming along Route 6A, as numerous mature trees are equal to or above the height of the wires.

Through trimming allows the lines to pass through the trees. The following clearances are specified by ComElectric:

Minimum Clearance for 25 kV Lines

Top trimming	8 feet
Side trimming	8 feet
Under/overhang trimming	12 feet

The annual permit states that trees which have been rendered unsightly by repeated pruning for clearance shall be removed and replaced by ComElectric. However, the designated area for replanting can be determined by the District Highway Director anywhere within the right-of-way or on other state roads if no suitable location is found within the state highway layout. Discussion with the MHD District 5 office indicates that tree replacement does not often take place on Route 6A. No other specifications regarding species, sizes or planting procedures for replacement trees are provided in the permit with ComElectric.



An example of through trimming

TOWN OF BARNSTABLE

Approximately one mile (4600 feet) of the approximately 34-mile Route 6A corridor is owned and maintained by the Town of Barnstable. From approximately mile 13.6 to mile 14.3, the Barnstable tree warden has the responsibility for protecting and maintaining all trees within the public right-of-way. Current tree

maintenance for this section of roadway consists of emergency work such as removing fallen limbs, minor pruning, and limited pest management. The few shade trees found along this brief stretch of Route 6A are typically located under utility lines. Unlike the state highway, the tree warden's policy to date has allowed these trees to grow naturally without heavy pruning unless the tree poses a public safety hazard. There is currently no tree replacement program for this section of town-owned road, although the tree warden does have a small annual tree planting budget for application town-wide.

Analysis of Existing Vegetation Management Practices

MASSACHUSETTS HIGHWAY DEPARTMENT/COMMONWEALTH ELECTRIC COMPANY

Concerns have been raised by residents and local officials over the extent and nature of tree trimming and sight distance clearing by the MHD and ComElectric. The MHD has indicated that public notice of any tree work is provided to local permitting authorities. However, there is a need for considerable public education of the nature and extent of tree trimming activities by both the MHD and ComElectric.

In addition, given the concern for maintaining the character of the existing tree canopy on Route 6A, the MHD should consider specific pruning standards based on specific tree species. Currently, trees are pruned every 3-5 years regardless of species. More frequent pruning is strongly recommended, especially for young and newly planted trees and under utility lines in order to maintain their vigor and appearance. Pruning of more than 1/3 of the tree should be avoided, as this practice reduces tree vigor which may in turn make trees susceptible to disease or pest infestation.

It should also be noted that sight distance clearing does not specify the maximum size tree which may be removed under this type of contract, in contrast with "tree trimming", which defines a tree as having a diameter of 4" or greater. It is recommended that a maximum diameter of 1-1/2" be established for sight distance clearing work to alleviate local concerns.

TOWN OF BARNSTABLE

It is difficult to assess the impact of the Barnstable tree warden's approach to pruning trees, which is to let them grow naturally in close proximity to overhead wires, due to the few trees that are found on this one-mile stretch of Route 6A. However, the photo below illustrates that mature trees can successfully co-exist with overhead utility lines.

It would be beneficial to undertake a new tree planting program for this village which includes frequent pruning while trees are young in order to maintain their vigor and appearance. While

Utility line pruning which maintains tree form

there are limitations posed by existing curb cuts and overhead utility lines, the appearance of this county seat of government could be greatly enhanced through a tree planting effort.

Recommendations

The future of the tree canopy on Route 6A depends upon the commitment of all parties who have a stake in its current management. This section focuses on four different priorities that will need to be addressed to ensure that future generations are able to enjoy the scenic beauty created by Route 6A's distinctive tree canopy.

The first priority identified in this plan is maintenance of the existing tree canopy in order to preserve its vitality and minimize losses. The second priority is to develop a tree replacement program in cooperation with Commonwealth Electric Company, the Massachusetts Highway Department and other public/private partnerships. The third priority is to establish a new tree planting program for those areas currently without tree canopy. Finally, revisions to existing regulations and procedures are recommended to enhance the existing tree canopy as well as to improve coordination among different parties responsible for maintaining vegetation on Route 6A.

PRESERVATION AND MAINTENANCE OF EXISTING VEGETATION

Trees which contribute to the canopy of Route 6A are currently maintained by the Massachusetts Highway Department, Commonwealth Electric Company, the Town of Barnstable, and private property owners. For many years, there has been no comprehensive program dealing with corrective pruning, fertilization, pest management and other necessary cultural practices on a routine, planned basis in order to maintain the vitality of the tree population and therefore minimize losses. The establishment of a preventive maintenance program will result in stronger, healthier and more attractive trees, which will lead to reduced costs for all parties currently involved in their management. The following are priority maintenance activities which should be performed on the Route 6A tree canopy in order to preserve this valuable resource.

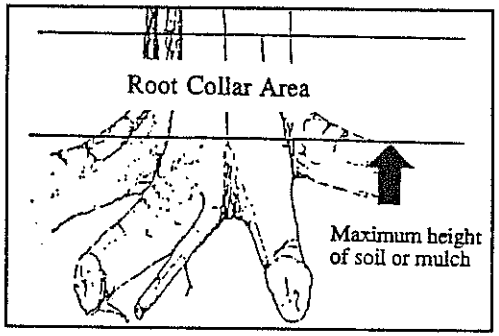
Pruning Techniques • A key consideration in retaining the scenic character of the tree canopy is the technique employed in pruning trees. Bartlett Tree Experts identified a total of 6818 trees which need pruning. Collectively pruning trees on a more frequent basis helps to maintain their vigor and appearance and encourages the development of proper form. The ANSI A300 pruning standards should be used by both the public and private sector when pruning trees on Route 6A. Refer to *Appendix* for these standards. Newly planted trees should receive standard pruning using these guidelines. When necessary to correct structural deficiencies, storm damage or interference with infrastructure or wires in established trees, crown reduction pruning should be used in addition to standard pruning.

Tree Maintenance Program • In addition to regular pruning, a comprehensive maintenance program should be developed for the trees along Route 6A. This program should include the following activities:

- *Structural supports:* A total of 1099 trees were identified for cable supports to compensate for structural deficiencies. Within this population, some trees have been targeted for brace rods. Tree canopies should be initially supported with cables and some with brace rods in order to secure longevity and beauty.

- *Fertilization:* A total of 6818 trees were designated for fertilization based on the presence of deficiencies or substandard growth. Fertilization with a high nitrogen, slow release fertilizer should be completed on all high value and deficient trees annually.

• *Root collar care:* Numerous trees with root collar disorders, girdling roots or those requiring mulch or mulch corrections were identified for treatment. Root collar care should coincide with pruning tasks.



Typical root collar

• *Integrated pest management:* There were moderate levels of insect pests found on many tree species. Disease and insects can be managed with an Integrated Pest Management (IPM) program. IPM technologies include periodic inspection for pests, beneficial elements and cultural problems, and applying appropriate treatments to prevent pest outbreaks. See *Appendix* for Bartlett Tree Experts Plant Health Care Using IPM Strategy and Requirements for Integrated Pest Management.

In addition, care should be taken during any adjacent construction activities to protect trees from disturbance. See section on *Recommended Plants and Planting Procedures* for maintenance of existing trees as well as the *Appendix* for specific Plant Health Care Programs.

Educational Efforts • The MHD and ComElectric should consider undertaking an educational program for the Old King's Highway Historic District Committees, planning boards, and interested residents regarding tree removal, trimming and sight distance clearing work in order to minimize conflicts and confusion. A program to educate private property owners about the importance of maintaining trees along Route 6A is also key to maintaining their value. Refer to *Implementation* section for assistance in carrying out these efforts.

Revisions to Commonwealth Electric Company Permit • The annual permit issued to Commonwealth Electric Company by the Massachusetts Highway Department is a statewide permit. By necessity this permit contains general language which covers all state roads that ComElectric maintains. Given the value and distinctive character of the trees along Route 6A, the MHD should consider developing a specialized annual permit with ComElectric for Route 6A. At a minimum, this revised permit should include the following:

- a requirement for a certified arborist on staff to oversee all tree trimming/removal work by ComElectric or their subcontractors;
- establish minimum qualifications for tree trimming personnel, including subcontractors;
- a requirement that pruning meet American National Standards Institute (ANSI) A300 standards;
- a provision for notification of the local tree warden for any proposed tree trimming or tree removal work; and,
- a provision for notification of the local Old King's Highway Historic District Committee and/or local planning board for any proposed tree trimming or tree removal work.

In addition, ComElectric should consider revising the Construction Operating Policies and Procedures manual which is used by tree trimming personnel. A revised manual, which clearly illustrates pruning techniques according to ANSI A300 standards, could also be used in a community education program for residents and local officials.

Special Recognition for Tree Protection • Tree Line USA is a program sponsored by the National Arbor Day Foundation and administered through the office of the State Forester. This program is designed to recognize utility companies that take special care to protect the health and aesthetics of trees that they maintain. By using state-of-the-art techniques described in the program, the utility company can reduce costs through fewer tree removals, less annual pruning and fewer customer complaints.

To qualify for the award, the utility company must meet four requirements:

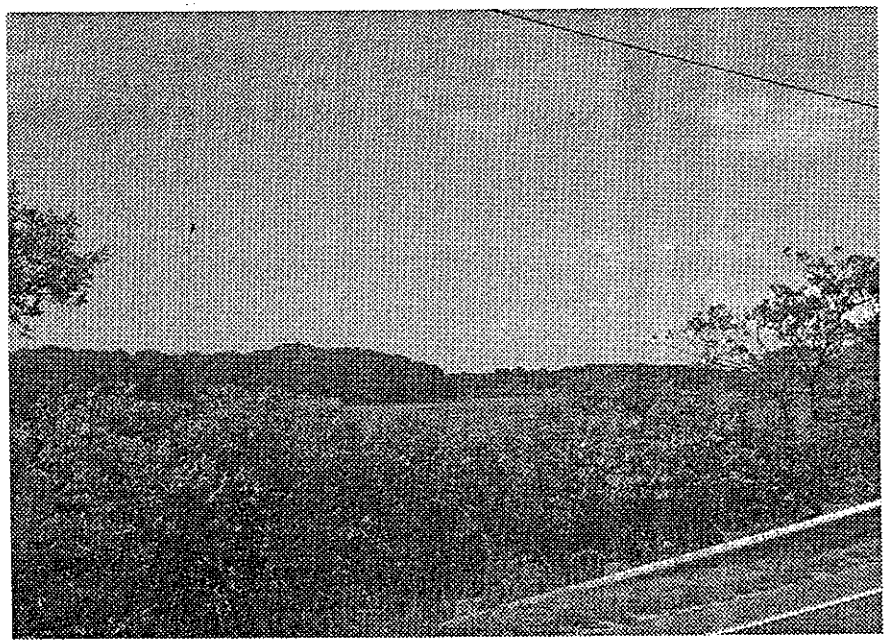
- they must practice pruning, trenching, and tunneling methods that reduce tree mortality;
- they must conduct annual training for all employees, contractors, and supervisors who do pruning and trenching work for the utility;
- they must designate an arborist, forester, or other trained utility employee to ensure that the training occurs and proper work practices are followed;
- they must sponsor an ongoing community tree planting program, provide at least one mailing including educational information about trees, and sponsor or participate in annual Arbor Day events.

For more information about the National Arbor Day Foundation's Tree Line USA program, contact the State Forester. An additional program that is highly recommended for all tree trimming personnel is the Electrical Hazards Awareness Program sponsored by the National Arborists Association. For more information, contact Bartlett Tree Experts, Osterville, MA, at (508)428-2397.

Vista Pruning • Vista pruning consists of the selective removal of specific "windows" of vegetation that block or obscure a view. For Route 6A, vista pruning could enhance existing views to waterbodies and coastal features, thereby increasing the scenic qualities of Route 6A. The most common type of vista pruning likely to be performed on Route 6A would consist of crown raising by removing lower limbs from the main trunk of a tree, and reducing or thinning out of specific weed trees or invasive understory vegetation.

The Route 6A Corridor Management Plan identified the following locations where vista pruning could enhance the scenic character of the roadway:

Mile No.	Location
2 - 2.5	Sandwich - Mill Creek
7 - 8.2	Sandwich/Barnstable - Scorton Creek
9.5	Barnstable - Bridge Creek
13.5	Barnstable Harbor
16.5	Barnstable - Mill Pond
22.5	Dennis - Scargo Lake
23	Dennis - Sesuit Creek
24.7 - 25	Brewster - Quivett Creek
26	Brewster - Stoney Brook



Scenic salt marsh along Route 6A

In addition, the following locations have been identified through preparation of this plan as potential locations for vista pruning:

Mile No.	Town
4.2	Sandwich - cranberry bogs
4.5	Sandwich - Twin Ponds
6.4	Sandwich - Scorton Creek bridge
8.1 - 9.0	Barnstable - Howland Lane to Scorton Creek marsh
10.7	Barnstable - wetlands @ railroad crossing

In all cases, it is essential that vista pruning be performed by a certified arborist in close consultation with the local Conservation Administrator.

Dedicating Significant or Historical Trees • Special recognition for some of the mature specimen trees along Route 6A is a valuable tool in increasing public awareness of this natural resource. The Shade Tree Laboratories at the College of Food and Natural Resources, University of Massachusetts, in cooperation with the Massachusetts Department of Environmental Management, Division of Forests and Parks, maintains a New England-wide list of the largest tree of each species, or "champion" trees. National records are maintained by the American Forestry Association. Currently there are no "champion" trees listed with the Shade Tree Laboratories on Route 6A or anywhere on Cape Cod, although a few specimens may qualify.

To encourage volunteer interest and participation in preserving the Route 6A tree canopy, residents, schools, and other civic organizations could be invited to search out the largest and oldest trees for nomination as Champion Trees. In addition to the fun of searching for eligible trees, Champion Tree dedication could be a valuable tool for increasing public awareness of the value of the trees along Route 6A. This increased awareness could result in improved protection for existing trees through more frequent maintenance.

The publication New England Records of Champion Trees describes the method for obtaining accurate measurements of champion trees and where to report potential candidates. The tree evaluation data compiled for this plan provides some of these measurements, such as tree height and diameter. It should be noted, however that the exact location of trees are not listed in order to ensure the privacy of individual homeowners and to protect against vandalism.

For potential champion trees on private property, individual homeowners or beautification committees should first contact the local tree warden or Barnstable County Cooperative Extension Service for assistance. For potential champion trees within the public right-of-way, civic associations or beautification committees should work to nominate trees through the Massachusetts State Forester. For more information, contact:

Secretary of Environmental Affairs
Department of Environmental Management
Division of Forests and Parks
100 Cambridge Street
Boston, MA 02202

American Forests National Register of Big Trees
P.O. Box 2000
Washington, DC 20013

TREE REPLACEMENT PROGRAM

Maintaining the existing trees along Route 6A is a critical step in ensuring that the majestic canopy which lines the roadway is there for generations to come. Equally important is planning for the replacement of trees which will require removal due to disease, loss during storms, or a hazardous condition. In particular, the removal of hazardous trees will minimize competition among other, more valuable or historic trees which can improve Route 6A's scenic quality and increase motorist safety. However, the scenic quality of the tree canopy will be jeopardized without replacement planting.

A total of 678 trees were targeted by Bartlett Tree Experts for removal because of poor health, poor growth characteristics, or interference with more valuable trees. Of these trees, approximately 366 were declared hazardous. Bartlett Tree also noted that 5% of the total tree population is White Ash. Many of these trees are exhibiting ash decline. This mycoplasmalike organism

is slowly killing the White Ash population and there is no cure. For more information, see *Appendix* for information on this disease and *Plant Care Using IPM Strategy*.

In order to address these issues, the Commission will work with the Massachusetts Highway Department to develop a Hazard Tree policy and begin implementation of this policy in 1995/96. This policy will need to include replacement planting. As noted in the *Review of Existing Regulations and Procedures* section, the Massachusetts Highway Department currently replaces trees which are removed. However, the Department uses its discretion in selecting the size, species and location for replacement planting. It is therefore recommended that the MHD consider incorporating language into the Hazard Tree policy and their existing contract specifications to plant replacement trees only on Route 6A and not on other routes. Recommended locations for replacement planting are as follows:

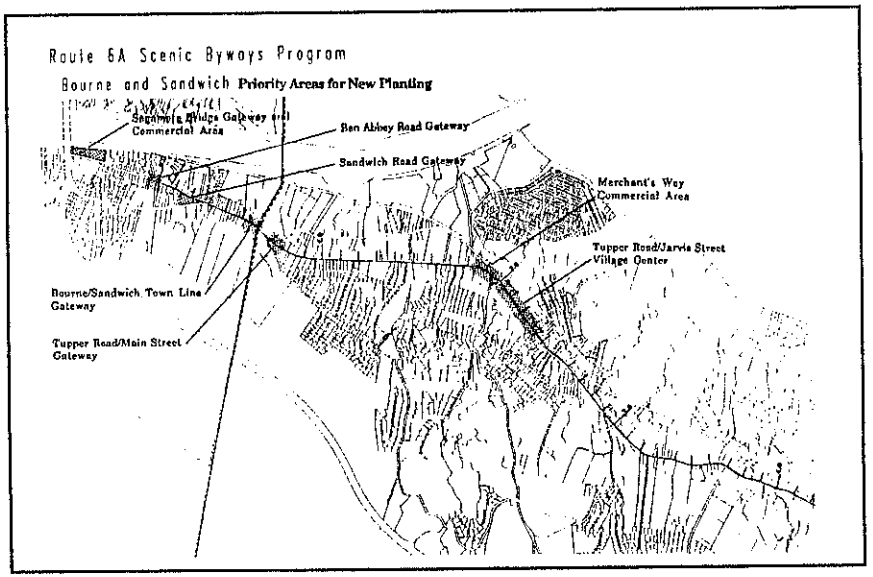
- in close proximity to the location where the tree was removed;
- set back on private property with the owner's consent;
- in areas designated for new tree planting on Route 6A.

See the section below on *New Tree Planting Program* for possible planting locations, and the section on *Recommended Plants and Planting Procedures* for recommended species and planting specifications. It is recommended that the MHD develop replacement tree planting specifications for Route 6A using these guidelines. In addition, trees should be planted at a size of 3" dbh depending on availability and species survival tolerance.

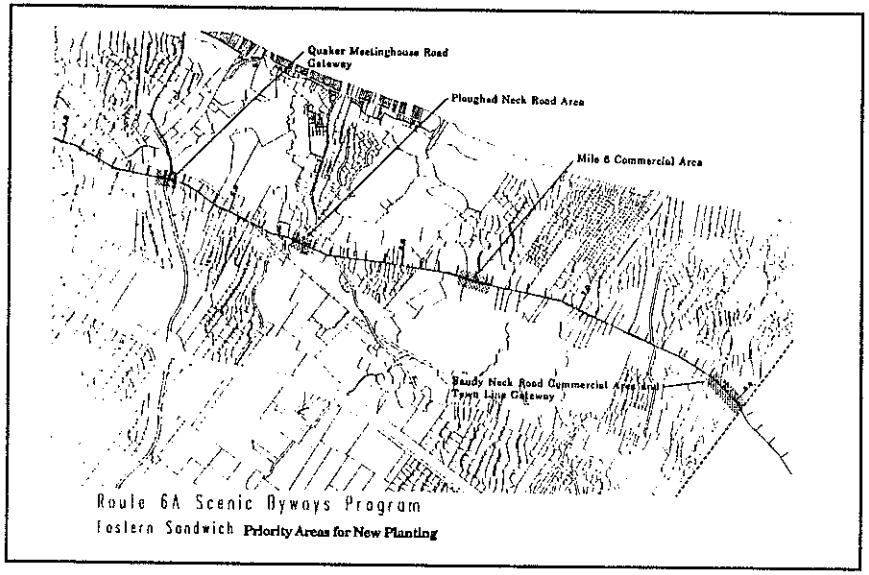
Replacement planting could be facilitated through the establishment of a regional nursery developed from tree seedlings currently growing adjacent to or under historic or significant trees along Route 6A. See *Implementation* section for more information on potential sources of replacement trees and the importance of establishing a Street Tree Advisory Board to assist in this effort.

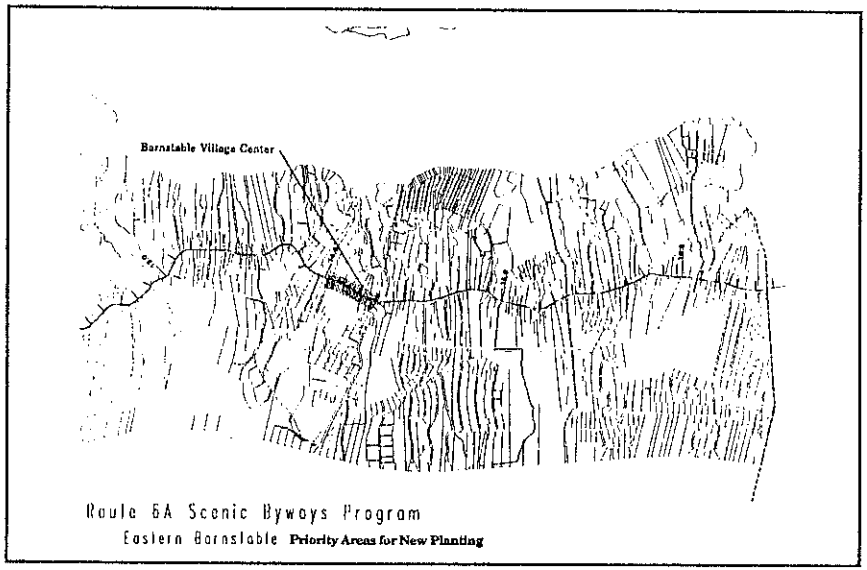
NEW TREE PLANTING PROGRAM

While the majority of the Route 6A corridor is graced by the beauty of a distinctive tree canopy, the initial inventory prepared for this study identified several areas where this tree canopy was absent. Therefore, priority areas have been established for each town along Route 6A based on the absence of tree canopy. New tree planting, however, is not recommended for locations where scenic views should be maintained (see section above on *Vista Pruning* for more information). For enlarged versions of the following priority area maps, see *Appendix*.



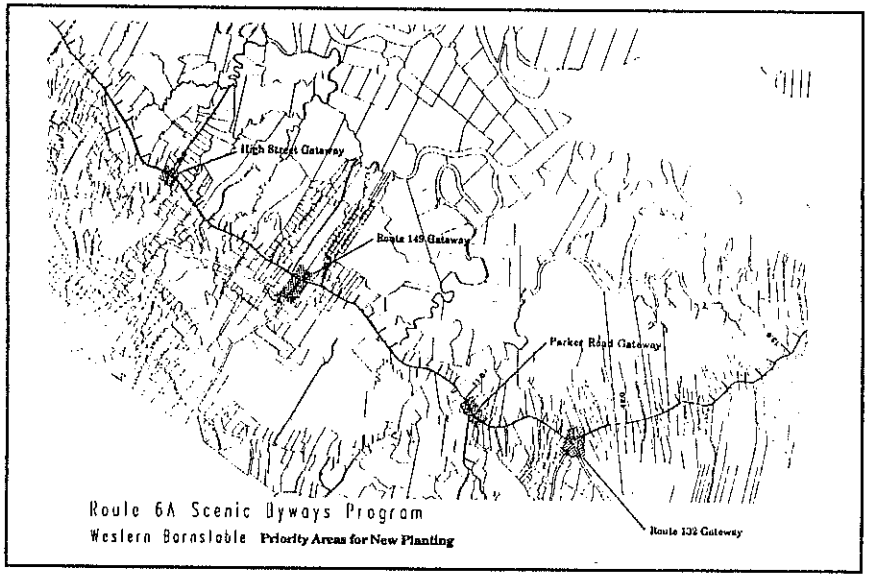
Priority locations for new planting include village centers, gateways to the corridor, and areas with existing commercial development. It should be noted that several priority areas are currently constrained by overhead utilities, existing curb cuts, intersection design or other man-made features that will need to be resolved before any new planting may take place. In particular, the placement of utilities underground would vastly improve the appearance of village centers and should be considered in any resurfacing project on Route 6A.

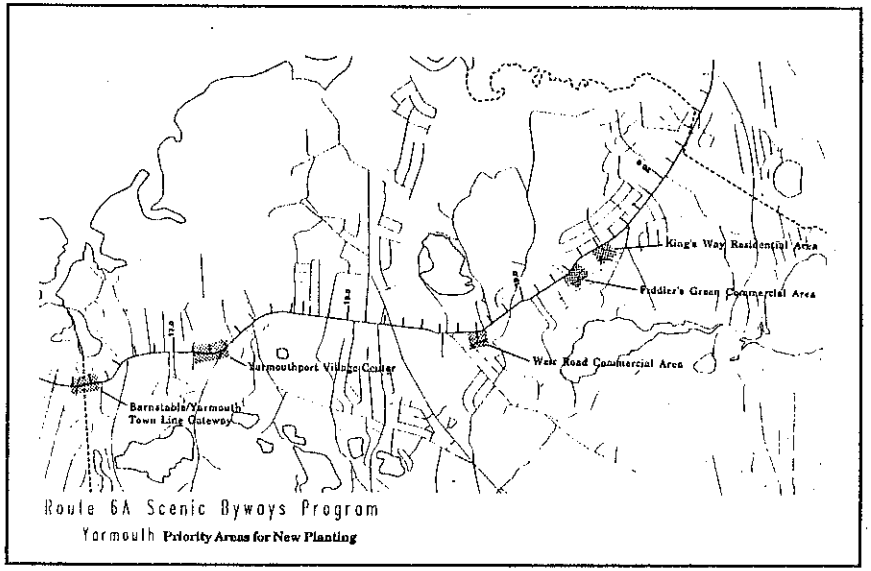


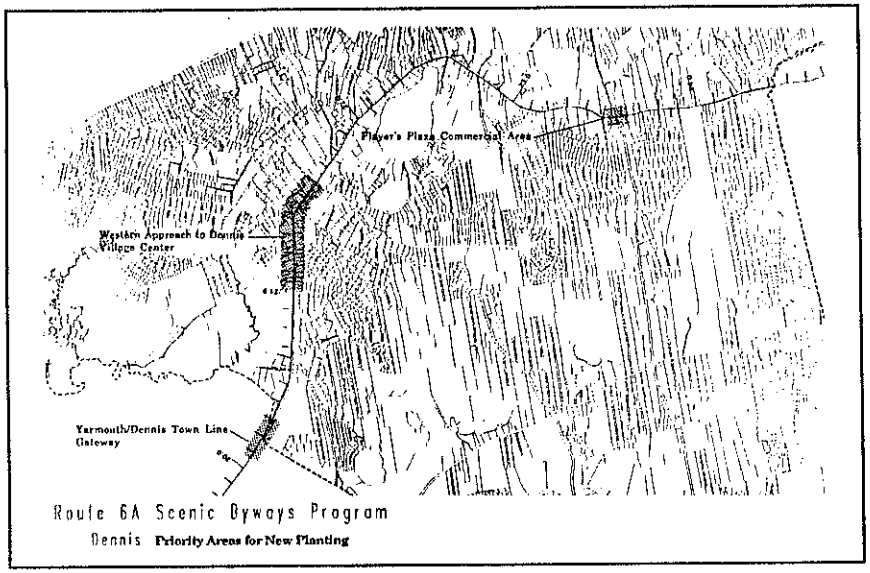


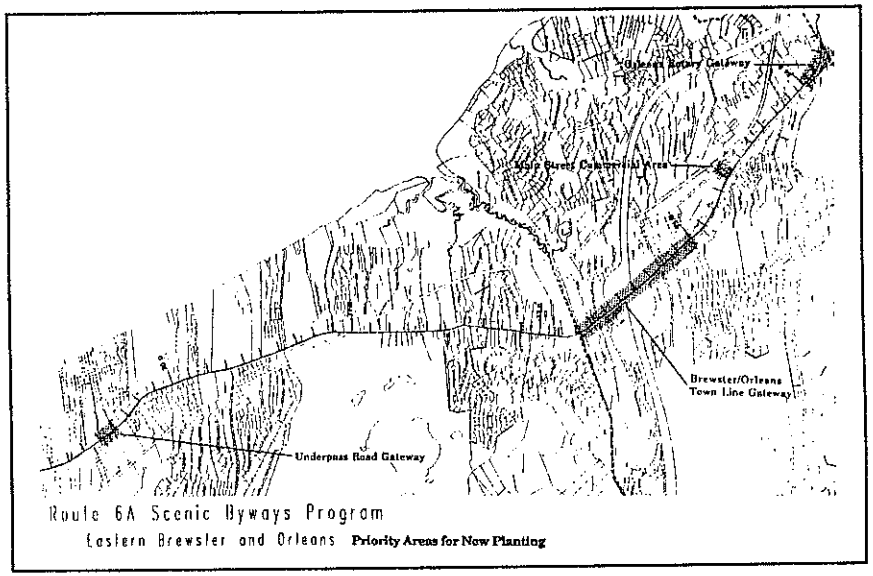
In addition to priority area planting, there are numerous opportunities to plant individual trees in a variety of locations along Route 6A. As in replacement tree planting, new tree planting on

Route 6A will require the cooperation and assistance of local officials, board members, abutters and volunteers in order to be successful. The establishment of a regional nursery may also

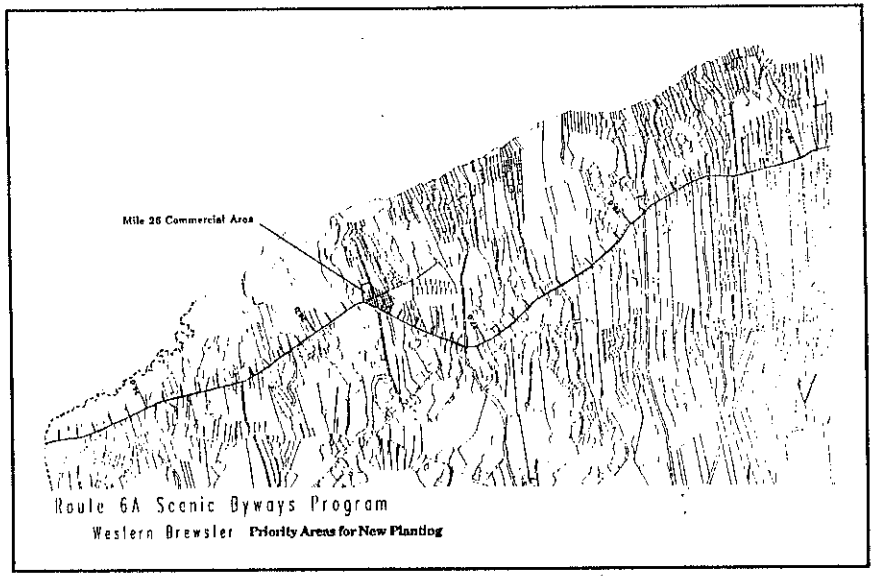








assist in new tree planting efforts over the long-term. It is recommended that a Street Tree Advisory Board be established to help coordinate new tree planting on Route 6A in Phase 3 and to pursue additional sources of funding. See *Implementation* section for more information.



RECOMMENDED REVISIONS TO REGULATIONS AND PROCEDURES

Guidelines for New Tree Planting • The review of development projects by the Old King's Highway Historic District Committees could be strengthened by establishing guidelines for new tree planting along Route 6A. Particularly for commercial development and residential subdivisions, it is recommended that the regulations include the submission of a landscape plan for consideration by the committee. At a minimum, this plan should include the following information:

- existing and proposed topography;
- location of existing trees and hedges;
- provision for existing vegetation to remain whenever possible;
- proposed planting plan which includes size,

genus and species, and quantity of plant materials; and
• erosion control methods, if applicable.

For additional assistance, refer to the section on Recommended *Plants and Planting Specifications* for species recommendations and specifications. It is recommended that the Old King's Highway regulations clarify that hedgerows are included within Old King's Highway jurisdiction, as this vegetation contributes significantly to the scenic and historic setting of Route 6A. For additional assistance in assessing historical landscape elements such as hedges, landscape plantings, and stone walls, contact the Cultural Resources section, Massachusetts Highway Department, at (617)973-7487.

Tree Trimming or Removal • As noted above, any tree trimming or tree removal requires the approval of the local Old King's Highway Committee or planning board. To assist in clarifying the purpose and extent of these activities by the MHD, it is recommended that a Memorandum of Understanding (MOU) be developed between the Old King's Highway Committee or planning board in each town and the Massachusetts Highway Department District 5 office. The MOU should establish a point of contact for each committee and a procedure for notification of any proposed work. It is also recommended that the MOU include a review of any proposed tree trimming or tree removal work by the local tree warden as well as oversight of actual tree trimming work by this official or the State Forester. Finally, the MOU should include a commitment to replace any trees removed only on Route 6A.

Zoning Bylaws, Subdivision Regulations • Zoning bylaws and subdivision regulations will have an impact on the character of Route 6A when new development is proposed. Therefore, it is recommended that the towns consider specific landscaping requirements for proposed development on Route 6A. These requirements should include increased front buffers and limits on the clearing of existing vegetation. For more information, refer to Brewster's Corridor Overlay Protection District (see *Appendix*) which provides for additional front landscaped buffers and tree planting on Route 6A. In addition, it is recommended that the local tree warden be included in the site plan review process for development projects on Route 6A.

The towns should also consider the development of entry planting, subdivision roadway tree planting, and buffer planting requirements for inclusion in local subdivision regulations. Existing vegetation should be retained wherever possible to screen new subdivisions from the roadway.

Design Guidelines for New Planting

INTRODUCTION

The following section illustrates guidelines for new and replacement planting along the Route 6A corridor. The guidelines focus on the role of vegetation in enhancing the scenic and historic qualities of Route 6A, while acknowledging some of the other design elements which play a role in enhancing these qualities. In preparing these guidelines, the Commission recognizes that further examination of the history of particular tree species and historic planting patterns along Route 6A is needed to guide future planting efforts.

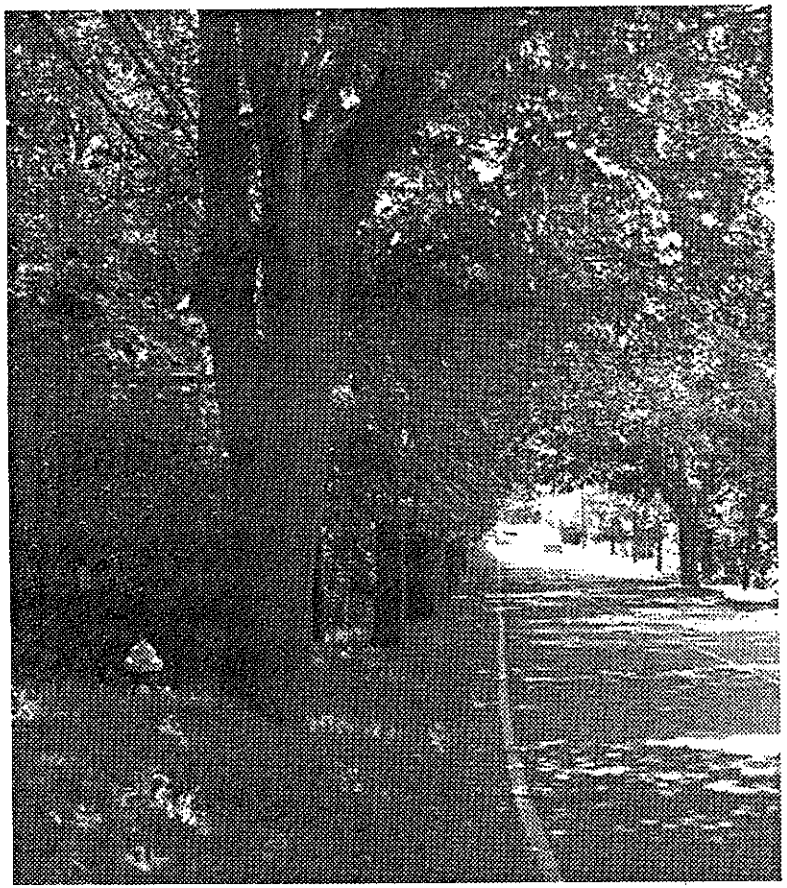
The guidelines are intended for use by designers, beautification committees and board members, as well as residents interested in landscape design. It should be noted that the Massachusetts Highway Department must approve any alterations, which includes any type of planting, within the state highway layout. In addition, plant materials should be carefully located so that an adequate stopping sight distance for vehicles is maintained.

REINFORCING THE LINEAR CORRIDOR

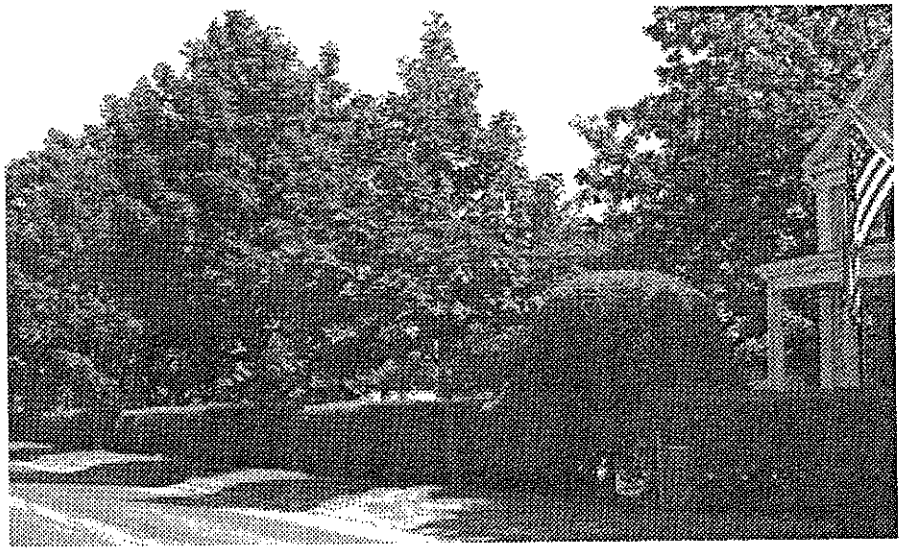
Vegetation has played a key role in emphasizing the winding nature of the Route 6A corridor, thereby contributing to its scenic beauty. In particular, the thousands of planted trees provide a pleasing rhythm for passersby. The many hedgerows which line Route 6A also help to create a sense of enclosure and human

scale to the roadway. In carrying out new planting along Route 6A, consider the following alternatives to reinforce this linear effect:

Regularly spaced tree planting • Plant new trees in areas currently lacking tree cover wherever possible. New tree planting, however, is not recommended for locations where scenic views should be maintained, such as around marshes and wetlands. Trees should be spaced at regular intervals according to their expected mature size. In addition, a number of different species should be planted in any one area to reduce the potential spreading of any pest or disease that may infect a particular species. Refer to the Tree Tables in the *Recommended Plants and Planting Procedures* section for recommended spacing and setback from the edge of pavement. Also see below for guidelines on *Planting Under Utility Lines.*



Regularly spaced trees provide a pleasing rhythm



Hedges used to maintain the street edge in Yarmouthport

Hedges • Historically, formal hedges such as privet have been used to maintain the street edge on Route 6A. Both formal or informal hedges are a good alternative if the planting area is of limited width, or if overhead utility lines are present. Refer to the Hedge Table in the *Recommended Plants and Planting Procedures* section for recommended setbacks for hedges from the edge of pavement. Periodic trimming is strongly recommended where a sidewalk is immediately adjacent to a hedgerow.

Hedges and trees • Used in combination, hedges and trees are a very effective means of creating both enclosure as well as a visual and sound absorptive buffer.

Other plant materials • Planted in masses or drifts, other plant materials such as bulbs, perennials or shrubs can help to emphasize the linear corridor while providing seasonal color and interest in the Route 6A landscape. Towns may consider a bulb or perennial as a theme plant for public or private planting efforts.

PLANTING UNDER UTILITY LINES

Overhead utility lines on Route 6A pose significant constraints for any new tree planting. The following guidelines are designed to minimize conflicts between overhead utility lines while maintaining the sense of enclosure which contributes to the scenic quality of Route 6A:

Hedges • Hedge planting is a good alternative for many locations with overhead utility lines. Refer to the Hedge Table in the *Recommended Plants and Planting Procedures* section for recommended species and spacing.

Small trees under utility lines in Barnstable

Small trees • Small trees under 30 feet in mature height may be planted to avoid the need for substantial pruning as trees mature. It should be noted, however, that small trees will not contribute significantly to the overall tree canopy, but recommended species often have flowers, fall color or other seasonal interest.

Medium or large trees • Where overhead utility lines are directly adjacent to the edge of pavement, medium or large trees may be planted behind utility lines, provided that adequate separation is maintained. Refer to the Tree Tables in *Recommended Plants and Planting Procedures* for recommended setbacks from pavement and utility lines. In some cases, a certified arborist or local tree warden may determine that site characteristics warrant placement of large trees closer to utility lines than is recommended in this plan.

TRANSITION AREAS

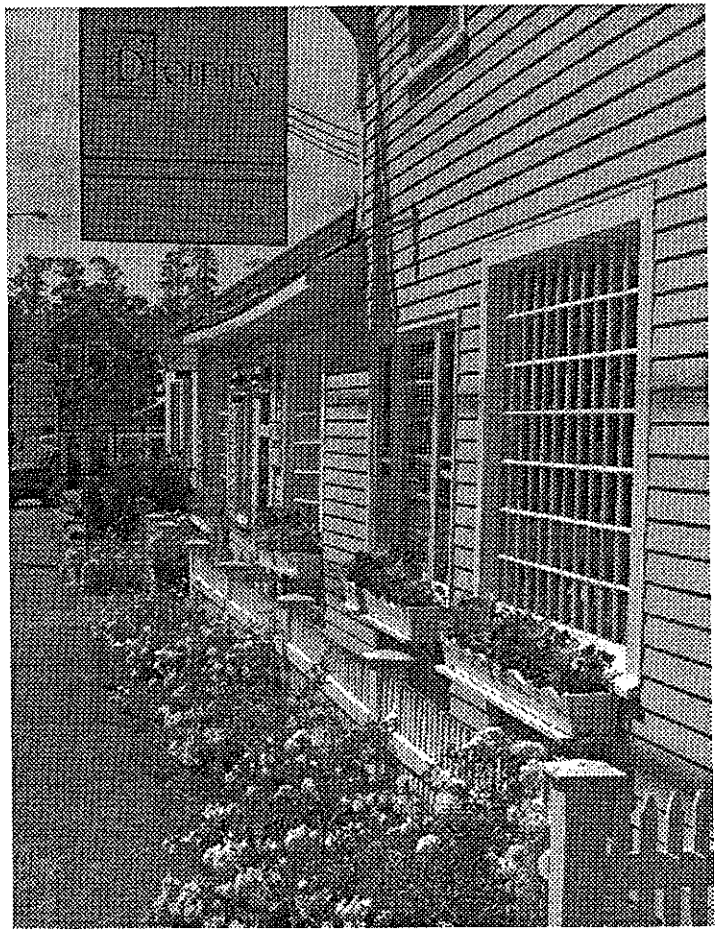
Transition areas consist of those locations where changes in development scale or land use occur along Route 6A, such as from residential to commercial land use, or from residential use to the more densely developed village centers. Town lines are also transition areas which serve as gateways or entrances to each community along Route 6A. The following guidelines identify different ways to blend these locations into the surrounding landscape and to celebrate the unique qualities of each community:

Village centers • The transition from rural or residential use to village centers on Route 6A can be improved by a well-defined village streetscape. Planting shade or flowering trees can help to create shade for pedestrians and provide seasonal interest. Low fences and/or hedges can also be used to define the streetscape edge. Flower planting in containers or window boxes are also encouraged during the summer months to create visual interest.

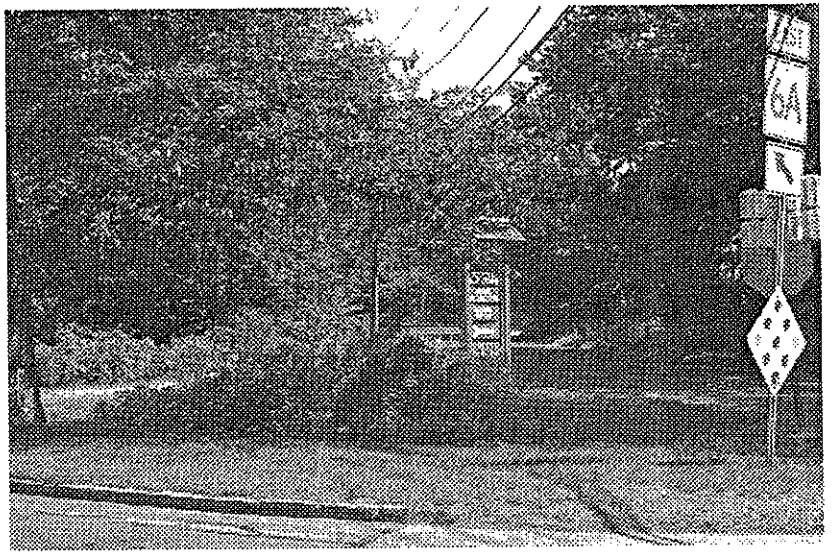
Town lines • Planting at the town lines can help to identify these transition areas and also serve to reinforce each community's distinct identity. It may be desirable to develop a common theme for planting at all of the town line locations. Planting design should reflect the historic and natural landscape of Route 6A with

highly stylized landscape treatments discouraged.

Gateways • Numerous roadways which intersect with Route 6A serve as gateways or entrances to the corridor. The sense of arrival to Route 6A may be enhanced through tree planting, bulbs, perennials, shrubs or groundcover. As in town line planting, gateway treatments should reflect the historic and natural landscape of Route 6A.



Flower planting helps to beautify the Route 6A streetscape



An attractive gateway perennial planting in Sandwich

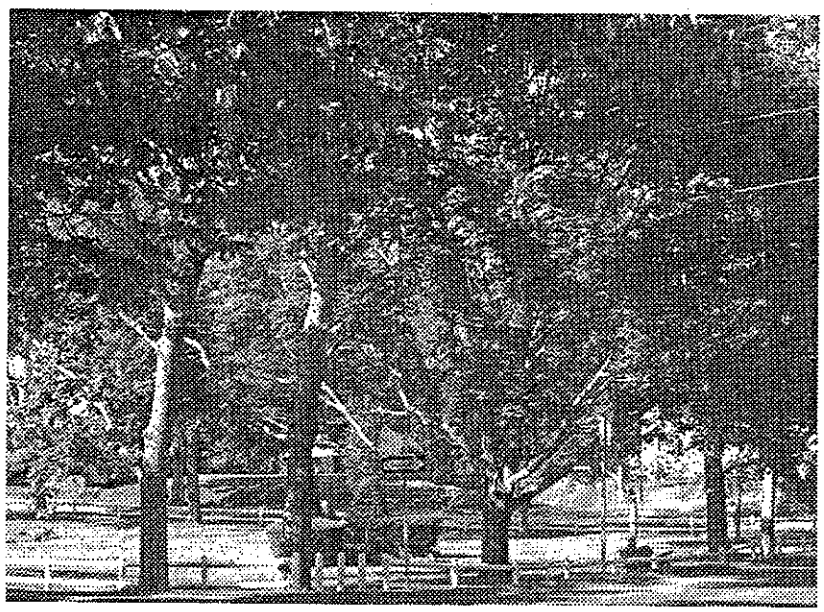
TOWN COMMONS

Town commons have special historical and cultural significance which extends beyond their role in providing open spaces on Route 6A. Town greens and commons were historic meeting and gathering places for the community at large. Some commons may have served as community market places for early villages and settlements along the route and as militia training grounds. Today, many contain pedestrian amenities and accommodate a wide variety of recreational activities. Town commons are a visual amenity for the corridor as well. Opportunities to preserve and enhance existing commons and greens are strongly encouraged along Route 6A. Consider the following design elements as suggested by the Department of Environmental Management's publication Common Sense:

Tree planting • Tree planting in a common has a functional as well as a design purpose. Trees provide shade during the summer months and define space by providing enclosure. Simple, traditional tree planting will help to provide the common with a

unified design. Historical research into past planting patterns should be conducted to determine locations for new tree planting. It is recommended that trees be planted in rows, groups or blocks. Trees can also be used as a visual focus for the common.

Turf • Green lawns provide comfort, visual appeal and erosion control. Turf areas are often used as multi-purpose recreational areas on town commons. Therefore, lawn areas need to be well-maintained to preserve the common's appearance.



This Yarmouthport common is graced with mature shade trees

Paving • Most commons on Route 6A are without significant paved areas. However, if pedestrian use requires paving materials, high quality, traditional materials are recommended. Prior research and careful design should be conducted to maintain the historical integrity of the common.

Walls and fences • Walls and fences help to define the common, direct pedestrians, and provide safety in high traffic locations. Fences and walls may be used to introduce rhythm to the space. Fences should complement other design elements on the common and be constructed of durable materials. Hedges may also be used to define space in lieu of fences where appropriate.

Site furnishings • Site furnishings include benches, gazebos, lighting, water fountains, trash receptacles, bicycle racks, and signs as appropriate. These elements can help to unify a common as well as providing facilities for pedestrians and users of the common. As in walls and fences, site furnishings should complement other design elements and reflect the historic character of the Route 6A corridor.

Ornamental features • Features include plaques, monuments, and statues, which provide a visual focus to the common. If new features are proposed, they should be based on the historic and/or cultural significance of the site.

COMMERCIAL AREAS

Areas which contain a concentration of commercial uses and large-scale commercial developments are often characterized by a lack of tree planting or other landscape treatment. These areas stand in sharp contrast to adjacent rural or residential areas. Design issues to consider include entry road treatment, buffers and tree planting in parking lots.

Land use transition • Plant new trees or other landscape materials along Route 6A to provide a gradual transition from residential or rural areas to commercial areas.

Buffers • In creating new commercial development, retain existing vegetation or plant new trees or shrubs along Route 6A to screen the development from the roadway. Towns should consider increasing buffer requirements along Route 6A where appropriate.

Trees in parking lots • Towns should consider increasing the ratio of trees to parking spaces to reflect most subdivision regulations. A ratio of one street tree/40 feet or one street tree/four parking spaces is recommended for commercial development to improve the appearance of parking lots from the roadway as well

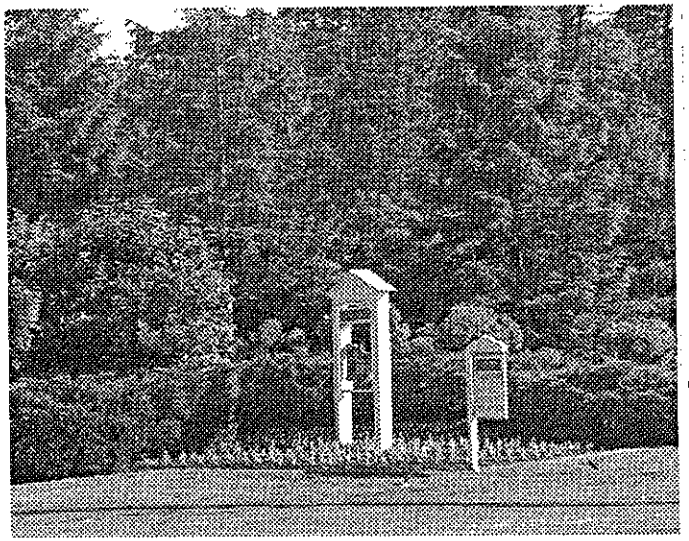
as to provide shade and other environmental benefits. Planting islands in parking lots should be sized according to the mature size of the tree to be planted. See section on Recommended Plants for Route 6A for tree lawn/bed widths.

Entry plantings • Shrubs and flowering trees should be included along the site drive to a new commercial development to create a sense of arrival. The use of hedges or traditional plant materials consistent with the historic character of Route 6A are encouraged.

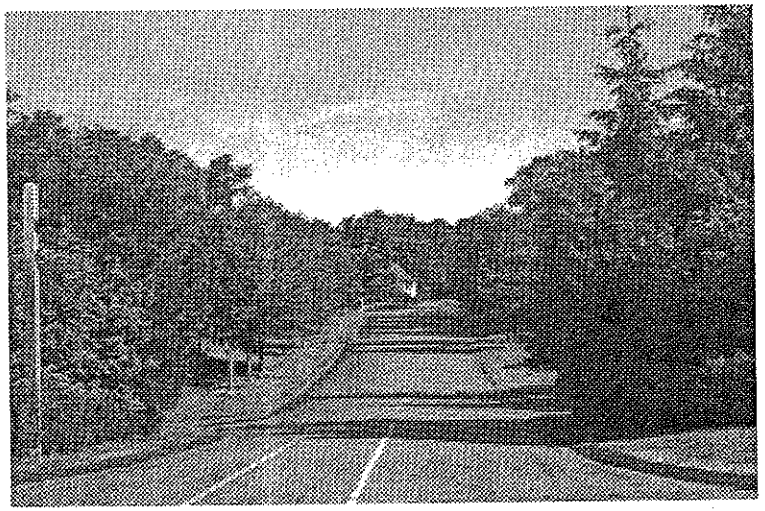
RESIDENTIAL SUBDIVISIONS

Subdivision roadways will have an impact on the character of the corridor where they intersect with Route 6A. Consider the following in the design of new subdivisions on Route 6A to limit views of new development and maintain the rural characteristics of the corridor:

Entry planting • Attractive entry landscaping can enhance the appearance of residential subdivisions. Select a variety of species



Entry planting for a residential subdivision on Route 6A



New and existing trees buffer this residential development from the roadway

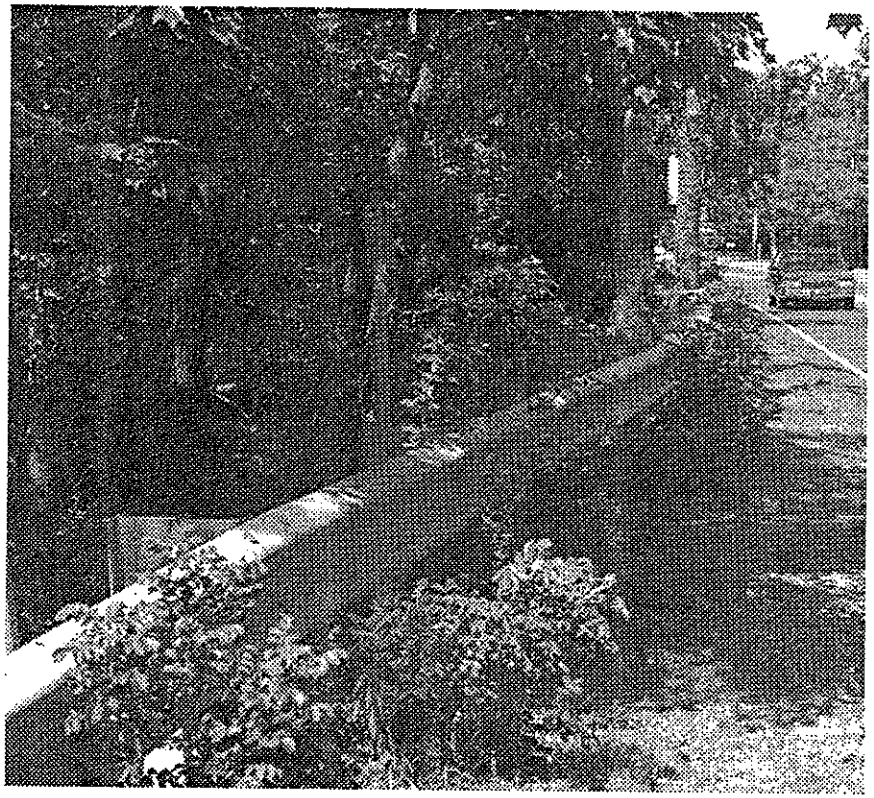
in mass plantings. As in commercial development, entry plantings should reflect the historic character the Route 6A landscape. Entry plantings should also utilize any boulders uncovered in the course of site preparation work or incorporate stone walls in entry planting.

Subdivision design • Wherever possible, existing vegetation should be retained to visually screen new residential development from Route 6A. Where removal of existing vegetation is necessary, replant any cleared areas adjacent to Route 6A with trees or other vegetation to provide a wooded buffer.

ROADWAY APPURTENANCES

Inconsistent design elements along the roadway such as steel guardrails, drainage swales, and chain link fencing can create a significant visual impact on the scenic and historic character of Route 6A. These visual impacts can be minimized through the use of plant materials to soften and blend these structures into the surrounding landscape. It should be noted that a Highway

Access Permit may be required from the Massachusetts Highway Department for this type of planting. In addition, the MHD should be consulted prior to any planting to ensure that plant materials are not pruned or removed during roadside maintenance.



Recent Rosa rugosa planting to soften existing guardrails

Plant materials • Vines, groundcover or low-maintenance shrubs may be used to soften and screen guardrails, drainage swales and chain link fencing. Use plant materials that are effective year-round and require a minimal amount of maintenance. See Plants for Special Uses Table in the *Recommended Plants and Planting Procedures* section for recommended plant materials.

Recommended Plants and Planting Procedures

PLANTING SPECIFICATIONS

The purpose of this section is to provide technical information to guide the installation of plant materials, in particular trees, along Route 6A. Prior to doing any new planting, a careful analysis of the site should be performed so that plant materials can be matched to site conditions. Plant materials should always be of the highest quality and free from pests or disease at the time of purchase. In addition, species diversity should be maintained in any one area to reduce the potential spreading of any pest or disease that may infect a particular species.

Plant Selection • Choose plant material that will most readily adapt to the particular conditions of the site. Factors that may vary at each planting site include soil limitations, exposure, wind velocity, soil moisture, and temperature fluctuations. These conditions may vary from one side of the road to the other or from one block to another.

Protection During Construction • Protection of trees from mechanical injury caused by construction equipment and vehicles will reduce wounds on trunks and root systems of trees that allow the entry of disease organisms or pests. Protective measures could be as simple as constructing a fence or similar barrier around an area as large as the rootzone with the tree or group of trees in the middle. This will prevent damage to trunks, roots, and low hanging branches caused by physical injury and soil compaction.

Protection from changes to the grade over the rootzone and around the trunk are also important to ensure that the water, mineral and oxygen supply to the roots is not restricted. Decline and death of trees and shrubs can be caused by raising or lowering the grade around the rootzone and trunk of the tree by as little as 3 inches. If gentle grading away from the trunk flare and

surrounding rootzone is not possible, retaining walls should be constructed to protect trees from changes in grade.

Trees need to be protected during excavation for water and sewer lines. If the trench cannot be routed around the tree, the next best alternative is to tunnel under it. Power-driven soil augers may be used for this purpose. If this is not possible and the trench must pass by the side of the tree, some basic guidelines apply. These include trenching as far from the tree roots as possible in order to cut the fewest roots possible, and cutting them cleanly. Backfill the trench as soon as possible to reduce root exposure to air. The use of asphalt-based paint on cut root ends is no longer recommended.

Planting Hole Preparation • When digging planting holes, it is important not to use large machinery such as backhoes. This results in soil compaction through which roots will not grow. Hand digging of the hole or the use of tree spades is recommended. It should be noted that the use of tree spades can result in glazing of the soil along the inside of the hole. This glazing creates a barrier to the growth of roots into the surrounding soil and should be scraped off to ensure that roots may grow unimpeded into the adjacent soil.

The most recent school of thought regarding planting hole preparation recommends that it is more important to prepare a wide planting hole than a deep one because most feeder roots are located within the top 6" to 12" of the soil. In addition, roots often extend over an area two to three times larger than the canopy of a tree. Therefore, the diameter of the planting hole should be loosened (thus improving aeration) up to three to five times the diameter of the root ball. In addition, the planting hole should be no deeper than the root ball as measured from the trunk flare to the bottom of the ball. Holes dug deeper than the root ball often result in settling of the plant to a point above the trunk flare, increasing its chances of trunk rot, decline, and mortality.

Tree Lawn Width • Most tree/sidewalk or tree/roadway interference on Route 6A can be avoided by selecting species that are compatible with the site. Trees should not be planted where tree lawns are less than three to four feet wide. The width of tree lawns or beds should be based on the mature size of the tree to be planted. For recommended tree lawn widths, refer to the following Tree Tables.

Planting Procedures • Landscape plants are available from nurseries bare root, balled and burlapped (B&B), or containerized. Planting procedures will differ with the type of planting stock as follows:

Bare Root. After preparing the planting hole, bare root trees should be planted on compacted mounds within the planting hole. Spread the roots over the mound. Backfill the hole, taking care not to place soil on top of the root collar or against the stem. Create a saucer of soil to aid in irrigation.

Container Plants. Dig the planting hole no deeper than the depth of the root ball. In clay and poorly drained soils, dig the hole from two to four inches shallower than the root ball. Remove the plant from the container and ease the roots out of the ball. If the roots are densely matted, slice the outer root ball two or three times with a knife to separate the roots. Backfill the planting hole and create a saucer of soil to facilitate irrigation.

Balled and Burlapped Plants. To plant balled and burlapped plant material, the hole should be as deep as the bottom of the root ball to the beginning of the trunk flare. Remove excess soil from the top of the root ball to the trunk flare juncture. When the tree or shrub is set into the planting hole, this juncture should be no deeper than the existing grade. Once the plant is set into the hole, all twine, wire, rope and burlap should be removed from around the root ball.

The most current recommendation for backfilling the planting hole is to use the unimproved soil that was removed from the hole. This is preferable to adding large amounts of organic matter such as compost and peat. Tree roots planted in holes improved by the addition of these materials have been shown not to grow into the surrounding soil, but instead stay within the improved soil zone. This creates a rootbound effect within the planting area that reduces the mature size of the tree as well as its vigor. However, if the existing soil is very sandy, rocky, or consists of

poor fill, the addition of organic matter or a quality topsoil of similar texture to the existing soil may be necessary as backfill.

Carefully tamp the soil lightly to remove air pockets during the backfill process. Another method to remove air pockets is to fill the hole halfway with soil, water thoroughly and allow it to drain. Finish filling the hole and thoroughly water again.

Soil Compaction after Planting • Trees require adequate oxygen, water and nutrients to overcome transplanting shock and to grow and thrive. Soil compaction after transplanting can restrict these essential elements and result in tree mortality. For this reason it is important that measures are taken to prevent vehicular or pedestrian traffic over any recently planted area. Suggestions for reducing or eliminating compaction caused by traffic include planting groundcovers over the planting area, or installing a barrier around the planting area.

In areas of frequent foot traffic, it may be necessary to take stronger measures to prevent soil compaction. These would include tree grates, of which many types are available. They should be installed according to manufacturers directions.

Staking • Research has shown that trees that are allowed to sway in the wind develop stronger trunks and larger root systems than trees that are firmly staked. Although opinions differ about staking trees at the time of planting, it is generally agreed that not all trees need staking. Trees with strong trunks may only need stakes without guy wires to prevent mower damage to the trunk. Small trees without heavy canopies may not need staking. However, if the root ball of a tree is not stable in the soil such as in the cases of bare root plant material, if the canopy is oversized for the rootball, or if the planting location is windy, the tree should be staked as low to the ground as possible with loose guy wires in order to keep the root ball stable and still allow the tree to sway slightly. Guy wires that are taut often result in physical damage caused by rubbing against the bark. In most cases, the stakes should be removed at the end of the first full growing season.

Mulching • Properly carried out, mulching will reduce weeds, moderate soil temperatures, conserve soil moisture around the root ball, and provide an attractive appearance. Improper mulching can damage the health of the plant by providing an attractive environment for pests or rodents. After planting, apply an organic mulch around the rootzone only at a depth of two to four inches. The mulch should be pulled back from the immediate base of the tree to allow for air circulation.

Irrigation • Sufficient watering is critical to the survival of transplanted trees and shrubs during the first year. Studies show that stress brought on by drought or underwatering is one of the most important factors in tree decline and mortality among newly planted trees. For the formation of healthy root growth, plant material should be thoroughly watered at the time of planting. During the first growing season, plants should be deeply watered at least once a week in order to become established. Existing trees should also be watered in the spring to leach accumulated salts from the soil as well as during periods of summer drought.

Applying Fertilizer • Fertilizer should be applied in accordance with soil test results. Nitrogen will usually be the mineral most needed. At the time of planting, avoid placing water soluble nitrogen fertilizer directly into the planting hole to prevent injury to the roots. If needed, a slow release or organic fertilizer can be used in the planting hole, or fertilizer can be applied to the surface of the planting area according to manufacturer's directions. If fertilizing is desired in subsequent years, follow manufacturer's directions and broadcast fertilizer on the surface of the planting area.

Tree Wrapping • Some injuries to the bark are caused by sun damage (sunscald) or temperature extremes (frost cracks). In order to protect the bark from such injuries, nurserymen have commonly wrapped the bark of thin-skinned trees with tree wrap designed to reduce damage of this kind. Recent research indicates that tree wraps may not offer the protection that was intended. Some tree wraps have been found to retain excess moisture underneath the wrap, encouraging fungal or bacterial growth. This can be serious if wounds exist in the trunk before the wrap is applied. If it is necessary to use tree wrap, it is recommended that an appropriate material be selected, that the

trunk be checked frequently, and that the wrap be removed during periods of active growth.

Pruning young trees • The goal of pruning young trees at the time of planting and every year thereafter is to begin shaping them correctly so that future health and structural problems may be avoided. If young trees are not pruned correctly, structural problems may occur that require cabling or bracing at a later time or may result in early decline or mortality.

After planting, inspect the tree for root suckers, water sprouts, broken, dead, crossed, conflicting, or split branches and remove them. Some research has shown that recovery from transplanting shock and post-planting growth is more rapid for trees on which a minimal amount of pruning is performed. However, pruning back lower branches or thinning the crown at this time can actually stunt root development.

The training of young trees usually begins a year or two after planting and should occur every year thereafter. In a single year, no more of the tree should be pruned than is necessary to enhance the shape or structural strength of the tree.

In the first year, prune so as to begin encouraging a central trunk or leader or well spaced multiple trunks or leaders, depending upon the growth habit of the species or specimen. Removing, heading, or thinning lateral branches which have grown higher than the tip of the terminal leader is also important in encouraging a central leader.

Pruning in subsequent years should continue as necessary. Prune back any branches that compete with the leader and protrude from the crown. Any laterals that have grown inward toward the center of the crown, or unnaturally downward should be removed, as well as water sprouts or root suckers.

Pruning established Trees • See *Appendix* for Tree Maintenance Specifications for established trees.

Pruning Hedges • Hedges may have a naturalistic and informal shape, or may be formally sheared. Naturalistic hedges used for screening may need no more than selective annual pruning to encourage attractive new growth and remove old wood. Plants that create attractive informal hedges include barberry, burning bush and certain spireas. Formal hedges generally require more frequent shearing, possibly several times a year. Plants that tolerate shearing and therefore make good formal hedges include yews, privet, Amur and hedge maples. Both types of hedging require careful pruning.

The first shearing each spring should occur shortly after the main flush of spring growth has matured, usually in early July. Shearing should be repeated as needed throughout the summer. When mature, a properly formed hedge will have a narrower width at the top of the hedge than at the bottom, allowing sunlight to reach the lower branches as well as the upper branches and preventing gaps from occurring.

Soil Salt Levels • Sodium chloride used as a deicing agent, while essential for ensuring public safety, is tremendously damaging to street trees. As snow laden with salt melts, it runs off the road into the rootzone of trees along the sides of the road. Once in the soil, it breaks down into separate chloride and sodium ions. The results are twofold. The chloride ions which are absorbed by the roots collect in the buds and leaves and result in marginal leaf necrosis or wilt. The sodium ions which remain in the soil cause a loss of soil structure which make it much more susceptible to compaction. This problem may persist if rainfall or heavy irrigation in the spring does not leach the salt out of the soil.

To reduce the problems associated with high salt concentrations, snow removal agencies should consider mixing sand, light gravel, or cinders with the salt to reduce the concentration of sodium chloride. In addition, the piling of salt-laden snow around the bases of trees should be avoided, and trees should be watered thoroughly in the spring to help alleviate the detrimental effects of road salt runoff.

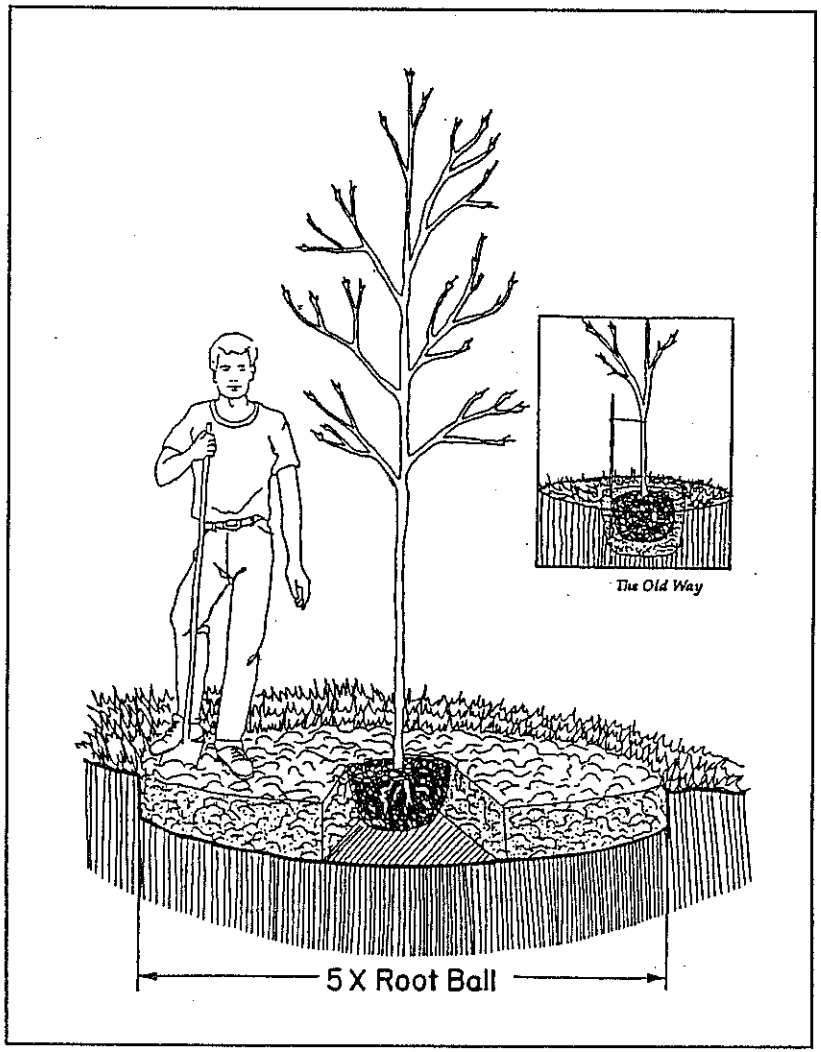
SELECTED TREES, HEDGES AND PLANTS FOR SPECIAL SITUATIONS

The following tables list plant materials which are adaptable to the environment of Cape Cod. Plant materials were selected with the assistance of the Barnstable County Extension Service based on their resistance to pests and diseases and low maintenance requirements, such as watering, fertilizing, application of pesticides, and pruning. For these reasons, plants selected are not limited solely to native plant materials but rather favor those species which will adapt best to Cape Cod's climate and environmental conditions. The tables are divided into the following categories:

- Small, Medium and Large Trees
- Evergreen trees
- Hedges
- Plants for Special Situations

The Medium, Large and Evergreen tree tables include recommended horizontal distances between trees and overhead utility lines, as well as recommended horizontal distances between trees and the edge of pavement for those locations without overhead utilities. These distances are listed as a range in order to allow for different site conditions and to provide flexibility in creating a future tree canopy over the roadway. A certified arborist or the local tree warden may determine that in certain locations, site characteristics warrant planting trees closer to utility lines or the edge of the roadway than is recommended below.

Hedges may be used in addition to or in place of trees in certain situations to provide enclosure along Route 6A. The Plants for Special Situations table lists recommended plant materials to be used in screening roadway appurtenances such as steel guardrails and chain link fencing.



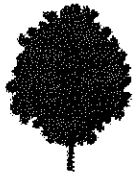
(Reprinted courtesy of Bartlett Tree Research Laboratories)

Recommended planting site preparation

Small Trees under 30 feet

These trees are suitable for use near or under power lines.

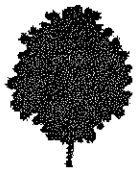
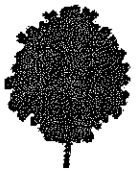
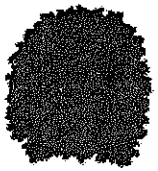
All trees in this category should be planted in a tree lawn at least 3 - 4 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing in feet on-center	Distance between road edge and trunk when under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible	Notes
	Acer buergeranum Trident Maple	s		p	20 - 25'	20 - 25'	15'	10'	s - m	m	a, f				r	attractive bark, tolerates acidic soil and some drought
	Acer ginnala Amur Maple	s sh			15 - 25'	15 - 25'	15'	10'	m - s	m - d	a	x	x		r	easily transplanted, fragrant flowers, extremely hardy, usually multistemmed, may require pruning to tree form but may be purchased as a single stem specimen, tolerates shearing, good scarlet fall color, may be considered by some to be invasive due to copious seed production
	Acer griseum Paperbark Maple	s			20 - 30'	20 - 30'	15'	10'	s	m	a				r	exfoliating bark, relatively maintenance-free, adaptable to most soil types including clay, red-scarlet fall foliage

Small Trees under 30 feet

These trees are suitable for use near or under power lines.

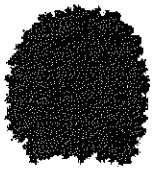
All trees in this category should be planted in a tree lawn at least 3 - 4 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing in feet on-center	Distance between road edge and trunk when under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible	Notes
	Acer tataricum Tatarian Maple	s sh			20'	20'	15'	10'	s - m	m - d	a				r	well shaped, needs little care, drought tolerant once established, adaptable to a wide range of conditions, often multistemmed
	Acer triflorum Three-flowered Maple	s sh			20 - 30'	20 - 30'	15'	10'	s - m	m	a, f				r	exfoliating bark, prefers moist acid soils, fall color ranging from yellow to red
	Cornus kousa Kousa Dogwood	s			20 - 30'	20 - 30'	15'	10'	s - m	m - d	f, s	x	x		r	wind intolerant, somewhat drought tolerant, resistant to dogwood anthracnose and gypsy moth, exfoliating bark on mature specimens, prefers rich, deep, moist, acid soils
	Cotinus coggygria Common Smoketree	s sh			10 - 15'	10 - 15'	10'	10'	m	m	s, a, f	x		s	r	adaptable to varying soil types, pH, and dry soils, usually multistemmed, easily regrows when damaged by snow or ice, several forms available with differing foliage colors

Small Trees under 30 feet

These trees are suitable for use near or under power lines.

All trees in this category should be planted in a tree lawn at least 3 - 4 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing in feet on-center	Distance between road edge and trunk when under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible	Notes
	Cotinus obovatus American Smoketree	s			20 - 30'	15'	10'	10'		d - m	s, a, f				r	tolerates drought and alkalinity, usually multistemmed, excellent scarlet fall foliage
varies according to variety	Malus spp. Crabapple	s		t	15 - 20'	varies	15'	10'	m - f	m - d - w	f	x	x	r	r	hardy and easy to grow, tolerant of intermittent drought or flooding, susceptible to Japanese beetles, suggested varieties include "tschonoskii", "Sargentii", "floribunda", "Zumi calocarpa", and "hupehensis"
	Ptelea trifoliata Hoptree	s sh	x	t	15 - 20'	15 - 20'	15'	10'		m	s, a, f	x			r	interesting native with fragrant flowers in June

Small Trees under 30 feet

These trees are suitable for use near or under power lines.

All trees in this category should be planted in a tree lawn at least 3 - 4 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing in feet on-center	Distance between road edge and trunk when under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible	Notes
	Pterostyrax hispida Fragrant Epaulette-tree	s			20 - 30'	20 - 30'	20'	10'	m	m	a, f	x			r	prefers acid soils and protection from strong winds
	Stewartia koriana Korean Stewartia Stewartia pseudo-camellia Japanese Stewartia	s sh			20 - 30'	10 - 15'	10'	10'	s	m	f, a	x			r	exquisite bark and fall color, very hardy, difficult to transplant when large
	Syringa reticulata Japanese Tree Lilac	s			20 - 30'	12 - 15'	10'	10'	m	m	f	x			m	sometimes multistemmed, easy to transplant, excellent for street tree use, tolerant of drought, wind and pH, intolerant of standing water, resistant to lilac borer and powdery mildew, "Ivory Silk" and "Summer Snow" are recommended cultivars

Medium Trees from 30 to 45 feet

These trees should be planted with caution under power lines or setback from utility lines as recommended in the following table.

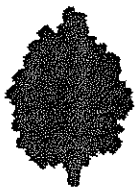
All trees in this category should be planted in a tree lawn at least 5 - 6 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height.	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Acer platanoides "Crimson King" Crimson King Maple	s sh		t	35 - 45'	20 - 30'	25'	18'	10'	m-f	m	a	x		r	m	dark maroon foliage all season, withstands urban conditions, poor soils, wind, cold, and seashore conditions, prone to aphids, verticillium, copius seed production may cause weediness
	Halesia carolina Carolina Silverbell	s sh		t	30 - 40'	20 - 30'	25'	18'	10'	m	m-w	f	x			r	prefers acid soils, deep rooted, shelter from winter winds
	Koelreuteria paniculata Golden Rain Tree	s		t	30 - 40'	30 - 40'	25'	23'	10 - 15'	m-f	m-d	s, a, f	x	x	s	r	tolerates drought, heat, cold, wind, pH, varying soil types, and air pollution, specify straight trunk and good branch structure from nursery, short-lived, transplant when young
	Magnolia kobus Kobus Magnolia	s sh			30 - 40'	30 - 40'	30'	23'	10 - 15'		m-d	s, f, a	x			r	tolerant of high pH, often multistemmed

Medium Trees from 30 to 45 feet

These trees should be planted with caution under power lines or setback from utility lines as recommended in the following table.

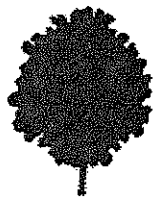
All trees in this category should be planted in a tree lawn at least 5 - 6 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height.	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Magnolia x loebneri Loebner Magnolia	s sh			15 - 20'	varies	25'	20'	10'	f	m-d	f	x			r	unnecessary pruning should be avoided, difficult to transplant, pH adaptable, tolerant of urban conditions, recommended cultivars include "Merrill", "Leonard Messel", "Ballerina"
	Ostrya virginiana American Hop Hornbeam	s sh			25 - 40'	20 - 30'	25'	18'	10 - 15'	s	m-d	a, s		x	r	r	drought tolerant once established, prefers acid conditions, neat growth habit, good on slopes, somewhat difficult to transplant
	Parrotia persica Persian Parrotia	s sh			20 - 40'	15 - 30'	25'	18'	8 - 12'	m	m	s, f, a				r	extremely tolerant of adverse conditions once established, usually multistemmed, interesting bark, prefers slightly acid soils, excellent for street tree use, difficult to find in local nurseries but worth it

Medium Trees from 30 to 45 feet

These trees should be planted with caution under power lines or setback from utility lines as recommended in the following table.

All trees in this category should be planted in a tree lawn at least 5 - 6 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height.	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Prunus sargentii Sargent Cherry	s sh			40 - 50'	20 - 30'	25'	18'	8 - 12'	f	m	a	x	x	i	m	short-lived, the most hardy cherry, flowers, bark, and fall color are attractive, severe cold, ice, wet snow and high winds often damage branches, the best large cherry
	Prunus subhirtella "Autumnalis" Higan Cherry	s sh			20 - 40'	15 - 30'	20'	18'	8 - 12'	m	m	a	x		i	r	short-lived, intolerant of air pollution, branches often damaged by severe cold, ice, wet snow and high winds
	Pyrus calleryana species Callery Pear	s		t	30 - 50'	20'	15'	15'	8 - 12'	m	m-d	s, a, f	x		s	m	adaptable to varying soil types, tolerant of drought and pollution, Spp. "Bradford" is very popular as a street tree but has a tendency to severe limb breakage and is somewhat susceptible to fire blight, "Aristocrat" has more horizontal branching and is less prone to breakage,

Medium Trees from 30 to 45 feet

These trees should be planted with caution under power lines or setback from utility lines as recommended in the following table.

All trees in this category should be planted in a tree lawn at least 5 - 6 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height.	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Pyrus calleryana species Callery Pear *(continued)*																"Chanticleer" is more narrowly upright and shows better resistance to fire blight, other recommended species include "Red Spire" and "Whitehouse"

Large Trees over 45 feet

These trees are suitable for use in large, open areas or locations without utility lines. They should be spaced as recommended in the following table.

All trees in this category should be planted in a tree lawn at least 8 - 10 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height.	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Acer pseudoplatanus Sycamore Maple	s sh		t	40 - 60'	40 - 60'	30'	30'	15 - 25'	f-m	m	s, a, f			i	r	excellent for windy exposed shore sites, popular street tree in Europe, withstands urban conditions, excellent for coastal areas
	Acer rubrum Red Maple	s	x	s	40 - 60'	40 - 60'	30'	30'	15 - 25'	f	m-w	s, a, f			i	r	prefers acid soil, somewhat weak-wooded, thrives in swampy locations, sensitive to drought, should be used with caution only on sites with little environmental stress, extremely hardy, frequently not allowed in new street plantings due to weak wood
	Acer saccharum Sugar Maple	s		s	60 - 80'	40 - 50'	30'	30'	20 - 30'	m	m	f			i	m	spectacular autumn color, sensitive to road salt, requires a large tree lawn as it does not do well in restricted growing areas, extremely hardy, susceptible to verticillium and decline

Large Trees over 45 feet

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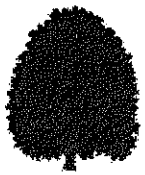
All trees in this category should be planted in a tree lawn at least 8 - 10 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Aesculus hippocastanum "Baumannii" Horsechestnut	s		p	50 - 70'	40 - 65'	30'	35'	20 - 25'	f	m	a	x		i	s	this is a non-fruiting variety, extremely hardy, withstands urban conditions, tends to be weak-wooded, pH adaptable
	Alnus glutinosa Black Alder and Alnus incana White Alder	s sh		p	40 - 60'	20 - 40'	25'	20'	15 - 25'	f	w-m	a			r	r	good for reclamation sites and wet locations, good windbreak, extremely hardy, pH tolerant, good where other trees will not grow, but not attractive in foliage or habit
	Carpinus betulus European Hornbeam	s sh			40 - 60'	40'	25'	25'	15'	s-m	m	s, a, f			r	r	tolerates moderate drought once established, tolerates shearing, difficult to transplant large sizes
	Cercidiphyllum japonicum Katsura Tree	s sh			40 - 60'	20 - 30'	25'	20'	10 - 15'	m-f	m	f			s	r	tolerant of moderate drought once established, females tend toward multiple stems if not trained to a single trunk,

Large Trees over 45 feet

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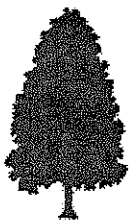
	Cercidiphyllum Japonicum Katsura Tree *(continued)*																males are generally single trunked, pH adaptable, somewhat difficult to transplant
	Cladrastus lutea (kentukea) American Yellow-wood	s			30 - 50'	40'	25'	18'	15'	m	m-d	a, s	x		s	r	a good understory tree, prune in summer or autumn as cut stems bleed profusely, extremely hardy, prefers alkaline conditions but tolerates acidic soils, can be weak-wooded due to narrow branching angles of major limbs, can be sensitive to drought and heat, deep rooted and intolerant of soil compaction, transplant when small
	Corylus colurna Turkish Hazel Turkish Filbert	s			40 - 50'	12 - 15'	15'	13'	8'	m	d-m	f, a				r	adaptable to adverse conditions and variable pH, very drought tolerant once established, thrives in cold winters and hot summers

Large Trees over 45 feet

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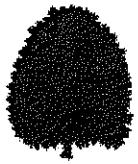
Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height.	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Fagus sylvatica European Beech	s sh		p	50 - 60'	100 - 120'	60'	55'	35 - 40'	s	m-d	f, a			r	r	difficult to transplant, shallow rooted, prefers acid soils, but tolerates alkaline soils, retains its lower branches to ground level
	Gingko biloba Gingko	s		t	60 - 80'	40'	30'	25'	15'	m	m-d	s, a, f			r	r	plant only asexually propagated male varieties, wind tolerant, tolerates drought and urban conditions, slow to establish, good in coastal locations
	Kalopanax pictus Castor-Aralia	s			40 - 60'	40 - 60'	30'	30'	15 - 25'	s-m	m	a	x			r	small black seeds that are eaten by birds, large maple-like leaves, prickles along branches, difficult to find in local nurseries but worth it
	Magnolia acuminata Cucumbertree Magnolia	s sh			50 - 80'	50 - 80'	30'	35'	15 - 25'	m-f	m	f		x		r	prefers acid soil, not tolerant of air pollution, extreme wetness or drought

Large Trees over 45 feet

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All trees in this category should be planted in a tree lawn at least 8 - 10 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height.	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Nyssa sylvatica Tupelo, Black Gum	s sh	x	t	30 - 50'	20 - 30'	25'	18'	8'	m	m- w-d	f			r	r	excellent scarlet autumn color, dislikes wind, large sizes are difficult to transplant, intolerant of drought, prefers acid soils, adaptable to poorly drained and wet soils
	Pseudolarix kaempferi Golden-larch	s			30 - 50'	20 - 40'	25'	20'	10 - 15'	s	m	f, a		x		r	this tree is a deciduous conifer, tolerant of air pollution, intolerant of alkaline conditions, protect from wind, the oldest tree in the USA is 100 years old and only 45' tall, difficult to find in local nurseries but worth it
	Quercus alba White Oak	s	x	t	50 - 80'	50 - 80'	30'	40'	15 - 25'	s	m-d	f				m	prefers acid soils, more susceptible to gypsy moth attack than other oak species, difficult to trans-plant when large, very long-lived, susceptible to soil compaction

Large Trees over 45 feet

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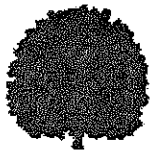
	Quercus bicolor Swamp White Oak	s sh	x		50 - 60'	50 - 60'	30'	20'	20 - 25'	m	m-w	f, a			r	r	drought tolerant once established, several diseases and pests attack this plant but do no serious damage, prefers acid soils
	Quercus palustris Pin Oak	s		p	50 - 60'	25 - 30'	30'	20'	15 - 20'	m-f	m-w				s	r	place at least 15'-20' from road due to branching habit, intolerant of high pH, tolerant of wet soils, clay soils, and urban conditions, readily trans-planted
	Quercus phellos Willow Oak	s			40 - 60'	40 - 60'	30'	30'	15 - 25'	f	m	s, a, f				r	fibrous root system, easy to transplant, finest textured of the oaks, long-lived, adapts to occasional flooding, Cape Cod is the northernmost limit for cold hardiness

Large Trees over 45 feet

These trees are suitable for use in large, open areas or locations without utility lines. They should be spaced as recommended in the following table.

All trees in this category should be planted in a tree lawn at least 8 - 10 feet wide.

Form	Botanical Name Common Name	Exposure (s) sun (sh) shade	Native to Cape Cod	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height.	Mature spread	Spacing in feet on-center	Distance between center of trunk and overhead utility lines	Distance between road edge and center of trunk when not under utility lines	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to snow and ice damage (s) susceptible (i) intermediate (r) resistant	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible to many	Notes
	Quercus rubra Red Oak	s	x	t	60 - 75'	75'	30'	43'	20 - 25'	m-f	m-d	f, a, s			i	r	intolerant of high pH, tolerates urban conditions and some drought once established, easily transplanted, adapts to adverse conditions
	Sophora japonica Japanese Pagoda Tree Japanese Scholar Tree	s		t	50 - 75'	varies	25'	25'	20'	m	m-d	f, a, s	x			r	fruit drop, difficult to prune attractively for street use due to "floppy" growth habit, tolerates drought and heat, withstands urban conditions
	Sorbus alnifolia Korean Mountain Ash	s			40 - 50'	20 - 30'	25'	18'	10 - 12'	f-m	d-m	s, a, f	x	x		r	pH tolerant, resistant to borers, fire blight may be a problem in warmer areas, dislikes heat, drying winds, and air pollution
	Tilia cordata Littleleaf Linden	s sh		s	80'	35 - 50'	30'	28'	15 - 20'	f-m	m	f, a	x		r	m	readily pruned, tolerant of constricted root conditions, pH tolerant, easily transplanted, withstands urban conditions, extremely

Large Trees over 45 feet

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All trees in this category should be planted in a tree lawn at least 8 - 10 feet wide.

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	Tilia cordata Littleleaf Linden *(continued)*																hardy, compact stately habit for street tree use, extremely susceptible to aphids and sooty mold
	Ulmus parvifolia Lacebark Elm Chinese Elm	s		t	40 - 50'	40'	25'	25'	10 - 15'	f	m	f, a			s	r	surface fibrous roots, pH adaptable, withstands urban conditions, tolerant of poor drainage, heat, wind, cold, drought, high humidity, extremely hardy, resistant to Dutch elm disease, elm leaf beetle, and Japanese beetle, beautiful bark on older trees
	Zelkova serrata Japanese Zelkova	s			50 - 80'	50 - 80'	30'	43'	15 - 20'	m-f	m	a			r	r	tolerates drought and wind once established, adaptable to pH and all soil types, "Village Green" is recognized as a superior selection that is resistant to Dutch elm disease and elm leaf beetle, is cold hardy, and has good fall color

Evergreen Trees

These trees are suitable for use in situations where screening may be necessary. Few have mature heights of under 30' that allow their use under power lines. Follow the recommended spacing as noted in the table.

All trees in this category should be planted in a tree lawn at least 5 - 6 feet wide.

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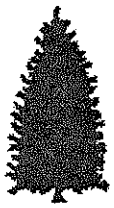
	Abies cilicica Cilician Fir	s			60 - 70'	20 - 30'	25'	18'	12 - 15'	s	m	f, a		x		r	tolerant of heavy clay soils and cold temperatures, intolerant of urban conditions and air pollution
	Abies concolor White Fir	s			30 - 50'	15 - 30'	25'	18'	12 - 15'	s-m	m	s, a		x		r	tolerate of heat, drought, and cold, intolerant of wet soils
	Abies homolepis (brachyphylla) Nikko Fir	s			30 - 50'	20 - 30'	25'	18'	12 - 15'	m	m	f		x		r	wide-spreading canopy, requires little maintenance, tolerant to moderate pollution
	Abies koreana Korean Fir	s			30 - 50'	15 - 25'	20'	15'	10 - 12'	s	m	f		x		r	intolerant of air pollution and high temperatures

Evergreen Trees

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	x Cupressocyparis leylandii Leyland Cypress	s		t	60 - 70'	10 - 15'	15'	12'	10'	f	m-d	s, a,f				r	adapts to any soil type, hardy
	Ilex pedunculosa Longstalk Holly	s sh		t	15 - 25'	15'	10'	13'	10'	s-m	m	a, f		x		r	usually multi-stemmed, resistant to holly leaf miner, adaptable to any type of soil although prefers acidic, tolerant of air pollution, soil compaction, salt and heat
	Juniperus virginiana Eastern Red Cedar	s	x	t	15 - 30'	8-20'	10'	13'	10 - 12'	m	m-d	s, a		x	r	m	extremely hardy, prefers sandy and rocky soil, tolerates seashore conditions, pH adaptable, alternate host to apple-cedar rust

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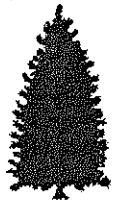
	Picea omorika Serbian Spruce	s		t	50 - 60'	25'	20'	18'	15'	s		s, a, f			r	m	extremely hardy, withstands urban conditions, tolerates winter winds, tall narrow profile may lend it to being planted as a street tree
	Picea orientalis Oriental Spruce	s		t	50 - 60'	25'	20'	18'	15'	s	m	s, a, f			r	m	extremely hardy, withstands urban conditions, would benefit from protection from winter winds, tolerant of poor, gravelly soils, tall narrow profile may lend it to being planted as a street tree
	Pinus cembra Swiss Stone Pine	s			30-40'	15 - 20'	15'	14'	10 - 12'	s	m	a				r	wind tolerant, prefers acidic soils, subject to white pine weevil damage to the terminal shoot, rarely reaches 25' after 25-30 years

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	Pinus koraiensis Korean Pine	s sh			30 - 40'	20 - 30'	25'	18'	12 - 18'	s	d-m	s, a, f				r	very hardy, adaptable to various soils
	Pinus nigra Austrian Pine	s		p	60 - 100'	20 - 40'	25'	23'	15 - 20'	m	d-m	f, a, s		x	r	m	extremely hardy and tolerant of almost any growing condition including clay soils, windy shore sites and topsoil denuded locations, dislikes reflected heat from pavements or buildings, susceptible to turpentine beetle, decline and diplodia blight
	Pinus parviflora Japanese White Pine	s		t	25 - 50'	25 - 50'	25'	28'	15 - 25'	m	m-d	s, a, f		x		m	tolerant of salt air, drought, and clay soils, attractive cones, good for coastal areas, plant away from excessive wind, susceptible to white pine weevil

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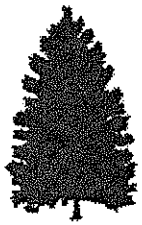
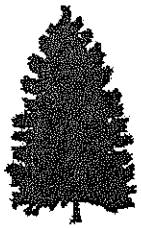
	Pinus strobus Eastern White Pine	s sh	x	s	50 - 80'	20 - 40'	30'	23'	15 - 25'	f	m	s, a, f			i	m	tolerant of dry soils and boggy soils, intolerant of salt spray and air pollutants, susceptible to white pine weevil damage to the terminal shoot
	Pinus sylvestris Scots Pine	s			30 - 60'	30 - 40'	30'	23'	15 - 25'	m	m	a				m	tolerant of urban conditions, adaptable to a wide range of soil types except for wet soils, prefers acid soils, picturesque and windblown form, susceptible to turpentine beetle
	Sciadopitys verticillata Japanese Umbrella Tree	s			20 - 30'	15 - 20'	15'	14'	8 - 12'	s	m	f, a				r	glossy needles, prefers acid soils, intolerant of dry, sandy soils, air pollution, and wind, although somewhat drought tolerant once established

Hedge Table

Hedges may be appropriate in situations where views need to be maintained, where overhead utilities or existing vegetation limit the height of plantings, or where right-of-way or planting bed width limit tree planting. Hedges may be clipped or left to grow in their natural form.

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Abelia grandiflora Glossy Abelia	dense, spreading and rounded	d	s sh			3 - 6'	3 - 6'	f	m-d	a, f		x	x		r	susceptible to winter dieback, well suited for hedges
Acer campestre Hedge Maple	rounded, densely branched to the ground	d	s sh			25 - 35'	25 - 35'	s	m	a, f		x			r	adaptable, tolerant of drought, compaction, pH, and air pollution, shears well
Acer ginnala var. semenovii Amur Maple	large shrub with rounded outline	d	s			10 - 15'	10 - 15'	s-m	m	a, f		x		x	r	good for screening, brilliant autumn color, dark green lustrous leaves
Berberis julianae Wintergreen Barberry	dense, spiny shrub with arching branches	e	s sh			6 - 10'	10 - 12'	m	m-d	s, a, f			x	x	r	best left unsheared therefore not suitable for formal hedges, intolerant of wet soils, the hardiest of the evergreen barberries, thorny, attractive year-round, may show winter damage in exposed windy locations, drought resistant

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Berberis mentorensis Mentor Barberry	stiff, upright, bushy with age, very regular in habit	se m ie	s sh			5'	5 - 7'	m-f	m-d	s, a,f					r	best left unsheared therefore not suitable for formal hedges, excellent for informal hedging because of its uniform growth rate, heat and cold tolerant, intolerant of wet soils, dark green leathery leaves, very adaptable, thorny
Berberis verruculosa Warty Barberry	neat, dense, compact	e	s sh			3 - 6'	3'	m	m-d	s, a, f			x	x	r	best left unsheared therefore not suitable for formal hedges, useful for informal hedging, leathery dark green foliage with whitish undersurface that turns dark purple in winter, may show winter damage in exposed windy locations
Carpinus betulus European Hornbeam	rounded when young	d	s sh	x		40 - 60'	40'	s-m	m	s, a, f		x			r	tolerant of moderate drought once established, tolerant of shearing, difficult to transplant when large, pH tolerant, fastigiate form available

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Chamaecyparis pisifera Sawara Falsecypress	pyramidal, loose open habit	e	s sh		t	3'	varies	m	m	f		x		x	r	one of the toughest plants for seaside and streetside locations, tends to self-shade its inner branches causing the inner needles to turn brown, prefers acid soils, pruning keeps them in vigorous condition, but do not shear
Cornus officinalis Japanese Cornel	rounded, dense habit	d	s sh			15 - 20'	15 - 20'	m	m-d	s, a, f		x	x	x	r	drought tolerant once established, reddish brown exfoliating bark, may be sheared
Euonymus alatus Burning Bush	mounded to horizontally spreading, flat-topped, usually broader than high	d	s sh			15 - 20'	15 - 20'	s-m	d-m	s, a, f		x			r	extremely effective in the winter landscape, corky-winged branches, good scarlet autumn color, pH adaptable

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Euonymus alatus "Compactus" Dwarf Burning Bush	compact, densely mounded	d	s sh			10'	10'	s-m	d-m	s, a, f		x		x	r	makes an excellent rounded hedge without pruning or with pruning every other year, perhaps growing to 15', brilliant scarlet autumn color, corky ridges on twigs, does well in heavy shade, very adaptable to all soil conditions except wet, pH adaptable, withstands heavy pruning
Forsythia intermedia Forsythia	upright, developing arching canes	d	s			8 - 10'	10 - 12'	f	d-m	s, a, f			x		r	pH adaptable, withstands urban conditions, wide-growing, best used in a shrub boarder or as massed groupings and bank plantings in large open areas, best grown unpruned
Hydrangea macrophylla Bigleaf Hydrangea	rounded, suckering, erect branching habit	d	s sh		t	3 - 6'	3 - 6'	f	m	f			x		r	withstands seashore conditions, prune right after flowering since buds form on the previous seasons growth although

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Hydrangea macrophylla Bigleaf Hydrangea *(continued)*																"All Summer Beauty" is reputed to flower on the current seasons growth, prefers acid soils supplemented with organic matter, may die to the ground in a cold winter
Ilex crenata Japanese Holly	rounded, dense, rigid, compact	e	s sh		t	varies	varies	s	m	a, f	x	x			r	fairly adaptable, prefers acidic soils, "Convexa" and "Microphylla" are frequently used in clipped hedges, tolerant of urban conditions, withstands severe pruning, long-lived
Ilex glabra Inkberry	upright, erect-rounded, branched	e	s sh	x	t	6 - 8'	8 - 10'	s	m-w	a, f	x	x		x	r	often looses lower leaves, prefers acid soils, withstands heavy pruning which is often done to rejuvenate old plants, drought intolerant, "Compacta" is better shaped than the species

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Juniperus virginiana Eastern Red Cedar	columnar	e	s	x	t	15 - 30'	8 - 20'	m	m-d	s, a				x	m	likes sandy, rocky soil, alternate host to apple-cedar rust, extremely hardy, tolerates seashore conditions, pH adaptable
Ligustrum amurense Amur Privet Common Privet	dense, upright with a weak pyramidal outline	d	s sh		t	12 - 15'	8 - 10'	f	m-w	s, a, f	x	x	x	x	m	intolerant of extremely wet soils, pH adaptable, tolerant of urban conditions and dry soils, withstands insect and disease attack without significant damage
Lonicera fragrantissima Winter Honeysuckle	wide-spreading, irregular habit with tangled mass of slender recurving branches	d	s			6 - 10'	6 - 10'	f	m	s, a, f		x	x	x	s	pH adaptable, intolerant of extremely wet soils, prune after flowering, when overgrown cut back to the ground to develop new shoots, susceptible to many pests and diseases, extremely fragrant flowers, holds its leaves into November, successful as a clipped hedge

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Prunus maritima Beach Plum	rounded, dense, widespreading	d	s	x	t	6'	6'	m	m-d	s, a, f			x	x	m	drought tolerant once established, intolerant of wet conditions, good for seashore plantings, susceptible to tent caterpillar, brown tail knot, plum pockets, and eroiphyid mites
Rhamnus frangula "Columnaris" Glossy Buckthorn, Alder Buckthorn or Tallhedge	narrow, columnar	d	s sh			18'	4'	f	m	a, f		x		x	m	withstands the coldest winters, can grow 12' in 5 years, does not exceed 4' in width, can be cut to within 3" of the ground, may require topping to keep it at the desired height, birds attracted to the berries and spread the seeds, withstands pests but susceptible to a canker-causing fungus
Rosa rugosa Rugosa Rose	sturdy with stout upright stems forming a dense mat along the	d	s		t	4 - 6'	4 - 6'	f	m-d	f, a, s		x	x	x	m	grows well on sandy dry exposed sites, pH adaptable, valuable for difficult sites, extremely vigorous,

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Rosa rugosa Rugosa Rose *(continued)*	ground, densely bristly, prickly															has naturalized on Cape Cod, withstands pruning and should be cut to the ground every third year to remove old wood and promote new growth, some claim it is invasive
Syringa microphylla "Superba" Littleleaf Lilac	dense, broad-spreading	d	s			6'	9 - 12'	s	m-d	s, a, f			x		r	can be used as a free-standing hedge, resistant to powdery mildew, adaptable to various soil conditions
Taxus baccatta "Repandens" Spreading English Yew	spreading, wide with pendulous branches	e	s sh			2 - 4'	12 - 15'	s	m	s, a, f	x	x			r	hardy, prefers sandy loam, attractive dark green
Taxus cuspidata Japanese Yew	irregular habit: crown erect or flattened, broad or narrow, spreading or upright	e	s sh		t	10 - 40'	10 - 40'	s	m	s, a, f	x	x		x	r	intolerant of wet soils, prefers moist sandy loam, but tolerant of other soil conditions, withstands heavy frequent pruning and urban conditions

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Taxus media cultivars	varies	e	s sh			varies	varies	s	m	s, a, f	x	x			r	prefers sandy loam although adaptable, recommended cultivars include "Densiformis", "Hatfieldii" and "Hicksii"
Viburnum dentatum Arrowwood	multistemmed dense, rounded with spreading branches	d	s sh	x	t	6 - 8'	6 - 15'	m	m-d	f, a			x		r	adaptable to various soils, suckers freely, good in hedges, durable, withstands urban conditions
Viburnum lantana "Mohican" Wayfaringtree	rounded, spreading	d	s sh			10 - 15'	10 - 15'	m	m-d	f, a			x	x	r	adaptable, drought tolerant, tolerant of high pH, resistant to bacterial leaf spot
Viburnum prunifolium Blackhaw Viburnum	multistemmed stiffly branched	d	s sh			12 - 15'	8 - 12'	s-m	m-d	f, a			x	x	r	adaptable to various soils, drought tolerant once established

Plants for Special Uses

These plants are useful for special situations such as softening harsh edges near drainage swales, or screening fences, guard rails, or chain link fences. After determining the purpose of the planting and analyzing the growing conditions where planting is desired, this list may be used to locate suitable plant material.

Botanical Name Common Name	Form	Exposure (s) sun (sh) shade	Seasonal appearance (e) evergreen (d) deciduous (h) herbaceous	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing for groundcovers	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible	Notes
Acanthopanax sieboldianus Fiveleaf Aralia	erect, upright shrub, flopping over to rounded outline	s sh	d		8 - 10'	8 - 10'		m	m-d	s, a, f			r	withstands urban and adverse conditions, tolerant of dry, clay, acid, and sandy soils, thorny stems, may be invasive due to suckering
Acer tataricum Tatarian Maple	large, multi-stemmed shrub	s	d		20'	20'		s-m	d-m	s, a, f			r	drought tolerant once established, useful in groupings
Actinidia arguta Bower Actinidia	twining vine	s sh	d			30'		f	m	s, a			r	dense foliage, prefers neutral to slightly acidic soils, grow in large areas, useful for screening
Ajuga reptans Bugleweed	groundcover forming a low dense mat	sh	h		4 - 12"		6 - 12"	f	m	a, f	x		r	hardy herbaceous perennial, many cultivars are available, may be rejuvenated by light mowing after blooming, drought intolerant, good for softening edges
Aesculus parviflora Bottlebrush Buckeye	wide-spreading, suckering, multistemmed shrub	s sh	d		8 - 12'	8 - 15'		s	m	f	x		r	needs acidic moist well drained soil high in organic matter, drought intolerant, pH adaptable, suckers readily from the base, good yellow fall color, excellent for massing and groupings

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Aesculus pavia Red Buckeye	small, round-topped shrub	s sh	d		20 - 25'	20 - 25'		s	m	f	x		r	no appreciable fall color, looses its leaves in early autumn, subject to leaf blotch, "Atrosanguinea" has consistent deep red flowers
Amelanchier arborea Amelanchier canadensis Amelanchier laevis Shadbush, Serviceberry	multistemmed shrub with a rounded outline	s sh	d	t	varies	varies		m	m-w	a	x	x	r	prefers acidic wet soils, good for screening in naturalized areas, good fall foliage, newer cultivars are less prone to pests and diseases
Arctostaphylos uva-ursi Bearberry, Kinnikinnick	groundcover forming a low-growing, broad, thick mat	s sh	e	t	6 - 12"	2 - 4'	12 - 24"	s	d	s, a	x	x	r	does best in acidic (4.5-5.5) poor sandy well drained soils, never apply fertilizer, drought tolerant, white or light pink flowers, difficult to transplant so use pot-grown plants, native to Cape Cod, effective on exposed sandy sites, useful for softening edges

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Aronia arbutifolia Red Chokeberry Aronia melanocarpa Black Chokeberry	upright, multi-stemmed shrub with an open, rounded crown	s sh	d	t	6 - 10'	3 - 5'		s	m	s, a, f	x	x	r	tolerant of wet and dry soils, brilliant red fruit on A. arbutifolia, excellent for massing, grouping and naturalizing
Berberis julianae Wintergreen Barberry	spiny shrub with arching branches	s sh	e		6 - 10'	10 - 12'		m	d-m	s, a, f	x	x	r	brilliant red autumn color, drought resistant, can withstand neglect and extremes of climate although may show winter damage in windy exposed locations, useful in dry rocky areas, intolerant of wet soils, the hardiest of the evergreen barberries, makes an effective thorny hedge with 1 1/2" spines, best left unpruned
Berberis x mentorensis Mentor Barberry	shrub with a stiff, upright growth habit	s sh	se m i		5'	5 - 7'		m-f	d-m	s, a, f			r	very adaptable, heat and cold tolerant, intolerant of wet soils, excellent thorny hedge, best left unpruned, good for massing

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Berberis verruculosa Warty Barberry	shrub with a neat, compact, dense habit	s sh	e		3 - 6'	3'		m	d-m	s, a, f	x	x	r	thorny, may show winter damage in windy exposed locations, best left unsheared therefore not suitable for formal hedges, but useful for informal hedging, massing and screening
Calluna vulgaris Scotch Heather	groundcover forming a dense mat	s	e	t	4 - 24"	2'	12"	s	d-m	s, a	x		m	very hardy and drought tolerant once established, prefers acid soils, may be cut back in the early spring to encourage new growth, susceptible to mites and scale, good for massing in coastal situations
Campsis grandiflora Chinese Trumpet Vine	clinging vine	s	d			20'		f	d-m	s, a, f	x		r	showy flowers, grows vigorously in any soil but not invasive, needs lots of room, very tough
Campsis radicans Trumpet Vine	clinging vine	s	d			30'		f	d-m	s, a, f	x		r	grows vigorously in any soil but not invasive, needs lots of room, very tough

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Chionanthus virginicus White Fringetree	very wide growing shrub with an open habit	s	d		12'	20'		s	m	f	x	x	r	very adaptable to soil type, grows very wide, fruit is attractive to birds
Clethra alnifolia Summersweet, Sweet Pepperbush	oval, round-topped, erect shrub with dense, clumplike growth habit	s sh	d	t	3 - 8'	4 - 6'		s-m	m-d	f, a	x		r	fragrant flowers in late summer, prefers acidic soils, has a clean habit, native to Cape Cod, mites may be a problem in hot dry locations, good for shady areas, massing and screening
Clethra barbinervis Japanese Clethra	tall, oval, erect shrub with dense, clumplike growth habit	s sh	d	t	10 - 15'	8 - 10'		s-m	m-d	f, a	x		r	drought tolerant, attractive bark, fragrant flowers in late summer
Comptonia peregrina Sweet Fern	shrub with slender, often erect branches forming an irregular, rounded, open crown	s sh	d	t	2'	4 - 6'		s-m	d-m	s, a			r	well adapted to poor dry infertile soil, difficult to transplant therefore best when container grown, good for naturalizing and on embankments, spreads by stolons, native to Cape Cod

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Cornus mas Cornelian-Cherry Cornus officinalis Japanese Cornel	large, broad multistemmed shrub with a rounded outline	s sh	d		20 - 25'	25 - 30'		m	m-d	s, a, f	x	x	r	drought tolerant once established, fruit can be messy and attract bees, adaptable to various soils and pH, good for screening and grouping
Cornus stolonifera (sericea) Red Osier Dogwood	rounded, spreading, multi-stemmed shrub, becomes dense	s sh	d		7 - 9'	10'		f	m-d	f	x	x	m	spreads by stolons, bright red twigs, pruning to the ground every 3-4 years produces more brightly colored twigs, extremely adaptable to various soils but prefers moist acidic fertile conditions, susceptible to twig blight and scale
Cornus stolonifera (sericea) "Flaviramea" Yellow-twig Dog-Wood	spreading shrub, becomes dense	s sh	d		7 - 9'	10'		f	m-d	f			m	spreads by stolons, twigs are brilliant yellow, pruning to the ground every 3-4 years produces more brightly colored twigs, extremely adaptable to various soils but prefers moist acidic fertile conditions, susceptible to twig blight and scale

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Cotoneaster adpressus Creeping Cotoneaster	compact, rigidly branched groundcover	s	d	t	12 - 18"	4 - 6'	4 - 5'	s-m	m	s, a, f	x	x	m	hardy, tough, drought tolerant once established, pH tolerant and good for seaside conditions, good soil binder, subject to Hawthorn lace bug and mites in hot dry conditions
Cotoneaster divaricatus Spreading Cotoneaster	multistemmed shrub with arching branches	s	d	t	5 - 6'	6 - 8'		m-f	m	s, a, f	x	x	r	hardy, tough, good soil binder, less susceptible to pests than other cotoneasters, good for grouping, massing and softening edges
Cotoneaster salicifolius Willowleaf Cotoneaster	large shrub with arching branches	s	e	t	10 - 15'	10'		s-m	m	s, a, f	x	x	r	hardy, tough, drought tolerant once established, pH tolerant and good for seaside conditions, good soil binder, low-growing cultivars are available such as "Emerald Carpet", "Repens", "Scarlet Leader", and "Repandens"

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Cytissus decumbens Prostrate Broom Cytissus procumbens Ground Broom	groundcovers with slender, grass-like stems and twigs	s	d	t	8 - 30"	3'	2 - 3'	m	d-m	s, a, f	x	x	r	prefers well drained sandy slightly acid soils, can be difficult to transplant but requires little care once established, frequently considered temporary since it matures to an unsightly sparse woody appearance and will not revegetate when pruned out
Cytisus x praecox Warminster Broom	erect, dense shrub with slender, grasslike stems and twigs	s	d	t	10'	4 - 6'		m	d-m	s, a	x	x	r	naturalized in places on Cape Cod, prefer well drained sandy slightly acid soils, can be difficult to transplant but requires little care once established, frequently considered temporary since it matures to an unsightly sparse woody appearance and will not revegetate when pruned out

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Deutzia gracilis Slender Deutzia	low, graceful, broadly mounded shrub	s	d		2 - 6'	3 - 4'		s-m	d-m	s, a, f	x		r	may require pruning of deadwood in spring, good for screening, massing, and softening edges, "Nikko" is a good compact cultivar that can be used as a groundcover
Enkianthus campanulatus Enkianthus	narrow, upright shrub	s sh	d		12 - 15'	5 - 6'		s	m-d	a, f	x		r	requires acidic soil supplemented with organic material, bright scarlet fall color
Euonymus alatus Burning Bush	mounded to horizontally spreading, flat-topped shrub, usually broader than high	s sh	d		15 - 20'	15 - 20'		s-m	d-m	s, a, f			r	tough, brilliant red fall color, appears to do well in heavy shade, tolerant of pH and all soil conditions except wet, "Compactus" and "October Glory" have more compact growth habit (10-15'), excellent for screening and massing
Forsythia intermedia spectablis Border Forsythia Forsythia suspensa Weeping Forsythia	multistemmed shrubs with upright, arching canes	s	d		8 - 10'	10 - 12'		f	d-m	s, a, f	x		r	best grown unpruned, good when massed in large open areas, intolerant of poor soil drainage

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Fragaria chiloensis Wild Strawberry Sand Strawberry	groundcover forming a thick mat	s	h	t	6 - 9"	12"	12"	f	d-m	s, a	x	x	m	edible fruit, does well on sandy sites, tolerates light foot traffic, requires regular watering, susceptible to red spider mites, spreads by runners, excellent for softening edges, Hybrid Ornamental Strawberry Number 25 is similar but grows more vigorously, is larger, and has delicious fruit
Hammamelis x intermedia "Arnold Promise" Hammamelis mollis Hammamelis vernalis Hammamelis virginia Witchhazel	large shrubs forming an irregular, rounded, open crown	s sh	d		20'	15'		m	m	f	x		r	prefers acid soils except for H. vernalis which prefers neutral to slightly alkaline soil, requires good soil aeration
Hedera helix English Ivy	clinging vine or ground-hugging groundcover	s sh	e		6 - 8"	90'	12"	f	m	a, f			s	prefers indirect light of high intensity, tolerates light mowing every other year, intolerant of drought, useful for covering slopes, preventing erosion, and softening edges

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Hemerocallis fulva "Europa" Hemerocallis fulva "Kwanso" Daylilly	groundcover with arching leaves	s sh	h		2'		2'	m-f	m-d	a, f	x		r	these are very tough varieties that can grow by railroad tracks or hold riverbanks, need no care once established, useful for naturalizing, reclaiming poor or damaged soil, softening edges, massing
Hydrangea macrophylla Bigleaf Hydrangea	rounded, suckering shrub with many erect, thick stems, usually unbranched	s sh	d	t	3 - 6'	3 - 6'		f	m	f	x		r	flower color ranges from pink to deep blue depending on soil pH, prefers supplemental organic matter when planted, flourishes near the seashore, flower buds may suffer from winterkill
Hydrangea anomala peteolaris Climbing Hydrangea	clinging vine	s sh	d	t		75'		s, then f	m	a	x		r	clings by small rootlike holdfasts, grows slowly until well established, then vigorous but will not smother trees
Hydrangea quercifolia Oak Leaved Hydrangea	upright, irregular, little branched, stoloniferous shrub	s sh	d		4 - 6'	6'		s-m	m	f	x		r	excellent foliage appearance, prefers a fertile, moist, cool root environment, useful for screening, massing, shady situations

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Hypericum Saint John's wort	dense groundcover	s sh	e		12 - 15"		12 - 18"	f	m	s, a, f	x			freely stoloniferous, one of the best groundcovers available, large yellow flowers, drought tolerant, shearing each spring will rejuvenate it and keep it compact, can be invasive, excellent for massing, softening and erosion control
Ilex crenata Japanese Holly	shrub of rounded, dense, rigid, compact habit	s sh	e	t	var ies	var ies		s	m	a, f			m	prefers slightly acidic soils, tolerates urban conditions, transplants readily, subject to white fly and mites in hot dry areas, excellent for massing and screening
Ilex glabra Inkberry	shrub with an upright, much branched, open habit	s sh	e	t	6 - 8'	8 - 10'		s	m-w	a, f		x	r	prefers acid soils, intolerant of drought, "Compacta" has a better shape than the species, excellent for massing and screening
Ilex x meserveae Meserve Holly	shrub	s sh	e		var ies	var ies		s	m	f		x	r	prefers acid soils supplemented with organic matter

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Ilex pedunculosa Long-stalk Holly	large shrub with dense habit	s sh	e		15 - 25'	15'		m-s	m	f, a		x	r	prefers acid soils supplemented with organic matter, resistant to holly leaf miner
Ilex verticillata Winterberry	oval, rounded shrub	s sh	d		6 - 10'	6 - 10'		s	m-w	f		x	r	prefers acidic soils supplemented with organic matter, does well in heavy soils, outstanding for mass plantings in waterside and wet soils, "Sparkleberry" is noted for its persistent berries
Juniperus chinensis Chinese Juniper	shrub, sometimes erect, sometimes bushy	s	e	t	var ies	var ies		s-m	m	a, f			r	pH adaptable, recommended cultivars that are resistant to phomopsis or kabatina blights include "Foemina"(p), "Iowa"(p), "Keteleeri"(p), "Pfitzeriana-aurea"(p & k), "Gold Coast"(k), useful as a groundcover or for screening
Juniperus conferta Shore Juniper	dense, bushy shrub	s	e	t	12 - 18"	6 - 9'		s	d-m	s, a, f			r	adaptable to poor, dry soils, intolerant of clay soils, low-growing spreading habit useful for softening edges and for coastal situations

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Kalmia latifolia Mountain Laurel	large, dense, symmetrical shrub	s sh	e		7 - 15'	7 - 15'		s	m	f	x		r	requires cool, acid, moist soil supplemented with organic matter, flowers best in full sun, many new cultivars available, excellent for massing and naturalizing
Lavendula angustifolia English lavender	groundcover	s	d		8" - 2'	1 - 2'	2'	m	m	a	x			"Compacta" has a compact habit (8"), good for softening edges
Ligustrum amurense Amur Privet	dense, upright, multistemmed shrub	s sh	d	t	12 - 15'	9 - 12'		f	d-m	s, a, f	x	x	r	unpleasantly fragrant flowers, tolerant of poor dry soils, seems to withstand several insect and disease problems that may occur, transplants readily, useful for screening, massing, and in shady locations
Liriope spicata Lilyturf	groundcover with grasslike leaves, forms large mats	s sh	h	t	8 - 18"		12"	m-f	m	a, f	x		r	tolerant of heat, drought, and almost any soil, fall mowing is recommended, useful in areas with poor soil or shade, on slopes, banks, and for softening edges

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Lonicera flava Yellow Honeysuckle	weakly twining vine	s sh	d		10 - 20'	10 - 20'		f	d-m	s, a, f	x		r	handsome native, fragrant orange-yellow flowers, drought resistant, pruning may be required to keep it within bounds
Lonicera fragrantis-sima Winter Honeysuckle	shrub with widespreading, irregular habit	s	d		6 - 10'	6 - 10'		f	m	a, f	x		r	tolerant of many soils and pH, fragrant flowers in February or March, intolerant of wet soils, readily develops new shoots when cut to the ground
Lonicera sempervirens Trumpet Honeysuckle	twining shrub	s sh	se m i		10 - 20'	10 - 20'		f	m	a, f	x	x	r	several cultivars available, good for screening
Magnolia x soulan-giana Saucer Magnolia	large, spreading shrub	s	d		20 - 30'	20 - 25'		m	m	f	x		r	prefers acidic soil supple-mented with organic matter, roots need ample room to develop, useful for massing and screening

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Magnolia virginiana Sweetbay Magnolia	small, multi-stemmed shrub with a loose, open, upright habit	s sh	d		10 - 20'	10 - 20'		m-f	m-w	f	x		r	does well in wet and swampy soils, drought tolerant, prefers acidic soils, semi-evergreen in protected places
Myrica pensylvanica Bayberry	upright, rounded, dense shrub	s sh	d	t	5 - 12'	5 - 12'		m	d-m	s, a		x	r	thrives in poor sterile sandy soil, tolerates heavy clay soil, excellent for screening, massing and on poor soil sites
Pachysandra terminalis Pachysandra, Japanese Spurge	dense groundcover of uniform height	sh	e		6 - 8"		6 - 12"	f	m	a, f	x		r	spreads by stolons, excellent for softening edges in shady situations
Phlox stolonifera Creeping Phlox	groundcover forming a low mat	sh	se m i	t	6 - 12"		12 - 18"	m	m	f	x		r	spreads by rooting at the nodes and by stolons, attractive woodland groundcover for dappled shade
Phlox subulata Moss Phlox	groundcover forming a dense mound	s	d	t	4 - 6"		12 - 18"	m	m-d	a, f	x		r	sturdy, adaptable to most soils, dramatic in large scale plantings when in flower, mowing is recommended after flowering to stimulate new growth, excellent for softening edges

Plants for Special Uses

These plants are useful for special situations such as softening harsh edges near drainage swales, or screening fences, guard rails, or chain link fences. After determining the purpose of the planting and analyzing the growing conditions where planting is desired, this list may be used to locate suitable plant material.

Botanical Name Common Name	Form	Exposure (s) sun (sh) shade	Seasonal appearance (e) evergreen (d) deciduous (h) herbaceous	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing for groundcovers	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible	Notes
Pieris floribunda Mountain Pieris	neat, bushy, low, rounded shrub	s sh	e	t	2 - 6'	2 - 6'		s	m	f	x		r	tolerant of higher pH than most Ericaceae, susceptible to Phytophthora root rot in wet conditions, resistant to lacebug, "Brouwer's Beauty" is more dense and compact than the species, useful for screening and massing
Potentilla cinerea Potentilla nepalensis Potentilla, Cinquefoil	groundcovers forming dense mats	s sh	e		3 - 10"	10 - 12"	8 - 10"	f	m	a, f	x		r	spreads by surface runners, attractive green foliage, good for softening edges
Potentilla fruticosa Bush Cinquefoil	very bushy shrub with upright stems forming a low rounded outline	s sh	d	t	1 - 4'	2 - 4'		s	m	a, f	x		r	tolerant of poor dry soils and extreme cold, flowers best in full sun, prefers neutral to alkaline conditions, many improved varieties available, useful for softening edges, screening, and massing

Plants for Special Uses

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Prunus maritima Beach Plum	rounded, dense, widespreading bush	s	d	t	6'	6'		m	m-d	s, a, f	x	x	m	intolerant of wet soils, tolerant of drought once established, susceptible to tent caterpillar, brown tail knot, plum pockets and eriophyid mites, good for naturalizing in coastal settings and massing
Rhododendron species and cultivars Rhododendron	shrub, with form varying by species and cultivar	sh	var ies		var ies	var ies		var ies	m	f	x		var ies	over 900 species and thousands of hybrids exist, prefers acidic soils high in organic matter, useful for screening, massing, groupings
Rosa rugosa Saltspray Rose	shrub with stout canes that are bristly and prickly, forms a dense mat on the ground	s	d	t	4 - 6'	4 - 6'		f	m-d	s, a, f	x	x	m	prefers acidic soil that has been supplemented with organic matter but also grows in pure sand, pH adaptable, drought tolerant, useful for coastal areas and on difficult sites
Spiraea x bumalda "Anthony Waterer"	broad, flat topped, low shrub	s	d	t	2'	4'		f	d-m	a, f	x		r	intolerant of wet soils, annual pruning is required for best effect, useful for massing, bank cover

Plants for Special Uses

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Spiraea x vanhouttei Vanhoutte Spirea	arching, fountain-like habit making a tall, broad mound	s	d	t	6 - 8'	10'		f	m-d	s, a, f	x		r	tough and adaptable, may require pruning of dead wood in spring, useful for light screening and massing, but thin growth habit is not conducive to heavy screening
Syringa meyeri "Palibin" Meyer Lilac Syringa microphylla "Superba" Littleleaf Lilac Syringa patula "Miss Kim" Manchurian Lilac	small, dense, neat, broad, rounded shrubs	s	d		6'	9 - 12'		s	m-d	s, a, f	x		r	adaptable to most soil conditions, resistant to powdery mildew, require little or no maintenance, flowers cover the plants and are spectacular, good for screening, massing, and grouping
Thymus serpyllum Creeping Thyme Mother of Thyme	groundcover forming flat, green mats	s	var ies	t	3 - 6"		6 - 12"	m	d	a, s	x		r	intolerant of wet soils and overwatering, no serious pests or diseases
Vaccinium corymbosum Highbush Blueberry	upright, multistemmed shrub forming a dense, rounded, compact outline	s sh	d	t	6 - 12'	8 - 12'		s	m-d	f	x	x	r	native to swamps, but does well in dry, acid, poor, sandy soils, mulching recommended, prefers soils with pH of 4.5 to 5.5

Plants for Special Uses

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Viburnum x Juddii Judd Viburnum	rounded, dense shrub with stiff upright branches	s	d		4 - 5'	4 - 8'		s	m	f	x		r	highly fragrant flowers, useful for screening and massing
Viburnum dentatum Arrowwood	multistemmed shrub with a dense, rounded outline	s sh	d	t	6 - 8'	6 - 15'		m	m-d	f, a	x		r	adapts well to various soil conditions, forms large clumps, transplants well, suckers freely, good in groupings, massing, screening
Viburnum lantana "Mohican" Wayfaringtree Viburnum	multistemmed shrub with stout branches forming a rounded outline	s sh	d		10 - 15'	10 - 15'		m	m-d	f, a	x	x	r	easily transplanted, prefers well-drained loamy soils but is adaptable, tolerant of high pH and drought, resistant to bacterial leaf spot, useful for screening and massing
Viburnum plicatum tomentosum Doublefile Viburnum	horizontally branching shrub, maturing to a rounded form	s sh	d		8 - 10'	9 - 12'		m	m	f	x	x	r	intolerant of drought, preferred cultivars include "Mariesii" and "Shasta", excellent for massing, screening, borders and softening upright edges

Plants for Special Uses

These plants are useful for special situations such as softening harsh edges near drainage swales, or screening fences, guard rails, or chain link fences. After determining the purpose of the planting and analyzing the growing conditions where planting is desired, this list may be used to locate suitable plant material.

Botanical Name Common Name	Form	Exposure (s) sun (sh) shade	Seasonal appearance (e) evergreen (d) deciduous (h) herbaceous	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing for groundcovers	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible	Notes
Viburnum prunifolium Blackhaw Viburnum	stiffly branched, multistemmed shrub	s sh	d		12 - 15'	8 - 12'		s-m	m-d	a, f	x	x	r	edible fruit, adaptable to various soil conditions, drought tolerant once established, useful in massing, screening and groupings
Viburnum x rhytidophylloides Lantanaphyllum Viburnum	rounded, upright spreading shrub	s sh	d		8 - 10'	8 - 10'		m	m	a, f	x	x	r	adaptable to various soil conditions, needs protection from winter winds, "Alleghany" and "Willowwood" are recommended cultivars, good for screening and massing
Viburnum rhytidophyllum Leatherleaf Viburnum	upright, multistemmed shrub with rounded outline	s sh	e		10 - 15'	10 - 15'		m	m	a, f	x		r	tolerant of heavy shade, prefers protection from winter wind and winter sun, transplants well, useful for massing
Viburnum sargentii Sargent Viburnum	upright, multistemmed shrub with a rounded outline	s sh	d		12 - 15'	12 - 15'		m	m	a, f	x	x	r	adaptable to various soil conditions, pH tolerant, "Onondaga" and "Susquehanna" appear to be promising cultivars, useful in massing and screening

Plants for Special Uses

These plants are useful for special situations such as softening harsh edges near drainage swales, or screening fences, guard rails, or chain link fences. After determining the purpose of the planting and analyzing the growing conditions where planting is desired, this list may be used to locate suitable plant material.

Botanical Name Common Name	Form	Exposure (s) sun (sh) shade	Seasonal appearance (e) evergreen (d) deciduous (h) herbaceous	Salt tolerance (t) tolerant (p) partially tolerant (s) susceptible	Mature height	Mature spread	Spacing for groundcovers	Rate of growth (f) fast (m) medium (s) slow	Soil requirements (d) dry (m) moist (w) wet	Soil fertility (f) fertile (s) sandy (a) average	Ornamental flowers	Ornamental fruit	Resistance to pests and diseases (r) resistant (m) resistant to most (s) susceptible	Notes
Viburnum sieboldii Siebold Viburnum	large shrub with stiff, stout, rigid branches	s sh	d		15 - 20'	10 - 15'		m-f	m	a, f	x	x	r	excellent foliage, flowers, and fruit, adaptable to various soil conditions but not dro.ught tolerant, "Seneca" has very persistent fruit, effective in groupings and for screening
Viburnum trilobum American Cran-berrybush	upright, spreading, multistemmed shrub with branches arching to the ground to create a rounded habit	s sh	d		8 - 12'	8 - 12'		m	m	a, f	x	x	r	prefers good soil but is adaptable to various soil conditions, easy to grow, useful for screening and massing
Vinca minor Vinca, Periwinkle	low groundcover	sh	e		6"		12"	m	m	f	x		r	excellent green foliage, good for softening edges in shady locations
Xanthorhiza simpli-cissima Yellow-root	flat-topped groundcover with erect stems and celery-like leaves, filling the ground as a mat	s sh	d		2 - 3'		18 - 24"	m	m	f, a	x		r	tolerant of many soils includ-ing clay, but prefers moist to wet soils, excellent in low wet spots with full sun, suckers freely to create a very solid mat, useful for softening edges

Implementation

The purpose of this section is to identify potential strategies to accomplish the major recommendations of the Route 6A Vegetation Management Plan. The Commission has received funding in Phase 3 of the Interim Scenic Byways Program to assist in implementing the Plan. The following is a description of the major Phase 3 actions to be undertaken by the Commission with the assistance of other public and private individuals and organizations.

CREATE A STREET TREE ADVISORY BOARD

Implementation of the Route 6A Vegetation Management Plan will require the cooperation and assistance of professionals, local officials, public agencies, and volunteers in order to be successful. In particular, undertaking a replacement or new tree planting program for Route 6A will require the assistance of volunteers such as village improvement associations and beautification committees. These organizations have already developed a working relationship with local business owners and homeowners in carrying out local beautification efforts. Therefore, their assistance will be invaluable in obtaining permission to plant trees on private property when necessary.

The Commission will work towards creating a Street Tree Advisory Board for Route 6A to assist with implementation of the Vegetation Management Plan. The Advisory Board will consist of a cross-section of professionals, local officials, public agencies, and volunteers. Creation of the Advisory Board will help to ensure that the actions begun in Phase 3 of the Interim Scenic Byways program are continued after the Commission's work is concluded.

Developing a volunteer program with a set of goals and objectives will be a responsibility of the Advisory Board. The Board will also be involved in the establishment and oversight of a regional nursery to provide future replacement trees for Route 6A. It is anticipated that the Advisory Board will assist in education efforts surrounding proper planting, pruning and maintenance, and may assist in keeping a record of any new planting in order to maintain the database established by this study. The Advisory Board could also provide assistance in dedicating Champion Trees as described in the *Recommendations* section.

MAINTAIN EXISTING TREES

A portion of Phase 3 funds will be used to establish a maintenance program for trees along Route 6A, beginning with the 500 historic/significant trees identified by Bartlett Tree Experts. Phase 3 funds will also be used to conduct a further evaluation of the 100 trees identified in Bartlett's tree evaluation as exhibiting signs of unreasonable risk. During Phase 3, the Commission will pursue funding for the development of a long-term maintenance program for all of the trees identified in the Plan through the America the Beautiful Act or other programs identified in the *Additional Sources of Funding* section below.

DEVELOP A HAZARD TREE POLICY

The Commission will pursue the development and implementation of a Hazard Tree policy with the Massachusetts Highway Department during Phase 3. In addition to development of this policy, the Commission will conduct a public education program for interested residents and public officials regarding the phased removal of hazardous trees and diseased trees such as the White Ash.

DEVELOP A REGIONAL NURSERY FOR REPLACEMENT TREES

Phase 3 funds will be used to establish a regional nursery in order to provide a long-term source of replacement trees for Route 6A. A potential source of transplants for the nursery are seedlings currently growing under historic or significant trees along the roadside in a nursery-style setting. Seeds, fruits and acorns could also be collected in the fall by volunteers and started in pots in the nursery. An additional source of tree seedlings are organizations such as the Barnstable Conservation District which offers seedlings for sale each spring.

Tree seedlings will be grown in the nursery until they reach an adequate size for replanting. Oversight and distribution of trees from the nursery will be the responsibility of the Street Tree Advisory Board.

PLANT NEW TREES IN PRIORITY AREAS

A portion of Phase 3 funds will be used to obtain and coordinate the planting of new trees in several of the priority locations identified in this Plan and the Corridor Management Plan for Route 6A. In particular, gateways to the corridor and village centers will be targeted for new tree planting. This effort may coincide with special events such as Arbor Day or special town celebrations. New tree planting will be a public/private effort involving professionals, local officials and volunteers including the Street Tree Advisory Board.

DOCUMENT HISTORIC PLANTING PATTERNS

The Commission, with the assistance of a consultant, will research the historic planting patterns on Route 6A including hedge, shrub and perennial planting, as well as conduct further research on historic trees along Route 6A. This effort will provide guidance for boards, committees and residents interested in planting design which is consistent with the scenic and historic character of Route 6A.

PROVIDE TECHNICAL ASSISTANCE

The Commission will offer assistance to the Massachusetts Highway Department and Commonwealth Electric Company in the development of a Memorandum of Understanding with the Old King's Highway Historic District Committees and local planning boards. The Commission, along with members of the Street Tree Advisory Board, will also offer assistance in developing a community education program for residents and local officials regarding the recommendations of the Vegetation Management Plan.

The Commission will encourage the Local Comprehensive Planning Committees in each town on Route 6A to incorporate the recommendations of this Plan into each town's Local Comprehensive Plan. The Commission will also assist the towns in proposing revisions to regulations which will help to protect and enhance the vegetation along Route 6A.

Potential Sources of Funding

AMERICA THE BEAUTIFUL ACT OF 1990

This act both authorizes and creates funding for both public and private sector urban and community forest programs. These programs are collectively called the "America the Beautiful Initiative". The America the Beautiful Act of 1990 authorized establishment of an urban tree planting and improvement program as a special component of the Urban and Community Forestry Assistance Program of the U.S. Forest Service in cooperation with the various states.

NATIONAL TREE TRUST

The mission of the National Tree Trust is to act as a catalyst for local volunteer groups in growing, planting and maintaining trees in rural communities, urban areas, and along the nation's highways. Designated by the President and established with the help of a grant from the U.S. Congress, the non-profit National Tree Trust's programs include: collecting regionally suitable tree seeds and providing them to Tree Bank nurseries, providing quality tree seedlings to volunteer organizations, encouraging state agencies to join with local volunteer organizations to plant trees along highways, and establishing partnerships between volunteer groups and elementary schools to encourage children to grow and care for trees in their community.

MASS RELEAF

The Commonwealth of Massachusetts offers grants through the MASS ReLeaf program in two forms: Small Business Administration (SBA) grants and traditional grants. The Commonwealth

recognizes that trees not only beautify neighborhoods, but produce positive economic results as well. The SBA grant program provides funds for local businesses to plant trees. Towns are eligible for both grant programs. SBA grants allow towns not only to purchase trees, but provides funding to assist local businesses in planting them.

Traditional MASS ReLeaf grants are awarded to volunteer groups and organizations for the purpose of expanding volunteerism and citizen urban forestry projects. These groups need authorization of the local tree warden to apply for funding and must meet eligibility criteria. For more information, contact:

MASS ReLeaf Coordinator
c/o Executive Office of Environmental Affairs
100 Cambridge Street, 20th floor
Boston, MA 02202

Resources

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Appendix 1

Excerpts from the Cape Cod Commission Tree Inventory, 1994:

- **Summary of Tree Inventory**
- **Tree Inventory and Roadway Data**
- **Sample Data Sheet**
- **Maps of Priority Areas for New Planting**

Old King's Highway (Route 6A) — Tree Inventory Summary

	A	B	C	D	E
1	TOWN	MILES	TOTAL # OF TREES	% OF MILES TO TOTAL ROADWAY	% OF TREE COVER TO ENTIRE ROAD
2	**BOURNE**	1/2 Mile	58	1%	1%
3	**SANDWICH**	8 Miles	882	23%	21%
4	**BARNSTABLE**	9 Miles	1351	25%	33%
5	**YARMOUTH**	3 Miles	195	8%	5%
6	**DENNIS**	5 Miles	481	14%	12%
7	**BREWSTER**	7 Miles	968	20%	23%
8	**ORLEANS**	3 Miles	211	9%	5%
9	**TOTALS**	**35.5 MILES**	**4146**	**100%**	**100%**

Data Collected During Summer 1994

OLD KING'S HIGHWAY (ROUTE 6A) TREE INVENTORY AND ROADWAY DATA

TOWN AND ROAD ORIENTATION	BOURNE NORTH/SOUTH	SANDWICH NORTH/SOUTH	SANDWICH NORTH/SOUTH	SANDWICH NORTH/SOUTH	SANDWICH NORTH/SOUTH	SANDWICH NORTH/SOUTH	SANDWICH NORTH/SOUTH	SANDWICH NORTH/SOUTH
MILE MARKER	0-0	0-1	1-2	2-3	3-4	4-5	5-6	6-7
LANDMARK	Sagamore Bridge	Burgess St./ Tupper Rd.	Tupper Rd. /Tupper Rd.	Tupper Rd./ Charles St.	Charles St./ Discover Hill	DiscoveryHill Rd./Manor Dr.	Manor Dr./ June La.	June La./ Long Hill Rd
LAND USE	Commercial	Commercial/ Residential	Commercial	Commercial	Residential	Residential/ Commercial	Residential/ Commercial	Residential
OVERHEAD UTILITIES	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	No/Yes	No/Yes
UTILITY IMPACTS	No	No	Yes	No	No	No		
SIDEWALKS	No/Yes	No	No	Some	No	No	No	No
SCENIC ELEMENTS	No	No	View to Sandy Neck	View to Village	Farm	Stone Walls, Bogs, Ponds		
NUMBER OF TREES	28/30	80/94	81/73	22/30	79/44	36/43	38/72	38/26
DOMINANT TREE SPECIES	B.Locust/Maple	Black Locust	Oak	Maple	Black Locust	Locust/Maple	Locust	Pine
SECONDARY TREE SPECIES		Maple	Pine	Linden	Maple	Pine, Maple	Tupelo	
DISTINCTIVE SPECIES	No	Black Locust	No	No	Black Locust	Locust, Linden		
HAZARDOUS TREES	No	No	No	No	Yes, Close to Road	Yes, Close to Road		
TREE CANOPY DENSITY	Light	Light	Medium	Light	Dense	Medium	Medium	Medium
CANOPY CONDITION	Poor	Poor	Poor	Average	Good	Good	Good	Good
TOTAL ROAD WIDTH	24'	24'	24'-37'	37'-45'-22'	22'	22'	22'	22'-30'-22'
STATE RIGHT-OF-WAY	70'		70'	70'	70'	40'-50'		
TOTAL TREES PER MILE	58	174	154	52	123	79	110	64

Data Collected During Summer of 1994

OLD KING'S HIGHWAY (ROUTE 6A) TREE INVENTORY AND ROADWAY DATA

TOWN AND ROAD ORIENTATION	SANDWICH NORTH/SOUTH	BARNSTABLE NORTH/SOUTH	BARNSTABLE NORTH/SOUTH	BARNSTABLE NORTH/SOUTH	BARNSTABLE NORTH/SOUTH	BARNSTABLE NORTH/SOUTH	BARNSTABLE NORTH/SOUTH	BARNSTABLE NORTH/SOUTH
MILE MARKER	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15
LANDMARK	Long Hill Rd./ Sandy Neck Rd.	Sandy Neck Rd./ High St.	High St./ Rt. 149	Rt. 149/ Parker Rd.	Parker Rd./ Sandy St. Cemetery	Sandy St. Cemetery/ RR	RR Bridge/ Courthouse	Courthouse/ Commerce Rd.
LAND USE	Residential/ Commercial	Residential	Residential	Commercial/ Residential	Residential/ Commercial	Residential	Residential	Commercial/ Residential
OVERHEAD UTILITIES	No/Yes	Yes/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
UTILITY IMPACTS								
SIDEWALKS	Some/No	No	No	No/Some	Yes/No	Yes/No	Yes	Yes
SCENIC ELEMENTS								
NUMBER OF TREES	50/76	79/67	102/62	80/90	93/65	97/78	100/94	68/44
DOMINANT TREE SPECIES	Pine	Oak	Maple	Locust/Maple	Locust	Silver Maple	Silver Maple	Ash
SECONDARY TREE SPECIES	Maple	Maple	Locust/ Horsechestnut	Cedar				Maple
DISTINCTIVE SPECIES						Silver Maple	Silver Maple	
HAZARDOUS TREES						Silver Maple		
TREE CANOPY DENSITY	Medium	Medium	Medium	Light	Medium	Dense	Dense	Medium
CANOPY CONDITION	Average	Good	Good	Average/Good	Good	Good	Good	Average
TOTAL ROAD WIDTH	22'	22'	22'	22'-21'-24'	24'	22'-24'	24'	24'
STATE RIGHT-OF-WAY								60'
TOTAL TREES PER MILE	126	146	164	170	158	175	194	112

Data Collected During Summer of 1994

)LD KING'S HIGHWAY (ROUTE 6A) TREE INVENTORY AND ROADWAY DATA

TOWN AND ROAD ORIENTATION	BARNSTABLE NORTH/SOUTH	YARMOUTH NORTH/SOUTH	YARMOUTH NORTH/SOUTH	YARMOUTH NORTH/SOUTH	YARMOUTH NORTH/SOUTH	DENNIS NORTH/SOUTH	DENNIS NORTH/SOUTH	DENNIS NORTH/SOUTH
MILE MARKER	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23
LANDMARK	Commerce Rd./ Bone Hill Rd.	Bone Hill Rd./ Vesper La.	Vesper La./ Winter St.	Winter St./ Kencomsett Ci.	Kencomsett Ci./ Trophy Dr.	Trophy Dr./ Tobey Farm	Tobey Farm/ Corporation Rd.	Corporation Rd./ Paddocks Pa.
LAND USE	Residential	Residential	Residential/ Commercial	Residential/ Commercial	Residential/ Commercial	Residential/ Wooded	Commercial	Residential/Wet/ Wooded
OVERHEAD UTILITIES	Yes/No	Yes/Yes	Yes/No	Yes/No	Yes	Yes	No/Yes	No/Yes
UTILITY IMPACTS								
SIDEWALKS	Yes/No	Yes/Yes	Yes/Yes	No	No	No	Yes/No	No
SCENIC ELEMENTS								
NUMBER OF TREES	51/84	36/61	21/30	44/25	43/32	55/38	39/18	70/53
DOMINANT TREE SPECIES	Silver Maple	Silver Maple	Silver Maple	Maple	Oak/Pine	Oak/Pine	Maple	Oak/Butternut
SECONDARY TREE SPECIES			Ash/Linden	Linden			Catalpa	Maple
DISTINCTIVE SPECIES	Silver Maple	Silver Maple						
HAZARDOUS TREES								
TREE CANOPY DENSITY	Dense	Dense	Medium	Light	Light	Medium	Light	Medium
CANOPY CONDITION	Good	Good	Good	Average	Poor	Average/Poor	Good/Poor	Good
TOTAL ROAD WIDTH	25'-23'	22'-21'	22'	22'-21'	21'	21'-24'	24'-34'	34'-24'
STATE RIGHT-OF-WAY						50'	60'	50'
TOTAL TREES PER MILE	135	97	51	69	75	93	57	123

Data Collected During Summer of 1994

OLD KING'S HIGHWAY (ROUTE 6A) TREE INVENTORY AND ROADWAY DATA

TOWN AND ROAD ORIENTATION	DENNIS NORTH/SOUTH	BREWSTER NORTH/SOUTH	BREWSTER NORTH/SOUTH	BREWSTER NORTH/SOUTH	BREWSTER NORTH/SOUTH	BREWSTER NORTH/SOUTH	BREWSTER NORTH/SOUTH	BREWSTER NORTH/SOUTH
MILE MARKER	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31
LANDMARK	Paddocks Pa./ Palmer La.	Palmer La./ Stonybrook Rd.	Stonybrook Rd./ Drummer Boy	Drummer Boy / Seatucket Rd.	Seatucket Rd./ Rt. 137	Rt. 137/ Point of Rocks Rd.	Point of Rocks Rd./ Ocean Edge	Ocean Edge/ CC Rail Trail
LAND USE	Commercial	Residential	Commercial/ Residential	Commercial/ Residential	Residential	Commercial/ Residential	Commercial/ Residential	Commercial/ Residential
OVERHEAD UTILITIES	Yes/No	Yes	Yes	Yes/No	No/Yes	No/Yes	Yes	Yes
UTILITY IMPACTS								
SIDEWALKS	Yes/No	Yes/No	No	No	No/Yes	No/Yes	Yes/No	No
SCENIC ELEMENTS								
NUMBER OF TREES	61/42	45/60	84/62	71/65	52/23	61/90	49/50	95/87
DOMINANT TREE SPECIES	Maple	Maple/Tupelo	Oak/Ash	Ash	Ash	Maple	Maple/Pine	Pine/Oak
SECONDARY TREE SPECIES	Ash/Tupelo		Maple		Maple	Butternut	Ash	Maple
DISTINCTIVE SPECIES								
HAZARDOUS TREES								
TREE CANOPY DENSITY	Medium	Medium	Medium	Medium	Medium	Medium	Medium/Light	Medium
CANOPY CONDITION	Average/Good	Good	Good	Good	Good	Good	Average	Average/Good
TOTAL ROAD WIDTH	24'	24'	24'	24'-26'-24'	24'	24'-23'-24'	24'26'-23'	23'-24'
STATE RIGHT-OF-WAY					60'			
TOTAL TREES PER MILE	103	105	146	136	75	151	99	182

Data Collected During Summer of 1994

LD KING'S HIGHWAY (ROUTE 6A) TREE INVENTORY AND ROADWAY DATA

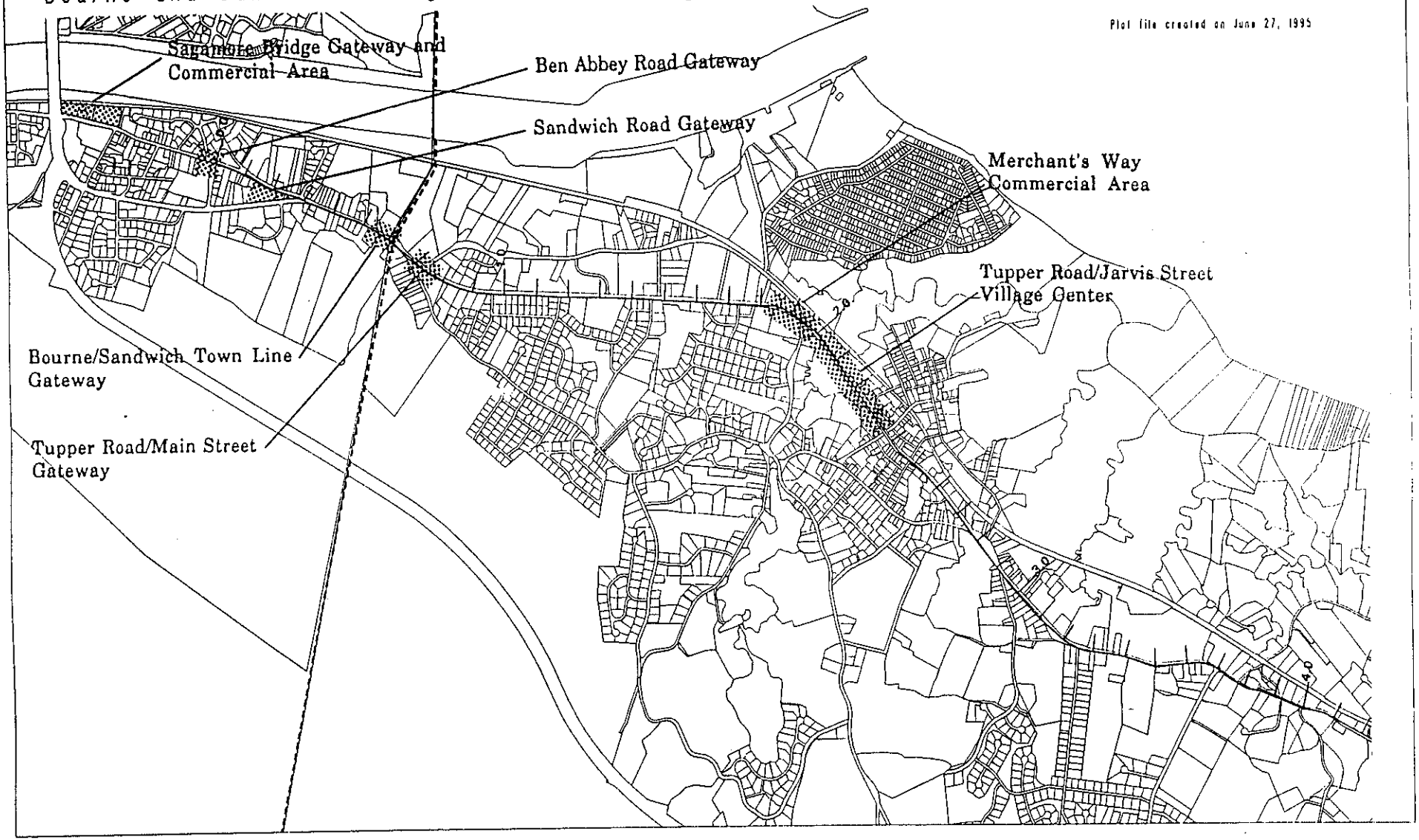
TOWN AND ROAD ORIENTATION	BREWSTER NORTH/SOUTH	BREWSTER NORTH/SOUTH	ORLEANS NORTH/SOUTH	ORLEANS NORTH/SOUTH
IILE MARKER	31-32	32-33	33-34	34-35
LANDMARK	CC Rail Trail/ Owl Pond Rd.	Owl Pond Rd./West St.	West St./Rt. 28	Rt. 28/ Rotary
AND USE	Commercial/ Residential	Commercial	Commercial	Commercial
OVERHEAD UTILITIES	Yes	Yes	No/Yes	Yes
ITILITY IMPACTS				
SIDEWALKS	No	No	Yes	Yes
CENIC ELEMENTS				
NUMBER OF TREES	87/92	32/46	56/58	8/11
DOMINANT TREE SPECIES	Maple/Butternut	Ash/Locust	Maple/Locust	Maple
JECONDARY TREE SPECIES	Pine/Oak	Butternut		
DISTINCTIVE SPECIES				
HAZARDOUS TREES				
TREE CANOPY DENSITY	Dense	Light	None	None
CANOPY CONDITION	Good	Average	Poor	Poor
TOTAL ROAD WIDTH	24'	24'-33'-50'	50'-29'-26'	26'-42'
STATE RIGHT-OF-WAY			65'	
TOTAL TREES PER MILE	179	78	114	19

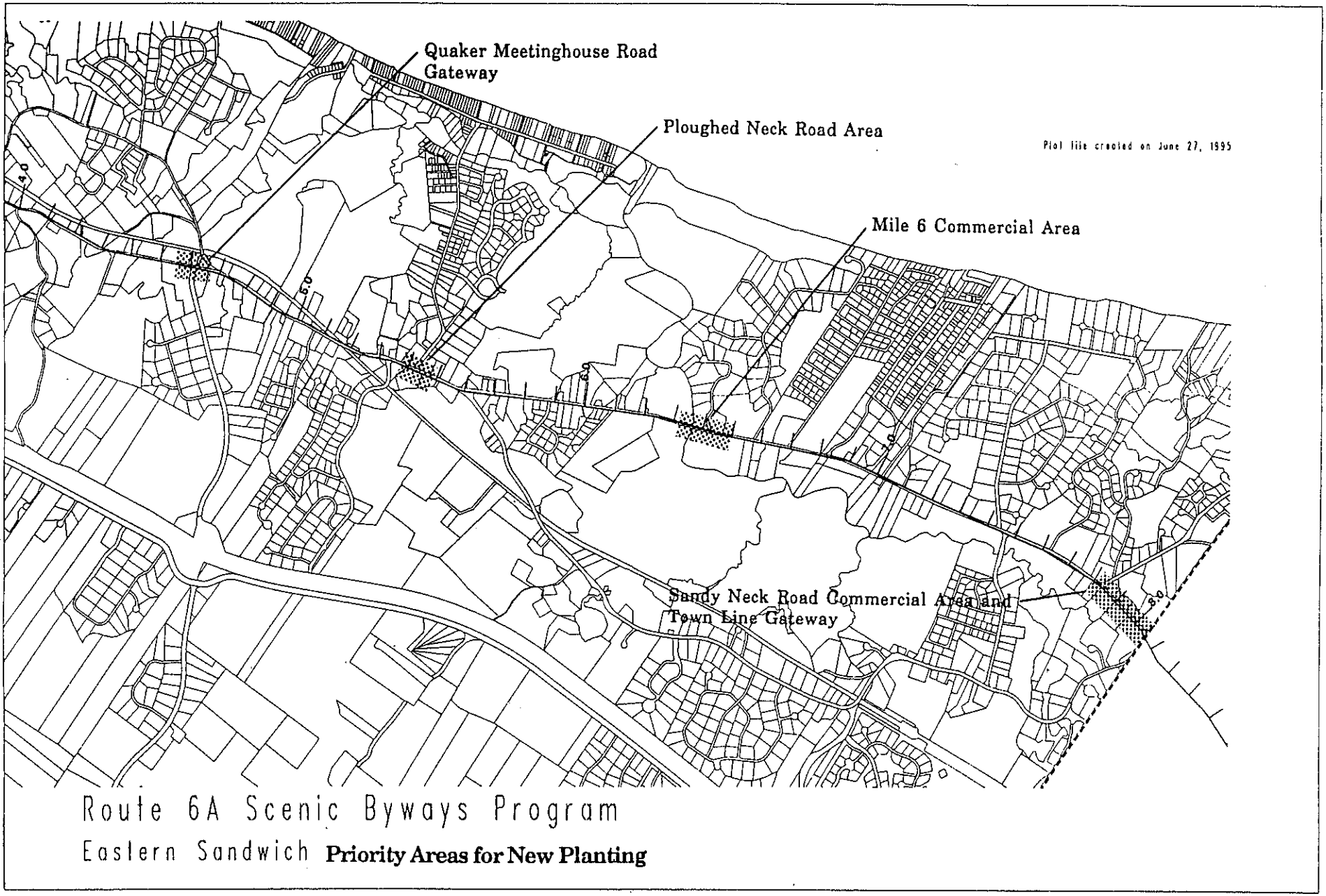
Data Collected During Summer of 1994

Mile 6.0 to 6.0											
SOUTH SIDE											
Town/Direction	MILE 5 SOUTH - MANOR DRIVE TO MURKWOOD CONSERVATION AREA										
Sanddwich East	This commercial/residential area has a nice canopy cover of maples and locusts, despite the many curb cuts and street intersections. The middle portion of the road has a few very nice rows of maples lining the street. Then there is a nice wooded section of tupelos on conservation land.										
Beginning Landmark											
Manor Drive											
Ending Landmark											
Murkwoods Con. Land											
Tenth Mile Segments	.1 mile	.2 mile	.3 mile	.4 mile	.5 mile	.6 mile	.7 mile	.8 mile	.9 mile	.10 mi	TOTALS
Land Use	COMM.	COMM.	COMM.	OPEN	COMM.	OPEN	COMM.	COMM.	COMM.	COMM.	
Utilities	N	N	N	N	N	N	Y	Y	Y	Y	
Sidewalks	N	N	N	N	N	N	N	N	N	N	
Tree Canopy Cover											
Tree Species											
Locust		3	2	2	10	10	10	2			39
Oak				3	4						7
Tupelo							2	2	2	2	8
Cedar		1									1
Maple	4	4	5	4							17
DBH 3-12"											0
12-24"		2	2	5	4						13
24" +	4	6	5	4	10	10	12	4	2	2	59
TOTAL	4	8	7	9	14	10	12	4	2	2	72
# of trees w/in 10' road	4	8	7	9	14	10	12	4	2	2	72
# of Dead Trees	0	0	0	0	0	0	0	0	0	0	0
Shrub/Understory	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	
Dense											
Medium	X					X	X	X			
Light		X	X	X	X				X	X	
None (no canopy)											
Open (marsh/bog)											
Canopy Condition											
Good	X	X		X		X	X	X	X	X	
Average			X								
Poor					X						
Comments											

Route 6A Scenic Byways Program

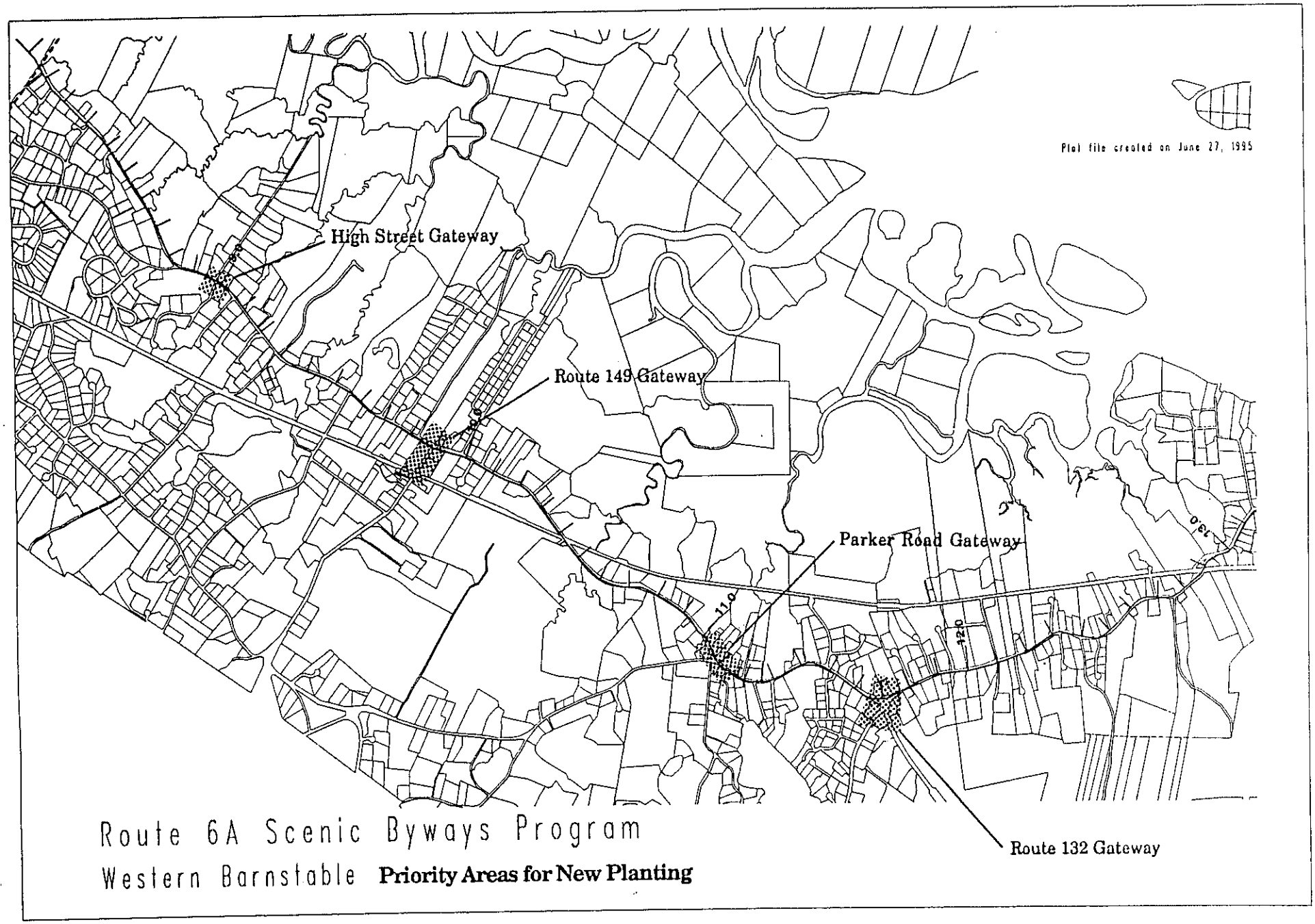
Bourne and Sandwich **Priority Areas for New Planting**

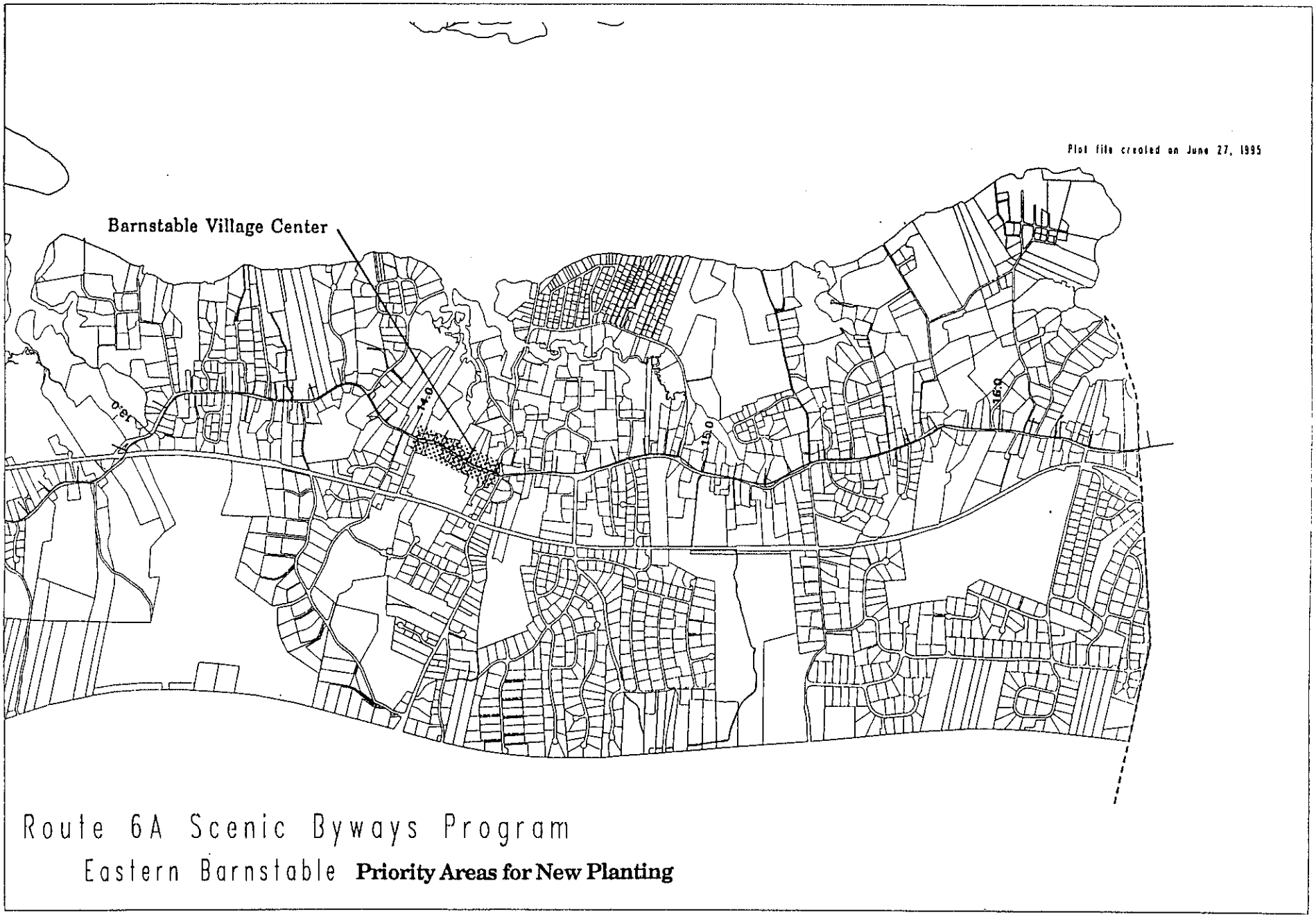




Route 6A Scenic Byways Program

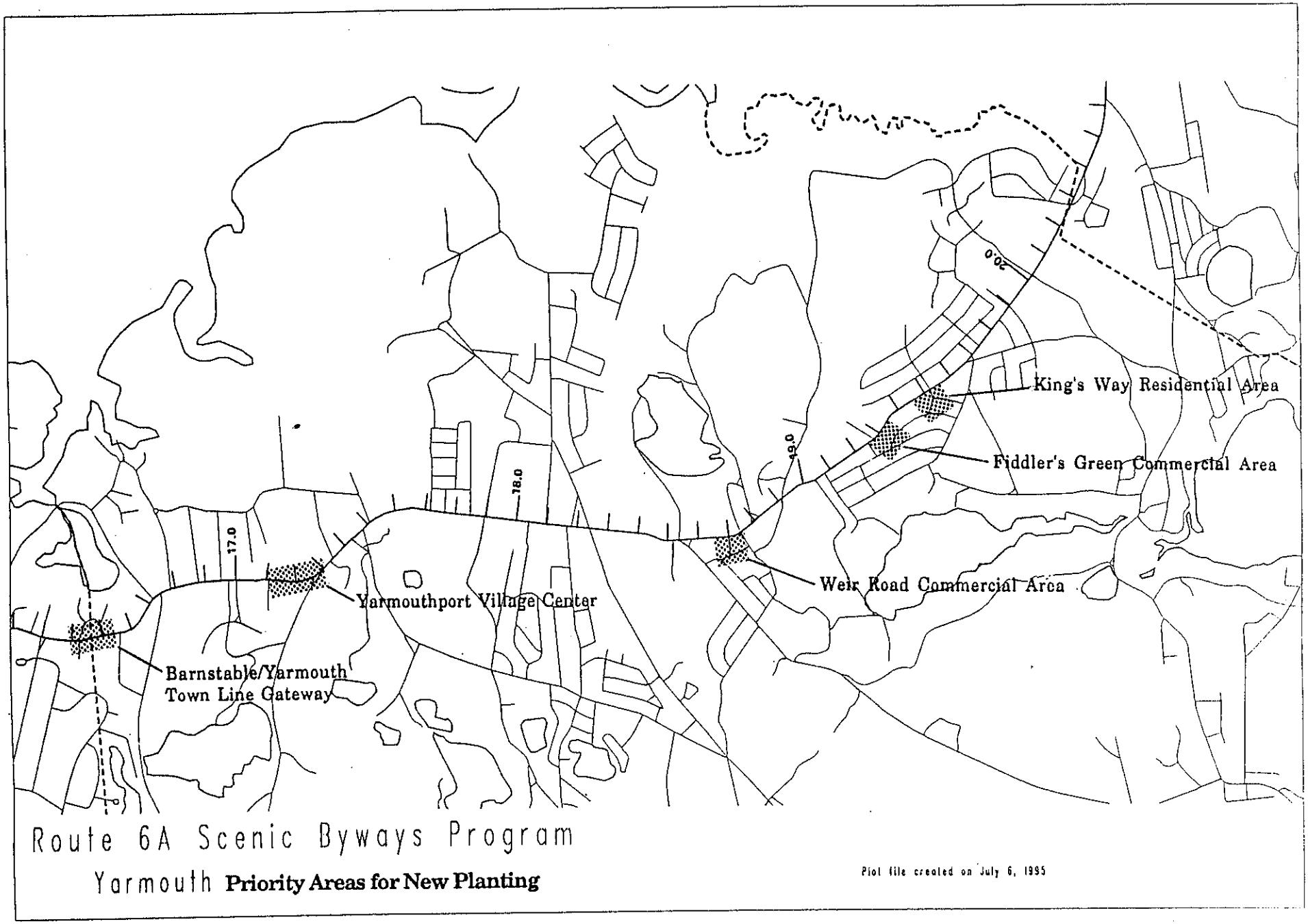
Eastern Sandwich **Priority Areas for New Planting**


Plot file created on June 27, 1995
High Street Gateway
Route 149 Gateway
Parker Road Gateway
Route 132 Gateway
Route 6A Scenic Byways Program
Western Barnstable Priority Areas for New Planting



Route 6A Scenic Byways Program

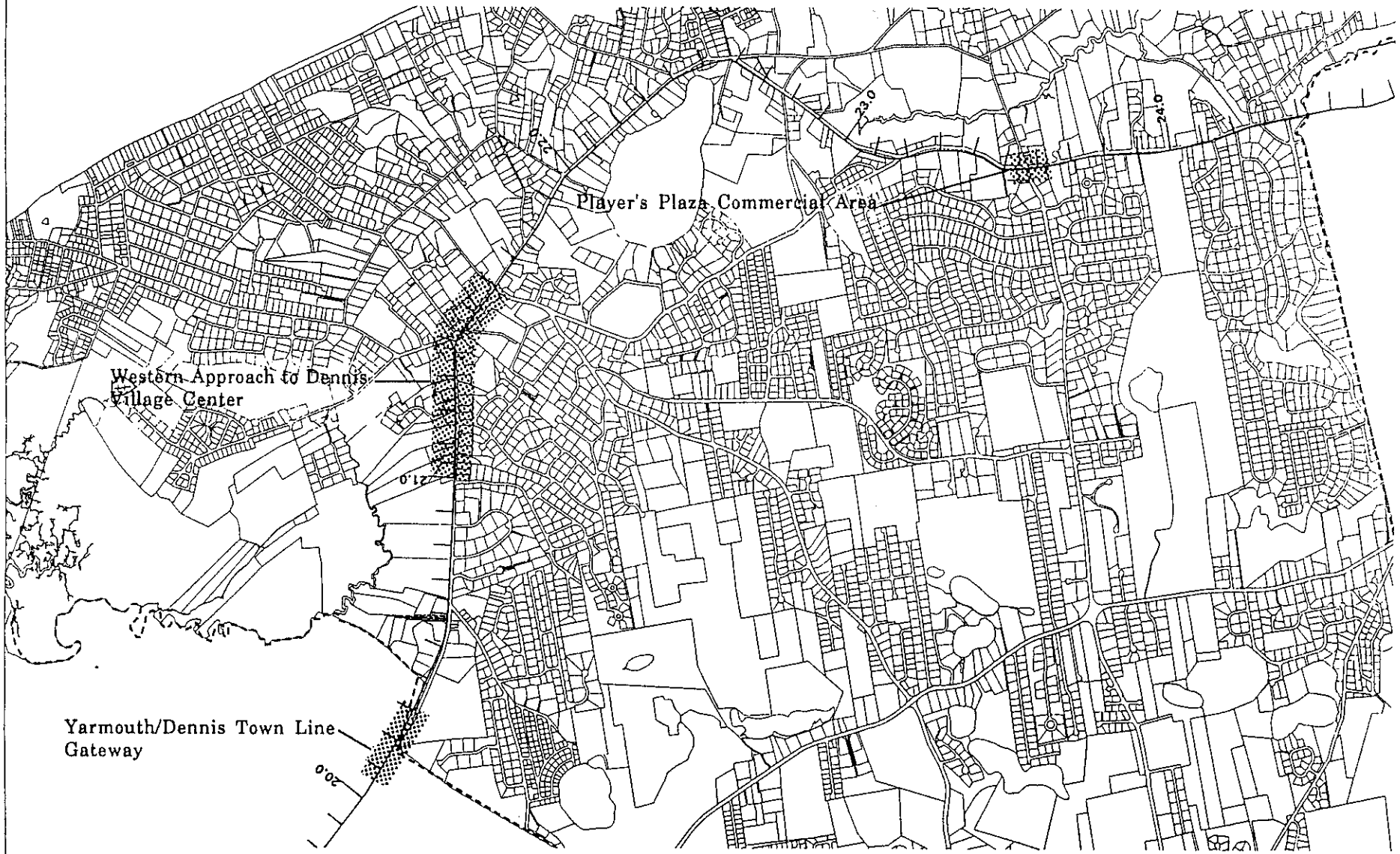
Eastern Barnstable **Priority Areas for New Planting**



Route 6A Scenic Byways Program

Yarmouth **Priority Areas for New Planting**

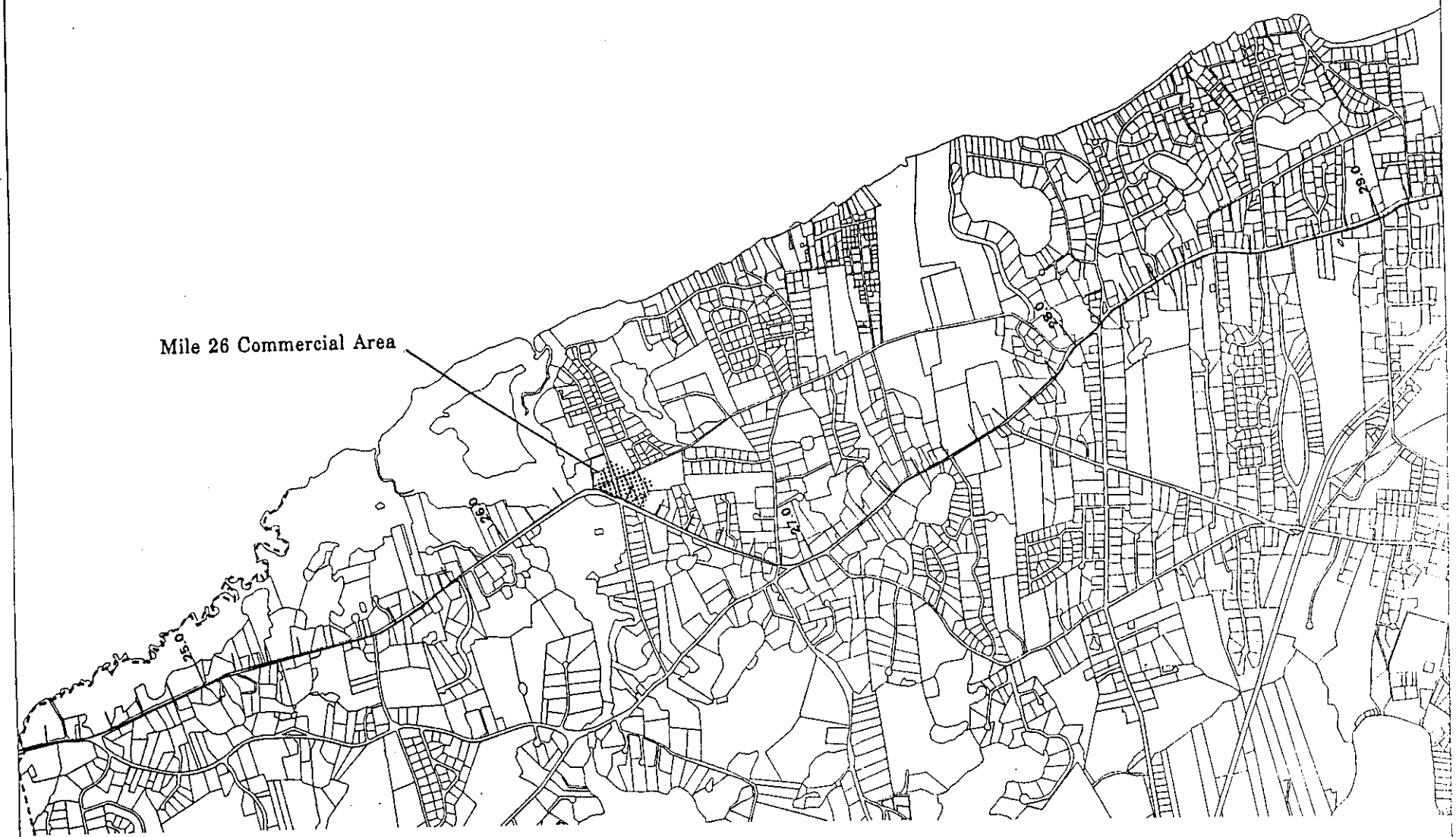
Plot file created on July 6, 1995



Route 6A Scenic Byways Program

Dennis - **Priority Areas for New Planting**

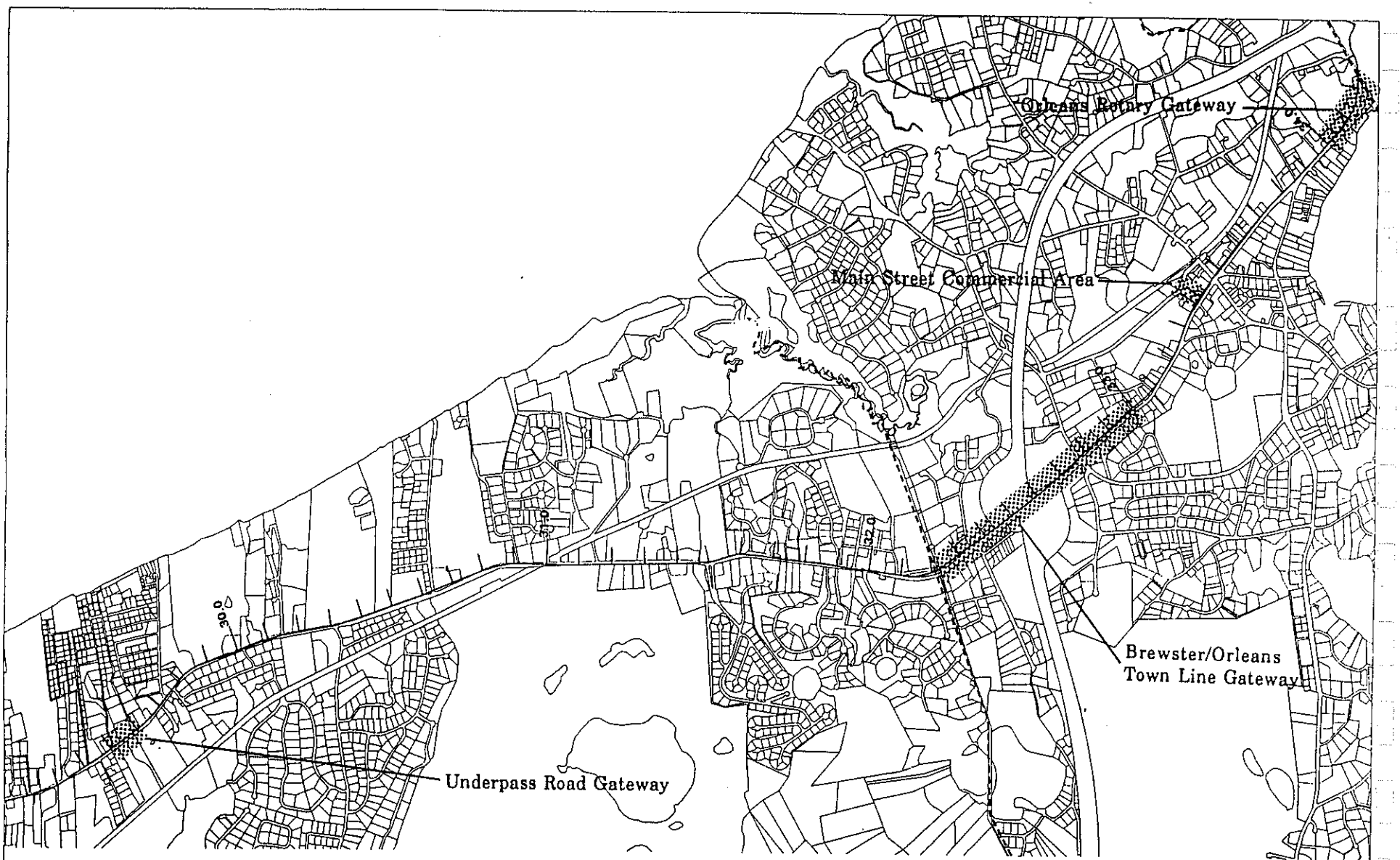
Plot file created on June 28, 1995



Route 6A Scenic Byways Program

Western Brewster **Priority Areas for New Planting**

Plot file created on June 28, 1995



Route 6A Scenic Byways Program

Eastern Brewster and Orleans **Priority Areas for New Planting**

Plot file created on June 28, 1995

Appendix 2

Massachusetts Highway Department Regulations:

- **Application for Permit to Access State Highway**
- **Special Provisions for Contractors**
- **Standard Specifications for Highways and Bridges Section 101**
- **Calendar for Annual Maintenance Programs**

MASS HIGHWAY

Massachusetts
Highway Department

RECEIVED
JUN 16 1995
CAPE COD
COMMISSION

Application for Permit to Access State Highway

To be completed by the applicant. See reverse for instructions.

1. Town/City _____

2. State Highway route number and/or name _____

_____

3. Description of property and/or facility for which access is sought (attach additional sheets if necessary).

_____

_____

_____

4. Description of work to be performed within State Highway Layout (attach additional sheets if necessary).

_____

_____

_____

5. Dig Safe number: _____

6. Applicant Information	7. Property Owner
Name _____	Name _____
_____	_____
Mailing address _____	Mailing address _____
_____	_____
Telephone number _____	Telephone number _____
Signature _____	Signature _____
Date _____	Date _____

Return completed application to District Highway Engineer for your Town/City. Refer to reverse side for appropriate address.

For office use only. Do not write below this line

1. Application number _____
2. Date received _____
3. Fee amount _____
4. MEPA required _____
   ENF-EOEA Cert. _____
   EIR-EOEA Cert. _____
   Other-EOEA Cert. _____
5. Section 61 finding _____
6. Mass historic action _____
7. Plans returned _____
   Revision submitted _____
8. Application complete _____
9. Permit issued _____
10. Permit denied _____

Instructions for Completing Application for Permit to Access State Highway

General

The MHD is granted authority to issue State Highway Access Permits by M.G.L. Chapter 81, Section 21.
Access is defined as:
I. Any physical work performed within the State Highway Layout; and/or,
II. Provisions for motor vehicles to enter or exit a State Highway facility from abutting properties.

A. Application for residential developments of 5 units or less shall include a sketch which indicates lot size, frontage along the State Highway, building location(s), and proposed driveway location(s) with respect to State Highway baseline.

B. Application for all non-residential developments and residential developments greater than 5 units must include engineered access plans (minimum of 2 copies) at an appropriate scale (1 inch = 20 or 40 feet) which clearly show all proposed work and:

1. State Highway Layout line and baseline (information available at District offices).
2. Property corners and dimension and bearings of lot lines.
3. Location and dimensions of proposed drive(s).
4. Location of existing drive(s).
5. Complete details of existing and proposed drainage.

Fee
A check payable to the Commonwealth of Massachusetts for the appropriate permit application fee must accompany the permit application

Fee Schedule for Access and Utility Permits

Residential Access Permits	
5 or less units	$25.00
From 6 to 49 units	$100.00
Greater than 49 units	$2,000.00
Non-Residential Access Permits	
Less than 25,000 square feet	$500.00
From 25,000 to 300,000 square feet	$1,000.00
From 300,000 to 750,000 square feet	$2,000.00
Greater than 750,000 square feet	$3,000.00
Non-Municipal Utility Permits Not in Conjunction with Access Permits	
Annual blanket utility permit	$500.00
Capital improvements to a utility	$500.00

Specific Instructions (print or type)

Line 1.
List name of municipality in which access is sought.

Line 2.
List name or number of State Highway Route(s) to which access is sought.

Line 3.
If access is sought under Definition II above, briefly describe facility for which access is sought.

Example 1:
Private single family residence at 100 State Road. Approximate size of proposed building 2,500 s.f. Approximate lot size 0.75 acres.

Example 2:
500,000 s.f. enclosed shopping mall adjacent to State Route I-290 and Route 20. Approximate lot size 67 acres.

Line 4.
Briefly describe the proposed work to be performed within the State Highway Layout.

Example 1:
Remove 50 feet of existing granite curb on south side of highway in order to construct driveway access and modify the roadway geometry to accommodate left-turn lane.

Example 2:
Excavate 10 foot x 10 foot section of roadway at Station 100 + 00 in westbound lane in order to install water service to residence at 100 State Street.

Line 5.
A Dig Safe number must be obtained by calling 1-800-322-4844. If construction within the State Highway Layout does not commence within the period allowed by Dig Safe, a new number must be obtained prior to beginning construction.

Line 6.
Individual or business making application must complete the required information, including date of application and signature.

Line 7.
Complete this section only if the individual or business making application is other than the property owner of the land for which access is sought.

Return completed application and fee to appropriate District Office listed below. Please contact the Permit Engineer at this address if additional information is required.

District 1
270 Pittsfield Road
Lenox, MA 01201
(413) 637-1750

District 2
811 North King Street
Northampton, MA 01060
(413) 584-1611

District 3
403 Belmont Street
Worcester, MA 01604
(508) 754-7204

District 4
519 Appleton Street
Arlington, MA 02174
(617) 648-6100

District 5
1000 County Street
Taunton, MA 02780
(508) 824-6633

PROSECUTION OF WORK

Add the following new paragraph at the end of Section 8.0 of the 1988 edition of the Standard Specifications For Highways and Bridges:

For the purpose of this contract, the Contractor shall be permitted to sublet up to and including sixty-five (65) percent of the original contract price provided that any subcontracts in excess of fifty (50) percent are sublet to employee owned corporations of which former Massachusetts Highway Department employees own at least thirty-five (35) percent of the shares of the corporation and of which former Massachusetts Highway Department employees are at least thirty-five (35) percent of the employees. Former Massachusetts Highway Department employees shall be defined as those employees whose state employment has been terminated through privatization.

PERSONNEL

The Contractor agrees to make best efforts to hire those qualified former Massachusetts Highway Department regular maintenance service employees that have had their state employment terminated through privatization.

The Contractor further agrees that best efforts shall include, but not be limited to, an interview and consideration of each former employee that applies for any available employee position created by this privatization contract.

The definition of qualified maintenance service employees shall include, but not be limited to, those employees that have satisfactory disciplinary, attendance and performance record over the six month period that has elapsed prior to the effective date of this privatization contract.

The Contractor further agrees to provide the Massachusetts Highway Department with a detailed report summarizing his hiring efforts within fourteen (14) calendar days after this contract is awarded.

A notice to proceed will not be issued until all of the aforementioned conditions have been satisfied.

A semi-annual report listing all former Massachusetts Highway Department employees that have been hired by the Contractor shall be provided to the Department within fourteen (14) calendar days after each six month period has elapsed. Such report shall state the status of each hired employee and include their position and hours worked for the six month period.

ITEM 102.03 SAFETY SITE DISTANCE CLEARING **ACRE**

The work to be done under this item consists of the safety and sight distance clearing of undesirable hazardous growth: removal of designated trees, stumps, and undesirable brush; removal of dead, dying or diseased trees, brush and plant material; removal of uprooted trees and stumps; tree up-branching and shaping; removal of all dead, dying, broken and certain other limbs and branches; and the removal of all stubs of limbs and branches from all designated trees within the described limits of the State Highway in said Counties.

The intent is to remove vegetative growth that hinders and/or restricts the safety sight distance at locations described hereinafter to provide a safe desirable stopping distance and to expose traffic signs for ease of visibility.

In Roadway Cut Sections, it is a requirement of this contract that trees up to 2" in diameter shall be cut flush for a distance of up to 10 feet (maximum) from the toe of slope where directed by the Engineer.

LIMBS AND BRANCHES Shall be defined as wood having a diameter of ½" or over and wood which has a diameter of less than ½" shall be considered a TWIG.

A DYING LIMB OR BRANCH May have live growth at some point, but shall be removed if found to be in an unhealthy condition.

While it is not the intent that every dead, dying and/or broken twig be removed from trees requiring trimming, the tree worker will be required to remove all such twigs accessible in the areas of the tree in which he is working.

Limbs and branches which over hang onto State Highway Layout from trees located outside the State Highway Layout limits shall be considered as part of this contract. The clearing and trimming of such limbs and branches shall only be required back to a point vertical with the State Highway Layout line without the necessity of trespassing on private property. However, if the Contractor obtains permission for entry onto the private land from the property owner, trimming may be performed in a normal manner.

Tree up-branching under this contract will be restricted to trees which have limbs and branches extending over roadways, shoulders, and turnouts used by trucks or other large vehicles, whether they are in transit or parked. This up-branching shall be done regardless of the type of construction of the roadways, shoulders, or turnouts. Up-branching and/or trimming will be required to produce a 15 foot minimum clearance over all locations described above and the removal of limbs and branches

(Cont.)

ITEM 102.03 (Continued)

involved in this operation shall be accomplished as outlined herein.

Tree shaping may be required on trees where up-branching done under this contract has distorted the natural symmetry of the tree. Tree shaping shall consist of the removal of limbs and branches from other locations of the tree where removal is desirable to restore natural symmetry.

All sucker growth on all tree trunks within the limits of the work area shall be removed from the ground level to the beginning of the main branch system.

Any and all branches extending directly below a street luminary as to limit the light reaching the street or path/sidewalk surfaces shall be removed and all branches shall be cut back to afford a minimum of four (4) feet clearance on all sides of the luminary.

The path/sidewalk surface shall be considered as the area from the edge of the roadway surface to the edge of the path/sidewalk surface farthest from the roadway.

The Contractor may be required to work all the daylight hours to comply with the lane closure requirements.

SUPPRESSION OF DUTCH ELM DISEASE

The General Laws of the Commonwealth dictate that infected Elm trees be disposed of in such a manner to prevent the spread of Dutch Elm Disease. Diseased wood shall be disposed of in accordance with the provisions of General Law, Chapter 660, Acts of 1948; Chapter 161, Acts of 1949, regulation 660-51A; and in accordance with any additional regulations.

All trimming and pruning shall conform to recognized tree surgery practices and particular note should be made that painting be required on all cuts 2" (two inches) or over in diameter, and the tree paint shall conform to subsection M6.07.0).

Recognized tree surgery practices direct that all limbs and branches which require removal and all stubs regardless of age be cut NEARLY flush, either to a union with the next larger sound limb, or branch, or NEARLY flush to the trunk of the tree.

By cutting NEARLY, but not quite, flush with the trunk, limb or branch, the "collar" is left at the top of the wound (in the crotch of the union). This will permit the callus growth to cover the wound in a shorter period of time.

(Cont.)

ITEM 102.03

SUPPRESSION OF DUTCH ELM DISEASE (Continued)

Burning of removed tree debris will not be permitted within the State Highway Layout.

The Contractor shall take all necessary precautions to avoid spillage from his truck onto the traveled ways. Any material which drops from the vehicle when the material is being carried over the highway shall be removed immediately by the Contractor.

It shall be the responsibility of the Contractor to observe all State Laws and Local Ordinances pertaining to the hauling of such materials.

No vehicles, equipment, or material shall be left on the road surface or shoulder or adjacent to it any time other than during actual working operations.

The Contractor shall be fully responsible for the organization and supervision of the crew and be fully responsible for satisfactory performance of all work required under this contract.

The work area within the interchange shall be located as follows:

1. Shall be from the beginning of the deceleration lane to a point beyond the ramp and the connecting road to permit desirable sight distance.

2. Will include the outside and the inside of curves. In the event a rotary is included, the work would be required on the outside of the curve.

3. The area to be clear cut horizontally and vertically will extend from the edge of the pavement horizontally a minimum of six (6) feet. In the event any plant is disfigured it shall be removed.

4. In the event a sidewalk is included within the limits of the interchange all vegetative growth over and above the guardrail will be removed as directed by the Engineer.

5. The area extends from the edge of the ramp pavement a maximum distance of fifty (50) feet measured horizontally to obtain the desirable sight distance.

Trees and shrubs planted on abutment slopes for erosion control will be trimmed and/or removed as directed by the Engineer.

(Cont.)

ITEM 102.03 (Cont.)

SUPPRESSION OF DUTCH ELM DISEASE (Continued)

Trees shall be trimmed if accessible from the pavement or grassed roadside area.

All brush, growth, trees (diameter under nine inches (9" measured three feet (3') above the ground) to be removed shall be cut flush with the ground with a two inch (2") tolerance permitted.

A tree to be considered as a separate pay item shall be defined as having a diameter of nine (9) inches or over measured at a point three (3) feet above the ground as defined in Section 101 of the 1988 Standard Specifications.

All safety and sight distance clearing shall conform to the relevant provisions of Selective Clearing of Section 101 of the 1988 Standard Specifications, as amended, unless otherwise specified in these Special Provisions.

The work of log and stump removal shall be the same as for tree removal, except that the foliage and branches have been removed by others, and may consist of either a felled and sawed log and associated stumps; felled and unsawed log and stump, or a standing trunk up to, but not including, the lower main branch system.

Any curbing removed by the Contractor in order to cut or remove trees or stumps shall be reset and full compensation for such work shall be included in the contract unit prices.

ITEM 102.1 TREE TRIMMING **EACH**

The work to be done under this item consists of removing all dead, dying, broken and certain other limbs and branches as described hereinafter and the removal of all stubs of limbs and branches from all trees located within the limits of the state highways in District 5C and the satisfactory disposal of all such removed debris.

TREE shall be defined as having a diameter of 4" or over, measured at a point of three (3) feet above the ground.

All sucker growth on all tree trunks within the limits of the contract shall be removed from the ground level to the beginning of the main branch system.

Burning of removed tree debris will not be permitted within the State Highway Layout.

(Cont.)

ITEM 102.1 (Continued)

This work will be paid for at the contract each price under Item 102.1 which price shall include full compensation for all labor, materials, equipment, apparatus, tools and incidentals necessary for the satisfactory completion of the work.

ITEM 105.41 TREE REMOVED (CUT 6 IN. BELOW) DIA. UNDER 24 IN.	EA
ITEM 105.421 TREE REMOVED (CUT FLUSH) DIA. UNDER 9 IN.	EA
ITEM 105.422 ISOLATED GROWTH REMOVED	EA
ITEM 105.44 TREE REMOVED (CUT 6 IN. BELOW) DIA. 24 IN. & OVER	EA
ITEM 105.501 STUMP REMOVED (CUT 6 IN. BELOW) DIA. UNDER 9 IN.	EA
ITEM 105.51 STUMP REMOVED (CUT 6 IN. BELOW) DIA. UNDER 24 IN.	EA
ITEM 105.54 STUMP REMOVED (CUT 6 IN. BELOW) DIA. 24 IN. & OVER	EA
ITEM 105.57 LOG AND STUMP REMOVED (CUT 6 IN. BELOW) DIA. UNDER 24 IN.	EA
ITEM 105.60 LOG AND STUMP REMOVED (CUT 6 IN. BELOW) DIA. 24 IN. AND OVER	EA

The work to be done under these items shall consist of the removal and satisfactory disposal of trees and stumps and in accordance with the relevant provisions of Section 101 and the following:

Items 105.41, 105.44, 105.501, 105.51, 105.54, 105.57 and 105.60 are for the purpose of cutting trees and stumps to a depth 6 inches below the natural surrounding ground level.

Items 105.421 and 105.422 are for cutting trees and stumps flush with the natural surrounding ground level, or as near flush as possible to the existing water or ice level in designated swamp areas rather than removing the entire stump together with its major root system, as specified in Section 101. Item 105.421 shall consist of the removal of isolated trees as directed having a diameter less than 9 inches but not less than 4 inches. Item 105.422 shall be for the removal of vegetative growth as directed having a diameter less than 4 inches.

Item 105.51 shall be for stumps having diameters of less than 24 inches but not less than 9 inches and Item 105.501 shall be for diameters less than 9 inches but not less than 4 inches.

Any curbing removed by the Contractor in order to cut or remove trees or stumps shall be reset and full compensation for such work shall be included in the contract unit price for the tree and stump removal items involved.

Cavities left from trees or stumps, removed or cut 6 inches below ground shall be backfilled with earth materials natural to the surrounding area and graded to meet the adjacent ground surface.

(Cont.)

ITEMS 105.41 THROUGH 105.60 (Continued)

All work under this contract will be paid for at the unit bid prices under the respective items, which price shall constitute full compensation for all labor, tools, material, equipment, and other incidental work necessary to satisfactorily complete the items.

Partial payment in the amount of 75% of the unit bid price for the item will be paid for a tree removed by topping with its stump remaining flush with the ground when, in the judgment of the Engineer, heavy snow cover would make complete removal specified under the item impracticable.

Topping shall consist of reducing a tree by removal and the satisfactory disposal of all limbs, branches and the main truck to a point below the main branching system. In locations where a low stump would create a safety hazard, as determined by the Engineer, the tree shall be topped as directed to leave not less than an eight (8) foot high stump, irrespective of the tree's natural branching height.

All work done under Items 102.03, 102.1, 105.41, 105.421, 105.422 and 105.44 shall be performed or supervised by a certified tree surgeon or arborist with proof of certification submitted to the Engineer upon request.

ITEM 106.151 EXTENDING BLEEDER (BRIDGE DECK) EACH

Work under this item shall consist of extending existing bridge bleeders as directed by the Engineer. The purpose of this work is to direct bridge deck drainage away from the concrete and steel elements of the bridge. The typical extension will consist of adding the desired length of 1" or 2" PVC pipe to the existing bleeder.

Work under this item shall include all material, labor and equipment required to complete the work to the satisfaction of the Engineer.

ITEM 106.16 FURNISH AND INSTALL SCUPPER GRATE EACH

The work under this item shall conform to the relevant provisions of Section 220 of the Standard Specification and the following:

Damaged or missing scupper grates shall be replaced in kind as directed by the Engineer. In addition to furnishing and installing new grates under this item, the Contractor may have to remove and properly dispose of existing damaged grates, at no additional compensation.

(Cont.)

SECTION 100

EARTHWORK, GRADING, DEMOLITION, RODENT CONTROL AND BORINGS

SECTION 101
CLEARING AND GRUBBING

DESCRIPTION

101.20 General.

This work shall consist of clearing, grubbing, cutting, removal and disposal of all vegetation and debris from areas either within or outside of the Right-of-Way as shown on the plans or designated by the Engineer. The work shall also include the preservation from injury or defacement of all vegetation and objects designated by the Engineer to remain.

CONSTRUCTION METHODS

101.60 General.

The burning of trees, brush, stumps, etc., will not be permitted. The Contractor shall provide other satisfactory methods of disposal without additional compensation.

The Contractor shall obtain written permission of the Engineer for use of storage areas within the Right-of-Way requiring clearing and grubbing or selective clearing and thinning. Any clearing for the Contractor's convenience shall be done at his own expense. All such areas shall be restored to a condition acceptable to the Engineer including necessary mulching, seeding, and planting without additional compensation.

The Engineer shall be provided with notarized copies of agreements between the Contractor and owners of land used as disposal or storage areas.

When fencing is installed outside normal clearing areas, every reasonable effort shall be made to preserve trees or shrubs whose removal is not essential to the installation of the fencing.

Acceptable material obtained on the project may be used to produce wood chip mulch. The Contractor shall use an approved chipper and ¼ inch knife setting as described under Subsection M6.04.3. Wood Chip Mulch. Material obtained from Elm trees shall not be accepted for use.

Wood chips produced on the project from clearing and grubbing shall be stockpiled within the location and used where and as directed.

Except for materials used for making wood chip mulch, the Contractor shall make all arrangements and negotiations necessary for the satisfactory disposal of trees, shrubs, stumps, roots, dead wood and other litter, in areas outside the Right-of-Way and in such manner that no condition or accumulation of material shall be permitted to disfigure or mar the finished landscape.

101.61 Clearing and Grubbing.

The stumps of all trees, brush and major roots shall be grubbed and removed in all excavation areas and under all embankments where the original ground level is within 3½ feet of the subgrade or slope of embankments.

All trees, stumps, and brush shall be cut off within 6 inches of the ground in embankment areas where the original ground level is more than 3½ feet below the subgrade or slope of embankments.

Trees and shrubs that are specifically designated by the Engineer not to be cut, removed, destroyed or trimmed shall be saved from harm and injury.

All damage done to trees by the Contractor's operation and all branches of trees extending within the roadway shall be trimmed and painted where cut as directed to provide a 20-foot minimum vertical clearance including selective trimming of such trees as directed.

101.62 Selective Clearing and Thinning.

A. General.

The work under this item shall consist of the removal of hazardous growth and dead, dying or diseased plant material; the removal of groups and individual plants which interfere with the growth of more desirable types of trees and the clearing away of lesser growth that may obscure outstanding trees, tree groups, or scenic views. Any part of tree trunks or base of plant material located on the Location Lines shall be considered within the State Highway Limits.

Densely wooded areas shall be thinned to provide space for healthy growth by eliminating thinner, weaker trees and the reduction of number of varieties.

The Contractor's attention is called to the requirements for work under this item. The desired appearance to be attained in certain areas of heavy growth may require three or more operations. First, the obvious dead, dying and diseased trees and undergrowth shall be cut and cleared out of the area. This work includes removal of any previously fallen trees, branches, uprooted stumps and other debris as directed. Next, the area is to be thinned out, as directed, by removing the less desirable trees and brush which interfere with the growth of the better plant material. Finally, clear out lesser growth which may obscure outstanding trees, tree groups or scenic views.

Tree up-branching and shaping under this item will be restricted to trees which have limbs and branches restricting sight distance, extending over roadways, shoulders, turn outs, etc. Up-branching or trimming will be required to produce a 20-foot minimum vertical clearance over all locations described hereinbefore, and the removal of limbs and branches involved in this operation shall be accomplished as outlined hereafter.

B. Prosecution of Work

(Supplementing Subsection 8.03). Quality of work must conform with accepted tree trimming practices.

All trimming and pruning shall conform to recognized tree surgery practices, and particular note should be made that painting with an approved tree dressing or paint, will be required on all cuts 2 inches or over in diameter.

The dressing or paint shall be applied no later than two days after the cuts are made.

Recognized tree surgery practices include among many others, the fact that all limbs and branches which require removal and all stubs regardless of age must be cut flush either to a union with the next larger sound limb or branch or flush to the trunk of the tree.

The cutting shall be performed by experienced woodsmen. Trained tree climbers are required for pruning of tall growth. Care shall be exercised by the Contractor to prevent injury to trees and shrubs designed to be preserved. Any injury to limbs, bark or roots of such plants shall be repaired by the Contractor, as directed, or the plants replaced without additional compensation for such repair or replacement.

C. Cutting and Treatment of Stumps and Stubble.

Standing trees, undesirable brush and existing stumps to be removed shall be cut flush with the ground and a 2" tolerance permitted and the resulting stumps or stubble then brushed or sprayed with a chemical spray material conforming to the requirements of M9.02.0 of Division III, Materials.

Application shall be by brush or spray so as to give complete coverage and wetting to the point of runoff.

This application shall be completed within two days after the cutting.

As the specified chemical herbicide is harmful to desirable roadside growth, the Contractor shall apply the chemical in such a manner that damage will not occur either from the direct spray or from drift of the chemical to any desirable growth.

The Contractor shall use all necessary precautions to prevent injury to crops or damage to other desirable growth on private abutting property, as well as to those within the Right-of-Way, and shall assume full responsibility for any damage.

D. Disposal of Cuttings.

The Contractor may dispose of cut material by processing into a wood chip mulch as described in Subsection M6.04.3 and spreading uniformly throughout the cleared and thinned areas as directed by the Engineer.

101.63. Disposal of Trees.

All trees to be cleared shall become the property of the Contractor, and the satisfactory disposal of the wood in such trees outside the Right-of-Way shall become his responsibility.

The trees, including cuttings and slash shall be disposed after cutting as soon as practicable and in such a manner as not to detract from the appearance of the roadside.

If the existing ground in the area is disturbed by any of the work or equipment, the Contractor shall rough-grade and loam and seed if necessary the disturbed areas, if so directed, without additional compensation.

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101.64. Disposal of Stumps and Brush.

After removal, all stumps including the major root system shall be disposed by the Contractor at his own responsibility outside the layout where the material will not cause obstructions to streams and will not detract from the appearance of the roadside.

101.65. Disposal of Dutch Elm Diseased Wood.

Dutch Elm diseased wood shall be disposed of in accordance with the provisions of General Law, Chapter 87, Section 5 and Chapter 132, Sections 8 and 11, as amended; and in accordance with any additional local regulations.

Where the work includes the removal of elm trees or the limbs of elm trees, such trees or limbs thereof shall be disposed of immediately after cutting or removal and in such a manner as to prevent the spread of Dutch Elm disease. This shall be accomplished by covering them with earth to a depth of at least 6 inches in areas outside the highway location where the Contractor has arranged for disposal.

Where the work includes the removal and disposal of stumps of elm trees, such stumps shall be completely disposed of immediately after cutting in the manner specified above.

COMPENSATION

101.80 Method of Measurement.

Clearing and grubbing shall be measured by the horizontal plane area and will be the number of acres within the limiting stations of the project and/or as designated by the Engineer and the outside limits of measurement shall extend to a point 5 feet beyond the top or bottoms of slopes, excluding existing roadway and shoulder surfaces, streams or bodies of water.

Areas outside of the limits specified above, when cleared and grubbed in connection with the construction of fences shall be computed on the basis of a ten foot width multiplied by the total length of fencing installed, and when done in connection with excavating ditches or trenches the width shall be limited to 5 feet beyond the outer edges of the excavation.

Measurement of selective clearing and thinning will be based on the actual number of acres which receive the required attention. Approximate locations will be shown on the plans or detail sheets and as designated in the field by the Engineer.

Only such trees as have a shortest diameter of at least 9 inches and less than 24 inches shall be included in the item of Trees Removed (Diameter Under 24 Inches). Only such trees as have a shortest diameter of 24 inches or more shall be included in the item of Trees Removed (Diameter 24 Inches and Over).

The item of Stumps Removed shall include the removal and satisfactory disposal of all tree stumps which remain in their original position and measure 9 inches or more in shortest diameter at the cutoff point, where the trees have been previously removed by others. A stump shall not be construed as a tree under these specifications unless the trunk extends over 6 feet above the average ground.

Trees or stumps to be removed which have the shortest diameter specified for payment will be measured in place by the following procedure:

Where the tree consists of a single trunk extending more than a 3 foot vertical height above the average natural ground line, the shortest diameter shall be measured at the 3 foot level above the average elevation of the original ground.

Any tree whose main trunk separates into multiple trunks or which has limbs or branches growing out from the main trunk below the 3 foot level defined hereinbefore shall have its shortest diameter measured at the lowest point on the main trunk where multiple growth or branching out begins.

The shortest diameter of a stump shall be measured at the cutoff except that where multiple growth begins below cutoff, the shortest diameter shall be measured at the main trunk where multiple growth begins.

Measurement for payment under the respective items shall be such that any individual growth to be classed as a tree stump shall be measured in a manner to limit payment to one single tree or stump at each particular location of the individual growth. When multiple trunks with a common root system are separated at ground level each separate trunk shall be considered as an individual growth under these specifications.

The quantity of trees or stumps to be paid for will be the number actually removed by the Contractor in the completed and accepted work as determined by count.

Wood chip mulch produced from Clearing and Grubbing will be measured by the cubic yard (truck load measure) at time of spreading.

101.81 Basis of Payment.

Clearing and Grubbing and Selective Clearing and Thinning will be paid for at the contract unit price per acre.

When Clearing and Grubbing is not included in the Proposal as a payment item, payment for any such work will be included in the items of Earth Excavation or Borrow except as herein provided for the removal of trees and stumps.

The removal of trees, including the stumps thereof and required spray material will be paid for at the contract unit price each for the particular kind of work involved, as defined hereinbefore when a quantity is given in the Proposal under their respective items, otherwise this work will be paid for at the contract unit price for excavation or at the contract unit price per acre of Clearing and Grubbing or Selected Clearing and Thinning, whichever is applicable. The contract unit price shall include the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations. The contract unit price for the respective items shall not include any trees or stumps removed from the area paid for under the item of Clearing and Grubbing or Selected Clearing and Thinning.

No payment shall be allowed for preparation and spreading of wood chip mulch used from areas included under Selective Clearing and Thinning. Wood chip mulch directed to be produced from Clearing and Grubbing shall be paid for complete in place at the contract unit price.

Only such trees or stumps as have a shortest diameter of 9 inches and over, measured as stipulated in Subsection 101.80 shall be included for payment.

101.82 Payment Items.

101.	Clearing and Grubbing	Acre
102.	Selective Clearing and Thinning	Acre
103.	Tree Removed (Diameter Under 24 Inches)	Each
104.	Tree Removed (Diameter 24 Inches and Over)	Each
105.	Stump Removed	Each
767.4	Wood Chip Mulch	Cubic Yard

SECTION 112
DEMOLITION OF BUILDINGS, STRUCTURES AND BRIDGES

DESCRIPTION

112.20 General.

The work to be done consists of demolishing completely such buildings and structures as are listed in the Proposal.

Said demolishing of the buildings shall be done on the site. Buildings as such shall not be removed intact from the site by the Contractor nor shall they be sold to others for such removal.

"Buildings" or "Structures" shall be considered interchangeable terms within the scope of these Specifications.

The Contractor shall not proceed with the demolition of any building or structure unless and until he receives written approval.

Structures which must be removed, and which are not listed in the Proposal will be removed by others at the direction of the Department. The Contractor's attention is directed to the relevant provisions of Subsections 8.04, 8.08 and 9.05 wherein it is stipulated that he shall have no claim for damages for any delay in the prosecution of the work under any of these items, or for the omission of any one or more of the items scheduled in the Proposal.

The Department may withdraw from the Contract any or all of the structures which are scheduled for

DEPARTMENT OF PUBLIC WORKS

CALENDAR FOR ANNUAL PROGRAMS

Snow & Ice

Date- ~~April 1, 1984~~

WEEKS

PROJECTS	CODE	SECT	JULY					AUG.				SEPT.				OCT.					NOV.				DEC.			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Tree Removal	TR	R														D	-	-	A						S	-	-	-
Tree Trimming	TT	R						D	-	-	A										S	-	-	-	-	-	-	-
Mist Blower Spray	MS	R											D	-	-	-	-	-	-	-	A							
Poison Ivy Spray	PS	R												D	-	-	-	-	-	-	A							
Guard Rail Spray	GR	R												D	-	-	-	-	-	-	-	A						
Hydraulic Spraying	HS	R												D	-	-	-	-	-	-	-	A						
Erosion Control Planting	EC	R														D	-	-	-	-	-	-	-	-	-	-	-	-
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Portable Sanitary Facilities	PT	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C								
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Trash Disposal	TD	R	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tree Planting (BET)	TP	R														D	-	-	-	-	-	-	-	-	-	-	-	-
Plant Fertilization	PF	R																							D	-	-	-
Highway Cleaning	HC	I														D		-	-	-	-	-	-	-		A		
Catch Basin Cleaning	CB	I	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C						

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Tree Removal	TR	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C						
Tree Trimming	TT	R	-	-	-	-	-	-	-	-	-	-	-	-	C													
Mist Blower Spray	MS	R										S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C
Poison Ivy Spray	PS	R																							S	-	-	C
Guard Rail Spray	GR	R														S	-	-	-	-	-	-	-	-	-	-	-	C
Hydraulic Spraying	HS	R																							S	-	-	C
Erosion Control Planting	EC	R	-	-	-	A										S	-	-	-	-	-	-	-	-	-	-	-	C
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Plant Fertilization	PF	R	A														S	-	-	-	-	-	-	-	-	C		
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COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

CALENDAR FOR ANNUAL PROGRAMS

Date- April 1, 1984

WEEKS

PROJECTS	CODE	SECT	JULY					AUG.				SEPT.				OCT.					NOV.				DEC.					JAN.				FEB.				MARCH				APRIL					MAY				JUN			
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DEPARTMENT OF PUBLIC WORKS

CALENDAR FOR ANNUAL PROGRAMS

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PROJECTS	CODE	SECT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
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PROJECTS	CODE	SECT	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
			DEC.	JAN.				FEB.				MARCH				APRIL					MAY				JUNE			
Sign Maintenance			D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	A										
(FED. AID)	TSM	T																							S	-	-	-
Sign Washing	TSM	T	-	-	-	-	-	A								S	-	-	-	-	-	-	-	-	-	-	-	C
Call Box- Maint.			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C
(FED. AID)	CBM	T										D	-	-	-	-	-	-	-	-	A							
Hydro-Cell Maint.				S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(FEd. AID)	IA	T																										
Delineation Mile																S	-	-	-	-	-	-	-	-	-	-	-	-
Markers (Fed. Ai	TMM	T																										

LEGEND

D = Date Districts to send Details

A = Date of advertising

S = Date Work Starts

C = Date Work to be Completed

H = Highways

B = Bridges

T = Traffic

R = Roadsides

I = Ice & Snow

O = Office Engineer

Appendix 3

Commonwealth Electric Company:

- **Annual Permit with Massachusetts Highway Department**
- **Construction Operating Policies and Procedures**

The Commonwealth of Massachusetts

Highway Department

MAILED
JAN - 5 1995
MASS. D.P.W.

PERMIT - STATEWIDE

Subject to all of the terms, conditions and restrictions printed or written below, and on the reverse side hereof, permission is hereby granted to the COMMONWEALTH ELECTRIC COMPANY, Robert Alves, 180 MacArthur Drive, New Bedford, MA 02740 to enter upon State Highways STATEWIDE for the purpose of: removing manhole covers to clean, inspect, maintain and adjust associated lines, cables, valves and other appurtenances; opening and shutting water gates and other controlling valves; installing and maintaining aerial service connections; trimming trees for overhead line clearance· guying, removing, repairing and replacing poles and overhead wires.

Other than for aerial service connections this permit does not authorize additional overhead wires or the extension of same.

This permit does not authorize the installation of additional wires, cables, or pipes within the existing manholes or the extension of same.

The above described maintenance work is only allowed where there is no "excavation" either in the paved roadway or elsewhere within the State Highway Layout.

Also, before work commences the District Highway Director must be given 48 hours notice.

Any direction or instruction received from the District Highway Director shall be considered an integral part of this permit.

Where the maintenance work requires excavation or the work is of a maintenance nature and not described above, a request in writing with a dig safe number on the approved application form must be submitted, by the applicant, to the District Highway Director. If approved an addendum will be made an integral part of this permit, allowing for its completion, at no additional fee.

The District Highway Director will make the determination if the work is of a maintenance nature.

If the work is not of a maintenance nature, as determined by the District Highway Director, a separate permit request and dig safe number must be made in writing to the District Highway Director on a permit request form as provided. There may be a fee for this new permit.

EMERGENCY WORK

Permission is also granted to enter onto State Highways to perform work of an emergency nature.

Emergencies must be unexpected situations or sudden occurrences of a serious and urgent nature that demand immediate attention.

EMERGENCY WORK (cont.)
The District office is open between 8:45 a.m. and 5:00 p.m., Monday thru Friday. If the emergency occurs during these hours the Grantee must immediately notify the District Permit Engineer at (508) 824-6633, Ext. 210, giving a description and location of the emergency including the Route number and name of the associated City or Town.

If the emergency occurs when the District office is closed or when the District office cannot be reached by phone, the Grantee shall immediately notify the Department Radio Room in Boston by phone at (617) 482-1135 with the location and description of the emergency as previously noted. The Boston Radio Room is open 24 hours a day, 365 days a year. Subsequently, the Grantee must notify the District Highway Director of this action on the next business day.

In emergency situations where the work is within the paved surface, backfill shall be made in six inch (6") layers and mechanically compacted to the elevation of the subgrade and then gravel placed and compacted in a maximum of 6 inch (6") layers to a level two inches (2") below finished grade. The last two inches (2") shall be made with bituminous concrete to form a temporary patch. The temporary patch shall remain in place for a minimum of ninety (90) days unless directed otherwise by the Engineer and monitored periodically by the Grantee for settlement.

The permanent patch shall then be installed. The pavement shall be cut one foot (1') outside all limits of the excavation within the roadway surface, then excavated to a depth of nine inches (9") to place a six inch slab of Class F, High Early, Air Entrained Cement concrete with number (4) steel reinforcing rods on a twelve inch (12") grid, to bridge the trench. The last three inches (3") shall be paved with Bituminous Concrete Type I, compacted in two lifts consisting of one and one half inches (1 1/2") of binder and one and one half inches (1 1/2") of top to meet the existing pavement surface.

POLES

In replacement of poles no changes shall be made in their location, height, equipment or attached wires without an addendum to this permit as previously described, including a dig safe number if appropriate.

No supporting fixtures shall be installed without an addendum, including dig safe number, and they shall not be placed nearer to the roadway than the poles which they support. Neither shall they be supported from the opposite side of the road.

Lash-ups shall only be allowed in emergencies where the existing pole is in danger of falling.

All installations such as utility poles located within 6 feet (6') of the edge of pavement and not protected by guardrail shall have reflective markers mounted on or attached to said pole.

Mounting height: 4' above pavement.
Reflective color: White on main roads and yellow on ramps.

POLES (cont.)
Design and Application - Reflective markers or coatings shall be placed to face oncoming traffic and shall be capable of reflecting light clearly visible under normal atmospheric conditions from a distance of 1,000 feet (1000') when illuminated by the upper beam of standard automobile headlamps.

Some of the material meeting the foregoing criteria is as follows:

Glass or plastic prismatic reflective elements or plastic elements with reflective sheeting sealed therein and used for reflective markers shall be a minimum of 3 inches (3") in diameter or may be another geometric shape so long as the unit will contain an inscribed circle having a 3 inch (3") diameter.

Reflective Coatings - If a reflective coating is used, the coated area shall be a minimum 5" x 5" square mounted as a diamond.

It shall be the responsibility of the owner to maintain said reflective markers as long as the facility is in existence.

TREE TRIMMING

No trimming will be allowed between May 1st and October 1st.

Only qualified tree workers will be approved by the Department. No main branches or any part of the trunk shall be removed nor a tree be mutilated in any way. To prevent this, the wires shall be outrigged or enclosed in a shield or cable. Trimming shall consist of sucker growth and broken or dead limbs only and shall be undercut to prevent breaks and stripping of bark, and if over one inch (1") in diameter shall be painted. Trees which have been rendered unsightly by repeated pruning for clearance shall be removed and replaced by the Grantee. The replacement shall consist of a Bona Fide Order with an established nursery before removing said trees. The Grantee shall deliver to the District Highway Director the order for replacement, with the size and species required left to the discretion of the District Highway Director. The designated area for replacement may be on any Route or in any Town reasonably nearby and dependent upon availability of space within the layout.

All chippable material, if requested by the District Highway Director, shall be reduced to chips and stockpiled, as directed, in the nearest Maintenance Area for use by the Department.

At the conclusion of each day's work all cutting and trimming shall be removed from the site and trimmings from Elm trees must be buried.

GENERAL CONDITIONS

All work shall be performed in accordance with the 1988 Edition of the Commonwealth of Massachusetts, Department of Public Works Standard Specifications of Highways and Bridges.

Necessary signs, lights and barriers shall be installed by the Grantee in accordance with the 1988 Edition of the Manual on Uniform Traffic Control Devices. Except for emergencies, no equipment, trucks, etc. shall occupy any part of the travelled way, except between the hours of 9:00 a.m. and 3:30 p.m. from Monday thru Friday. Saturday and Sunday work is not permitted under the terms of this permit. Also, no work shall be allowed on holidays or the day before or the day after a long weekend which involves a holiday without the permission of the District Highway Director except during emergencies as previously described.

All required signs and traffic warning devices shall be furnished by the Grantee. Cones or non-reflectorized warning devices shall not be left in operating position on the highway when the daytime operations have ceased.

If it becomes necessary for the Department to remove any construction warning devices or their appurtenances from the project due to negligence by the applicant, charges will be assessed the applicant.

All vehicles, except passenger cars, which are assigned to the permitted project and which operate on the site at speeds of 25 M.P.H. or less shall have an official SLOW MOVING VEHICLE emblem displayed and subject to Chapter 90 Section 7 of the Massachusetts General Laws.

All personnel who are working on the travelled way or breakdown lanes shall wear approved safety vests and hard hats.

No work, other than of an emergency nature, shall be authorized during snow, sleet or ice storms and subsequent snow removal operations. When work is required the Grantee shall notify the District Highway Director the next business day,.

If it becomes necessary, the Department shall place an inspector on any project and the inspector will be paid for under a reimbursable account by the Grantee.

No detours of blasting is allowed under the terms of this permit and two-way traffic shall be maintained at all times except during extreme emergencies.

This permit may be modified or revoked at any time by the Department without rendering the Department or the Commonwealth of Massachusetts liable in any way.

The Grantee shall indemnify and save harmless the Commonwealth and its Highway Department against all suits, claims or liability of every name and nature arising at any time out of or in consequence of the acts of the Grantee in the performance of work covered by this permit and/or failure to comply with the terms and conditions of this permit whether by itself or its employees or sub-contractors.

GENERAL CONDITIONS (cont.)
Uniformed police shall be in attendance to direct traffic and protect the safety of the public and workers unless directed otherwise by the District Highway Director.

The shoulder, grass and sidewalk shall be restored, full width, to a condition similar or equivalent to that which existed prior to the work.

All operations shall be conducted so as not to interfere with, interrupt, or endanger the general public or the flow of traffic.

A COPY OF THIS PERMIT MUST BE ON THE JOB SITE AT ALL TIMES FOR INSPECTION. FAILURE TO HAVE A COPY OF THIS PERMIT AVAILABLE AT SUCH SITE WILL RESULT IN SUSPENSION OF THE RIGHTS GRANTED BY THE PERMIT.

(SEE OTHER SIDE FOR ADDITIONAL CONDITIONS)

NO WORK SHALL BE DONE UNDER THIS PERMIT UNTIL THE GRANTEE SHALL HAVE COMMUNICATED WITH AND RECEIVED INSTRUCTIONS FROM THE DISTRICT HIGHWAY DIRECTOR OF THE MASSACHUSETTS HIGHWAY DEPARTMENT AT 1000 COUNTY STREET, TAUNTON, MA 02780 (508) 824-6633

THIS PERMIT SHALL BE VOID UNLESS THE WORK HEREIN CONTEMPLATED SHALL HAVE BEEN COMPLETED BEFORE DECEMBER 31, 1995.

DATED AT TAUNTON THIS 30TH DAY OF DECEMBER, 1994.

MASSACHUSETTS HIGHWAY DEPARTMENT

BY _____

BERNARD MCCOURT
DISTRICT HIGHWAY DIRECTOR

MEB:gls
cc: Foreman
Dist. 1
Dist. 2
Dist. 3
Dist. 4

TREE TRIMMING FOR UTILITY LINE CLEARANCE

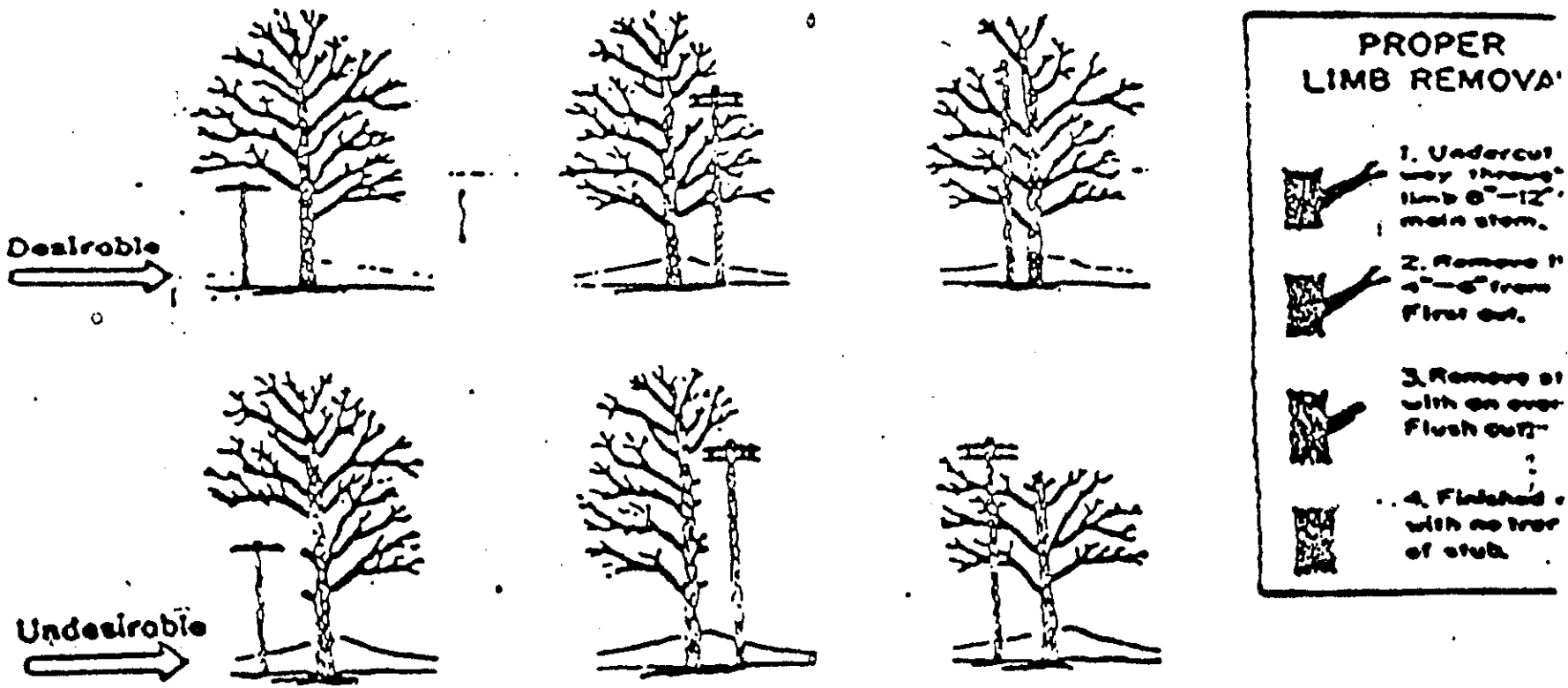
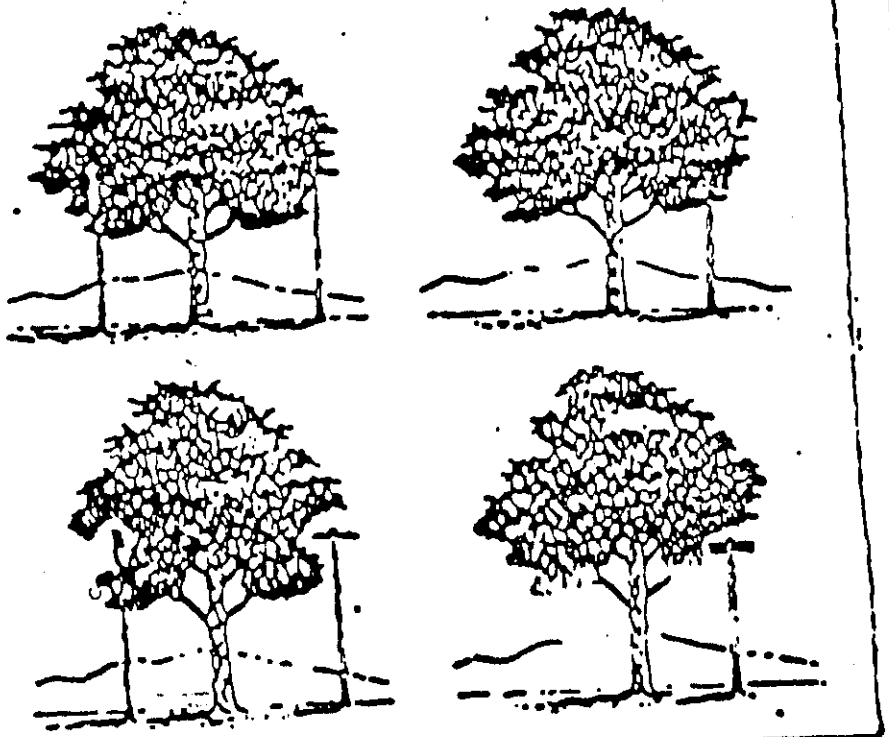
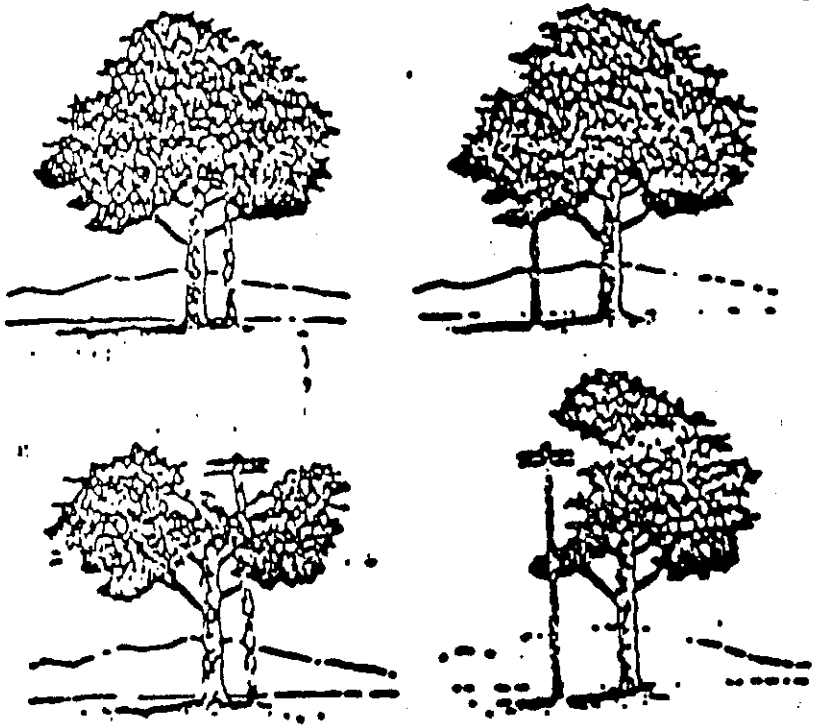


PLATE N

DESIRABLE TREE MODIFICATION



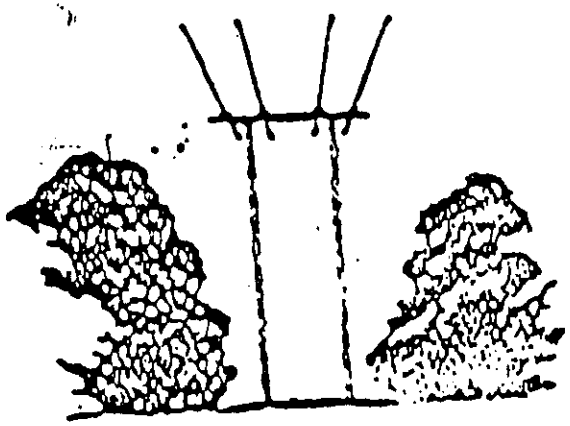
UNDESIRABLE TREE MODIFICATION



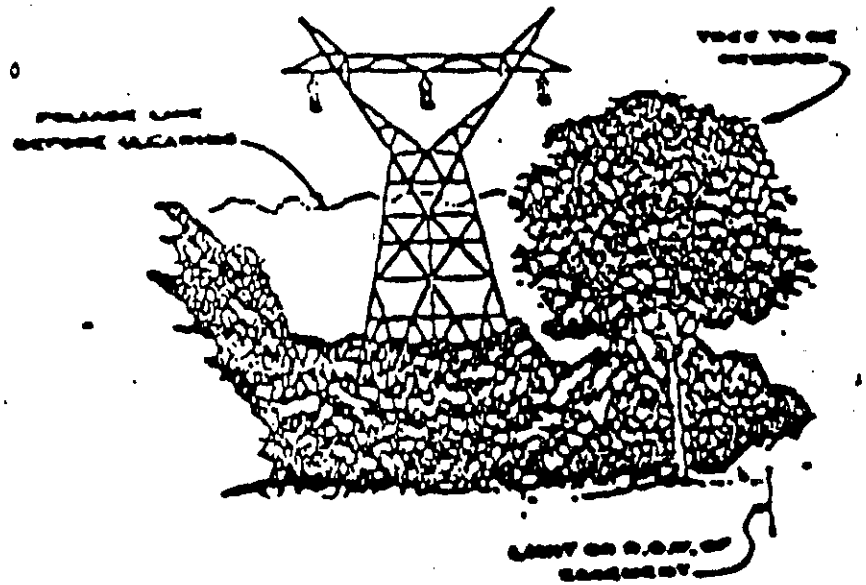
IN EXTREME CASES, AS FOR EXAMPLE—WHERE TREE IS TO BE DESTROYED BY DISEASE IT MUST BE REMOVED AND REPLACED.

PLATE

TRANSMISSION LINE RIGHT-OF-WAY CLEARING



UTILITY LINES PARALLEL TO INTERSTATE SYSTEM SHALL BE AT SUCH A DISTANCE AS TO BE SCREENED BY A BUFFER ZONE OF TREES.



TRANSMISSION LINE R.O.W. CLEARING FOR OPERATION AND MAINTENANCE.

CONSTRUCTION OPERATING POLICIES AND PROCEDURES

APPROVED 12/29/83 DATE

DISTRIBUTION TRIM POLICY

I. GENERAL

Purpose:

The Distribution Trimming Policy is intended to provide trimming contractors with guidelines for performing work acceptable to the Company, including proper trimming techniques, work progress reporting and time reporting.

The Trimming Policy also documents general management procedures for dealing with the various aspects of Trimming Program Control.

The Policy pertains to both maintenance trimming which is done on an ongoing cyclic basis of approximately three years and to "new work" trimming.

Note: Company representative or delegate as referred to in this policy shall be understood to mean those individuals normally assigned to monitor tree crew activities in a given district or area within a district.

II. GUIDELINES FOR TREE TRIMMING AND REMOVAL

A. The desired amount of clearance necessary for conductors and electrical equipment should be such that high winds, rain, heavy snow, ice or a combination of any of them will not cause limbs or trees to come in contact with wires or other equipment. Effort should be made to remove any dead trees or limbs which in the event of their falling could contact conductors.

1. Specific Clearances -

   Refer to Exhibit 1 for specific clearances.

2. Road Screens - Minimum Clearance to Conductor

   . Road crossing near midpoint of span between highline structures

   115KV Vertical - 20 Ft.; Horizontal - R/W Sideline

   345KV Vertical - 30 Ft.; Horizontal - "

   . Road crossing near highline structure

   115KV Vertical - 15 Ft.; Horizontal - R/W Sideline

   345KV Vertical - 20 Ft.; Horizontal - "

II. GUIDELINES FOR TREE TRIMMING AND REMOVAL (Continued)

B. Generally Accepted Scientific Arboricultural Principles as Applied to Line Clearance Work - For safe and healthy trees, the following recommendations are suggested:

1. Branches growing into a conductor should be removed by cutting back at a lateral or main side branch, rather than stub cutting. ("Natural Trimming")

2. Properly flush all cuts, allowing for proper growth over cuts. Cuts shall be smooth to allow for callus tissue to form and to retard decay. Saw cuts made flush to the laterals reduce the number and vigor of regrowth sprouts. Keep the use of pole pruners to a minimum.

3. Paint with growth retardent paint all cuts over one inch in diameter.

4. Remove raised sucker clusters at parent limb and remove undesirable limbs that have been stubbed off and have formed accumulated sucker clusters.

5. Drop crotch to a branch at least one third the size of the limb that it is attached to, leaving enough leaf area to insure continued healthy growth of the limb.

6. Directional prune so that growth will be away from wires.

7. Lighten overhanging (within 10' of trimmed zone) or adjacent leaders and branches and shorten evergreens overhanging conductors to prevent limbs touching or breaking off and falling on lines in severe storms.

8. Remove leaders and limbs that are a hazard to lines due to death, decay, weak configuration and split or weak crotches.

9. No damage by loosening or stripping of the bark shall be caused during trimming.

10. Only appropriate tree tools in working condition shall be used.

CONSTRUCTION OPERATING POLICIES AND PROCEDURES

II. GUIDELINES FOR TREE TRIMMING AND REMOVAL (Continued)

11. Climbing irons shall not be used in any tree unless the tree is to be removed.

12. All severed limbs and branches (hangers) shall be removed from trees after trimming.

13. Guidelines for tree removal.

a. Trees to be removed

- Unless previous arrangment has been made with the Company Representative, trees that are a hazard to the lines shall be removed; i.e. any tree which by the nature of its health, size, or condition endangers the line.
- Defective or diseased trees shall be removed whenever possible.
- Fast-growing and weed trees shall be removed as undesirable species, whenever possible.

b. Method of removal

- Trees shall be felled away from the conductors.
- In areas where damage might be caused to conductors or property, trees shall be stripped of all limbs with the trunk removed in sections, as necessary.
- All brush shall be removed daily from public thoroughfares and other improved places unless otherwise arranged with the Company Representative.
- All stumps shall be cut flush and parallel to the ground. Tree stumps shall not exceed a maximum height of three (3) inches. All brush shall be cut flush and parallel to the ground.
- Wood and brush (cribbing) shall be used as a cushion to protect from potential damage due to felling trees or heavy limb sections. The probability of a bouncing effect is normally increased when using cribbing and should be allowed for.

APPROVED 12/28/83 DATE

II. GUIDELINES FOR TREE TRIMMING AND REMOVAL (Continued)

Note: For a more thorough explanation of "Natural Trimming" plus additional pertinent information relating to tree work, refer to Appendix 1.

C. Safety - Good Relations - Clean Up

1. Safety - The Contractor will take all safety and protective precautions and with respect thereto will strictly enforce all applicable regulations of Municipal, State and Federal Laws, the various insurers and the Company.

2. Good Relations - A neat appearance, pleasant approach and a clear explanation as to what you mean or want when contacting people. In any instance where there is a misunderstanding or a possible cause for trouble with a customer or municipal official, notify the Company Distribution Superintendent, or designated represenative, so that proper action can be taken. When a property owner or municiple official absolutely will not allow proper trimming refer the situation to the Company representative in writing on a Trim Refusal/Misc. Trouble Report Form (Exhibit 2A). If trimming in a given area is under dispute - move to another area.

Utility Company Relations - Tree crew to contact the Company every day and report work location; details of who to report to, when and where will be specified by the local superintendent of T&D.

Outage - Whenever there is a question of a possible accidental outage of power caused by a tree crew, the Company is to be notified immediately.

Municipal Regulations - Notify the proper municipal official (Tree Warden, etc.) as required and let them know what location you are working in. Get permission to do tree work on municipal trees from the proper authority before doing the work.

State Relations - When doing tree work on a State Highway have a copy of the State Tree Trimming Permit with Permit Number. All tree work on State Highways must be approved and supervised by the proper State Official. State regulations on barricades and warning signs must be observed.

CONSTRUCTION OPERATING POLICIES AND PROCEDURES

II. GUIDELINES FOR TREE TRIMMING AND REMOVAL (Continued)

3. Dispose of all debris properly and leave the work area in a neat and clean condition. Unless otherwise specified, wood shall be left for the property owner.

III. CONTRACTOR RESPONSIBILITY

Note:

"The relationship of the Company and the Contractor is acknowledged to be that of owner and independent contractor. The means and methods employed for performing the details of trimming shall be the responsibility of the Contractor, subject to the suggestions and approvals of the Company's designated representative.

1. Compliance with laws and regulation.

The Contractor shall comply with all applicable laws and regulations and all work and materials are to comply in every respect with all applicable codes, laws and regulations.

All necessary permits, licenses, etc., for the Work unless obtained by the Company are to be obtained and paid for the Contractor, the Company to reimburse the Contractor for the cost thereof unless the Work is being done on a fixed fee basis.

2. Instructions to Contractor

Trimming work includes the furnishing of all supervision, labor, equipment, tools and services necessary to trim trees in designated areas and in a manner acceptable to local or state authorities and T&D Superintendents, or designated representatives, per the Trimming Contract/Purchase Order.

The Contractor will report daily in writing to the Company representative any damaged Company equipment (insulators, crossarms, etc.), encountered in the course of his work. The Trim Refusal/Misc. Trouble Report Form (Exhibit 2A) will be used for this purpose.

3. Indemnification and Insurance

Except in cases of injuries or damages to persons or property caused by the sole negligence of the Company, the Contractor shall indemnify and save harmless the Company and its officers, agents and servants from all claims and actions of any kind arising from or incidental to the performance of the Work and expenses incidental to such claims and actions, and shall assume without expense to the Company the defense of any such claims or actions.

CONSTRUCTION OPERATING POLICIES AND PROCEDURES

III. CONTRACTOR RESPONSIBILITY (Continued)

Before commencing any of the Work, Contractor shall be approved by the Commonwealth Electric Purchasing Department. Certificates of coverage satisfactory to the Company showing that the Contractor carries workmen's compensation, public liability, property damage insurance and auto liability, effective in the State of Massachusetts, and with limits specified by the Purchasing Department, will be required. The certificates of insurance must show the expiration dates of insurance coverages and must state the the policies will not be canceled or changed without 30 day's prior written notice by the insurers to the Company.

4. Trimming of Privately Owned Facilities

When a question arises as to the ownership of electrical facilities, when said ownership is not clearly defined on the Company furnished Progress Report maps, the Contractor shall consult the Company Representative. In general the Company will not accept responsibility for, nor authorize payment for, the trimming of privately owned facilities.

5. Priority of Written Agreement

In the event of any conflict between this policy and the terms of the formal written agreement or purchase order signed by both parties, the signed agreement or purchase order shall control.

IV. WORK MANAGEMENT

Daily Reporting

Tree crews shall report each morning to the District Superintendent of T&D or his delegate to relate their work location for the day and receive any instructions or additional work assignments.

Time sheets, supplied by the Company, shall be prepared daily with appropriate information and forwarded weekly to the District Superintendent of T&D or his delegate. An explanation of the time sheet and required information is contained in Appendix 2.

Company Supervision

Daily spot checks will be made by Company representatives with weekly follow-ups for the purpose of checking for proper clearances, proper trimming techniques, quality of trimming, productivity, safe work procedures, and proper cleanup.

IV. WORK MANAGEMENT (Continued)

During weekly follow-ups Progress Reports will be discussed -- the Progress Report consisting of an area, grid, or circuit map marked, dated and signed daily showing trimming progress. These progress reports may also be checked on daily spot checks. When a given progress map is completed it will be turned in to the Company representative.

Computerized Work Management System

Information recorded on the weekly time sheets will provide input data for a computerized Work Management System. This system will provide the Company with a variety of reports designed to aid in overall management of the Trimming Program including crew productivity comparisons, overall program progress (maintenance trimming), etc.

An explanation of the Work Management System is given in Appendix 2.

V. COMPANY ORGANIZATION

Maintenance Trimming

Maintenance Trimming will be done on a cycle as determined by past operating experience and foliage growth rates, combined with periodic field patrols. Area trimming will be done on a primary circuit basis.

Primary Circuit Maps will be furnished to the trimming contractor for the purpose of progress reporting. The Company representative should randomly check these Progress Reports on spot checks and examine each crew's progress during the weekly check. Progress Report maps should be checked for concurrence with actual work done, dates and signatures, as well as any notes concerning equipment damage, refusal to allow trimming, etc.

Weekly and spot checks shall include observance of contractors trim work including quality of work, proper trim methods, clearances and productivity.

Other Trimming

Other trimming includes "new work" trimming -- i.e., trimming necessitated by line extensions; and trimming necessitated by line rebuilds. Trim quality, methods, clearances and productivity should be checked in a similar manner to maintenance trimming.

CONSTRUCTION OPERATING POLICIES AND PROCEDURES

V. COMPANY ORGANIZATION (Continued)

Time Reporting

Contractors will fill out weekly time sheets on a daily basis and turn them in to the Company representative on a weekly basis. The Company representative will check the time sheets to ensure they reflect accurately the work done and are properly filled out and forward them to _____ for processing.

Details of the time sheet and Work Management System are given in Appendix 2.

Other Related Items

Privately Owned Facilities

The Company in general will not authorize trimming of privately owned facilities. Company representatives engaged in monitoring tree trimming activity shall, as a matter of course, note condition of privately owned facilities within the area and notify the Line Department Supervisor when conditions such as need for trimming, need for general line repair, etc., are found to exist. The Line Supervisor will in turn notify the District Service Manager, giving details as location, customer's name, details of the condition and recommended action; District Service Manager, will notify the customer.

Contractor List

Owners of private electrical facilities may occasionally ask for recommendations concerning private contractors for line maintenance or trimming work. The Company position is not to make recommendation of any specific contractor for reasons of liability. However, lists of known contractors engaged in line maintenance and engaged in trimming work, doing business within the Company service area, are maintained by the Company and are available upon request. The Company accepts no liability for work performed by contractors so listed. (See Exhibit 3 and 4)

APPROVED 12/28/83 DATE

1 D
2 D
3
4
5 D
6
7
8
9 D
10
11 D
12 D
13 D
14 D
15
16
17 D
18 D
19 D
20

Other Related Items (Continued)

Refusal to Allow Trimming

When the trimming contractor reports a refusal to allow trimming, the Company Representative shall contact the involved party in an effort to secure the proper trimming. If no agreement can be reached the refusing party shall be contacted via registered mail (return receipt requested). The letter (see Ex. 2 for sample) will relate our reasons for trimming i.e. protection of our facilities, reliability of service, protection of the public (tree climbers) and serve as documentation of our attempt to secure adequate trimming. The letter should be issued from the office of the District Service Manager, and a file of copies maintained at the same office with return receipts attached. A copy of the letter should also be sent to the local Tree Warden.

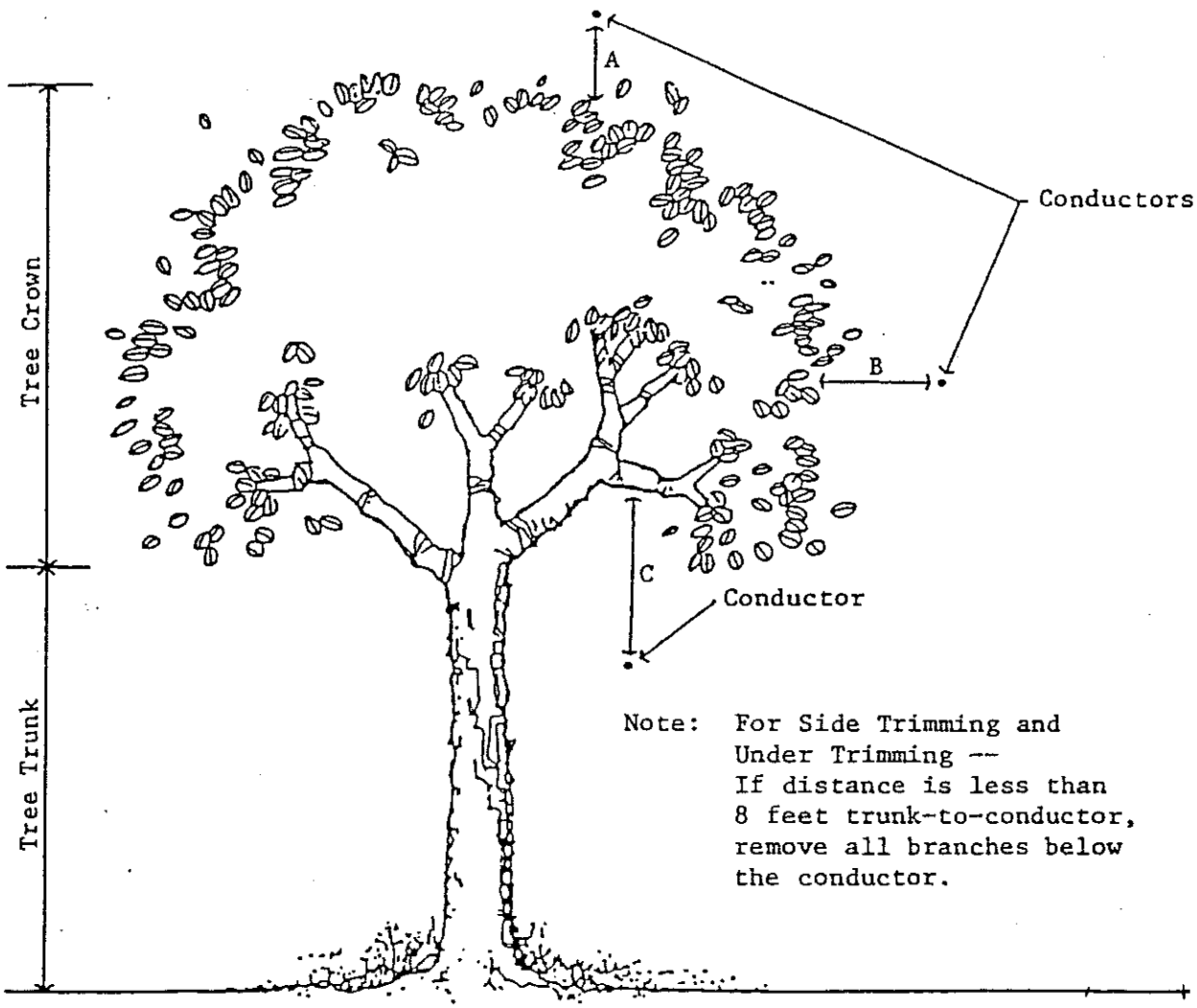
Hopefully this letter will prompt some to reconsider their refusal. If Not, we will have documentation of our intent and attempt to secure adequate trimming.

Documentation of Tree Removal

When, due to diseased or dead state, ornamental or large shade trees are by necessity removed, documentation in the form of detailed notes and/or photographs should be kept. This documentation may be valuable in the event a customer later brings a claim against the Company for the value of a tree claiming 'wrongful removal'.

CONSTRUCTION OPERATING POLICIES AND PROCEDURES

Exhibit 1



Note: For Side Trimming and Under Trimming -- If distance is less than 8 feet trunk-to-conductor, remove all branches below the conductor.

CLEARANCE	TYPE OF TRIMMING	MINIMUM CLEARANCE FOR 25 kV OR BELOW*
"A"	Topping	8 feet
"B"	Side Trimming	8 feet
"C"	Under Trimming (Remove overhang situations where possible)	12 feet **

*Services should be trimmed only to avoid contact.
**Thin, lighten, or shorten limbs above this point on pines to prevent snow loading

CONSTRUCTION OPERATING POLICIES AND PROCEDURES

EXHIBIT 2

Sample: Trim Refusal Documentation Letter
To be sent to parties refusing to allow adequate trimming via registered mail (return receipt requested).

Company Letterhead

Date

Name
Address

RE: Refusal to allow trimming at...(location)
(Describe location as accurately as possible include tree species, distance from permanent structure such as company pole, etc.)

Sir:

On (date) Mr. _____ of the _____ District Transmission and Distribution Department met with you to discuss your refusal to allow trimming at the above referenced location. At that time Mr. _____ discussed with you our reasons for trimming to maintain certain clearances from our lines - namely for protection of our facilities from tree related damage, reliability of service considerations, and public liability considerations as relates to possible injuries to tree climbers.

We were unable to persuade you to change your position at that time. Therefore, this letter is being sent to you, with a copy to the local tree warden and a copy retained in our files, to document our attempt to obtain adequate trimming.

Sincerely yours,

District Service Manager

Exhibit 2A

COM/Electric

TRIM REFUSAL/MISC. TROUBLE REPORT

☐ TRIM REFUSAL

☐ TROUBLE

Name _____

Address/Location _____

_____

Town _____

Pole No.(s) _____

Details _____

_____

_____

_____

_____

_____

Date _____

Reported By _____

OD 111

TD-08
Exhibit 3

LINE CONSTRUCTION CONTRACTORS

Acushnet Pole Line Construction
58 Perry Hill Road
Acushnet, Mass.
Tel. No. 995-7279

D.A.D. Pole Line Construction, Inc.
Andy Carr - Tel. No. 746-6438
Dave Wainio - Tel. No. 886-4961

Farrell Elect., Inc.
Holmes Road
North Eastham, Mass.
Tel. No. 255-1697

E. Fruean
Old Townhouse Road
South Yarmouth, Mass.
Tel. No. 775-5557

Paul Gomes
178 Smith Street
New Bedford, Mass.
Tel. No. 992-8927

Pete Hutchinson & Sons
General Contractors
Pole Line Service
Long Pond Road
Plymouth, Mass.
Tel. No. 746-8364

M & N Pole Line Construction
Airport Road
Hyannis, Mass.
Tel. No. 775-2209

NOTE: This list of Line Construction Contractors consists of contractors who have made themselves known to us and is intended for informational purposes only. No recommendation is intended or implied by inclusion on this list, nor vice versa. Furthermore, no agency relationship should be inferred because of such inclusion. The Commonwealth Electric Company accepts no liability for work performed by any private contractor and specifically disclaims same.

TREE SERVICE CONTRACTORS

Agricultural & Home Pest
Control Tree Spraying
24 Prospect
Falmouth, Mass
Tel. No. 548-2137

Barnes Tree Service, Inc.
Off Dexter Lane
Rochester, Mass.
Tel. No. 763-2553

Bartlett Tree Exports
Regional Offices:
Highland Ave., Seekonk, Mass.
Tel. No. 336-9330
Falmouth Road, Osterville, Mass.
Tel. No. 428-2397
Hingham, Mass.
Tel. No. 749-1104

Captain Ecology Tree &
Landscape Service
516 Old Fall River Road
No. Dartmouth, Mass.
Tel. No. 995-2104

Braddock W. Childs - Tree Service
342 Williamantic Drive
Marstons Mills, Mass.
Tel. No. 428-2454

Peter Childs - Tree Expert
24 Hartford Avenue
Marstons Mills, Mass.
Tel. No. 428-9092

Donald Combs
Old Mill Road
Osterville, Mass.
Tel. No. 398-6824

Dartmouth Lawn & Garden Care
131 Rockland Street
So. Dartmouth, Mass.
Tel. No. 993-4600

Evergreen Tree Service
6 Atlantic Avenue
So. Dennis, Mass.
Tel. No. 385-9062

Stanley R. Glover
Reed Avenue
Manomet, Mass.
Tel. No. 224-3969

Hixon Tree Company
1208 Somerset Ave.
Dighton, Mass.
Tel. No. 669-6441

Jon L. Holmes
79 North Road
West Yarmouth, Mass.
Tel. No. 775-9402

Horticultural Designs & Services
58 Dr. Braley Road
E. Freetown, Mass.
Tel. No. 763-4350

Knowles, G. Bourne & Co. Inc.
Route 6
Fairhaven, Mass
Tel. No. 997-8146

L&M Tree Service
564 West Yarmouth Road
W. Yarmouth, Mass.
Tel. No. 394-5854

Robert O. Langelier
47 Lucy Little Road
No. Dartmouth, Mass.
Tel. No. 997-2639

John A. MacKenzie Tree Service
1504 Wareham Street
Middleboro, Mass.
Tel. No. 947-8943

Monley Martin Tree Service
33 Frost Ave.
W. Yarmouth, Mass.
Tel. No. 394-5260

Jorge J. Medeiros
74 Bakerville Road
So. Dartmouth, Mass.
Tel. No. 992-2141

(See Note on Page 2)

TREE SERVICE CONTRACTORS

Meriz Tree & Landscaping Co.
Westport, Mass.
Tel. No. 636-8447

Mid Cape Tree Service
Almshse Road
Yarmouthport, Mass.
Tel. No. 362-6787

Millway Tree Service
91 Meridith Drive
E. Falmouth, Mass.
Tel. No. 548-7518

Oliver Tree Service
9 Clarence Street
So. Dartmouth, Mass.
Tel. No. 994-3188

Pete's Nursery
866 State Road
Westport, Mass.
Tel. No. 679-3230

Reardon & Sons Tree Co.
144 Dwelley Street
Pembroke, Mass.
Tel. No. 826-4774

Regis & Sons Tree Experts
Long Highway
Little Compton, RI
Tel. No. 1-401-635-4845

Sagamore Tree & Landscape Service
181 Old Plymouth Road
Sagamore Beach, Mass.
Tel. No. 888-3226

John Sears & Sons
221 Main Street
S. Yarmouth, Mass.
Tel. No. 398-8151

C. P. Swift, Inc.
E. Freetown, Mass.
Tel. No. 763-8921

NOTE: This list of Tree Service Contractors consists of contractors who have made themselves known to us and has been compiled for informational purposes only. No recommendation is intended or implied by a contractor's inclusion on this list, nor vice versa. Furthermore, no agency relationship should be inferred because of such inclusion. The Commonwealth Electric Company accepts no liability for work performed by any private contractor and specifically disclaims same.

Trees relating to line clearance can be classified as trees that need to be trimmed, trees that need to be removed, and trees that are non-hazardous, with no potential to cause interruptions to overhead electric conductors (Figure 1). Trees needing trimming are grouped into four general types: top, side, overhang or under, and through trimming (Figure 2).

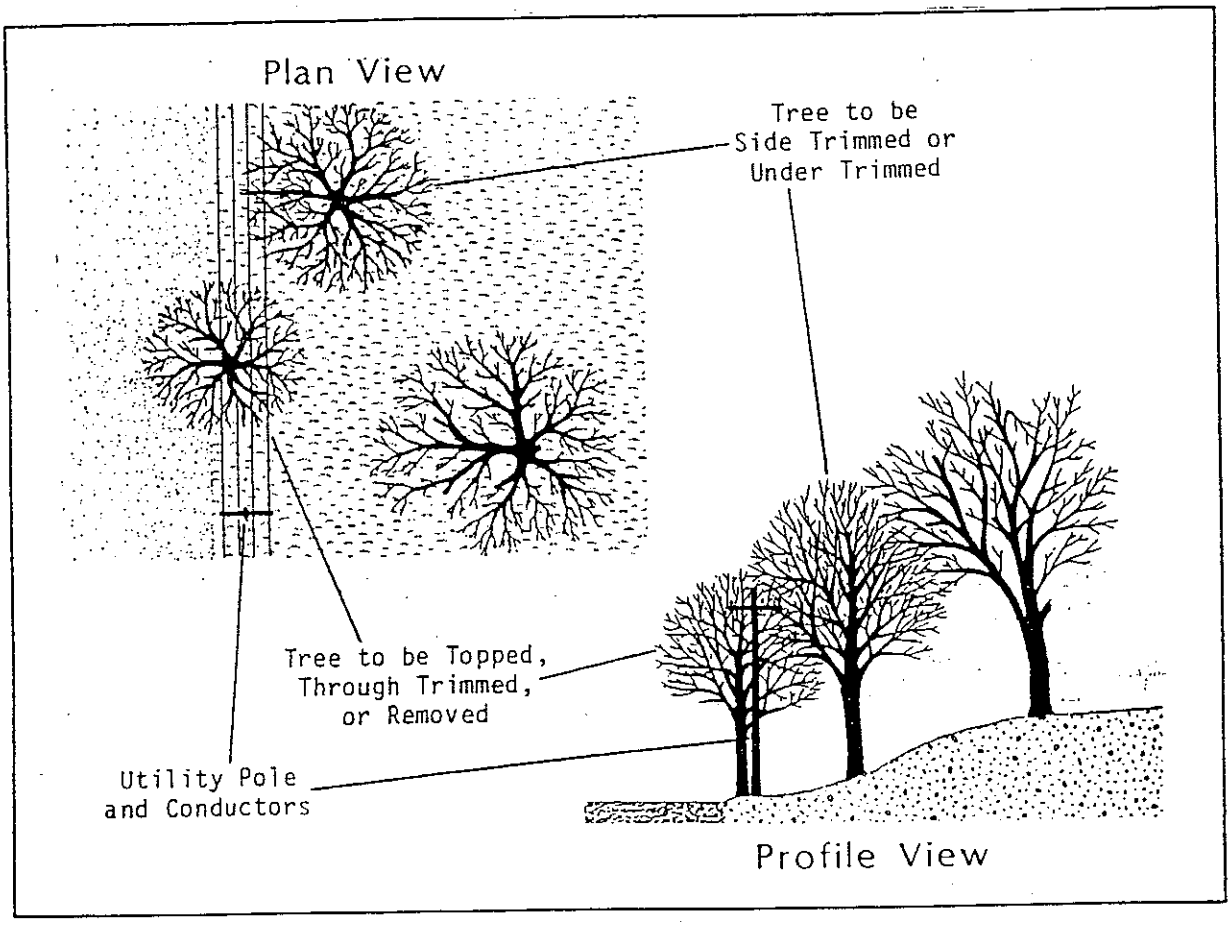


Figure 1. Relationship of Trees to Overhead Electric Conductors

II. METHODS OF TRIMMING

There are many methods of trimming trees for line clearance, but not all methods are attractive or advantageous to the tree, nor are all methods effective for long-term line clearance. The basic trimming methods are pollarding, shearing or rounding over, and natural trimming (Figure 3).

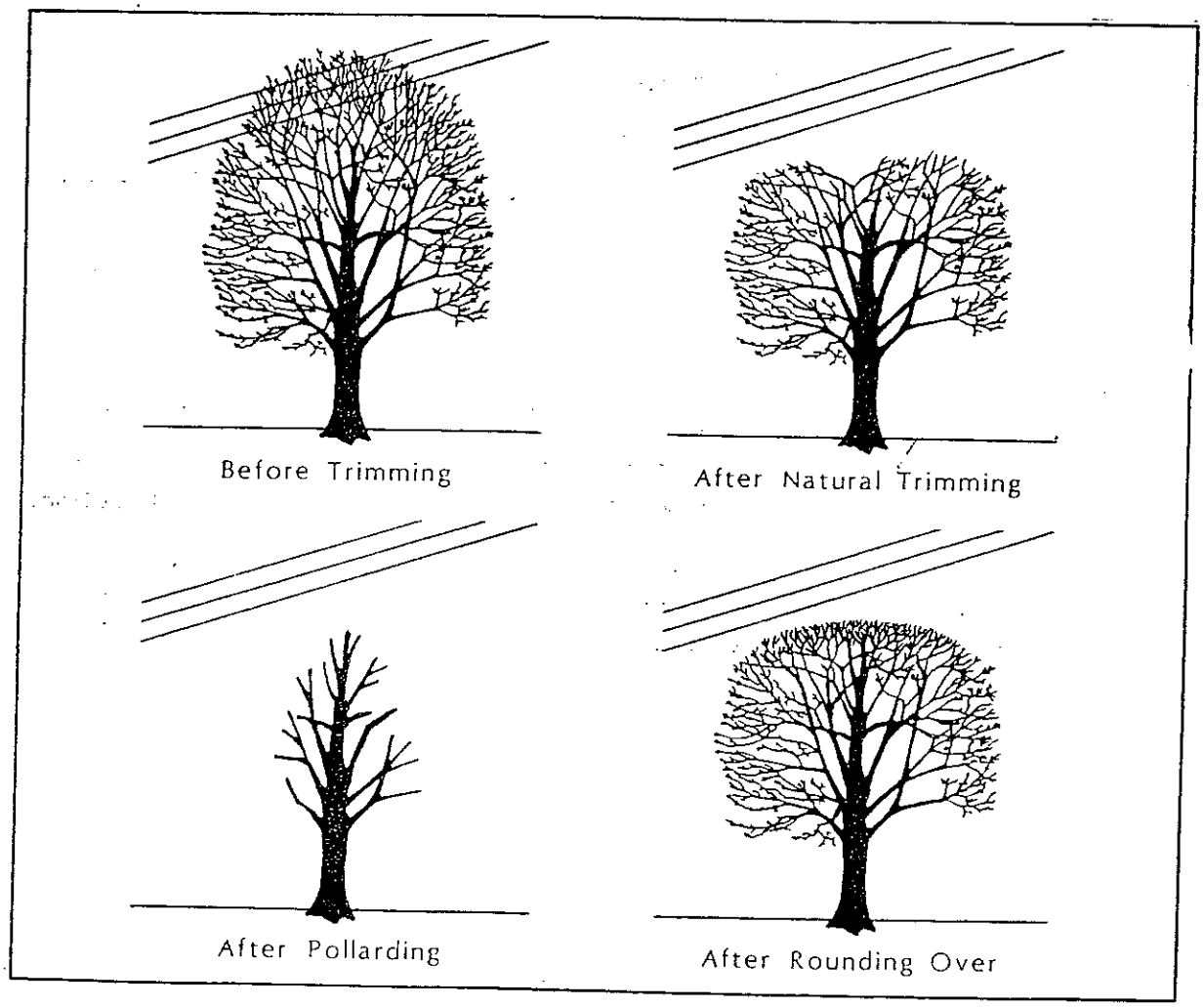


Figure 3. Basic Trimming Methods

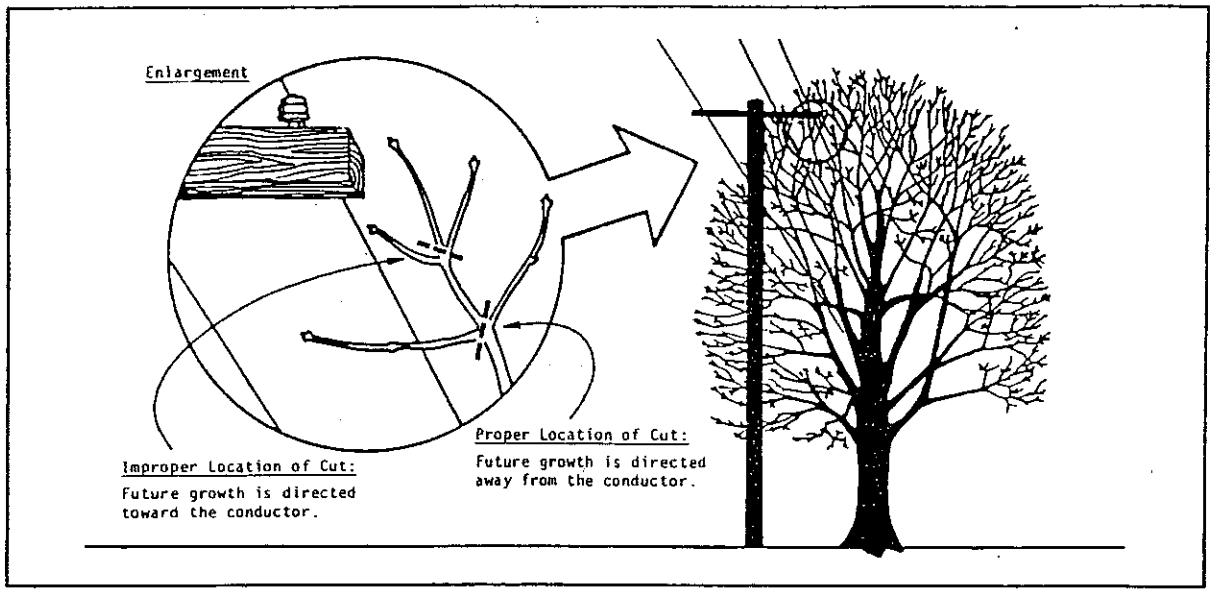


Figure 4. Natural Trimming (to direct growth away from wires)

TOP TRIMMING

Topping is cutting back portions of the upper crown of a tree. Topping is indicated when a tree is located directly beneath a line. The main leader or leaders are cut back to a lateral, which should be at least one-third the diameter of the limb being removed. Most cuts should be made with a saw. A pole pruner is used only to cut lateral branches. To minimize regrowth, no more than one-fourth of the crown should be removed when topping (Figure 5).

SIDE TRIMMING

Side trimming is cutting back or removing side branches that threaten the conductors. Side trimming is required where trees are growing adjacent ot utility lines. Limbs should be removed at a lateral branch. Notches in tree crowns should be avoided, if possible. Shortening branches above and below the indented area, or balancing the opposite side of the crown, will usually improve the appearance of the tree. When trimming, all dead branches over the wires must be removed, since this dead wood could easily break off and cause an interruption in service (Figure 5).

OVERHAND OR UNDER TRIMMING

Overhang or under trimming consists of removing limbs beneath the tree crown to allow wires to pass below the tree crown. This type of trimming will allow the tree to retain its natural shape and continue its normal growth. Overhangs are hazards when lines pass beneath a tree and should be removed according to the species of tree, location, and the general policy of the utility. When trimming, all dead branches above the wires are removed, since this dead wood could easily break off and cause an interruption. Many utilities have a set removal program for trees that overhang important lines (Figure 5).

THROUGH TRIMMING

Through trimming is the removal of branches within the crown to allow lines to pass through the tree. It is best suited for secondaries, street light circuits, and cables, although it is often used on primary circuits where there is no other way of trimming the tree. Cuts should be made at crotches to encourage growth away from the lines (Figure 5).

COMBINATIONS

If it often necessary to combine several types of trimming in order to maintain acceptable tree appearance and provide adequate clearances.

All line clearance tree trimming should be done in accordance with the "American National Standard Safety Requirements for Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and for Cutting Brush" (ANSI Z133.1). The ANSI Z133 standard provides safety criteria for line clearance tree trimmers and the public. Minimum working distances from energized conductors are listed and must always be observed (Table 1).

Table 1

MINIMUM WORKING DISTANCES FROM
ENERGIZED CONDUCTORS FOR
LINE CLEARANCE TREE TRIMMERS

Nominal Voltage Range (phase to phase)	Minimum Working Distance
2,400 - 13,200	2 ft. 0 in.
24,940	3 ft. 0 in.
34,500 - 115,000	4 ft. 0 in.
345,000	8 ft. 0 in.

Appendix 4

Bartlett Tree Experts, Tree Evaluation Consultant:

- **Tree Inventory and Management Plan Summary**
- **Tree Summary - Condition and Class**
- **Tree Maintenance Recommendations**
- **Council of Tree and Landscape Appraisers - Trunk Formula Method Form**
- **Tree Maintenance Specifications for Pruning**
- **Ash Dieback Disease**
- **Plant Care Using Integrated Pest Management Strategy**
- **Integrated Pest Management Requirements**
- **Plant Health Care Programs**

TREE INVENTORY
AND
MANAGEMENT PLAN

ROUTE 6A
OLD KING'S HIGHWAY
CAPE COD, MASSACHUSETTS

CAPE COD COMMISSION

JAMES B. INGRAM, V.P., NEW ENGLAND DIVISION MANAGER
ELLIS ALLEN, ARBORICULTURAL CONSULTANT
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BARTLETT TREE EXPERTS
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1995

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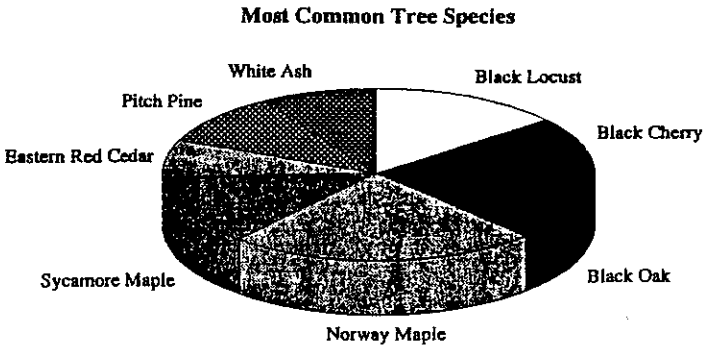
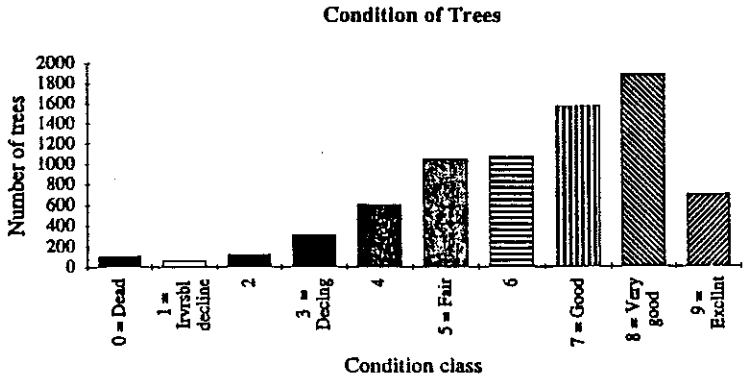
SUMMARY

The communities of Cape Cod are fortunate to be responsible for 7498 trees along Route 6A. The dominant species vary along the highway.



The majority of trees are growing along the borders of the road or planted in front yards. Culturally, many mature trees suffer from a lack of oxygen because of soil compaction. Both old and newly planted trees need proper root space to thrive. Many of the said planted trees have been limited by sidewalks, highway and wires.

Trees are generally in fair condition with specific individuals showing signs of a declining state of health. The tree population could be given a significantly higher condition rating if 9% of the trees rated between 0 into the 40% realm were removed.



Specific recommendations for Route 6A locations during the 1995-1996 season include:

- Removal of 678 trees which are declining or not contributing to the highway. Of these trees, 366 individuals have been declared hazardous (See Hazardous Trees in the Tree List - Work Type).

- Standard pruning, deadwood pruning, crown reduction and ground pruning of 6818 to eliminate potential hazards and undesirable growth. It is a good time to correctly prune these mature trees and small trees in order to promote proper growth characteristics (See Tree Maintenance Specifications).

- Fertilize all 6818 trees that are nutrient deficient and showing signs of decline. All trees except for trees being removed and 2 transplanted individuals should be fertilized (See Fertilization Recommendations).

- Implementing an Integrated Pest Management program to maintain pest populations below damaging levels (See Plant Health Care Using IPM Strategy).

- Install support cables in 1099 trees to compensate for weak tree canopies. Numerous trees to be cabled have been targeted for brace rod (BR) installation. Brace rods further support weak scaffold branches and tree canopies. (See Cabling and Bracing Recommendations). These installations should occur during the time of pruning (Tree List - Work Type).

- All special treatments should be followed in order to reduce cultural stress. Examples of these problem areas range from girdling roots and little mulch or too much mulch to mechanical damage on the lower bark tissue and buried root collars (See Root Collar Disorders and Guidelines for Mulch Application). All these treatments shall occur during the time of pruning (See Pruning Tree List - Work Type).

- Hazard Tree Evaluations should be completed on 100 trees exhibiting signs of unreasonable risk (See Hazard Tree Evaluation Tree List - Work Type). A systematic, thorough inspection using arboricultural instruments, recognized industry formula, and climber shall be necessary to detect disguised hazardous conditions. Only after a detailed evaluation is complete can an Arborist render these trees either hazardous or reasonable to leave.

INTRODUCTION

Route 6A can be characterized by both large and small shade trees that possess overextended limbs that create an aesthetic canopy for the highway. The trees co-exist with other species on properties that meld into a naturalized landscape along the road.

For many years, the trees along Route 6A have been maintained by both utility companies and the public. These people have not performed pruning, fertilization, pest management and other necessary cultural practices on a routine, planned basis in order to maintain the vitality of the tree population in order to minimize losses. Many private home owners and businesses have been very successful in preventing tree mortality and maximizing the aesthetics and safety of the trees. Even though people value their trees, very few communities have established a good criteria for tree management along the road. Everyone must realize that a preventive maintenance program will result in a monetary savings to the towns of Cape Cod as compared to current day crisis management.

In June, 1995, the Cape Cod Commission engaged the Bartlett Tree Expert Co. to develop a comprehensive Inventory and Management Plan for the historic Route 6A highway trees. In order to obtain the information necessary to develop the program, an inventory of tree canopy affecting the highway was undertaken. The objectives of the inventory were to determine the location, species, size, relative vigor, presence of pests or other adversities and maintenance needs for all tree species.

During the inventory, care was taken to include trees frequently over 60' off the highway. Five European beech trees between 38"-72" in diameter located at mile marker 14.6 in Barnstable are an example of trees that aesthetically lend to the beauty and character of the road, but do not grow adjacent to the highway. Other trees like the 42" English oak (tree #3452) found over 50' off the road in Yarmouth and the old row of catalpa trees near mile marker 20 in Dennis represent a significant part of Cape Cod history. From species like black gum and American elm that are a part of native American history to imported trees like Chinese quince and zelkova that are a part of our colonial history, Route 6A trees are very unique and deserve proper care.

Inventory information was necessary to develop a proactive tree management program. Specific goals of the program are to maximize tree health, longevity and appearance and minimize liabilities and risks associated with trees with unreasonable risk.

MANAGEMENT OBJECTIVES

The management objectives for the Route 6A trees are to:

Manage the risk associated with the tree population through practices which minimize failures and unreasonable conditions associated with the trees.

Maximize tree health and longevity through a preventative tree health care program.

Maximize the aesthetics of the highway by encouraging future tree diversity of desirable species and implementing a tree health care program.

Determine monetary value of the tree population in order to stress the importance of preventive care.

Specific Objectives

Hazard Tree Evaluation: Identification and correction of trees with unreasonable risks will be the first priority. The Cape Cod Commission should develop a Hazard Tree Policy and implement it to achieve this goal.

Planting: Trees should be planted properly in order to make sure that there is a continuous healthy tree population. Emphasis should continue on recommending planting a diversity of insect, disease and culturally tolerant species for passive enjoyment and aesthetic contribution to the Cape. Selection should favor tree species with historic significance. Many 1.5" to 3" caliper 5th, 6th and 7th generation trees from sailing vessel days, i.e., English oak, post oak and numerous others grow along the highway. With its open exposure, abundance of water and sandy soil, the highway offers a perfect seed bed site. These trees could be easily transplanted to other prime growing locations along the corridor.

Pruning: Established trees should be pruned. When necessary to correct structural deficiencies, storm damage or interference with infrastructure or wires, crown reduction pruning should be used in addition to standard pruning, following the tree inventory recommendations.

Newly planted trees should receive standard pruning. Following the management plan, the trees should be pruned using the given A-300 Pruning Standards.

Low value trees which are not an integral part of the highway should be removed in order to minimize competition among other valuable trees or historically significant trees and to increase aesthetics and safety needs.

INVENTORY PROCEDURES

An inventory of all trees affecting Route 6A was completed. The objectives of the inventory are as follows:

1. Determine the number, species and location of all trees that affect the highway dependent upon tree canopy.

2. Determine size and assess condition of each tree impacting the highway.

3. Assess requirements for immediate and long term tree maintenance requirements.

4. Determine total value of tree population affecting the highway.

INVENTORY CRITERIA

Tree Location: Over 34 miles of Route 6A were inventoried using mile markers every one-tenth mile starting in Bourne and ending in Orleans. Trees with tree canopy growing within close proximity to the highway were tallied for inventory and many other historical or significant trees were included.

Species: The common name of each tree was recorded and the scientific name documented.

Diameter: Tree trunk diameter at 4.5 feet or 1.3 m above ground was visually estimated or measured with a diameter tape or Biltmore stick.

Height: Tree height was designated by S, (small) M, (medium) and L, (large) language.

Condition/Vigor: An appraisal of relative tree health was based on appearance and site conditions. Condition was rated on a basis of 1 to 10 with 0 being irreversible decline and 10 being very healthy. If a tree was designated for removal its rating can be considered "0" for valuation calculations.

Soil Analysis: Soil samples were randomly obtained from all Town areas along the highway. Samples were analyzed for the following:

Soil pH
Organic matter content
Available and total phosphorus
Potassium, magnesium and calcium
Cation Exchange Capacity

Tree Health Concerns: Each tree was assessed for pests, cultural and environmental disorders.

Tree Maintenance: All trees were assessed for maintenance requirements and execution priority. The following criteria were considered:

- Removal
- Pruning
  a. Ground Pruning
  b. Standard Pruning
  c. Hazard Reduction Pruning
  d. Crown Reduction Pruning
- Fertilization
  a. Macronutrient
  b. Micronutrient
- Structural Supports
- Mulching
- Root Collar Excavation
- Injection
- Brace Rod
- Girdling Roots
- Inspect Cable
- Mulch Needed
- Root Collar Inspection
- Hazardous Tree
- Soil Test Needed
- Transplanting Required
- Insect Suppression
- Disease Suppression

INVENTORY RESULTS

Data collected in the tree inventory is presented by area north and south of Route 6A. There were 34.4 miles of 688 one-tenth mile areas for management purposes.

Species Composition: Route 6A has 7498 trees affecting the highway representing 121 species and varieties. Species diversity was fair: As a general rule no genus should compose more than 10% of a population and no species more than 5%. As a genus, maple (Acer) with 9 species ranging from boxelder and crimson king maple to silver maple and sycamore maple comprises 29% of the entire population. Norway maple, as a species, represents 14% of the trees along the route. With this monoculture, we run a great risk if a maple disease like verticillium wilt or an insect like thrips on maple were to become a severe problem.

Size Distribution: The majority of trees along the highway are less than 15" in diameter. Many trees greater than 15" however contribute greatly to the appearance of the route and the function of the highway. It will be important to provide care to all trees over 15" to extend their life expectancy at least until the trees in the 3-15" range mature. A continued moderate diverse planting program should be initiated so that there is always a supply of smaller trees moving into larger size classes. (See Route 6A Cape Cod Tree Recommendations). Often considered "weed trees" or undesirable, small trees growing along the road between 1.5" and 3" in caliper could be used as transplants.

Condition: Soil analysis from along the highway in each town reveals that phosphorus and Cation Exchange Capacity (nutrient retention capacity) are poor for growth of woody plants. Considerable variation in nutrient content and pH is normally encountered in Cape soils. Magnesium and calcium tends to be low. This can be corrected with regular applications of lime. Potassium levels are valuable, addition of this element will generally be beneficial. (See fertilization recommendations).

The majority of trees were in fair condition (condition classes 0-4 harbor most trees with unreasonable risk). Numerous trees are in a bad state of decline. Six hundred seventy-eight trees have been targeted for removal because of poor health, poor growth characteristics or interference with more valuable trees.

Pests were generally present at moderate levels. Numerous problem areas have been defined in our plant health care section. Five percent of the population is white ash. Many of these trees exhibit ash decline. This mycoplasmalike organism (MLO) is slowly killing our white ash and there is no cure (See Ash Decline) and (See Plant Health Care Using IPM Strategy).

Root collar disorders were another major limiting factor on many tree species. Soil and turf were present on the hundreds of root collars of many established trees. Excess soil must be removed to increase soil oxygen levels. In many cases, mulch can be added to barren soil where moisture levels were low. Root collars shall be done during the time of pruning.

Detrimental conditions can weaken the plant and increase the risk of root and canker diseases. A technical report is enclosed which explains root collar disorders. These trees have been listed as needing special treatment coinciding with pruning.

The F.A. Bartlett Tree Expert Company
CAPE COD COMMISSION Tree Inventory

07/31/95

Tree Summary - Condition And Class

Tree Name	Condition Class										
	0	1	2	3	4	5	6	7	8	9	10	Total
American Beech	0	0	0	0	1	0	0	1	1	0	0	3
Tree of Heaven	1	0	4	2	6	9	10	27	24	1	0	84
American Chestnut	0	0	0	0	0	0	0	0	0	1	0	1
American Elm	2	2	1	1	8	12	8	31	73	22	0	160
American Holly	0	0	0	0	0	0	0	3	4	2	0	9
Apple	0	0	2	1	2	3	10	11	9	2	0	40
Arborvitae	0	0	0	0	1	1	5	5	2	13	0	27
Basswood	1	0	1	3	4	9	15	35	47	19	0	134
	0	0	0	1	1	0	0	0	0	0	0	2
Bartlett Chestnut	0	0	0	0	1	1	2	0	0	0	0	4
Blue Atlas Cedar	0	0	0	0	0	0	0	0	1	1	0	2
Boxelder	0	0	0	0	0	0	3	0	0	0	0	3
Black Locust	6	9	11	46	76	135	122	140	93	12	0	650
Black Cherry	5	9	23	49	75	130	102	79	52	12	0	536
Black Gum	0	0	0	1	2	27	30	7	30	13	0	110
Black Oak	5	0	3	7	32	42	90	166	196	19	0	560
Colorado Blue Spruce	0	0	0	0	0	2	1	10	8	15	0	36
Black Walnut	0	0	0	0	0	2	0	2	3	2	0	9
	0	0	0	0	0	0	0	1	0	0	0	1
Bradford Pear	0	0	0	0	0	0	0	0	0	2	0	2
Butternut	0	0	0	0	0	0	0	1	3	1	0	5
Bigtooth Aspen	2	0	3	0	1	7	2	11	19	1	0	46
Buckthorn	0	0	0	0	0	0	0	1	0	0	0	1
Catalpa	0	5	3	2	6	13	11	15	29	5	0	89
Chinese Chestnut	0	0	0	0	0	0	0	0	3	0	0	3
Camperdown Elm	0	0	0	0	0	0	0	0	1	0	0	1
Cherry	0	1	0	0	1	4	1	0	0	0	0	7
Chinese Quince	0	0	0	0	0	0	0	0	0	2	0	2
Crimson King Maple	0	0	1	0	2	0	1	3	23	25	0	55
Cryptomeria	0	0	0	0	0	0	0	0	0	1	0	1
Douglas Fir	0	0	0	0	0	0	1	0	0	0	0	1
Flowering Dogwood	0	0	0	0	1	1	0	1	0	2	0	5
Dawn Redwood	0	0	0	0	0	0	0	0	0	1	0	1
European Beech	0	0	0	0	0	1	0	3	3	19	0	26
English Elm	0	0	0	0	0	0	2	0	8	0	0	10
European Larch	0	0	0	0	0	3	0	1	1	2	0	7
English Holly	0	0	0	0	0	0	0	0	1	0	0	1
English Oak	2	0	1	1	2	6	14	26	49	16	0	117
Eastern Redbud	0	0	0	0	0	0	0	0	3	0	0	3
Eastern Red Cedar	1	1	6	23	27	86	42	52	54	43	0	335
English Walnut	0	0	0	0	0	0	0	0	1	0	0	1
Eastern White Pine	0	0	0	1	0	6	3	7	2	1	0	20
Flowering Crabapple	0	0	0	1	2	0	1	6	7	2	0	19
Flowering Cherry	0	0	0	0	2	2	6	5	24	12	0	51
Fernleaf Beech	0	0	0	0	0	0	0	0	0	3	0	3
Flowering Ash	0	0	0	0	0	1	0	0	0	0	0	1
Flowering Plum	0	0	0	1	0	1	0	3	3	4	0	12
Fraser Fir	0	0	0	0	1	0	2	0	0	0	0	3
Fernspray Cypress	0	0	0	0	0	0	0	0	1	0	0	1
Fruiting Cherry	0	0	0	0	0	0	0	1	0	0	0	1
Green Ash	0	0	0	2	2	2	7	9	13	7	0	42
Gray Birch	0	0	0	0	0	1	0	2	0	0	0	3
Gray Dogwood	0	0	0	0	0	0	0	0	1	0	0	1
Goldenrain Tree	0	0	0	0	0	0	2	0	0	0	0	2
Hawthorn	0	0	0	0	0	2	1	2	0	1	0	6

The F.A. Bartlett Tree Expert Company
CAPE COD COMMISSION Tree Inventory

07/31/95

Tree Summary - Condition And Class

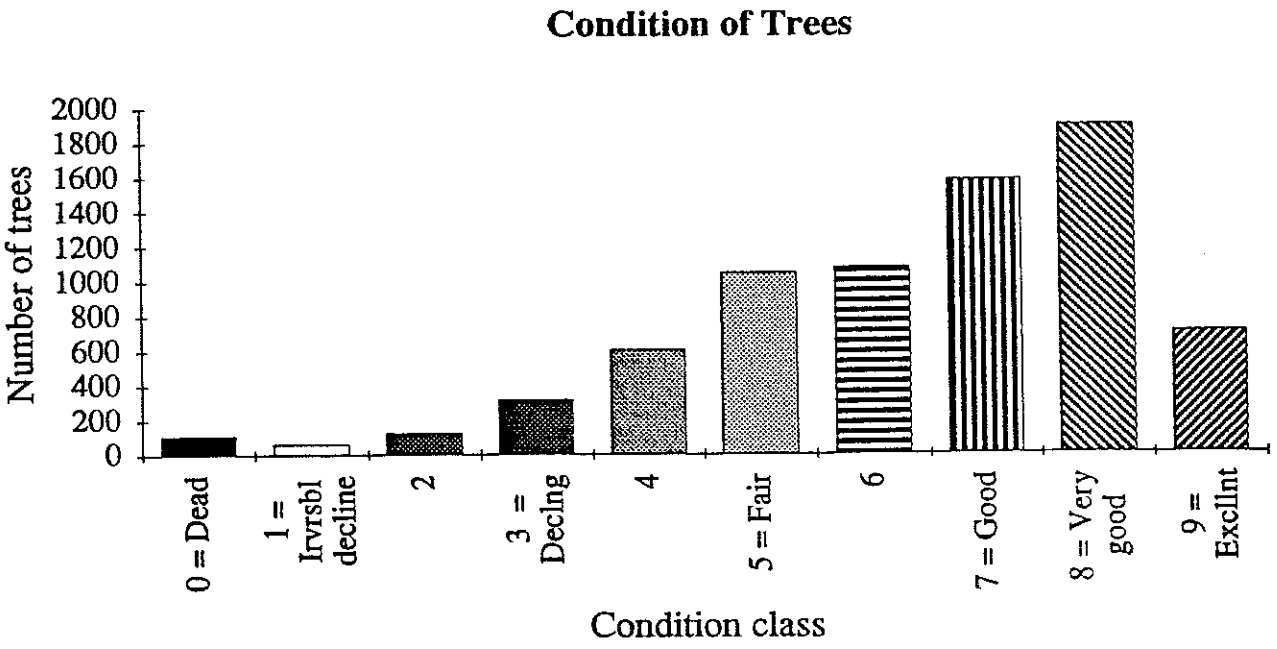
Tree Name	Condition Class										
	0	1	2	3	4	5	6	7	8	9	10	Total
Hemlock	0	0	0	0	0	0	0	0	10	0	0	10
Holly	0	0	0	0	0	0	0	0	0	1	0	1
Honeylocust	0	1	7	10	21	16	10	13	23	6	0	107
Horsechestnut	0	0	0	2	2	12	9	26	33	21	0	105
Hybrid Poplar	0	0	0	0	0	2	1	3	3	1	0	10
Japanese Maple	0	0	0	0	0	1	0	1	6	9	0	17
Japanese Black Pine	0	0	2	2	0	0	1	12	2	4	0	23
Japanese Tree Lilac	0	0	0	0	0	0	0	0	2	0	0	2
Katsuratree	0	0	0	0	0	0	0	0	0	3	0	3
Kousa Dogwood	1	0	0	0	0	1	1	0	14	11	0	28
Larch	0	0	0	0	0	0	0	0	0	1	0	1
Leyland Cypress	0	0	0	0	0	1	0	0	0	38	0	39
Linden	0	0	0	0	0	0	0	0	0	1	0	1
Littleleaf Linden	0	0	1	0	0	1	3	4	18	46	0	73
London Plane	0	0	0	0	1	3	3	2	8	4	0	21
Magnolia	0	0	0	0	0	0	0	0	2	4	0	6
Mimosa	0	0	0	0	0	0	0	0	2	0	0	2
Mockernut Hickory	1	0	0	0	0	0	2	1	9	3	0	16
Mountain Ash	0	1	1	2	2	2	6	1	0	0	0	15
Noble Fir	0	0	0	0	0	0	0	0	1	0	0	1
Norway Maple	4	13	5	29	73	118	168	270	305	63	0	1048
Norway Spruce	0	0	2	1	15	16	7	15	27	7	0	90
Overcup Oak	0	0	0	0	1	0	0	0	1	2	0	4
Pear	0	0	0	1	3	4	4	5	3	4	0	24
Plum	0	0	0	0	1	0	0	0	1	0	0	2
Pin Oak	0	0	0	0	2	1	0	7	19	8	0	37
Post Oak	0	0	0	0	1	1	2	7	11	6	0	28
Poplar	0	0	0	0	1	0	0	2	0	0	0	3
Purple Sycamore Mapl	0	0	0	0	1	1	0	4	3	2	0	11
Pitch Pine	62	2	21	51	46	89	72	52	46	4	0	445
Pussy Willow	0	0	0	0	0	0	0	1	2	0	0	3
Red Maple	2	1	3	6	25	36	42	55	56	15	0	241
Red Oak	0	0	0	0	1	0	1	0	1	5	0	8
Red Pine	3	1	3	2	17	4	5	9	4	0	0	48
Red Hickory	0	0	0	0	0	1	0	2	7	4	0	14
Red Elm	0	0	0	0	0	0	0	1	0	0	0	1
Red Mulberry	0	1	0	1	0	1	1	0	0	3	0	7
Rose of Sharon	0	0	0	0	2	0	0	0	2	1	0	5
River Birch	0	0	0	0	0	0	0	0	0	1	0	1
Sassafras	0	0	0	1	1	0	1	3	1	0	0	7
Sweet Cherry	0	0	1	0	0	3	0	5	11	1	0	21
Scarlet Oak	0	0	0	1	2	6	4	17	24	8	0	62
Scotch Pine	1	0	0	0	0	1	5	6	27	2	0	42
Siberian Elm	3	1	0	1	2	6	6	9	7	5	0	40
Sugar Maple	0	1	2	3	6	4	4	5	13	2	0	40
Silver Maple	0	1	7	9	19	29	37	44	30	5	0	181
Smoke Bush	0	0	0	0	0	0	0	0	0	1	0	1
Speckled Alder	1	0	0	0	9	6	1	19	39	23	0	98
Serbian Spruce	0	0	0	0	0	1	0	0	0	0	0	1
Sumac	0	0	0	0	0	0	0	0	2	1	0	3
Serviceberry	0	0	0	1	1	1	0	3	5	0	0	11
Sweetgum	0	0	0	0	2	0	0	3	1	4	0	10
Sweetbay Magnolia	0	0	0	0	0	0	0	0	0	1	0	1
Sycamore Maple	1	3	3	17	40	62	99	153	162	46	0	586
Yew	0	0	0	0	1	4	3	1	9	1	0	19

The F.A. Bartlett Tree Expert Company
CAPE COD COMMISSION Tree Inventory

07/31/95

Tree Summary - Condition And Class

Tree Name	Condition Class											
	0	1	2	3	4	5	6	7	8	9	10	Total
Turkey Oak	0	0	0	0	0	0	0	0	1	0	0	1
Tulip Poplar	0	0	0	0	0	1	0	3	3	6	0	13
Umbrella Pine	0	0	0	0	0	0	0	0	0	1	0	1
White Birch	0	0	0	1	1	2	2	3	4	3	0	16
Weeping Beech	0	0	0	0	0	0	0	0	0	1	0	1
Witch Hazel	0	0	0	0	0	2	0	0	0	0	0	2
Willow	0	0	0	5	6	10	7	6	6	3	0	43
White Mulberry	0	0	0	0	2	0	0	1	1	0	0	4
White Ash	5	9	5	23	34	74	57	96	83	10	0	396
White Fir	0	0	0	0	0	0	0	1	0	0	0	1
White Oak	0	0	0	0	1	7	11	24	33	9	0	85
White Spruce	0	1	2	7	8	6	4	9	8	4	0	49
Zelkova	0	0	0	0	0	1	0	1	3	2	0	7
Total	109	63	124	318	606	1046	1073	1572	1886	701	0	7498


Condition of Trees
Number of trees
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 = Dead
1 = Irvrsbl decline
2
3 = Declng
4
5 = Fair
6
7 = Good
8 = Very good
9 = Excllnt
Condition class

TREE MAINTENANCE RECOMMENDATIONS

Tree maintenance recommendations for the Route 6A corridor are based on the information that was developed for the 1995-1996 year period. The number of trees requiring each maintenance function is listed for 1995-1996. The tree populations should be reassessed in 1998 to develop specific priorities for the 1998-1999 period. A yearly timetable for conducting the work is presented.

The Tree List identifies plants and their maintenance requirements. These lists are presented for each of six hundred and eighty-eight (688) one-tenth mile areas on both north and south sides of the highway.

Removals: At the time of the inventory, six hundred and eighty-eight (688) trees were identified for take down. These were mostly declining trees which contribute little to the aesthetics of the highway. While they can be removed anytime, it would be best to remove them during the winter.

Pruning: Six thousand eight hundred and eighteen (6818) trees were identified for pruning in 1995-1996.

Structural Supports: One thousand and ninety-nine (1099) trees were identified for cable supports to compensate for structural deficiencies in 1995-1996. Within this population, trees have been targeted for brace rods. Tree canopies should be initially supported with cables and some with brace rods in order to secure longevity and beauty.

Fertilization: Six thousand eight hundred and eighteen (6818) trees were designated for fertilization in 1996 based on the presence of deficiencies or substandard growth. Fertilization should be done on all high value and deficient trees every year. All plantings designated for fertilization should be treated with Bartlett BOOST. BOOST is a high nitrogen, slow release fertilizer that is mixed with water and injected into the root zone of trees affecting 6A. The recommendation rate for BOOST is 50 gallons per 1000 square feet of surface area beneath the crown of the tree or off the road in adjacent yards. This is equivalent to 5.6 lbs. of actual nitrogen per 1000 square feet. BOOST contains all macro and micronutrients in proper proportions for optimum growth of Cape trees.

Root Collar Care: All trees with root collar disorders, girdling roots or requiring mulch or mulch corrections should be systematically treated. A listing of root system treatments are listed in the tree list under pruning. Trees with root system maintenance requirements are identified and all root collar care should coincide with pruning tasks.

Pest Management: There were moderate levels of insect pests found on many tree species. Disease and insects can be managed with an Integrated Pest Management (IPM) program. Bartlett's MoniTor program utilizes IPM technologies which include periodically inspecting trees for pests, beneficial elements and cultural problems and applying appropriate treatments to specific plants to prevent pest outbreaks. Please refer to both the Plant Health Care Using IPM Strategy section and Requirements for Integrated Pest Management section.

Yearly Calendar of Route 6A Tree Care

Function	January	February	March	April	May	June	July	August	September	October	November	December
Removals	XXXX	XXXX	Hazardous trees should be removed any time they are discovered							xx	xxxx	XXXX
Pruning:												
Shade trees	XXXX	XXXX	XXXX	xxxx	xxxx	xxxx	xxxx	xxxx	XXXX	XXXX	XXXX	XXXX
Evergreens and summer flowering shrubs		xxxx	XXXX	XXXX								
Spring flowering ornamentals					XXXX	XXXX						
Hedges	XXXX	XXXX	xxxx	xxxx	XXXX	XXXX	XXxx				XXXX	XXXX
Pest Management:												
IPM Program		xxxx	XXXX	XXXX	XXXX	XXXX	XXXX	XXxx	xxxx	xxxx		
Targeted Treatments		xxxx	xxxx	xxxx	XXXX	XXXX	XXXX	XXXX	XXXX	xxxx		
Fertilization:												
BOOST™		xxxx	xxXX	XXXX	XXXX	xxxx	xxxx	XXXX	XXXX	XXXX	XXXX	XXxx
Specialty		xxxx	XXXX	XXXX	XXXX	xxxx	xxxx	XXXX	XXXX	XXXX	XXXX	xxxx
Cable & Brace	XXXX	XXXX	XXXX	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	XXXX	XXXX
Lightning Protect	XXXX	XXXX	XXXX	xxxx	xxxx	xxxx	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

Key: XXXX Best Time xxxx Acceptable Time

ROUTE 6A (OLD KING'S HIGHWAY)

TRUNK FORMULA METHOD FORM

Appraised Value = Basic Value x Condition % x Location %
Basic Value + Replacement Cost x (Basic Price x [TA_A-TA_R] Species %)

Average Diameter = 15.25"

1. **Replacement Cost:** largest transplantable tree* $ 630
2. **Basic Price** of replacement tree* $ 36 /in²(cm²)
3. Difference in trunk areas of appraised & replacement trees
   - A. Appraised tree trunk area (TA_A or ATA_A)** 182.65 in²
   - B Replacement tree trunk area (TA_R)* — 7 in²
   - C. Difference in trunk areas 175.65 in²
4. Multiply **Basic Price** difference in trunk areas
   $ 36 (Line 2) /in²(cm²) x 175.65 (Line 3C) in²(cm²) = $ 6323.40
5. Adjust Line 4 by **Species** rating* 75 % = $ 4742.55
6. **Basic Value** = $ 630. (Line 1) + $ 4742.55 (Line 5) = $ 5372.55
7. Adjust Line 6 by **Condition** 53 % = $ 2847.45
8. Adjust Line 7 for **Location:**
   Location = (Site + Contribution + Placement) ÷ 3
   =(95 % + 95 % + 70 %) ÷ 3 = 87 % = $ 2477.28
9. **Appraised Value** = Round Line 8 to nearest $100 = $ 2477.00

Replacement cost* = Cost to buy & install largest-commonly-available-replacement tree but with no adjustments.
Basic Price* = Cost per unit trunk area of replacement tree. Can be based on the wholesale, retail or installed cost or cost of tree ÷ unit trunk area of replacement tree.
TA_A = Trunk Area of appraised tree (diam. 30" [75 cm] for less). See Table 4-1, 4-2, 4-3 or 4-4 or use the equation below:
TAA = $0.785d^2$ or $0.080c^2$
ATA_A = Adjusted Trunk Area of appraised tree more than 30" in diameter. See Table 4-1, 4-2, 4-3, or 4-4 or use the equation below:

English units for diameter > 30":	Metric units for diameter > 75cm:
ATA = $0.335d^2$ =69.3d - 1087	ATA = $0.335d^2$ =69.3d - 1087
for circumferences > 94":	for circumferences > 240cm:
ATA + $0.0333C_2$ + 22.1c 1087	ATA + $0.0333C_2$ + 22.1c 1087

$2477 x 7498 trees = $18,752,546.
- 237,300. (removal cost)

TA_R* = Trunk Area of largest-commonly-available-replacement tree
Species* = Species rating of appraised tree
Conditions = Structural integrity and health rating
Location = Site, Contribution & Placement rating averaged

TOTAL VALUE = $18,335,246.

CTLA's Sponsoring Organizations:
American Association of Nurserymen • 1250 I Street, N.W. • Suite 500 • Washington, DC 20005 • (202) 789-2900
American Society of Consulting Arborists • 5130 West 101st Circle • Westminster, CO 80030-2314 • (303) 466-2722
Associated Landscape Contractors of America • 12200 Sunrise Valley Drive • Suite 150 • Reston, VA 22091 • (703) 620-6363
International Society of Arboriculture • PO Box GG • Savoy, IL 61874 • (217) 355-9411
National Arborist Association • P.O. Box 1094 • Amherst, NH 03031 • (603) 673-3311

TREE MAINTENANCE SPECIFICATIONS

General Pruning Categories

Four categories of pruning were specified in the inventory. Briefly, these categories are:

Standard Prune: The routine pruning is equivalent to the National Arborist Association Class II Standard Pruning. This essentially consists of removal of all dead, dying, objectionable and weak branches accompanied by a light selective thinning of the crown. This type of pruning is recommended on trees with relatively sound branch structures. It is intended to remove undesirable branches, reduce wind resistance in the crown and promote strong, vigorous growth.

Crown Reduction Pruning: Crown reduction pruning or cutback consists of fine pruning as listed previously plus cutting back of individual limbs of leaders, underbranches or the entire crown. Crown reduction pruning is intended to help correct structural deficiencies in the tree or remove limbs which are interfering with structures or other trees.

Hazard Reduction Pruning: This pruning is intended to remove hazardous dead, dying, diseased and broken branches which are two inches in diameter or larger.

Ground Pruning: Same as Standard Pruning. This designation is given to small trees where no climbing is needed.

The following general guidelines apply to all pruning procedures:

- Pruning should encourage the development of the natural shape of the plant. Where crown reduction pruning is necessary, a tree-like form should be maintained with the top higher than the sides.

- Excessive thinning of the interior portions of the crown should be avoided. Instead, emphasis should be given to removing branches from the ends of limbs and leaders. One half the foliage must be maintained to the lower 2/3 of the limb or leader. Selective thinning of the ends of limbs will reduce the weight of the crown which helps prevent breakage during storms. This form of pruning also tends to discourage sucker growth on the interior portions of the limbs.

- Removing major limbs (more than 6 inches in diameter) should be avoided. Mature trees are growing very slowly. Subsequently, large pruning wound will not callus rapidly and severe decay in the remaining limb or trunk will result.

- Pruning shall be performed judiciously. Not more than one-third of the leaf surface area should be removed during any pruning operation.

Pruning Standards

Standard Pruning

Pruning will conform with the specifications for Class II Standard Pruning as listed in the "Standards for Pruning Shade Trees" published by the National Arborist Association. Fine pruning shall consist of the removal of dead, dying, interfering, objectionable and weak branches on the main trunks as well as those within the leaf area plus selective thinning of the crown. An occasional branch, up to one-half inch in diameter, may remain within the main leaf area where it is not practical to remove it.

Pruning Procedures

1. Pruning tools shall be sharp at all times to provide clean cuts.

2. All final cuts shall be made sufficiently close to the trunk to parent limb, without cutting into the branch collar or leaving a stub. Pruning cuts shall be made immediately in front of the branch bark collar and slanted downward and slightly away from the trunk or parent limb.

3. Heavy branches shall be precut to prevent splitting or peeling of the bark on the trunk or parent limb.

4. Maintaining the natural shape of the tree should be emphasized in all pruning. Structural pruning, in some cases, may require reshaping the crown to make the tree safe. In these cases, the tree should be given a symmetrical appearance. The top is to be higher and the sides reduced to maintain a tree-like form.

5. When structural pruning is required, not more than one-third of the total crown should be removed at one time. The branches or limbs should be cut to a lateral. The lateral should be at least one-third the diameter of the pruning cut. Avoid cutting back to sucker growth.

6. In removing lower branches for clearance (raising), care should be given to symmetrical appearances.

7. Pruning would not be treated with paints or other substances.

8. The presence of any structural weakness, disease condition, decayed trunk or branches, split crotches or branches shall be reported to the grounds department.

9. Obvious girdling roots will be removed at the time of pruning.

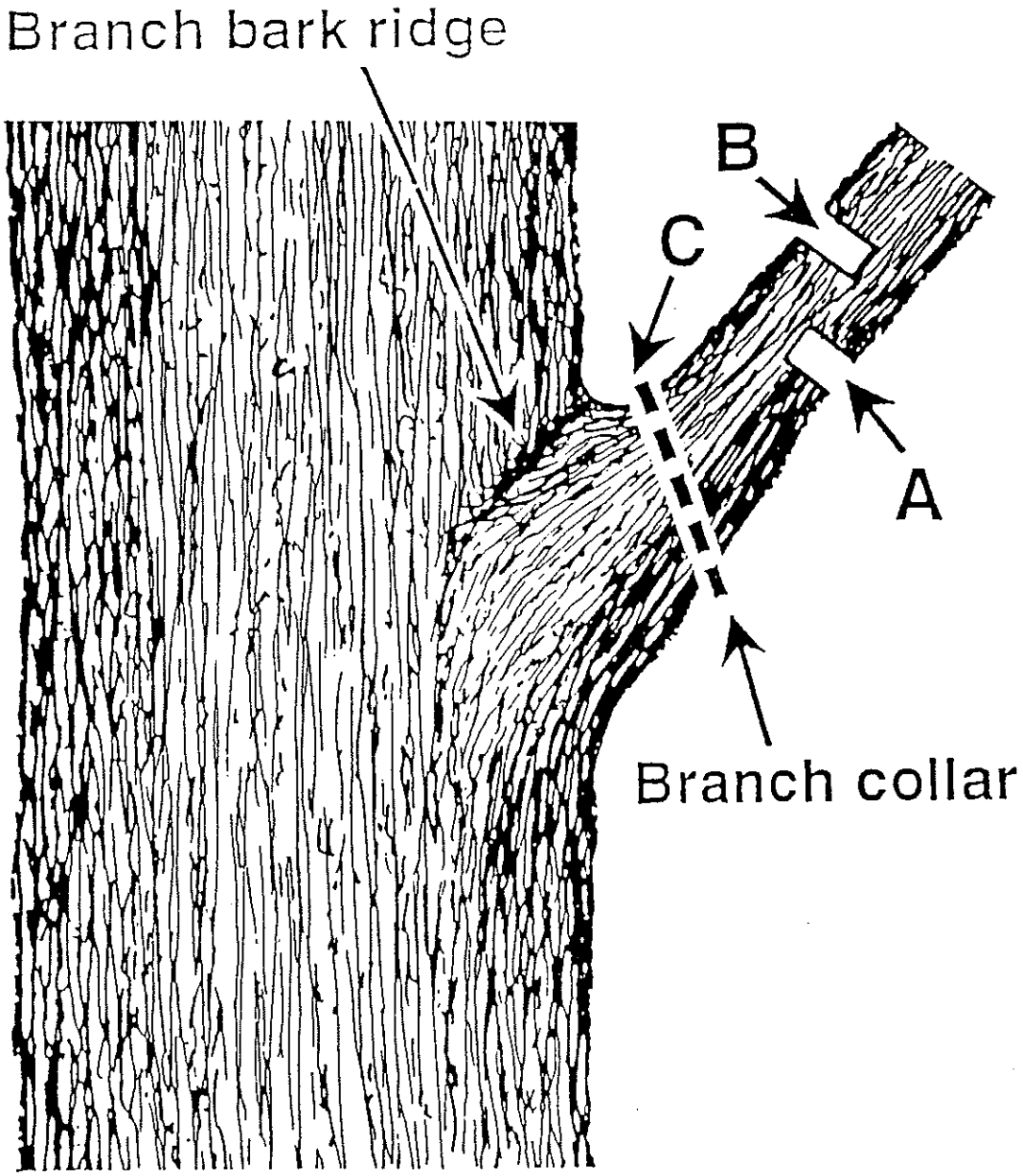
Crown Reduction Pruning

Crown reduction pruning shall conform with Class IV Cutting Back or Drop Crotch Pruning listed in the "Standards for Pruning Shade Trees" published by the National Arborist Association. Crown reduction pruning shall consist of fine pruning as listed previously, plus cutting back (reduction) of tops, sides, underbranches, or limbs. Specifications will follow fine pruning plus these additional provisions:

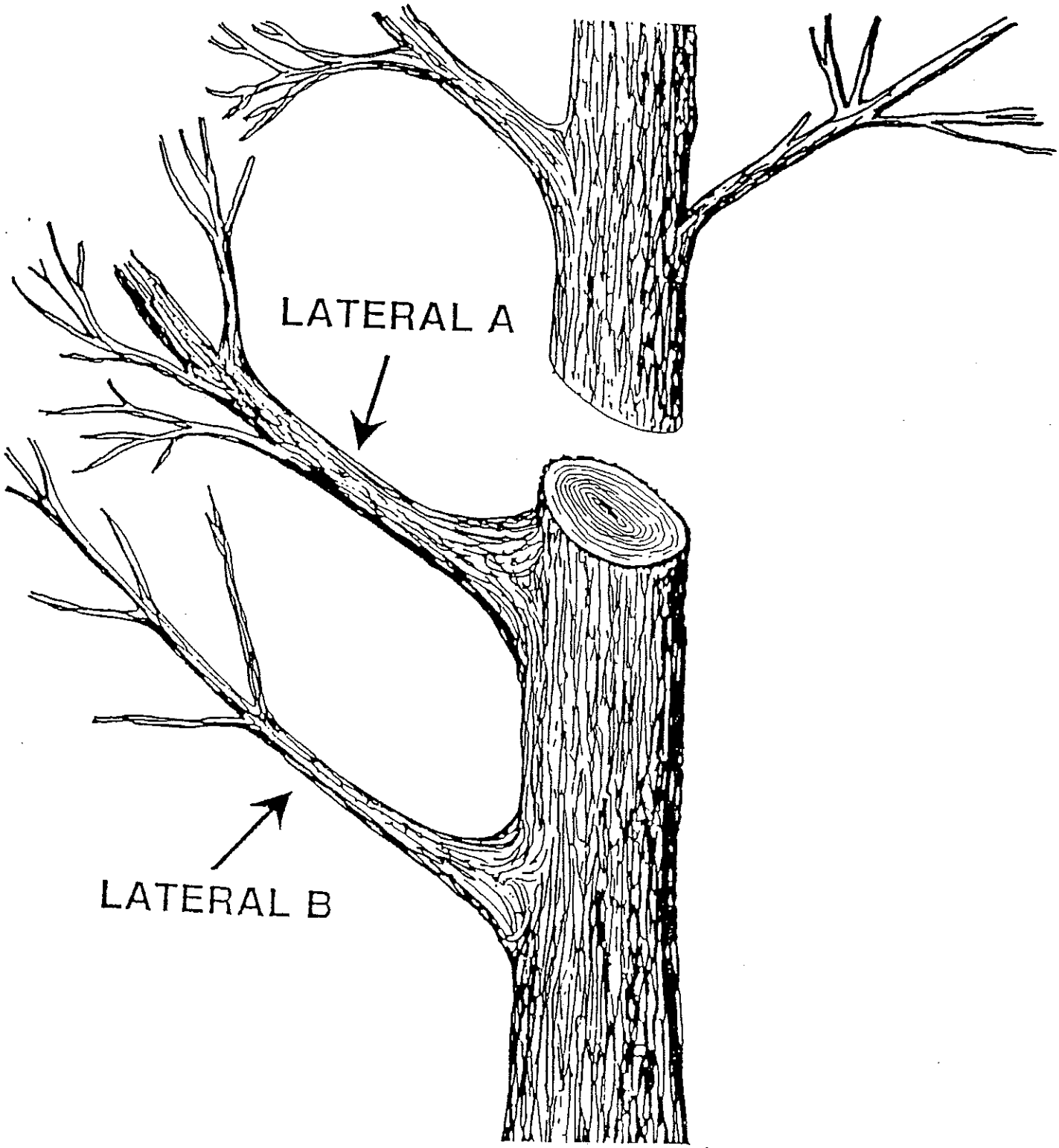
1. In reducing size, not more than one-third of the total crown area should be removed during a single operation. Avoid cutting back to small suckers. All effort should be made to cut back to a lateral at least one-third of the diameter of the cut being made.

2. In reducing overall size, attention should be given to the symmetrical appearance. Top is to be higher and sides reduced in order to maintain a tree-like form whenever possible.

3. When cutting back limbs, emphasis should be placed on maintaining a shape typical of the respective species.



Hardwoods


LATERAL A
LATERAL B

THE ASH DIEBACK DISEASE

HISTORY

THE PRECISE DATE at which ash dieback first appeared cannot be definitely established, however there are several reports of white ash dying from unknown causes in the early 1900's. White ash with typical dieback symptoms were observed as early as 1925 in southeastern Quebec by Pomerleau (1953). He stated this disease occurred after 1932 and around 1940, dates which were also coincident with the severe outbreak of birch dieback. Marshall (1930) reported numerous white ash trees of low vigor throughout Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York and Pennsylvania in 1930. He described these trees as having thinning foliage, "flags", and a considerable amount of dead wood due primarily to elliptical-shaped cankers varied in size and with well-defined margins. He further stated the cankers were red to brown in color, sunken, and tended to fray with age. He also made isolations from the cankers and was able to isolate imperfect fungi of the genera *Macrophoma, Sphaeropsis,* and *Diplodia.* He reported that drought had been severe during the previous two growing seasons before his observations and speculated that weather conditions were responsible for the actions of the canker-producing fungus. In Iowa, Reddy, *et al.* (1934) isolated *Cytospora annularis*[1] from diseased twigs and branches of green ash (*Fraxinus pennsylvanicum* var. *lanceolata*) and found by inoculating this fungus into one-year old white ash that it produced pronounced sunken cankers with swollen margins, killing tissues beyond the wound and nearly girdling the stem. Also in Iowa, Gilman *et al.* (1935) reported that they isolated *Cytospora annularis* Ell. and Ev. 11 times and *Didymosphaeria accedens* five times from green ash (*Fraxinus pennsylvanica* Marsh. var. *lancelota* (Borkh.) Sarg.) in early stages of decline. However, they did not attempt to establish the parasitism of these fungi and speculated that they were "secondary invaders" of injuries. In 1957, Silverborg and Brandt (1957) reported extentive dying of white ash in New York State and other parts of the Northeast for the past 15 years. They stated that the disease is found in young saplings and trees up to 24 inches dbh. They indicated the symptoms of the disease are first apparent during spring and early summer in the upper part of the crown with lower branches in the crown dying in subsequent years, requiring two to three years for complete killing. However, some trees may live from five to eight years. They also reported that yellowish- to reddish-brown sunken cankers with raised margins occur on many dying stems and branches. From these cankers they consistently isolated the fungus, *Cytophoma pruinosa* (Fries) von Höhnel, and in subsequent inoculations with this fungus found it to be pathogenic on 50 percent of the main stems one to three inches in diameter and on 50 percent of the branches ½ inch or less in diameter. They reported none of the stems four to six inches in diameter were affected. Koval (1960) reports *Cytospora pruinosa* causing "systemic infection" in 45 percent of the *Fraxinus americana* in the Russian towns of Primore. Brandt (1961) reviewed the literature on ash dieback up to 1961 and described the general symptoms of the disease. In other papers, Ross (1963a), reported a *Fusicoccum* sp. associated with ash dieback cankers; Silverborg, Risley, and Ross (1963) discussed general symptoms of the ash dieback disease, survey results and wood deterioration; Ross (1963b) presented etiologic possibilities of ash dieback such as fungi, viruses, nematodes, and soils, and Ross (1964) described cankers associated with ash dieback. The latter four papers were early phases of the present report and will be covered in detail later.

[1] Where authorities are not listed for scientific names, they were not listed in the original articles.

DESCRIPTION

Early Symptoms

A tree in the early stages of ash dieback may be very difficult to distinguish from a healthy tree by the casual observer. However a careful inspection will show the diseased trees to have numerous small dead twigs and branches scattered throughout the crown. Also, bark in diseased branches is a reddish-brown to orange as contrasted with the normal gray to brownish-green color in healthy twigs and branches. In many cases the best method of distinguishing the early symptoms of dieback is the appearance of pale-green or chlorotic foliage which is usually slightly dwarfed. Inspection of terminal shoot growth and radial stem increment in trees with early dieback symptoms generally show a slight reduction at least one year before the first foliar symptom expression.

Intermediate Symptoms

Trees in the intermediate stages of ash dieback have distinctly dwarfed and chlorotic foliage (Fig. 1). Differences in size and color of healthy and diseased leaves are shown in Fig. 1. In this stage, drastically reduced terminal shoot increment is responsible for the tufting of foliage at the tips of twigs and branches throughout the crown. Drastically reduced terminal shoot growth occurs in diseased trees compared with that of healthy trees (Fig. 4). Tufting of the foliage resulting from reduced terminal growth is common on diseased trees (Fig. 2). Also in the intermediate stage of the decline, a thinning of the crown becomes apparent as a result of tufted foliage and increasing numbers of dead twigs and larger branches (Fig.

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5). Sudden reduction in radial increment is also apparent at this stage of decline (Fig. 3). Generally, though not always present are large oval to diamond-shaped cankers, one to eight inches long, which form on the stem and larger branches throughout the entire tree (Fig. 6). The cankers appear as sunken areas of reddish-brown to orange dead bark with a distinct margin which is slightly raised and cracked (Fig. 7). These cankers generally are annual in nature but occasionally some breakover occurs and they may become perennial (Fig. 8). The dead bark over these cankers persists for a year or two but it eventually breaks away exposing the wood beneath. Callous tissue develops in varying amounts around the cankers depending upon the vigor and stage of decline of the tree. If the canker forms early in the tree's decline a small amount of callous tissue may be found, however if the tree is of low vigor callous tissue is imperceptible. In any case rarely does the callous tissue completely cover the exposed xylem. It is cankers of this type which are often responsible for killing large portions of the crown or sometimes the entire tree because of girdling. The killing of the smaller twigs and branches has a somewhat different pattern than that described above. Most often it appears that the smaller twigs and branches die progressively toward their base during the dormant season. The following spring and summer they appear reddish-brown to bright orange with the bark adhering tightly to the branch except at the base where it is fissured and separated from the main stem or branch (Fig. 9). In large areas of the dead bark, small sub-epidermal or erumpent black pycnidia about one mm in diameter form in great abundance (Fig. 10). Large masses of spores ooze from these pycnidia frequently during damp weather. Occasionally only a distal portion of the branch dies during the dormant season but continues to die toward its base during the growing season. Unlike the stem cankers the margin of the dead tissue is not well defined and sunken but maintains its form and changes color gradually distally from the normal gray or brownish-green to dark brown, reddish-brown, and eventually an orange color of the dead bark. Necrosis of this type generally involves only the branch affected and rarely extends past the base of the branch to the main stem (Fig. 11).

Late Symptoms

In the late stages of the disease, though all the main branches are dead, living bark may be found throughout the central stem. Numerous spindly, epicormic branches with dwarfed and chlorotic to purplish foliage, form along the main stem and about the base of large dead branches (Fig. 12). Once the tree reaches this stage it will rarely live more than another one or two years. The length of time required for death of a tree is variable depending upon size and site. In general, life expectancy of diseased trees is approximately ten years for large trees 16 inches dbh and larger.

ASH DIEBACK SURVEY IN NEW YORK

Methods

In the summers of 1960 and 1961 a survey was conducted by members of the New York State Conservation Department and the State University College of Forestry at Syracuse University to determine the distribution and intensity of ash dieback in New York State (Silverborg, *et al.*, 1963). A total of 438 sample plots were established using a line-plot procedure. All counties in the state were surveyed except New York City and Long Island counties. The sample plots were of two types. One type was established along roadsides and hedgerows and was rectangular in shape measuring one-half chain by two chains. The second type was established in woodlots and wooded areas and was one chain square. All trees 2.5 inches dbh and above were tallied. Each plot contained a minimum of 15 trees. In the survey a total of 8,494 trees were tallied.

Results

In woodlots and forested areas a total of 3,699 trees were surveyed; 63 percent were healthy, 31 percent were diseased, and 6 percent were dead. In roadside-hedgerow areas, 4,795 trees were surveyed; 64 percent were healthy 32 percent were diseased, and 4 percent were dead. From these results it is apparent that the disease is equally severe in both roadside-hedgerow and forested areas. Disease intensity appeared to be greatest along the Hudson River Valley from Warren County in the north to Westchester County in the south. Areas of high disease intensity were also found in Onondaga, Cayuga, and Jefferson Counties in central New York with scattered areas of high disease intensity in the western part of the state east of Buffalo (Fig. 18).

ETIOLOGIC POSSIBILITIES

The possible causes of ash dieback are briefly reviewed below:

Climatic Change

Hepting (1960, 1963) presents the hypothesis that many of the so called abiotic tree diseases may be related. He reports that the North American continent has undergone a gradual warming trend since 1900. As a result of this warming trend the mean annual temperature has risen two to three degrees F. He speculates that this change in temperature, though it may seem slight, is enough to disrupt macro- and microclimatic conditions about a tree and its associated biota causing an eventual de-

of complex diseases such as sweetgum blight, birch dieback, pole blight, and pitch streak of turpentine pines which have a similar symptom syndrome, have appeared at the same time, and have no known etiologic agent.

Drought

Though drought may be considered as climatic change, it should be investigated separately as concomitant periods of extreme temperature and moisture stress. Pomerleau (1953) and Marshall (1930) have pointed out that typical dieback symptoms occurred on ash species after periods of extreme drought. Hepting (1960) also has indicated that drought is involved in diseases such as pitch streak of turpentine pines and sweetgum blight whose symptoms are similar to those of ash dieback. True and Tryon (1956) associated canker formation in red oak (*Quercus rubra* L.) with the 1953 drought. Hansbrough (1936) found *Tympanis* canker of red pine (*Pinus resinosa* Ait.) to be severe after the 1930 drought. Drought cannot be excluded as an etiologic possibility in ash dieback because terminal and diameter increment has been reduced in ash trees and stem cankers have formed coincident with drought years within the past ten years in the Northeast.

Edaphic Factors

Many diseases of Woody and herbaceous plants have been shown to be the result of deficiencies or excesses of one or more of the essential elements in plant nutrition. For example, a potassium deficiency may cause chlorosis of foliage and reduced growth (Heiberg and White, 1951). Exesses of some elements such as manganese may result in bark necrosis (Berg, *et al.*, 1958).

These symptoms are present in ash dieback presenting the possibility that this disease may be the result of unfavorable soil factors.

Fungi

Previous investigators of diebacks and declines in white ash have isolated and in some cases established pathogenicity of a number of facultatively parasitic fungi (Marshall, 1930; Reddy, *et al.*, 1934; Gilman, *et al.*, 1935; Silverborg and Brandt, 1957; Koval, 1960; and Ross, 1963a). In the present study a number of fungi are associated with the dead branches and cankers of ash dieback trees therefore making them suspects in the etiology of this disease.

Viruses

Viruses are relatively uncommon in forest trees. This may be due in part to the fact that they are difficult to handle and detect. Virus diseases have a wide range of symptoms and may appear as brooming of small branches, spindly shoots and branches, necrosis, chlorosis, dwarfing and mottling of foliage. Viruses commonly occur in fruit trees and are known in several forest trees.

A graft-transmissible disease in Berlandier ash (*Fraxinus berlandieriana* A. DC.) characterized by yellowish leaves about one-quarter to one-third natural size and multiple, spindly, wirelike shoots has been reported (Plakidas, 1949). It is evident that some of the symptoms of ash dieback, such as chlorotic, dwarfed foliage and spindly epicormic branches are characteristic of a virus disease.

Nematodes

Within the past 20 years nematodes have become an important source of loss in the production of agricultural crops and in some forest nurseries in the South. Parasitic nematodes may be found associated with many forest trees, however, as yet they have not been demonstrated to be a problem in forest trees. Nonetheless, in a dramatic decline such as ash dieback they should be investigated as an etiologic possibility for they may provide entry courts for root rot organisms, reduce growth by mass feeding or even transmit viruses.

Air Pollution

The problem of air pollution in forest trees, until recently, has not been considered of great importance. However, with the recent rapid development of industrial areas and the use of enormous numbers of internal combustion engines which release toxic gases into the atmosphere, air pollution is now becoming an important point in the vicinity of specialized industry and large urban areas. Berry and Ripperton (1963) very vividly established this point when they were able to induce typical symptoms of emergence tipburn of eastern white pine (*Pinus strobus* L.) by exposure of plants to ozone concentrations of 6.5 pphm. Berry and Hepting (1964) found that some unidentified atmospheric constituents, possibly sulfur dioxide and fluorine, were causing a decline of eastern white pine in industrial areas of the Cumberland Plateau of Tennessee. Air pollution factors were not considered in this study due to time limitations.

In splitting the one-foot bolts and while preparing the test beams, it was noted that all the bolts from Class I, IV, and V trees were clear unstained and free of insect galleries, whereas the bolts from Class V+ trees were frequently discolored with a blue-black stain and had frequent insect galleries. In testing the beams, those from Class I, IV, and V produced normal even breaks with no indication of brashness, however, the Class V+ specimens produced very brash breaks and many times separated completely (Fig. 17).

The toughness of each beam was recorded in inch pounds. This value was divided by the specific gravity of each beam in order to make the toughness a function of specific gravity, giving a corrected toughness value. The mean corrected toughness values of each tree is presented in Table 13. Testing the differences of the means of the top and bottom bolts (20 samples per bolt) from each tree it was determined that the bottom bolts were significantly tougher at the 0.01 level in the Class IV and V trees and at the 0.05 level in the Class I and V+ trees (Table 14). Testing the differences of the means between the bottom bolts of Class I and V+, IV and V+, and V and V+, it was determined the Class I, IV, and V bolts were all significantly tougher at the 0.01 level than the Class V+ bolts. Using the same procedure to test the top bolts it was determined that Class I and IV bolts were significantly tougher at the 0.05 level, however, the Class V and V+ bolts were not significantly different at the 0.05 level, but somewhere between the 0.10 and 0.20 level (Table 15).

ROUTE 6A

PLANT HEALTH CARE
USING IPM STRATEGY

During June 1995, we inventoried trees along Route 6A between Bourne and Orleans. After assessing specific needs, we have developed a strategy to maintain tree health, vigor and aesthetics.

Aside from mechanical damage (basal injury), we did observe numerous insect and disease damage to various trees.

Adelgid on Hemlock

We strongly advise initiating an elm program and we would hope that towns would tend the remaining tree population. We would like to also recommend a plant health care program to treat other insect, disease and cultural problems along the highway. The following is a listing of other major specific pests found along the road:

I. Tree insects to be monitored and controlled:

- A. Aphids and scale - Maples, Beeches, Lindens, Tulip Poplar
- B. Adelgid, leafminer and borers - Arborvitae, Oak, Spruce, Hemlock, White pine, Birch, Holly
- C. Mites, pod gall midge - Honeylocust, Spruce, Elm

II. Tree diseases to be monitored and controlled:

- A. Diplodia and other fungus blights - Pines, Cherry, Crabapple, Ash
- B. Anthracnose fungus and verticillium wilt - Dogwood, Maple, London Plane
- C. Rust fungus - Apple, Ash, Hawthorn, Serviceberry

III. Cultural practices to be performed:

- A. Soil samples shall be taken in each town to identify pH and macro/micro nutrient deficiencies.
- B. Proper soil amending using broadcast fertilizers.
- C. Light pruning of obvious small diseased deadwood on the affected ornamental trees.
- D. Install elm bark beetle traps and clearwing borer traps, i.e., lilac ash borer, two-lined chestnut borer and dogwood borer to help better time borer emergence.

IV. Schedule of your MoniTor visits:

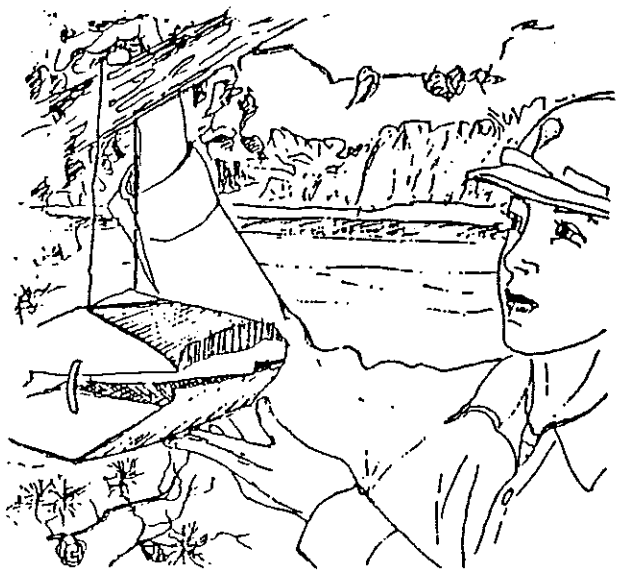
March - 1 inspection/treatment
April - 2 inspections/treatments
May - 2 inspections/treatments
June - 2 inspections/treatments
July - 2 inspections/treatments
August - 2 inspections/treatments
September - 2 inspections/treatments

ROUTE 6A

REQUIREMENTS FOR INTEGRATED PEST MANAGEMENT

The following equipment list includes materials required to conduct a minimal IPM inspection/treatment program:

1. One "Locked" storage bin.
2. One hand-held 1 or 2 gallon pump and sprayer and one 60 gallons per minute sprayer.
3. Chemicals:
   - Scalecide oil - 5 gallons
   - Mavrik - 1 quart
   - Dursban 50W - 2 lbs.
   - Orthene - 2 lbs.
   - 3336 or Benlate 50 DF - 2 lbs.
   - Insecticidal Soap - 5 gallons
   - Morestan - 2 lbs.
   - Manzate - 1 lb.
   - Tempo - 32 oz.
4. Biological Control:
   - Release times - April to late May
   - Lacewing - 1,000
   - Ladybug eggs - 1/2 pint
   - Trichogramma - 1 square
   - Predatory mites - 1,000
5. Pruning Equipment:
   - 1 pole saw, 1 pole pruner, hand pruners, wire rake and 1 hand shovel
6. Macroscope 8 x 30 monocular (Inter-Science Company)
7. Soil moisture meter
8. Soil pH meter
9. Fertilizers and amendment materials: slow-release fertilizers, iron chelate, magnesium chelate, aluminum sulfate, magnesium sulfate and dolomitic lime.
10. Pheromone traps: clearwing borer; 3 traps, yellow sticky traps; 1 trap.
11. Required references: Insects that Feed on Trees and Shrubs by Johnson and Lyon., Diseases of Trees and Shrubs by Sinclair , and Manual of Woody Landscaping Plants by Dirr.
12. Soil sample bags and lab forms.
13. Sample lab forms and plastic containers for sample insects and plant specimens.



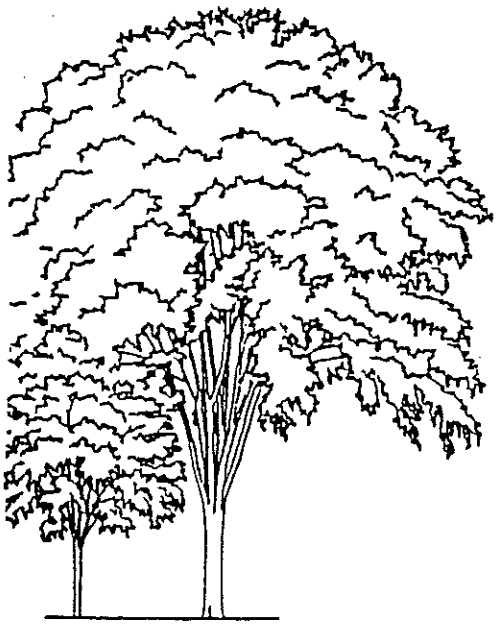
Plant Health Care Program

for

Elm

from the

Bartlett Tree Research Laboratories

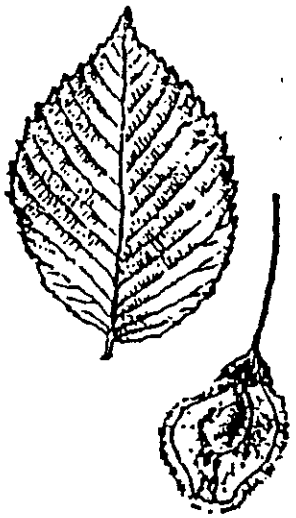


Elm trees are grand, large shade trees which will grow well even in the most severe urban situations. They transplant easily and grow very rapidly if conditions are at all favorable. Healthy leaves are lustrous dark green in the summer turning yellow in the fall.

Elms grow best in full sun but are tolerant of moderate shade. They have a great tolerance to soil pH, growing well in the range of 5.5 to 8.0. They are tolerant of compacted clay soils, well drained sandy soils and most soils in between. They grow best in nutrient rich, moist well drained soils.

The most common and well know disease is Dutch elm disease (DED). This is a fungal disease which is transmitted by twig or trunk feeding beetles and root grafts. Dutch elm disease plugs the vascular system of the tree causing a wilt which is often seen first in the upper branches (flags) and may move throughout the entire tree within a year.

Elm yellows is another serious disease of elms which causes yellowing, thinning, premature leaf drop and eventually death of infected trees. When leaves appear white during the summer the cause is a powdery mildew fungus. Black spots and premature defoliation are caused by another fungus. Scorching or yellowing of the leaf margins is caused by a bacterial infection of the woody tissue. Symptoms are often confused with DED, however, bacterial leaf scorch symptoms are seen in late summer and the leaves drop rather than die and hang onto branches.



Elms are often skeletonized and defoliate by elm leaf beetle. This insect eats the lower surface of leaves and holes in the leaf resulting in browning of the leaves. There are several scale insects which attack elm, elm scrufy scale and elm lecanium are two of the most common. They insert thier mouthparts into the tree and suck the sap out. Aphids are often found feeding on leaves. If they are in high levels, foliar damage can occur.

Recommended Monitoring for Elm

Timing	Treatment
Winter	Prune to remove dead, dying and diseased and interfering limbs. Remove wood from area to reduce bark beetle populations.
Late Winter	Apply horticultural oil to reduce populations of overwintering insects.
Mid Spring	Apply protective fungicide for black spot if tree has history of disease. Inspect for DED flagging.
Late Spring	Repeat black spot treatment. Monitor and treat elm leaf beetle. Inspect for DED flagging.
Summer	Monitor for DED, elm yellows, bacterial leaf scorch, leaf feeding insects and powdery mildew. Treat as needed. Pruning bacterial leaf scorch effected limbs out when discovered may locally eliminate the disease. Trunk inject fungicide to reduce chances of severe DED infections.
Fall	Systemically treat for elm leaf beetle if applicable. Remove fallen diseased leaves.

See Bartlett's *Pest Management Recommendations* for more details on a complete DED management program.

Trees may be treated with DED protectant fungicide and systemic insecticide for elm leaf beetle at any time when leaves are present in most states.

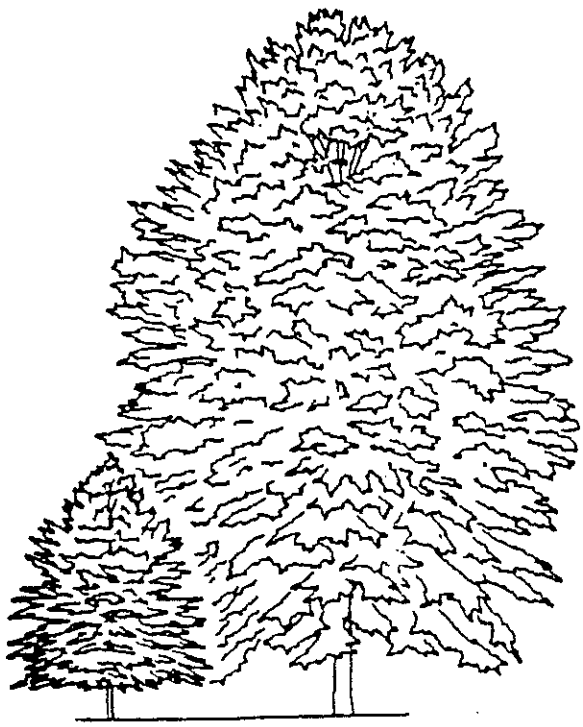
Plant Health Care Program

for

Pin Oak

from the

Bartlett Tree Research Laboratories



Pin oak (*Quercus palustris)* is a fast growing, large maturing shade tree which has a pleasing oval-pryamidal shape. Leaves are a deeply lobed, glossy dark green during the summer. Fall color is highly variable, ranging from red to brown. During the dormant season, the unique fine dense branch structure can be seen.

Growth of pin oak is best in areas of full sun. Trees growing in shade are slow to mature and often die prematurely. Pin oak will grow in most types of acidic soils and it is known for its tolerance to heavy clay soil. Flooding during the winter and early spring is easily tolerated. Soils which are saturated for more than a few weeks during the growing season may be detrimental to tree growth.

One of the most common problems with this species is chlorosis which develops when soil pH is over 6.5 to 7. This results in yellowing or browning between the leaf veins and eventual decline of the tree. This problem may be corrected either by treating the soil or by injecting iron into the trunk.

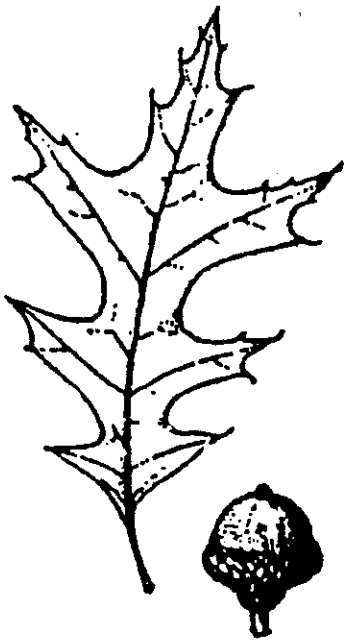
There are many insects which feed on pin oak. Many prefer trees which are under stress from root damage, lack of water or nutrients Obscure scale (*Melanapsis obscura*) is a very small insect which feeds on twigs and branches. From under its bark colored cover, it removes food produced by the leaves and intended for other parts of the tree. Horned oak gall (*Calirhytis cornigera*) and gouty oak gall (Calirhytis quercuspunctata) are caused by a small wasps. Large numbers of these galls result in dieback, decline and an unsightly appearance. Caterpillars which are occasional problems include gypsy moth, orange striped oak worm, cankerworms and oak leaf skeletonizers.

Common diseases which cause dieback and decline include bacterial leaf scorch, cankers and root rot. Leaf scorch (*Xylella fastidiosa*) is transmitted by several common sucking insects. Symptoms start as marginal browning separated from the green leaf blade by a thin yellow line and end as severe branch dieback. Numerous canker fungi attach twigs and the trunk of trees stressed by lack of water, root damage or nutrient deficiency. Root rot fungi are difficult to detect in these early stages. In final stages trees often totally collapse during hot, dry periods in the summer.

Leaf spot, anthracnose and leaf blister disease all may cause premature defoliation. To promote overall tree health, proper mulching, pest management, fertilization and irrigation are required. Some of these treatments can be applied at any time, others require very specific timing. An ideal plant health care system for pin oak is as follows:

Recommended Monitoring for Pin Oak

Timing	Treatment
Winter-Early Spring	Prune to remove dead, dying, diseased and interfering limbs. Inspect root collar. Soil sample. Apply sulfur and iron chelate as needed. Inspect for scale, cankers, gypsy moth egg masses and twig galls. Scale spray if needed.
Mid Spring	Anthracnose and leaf spot disease suppression treatment, if needed. Trunk inject iron as needed on a 3 year schedule.
Late Spring	Same as above without iron treatments. Monitor leaf feeding insects.
Early Summer	Same as above. Monitor leaf feeding insects and obscure scale. Horned oak gall sprays (if needed). Apply sulfur and iron chelate.
Mid Summer	Monitor soil moisture, leaf feeding insects and obscure scale crawlers.
Early Fall	Monitor bacterial leaf scorch, iron deficiency. Soil treat iron deficiency, gall and scale insects.



Systemic injections are available to treat iron deficiency. This treatment can be applied at any time, except when the tree is frozen, during droughts or on trees with severe root damage. Treatment should not be repeated more than once every three years. Soil applies systemic treatments are also available for sucking insects.

Plant Health Care Program

for

Red Maple

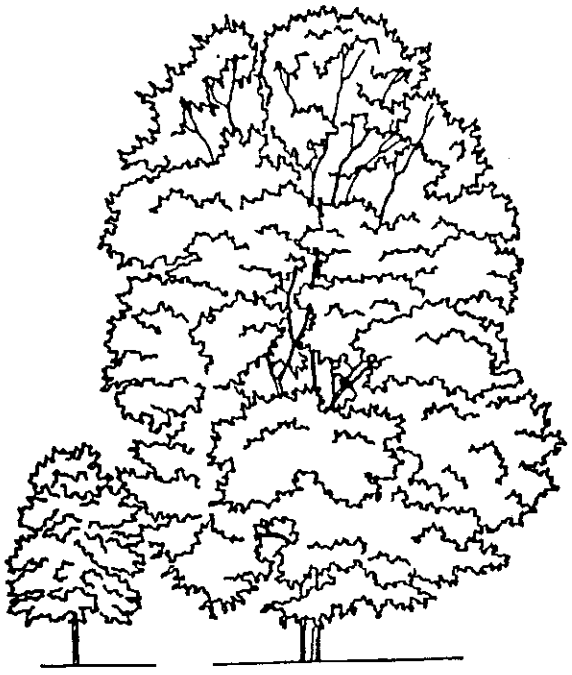
from the

Bartlett Tree Research Laboratories

Red maple is a medium size shade tree which grows in most landscapes. During the summer it has deep green leaves. It is one of the earliest trees to flower in the spring and provides dramatic color in the fall. Many red maple cultivars have been selected for fall color and specific crown shapes.

Red maple is native from Maine to Florida, west to Wisconsin and is adapted to a wide variety of acidic soils. It tolerates both very dry and moist sites but grows best in moist well drained soils. Growth is fastest in full sun, however, the tree will tolerate shade when it is young.

Yellowing between the veins of leaves, interveinal chlorosis, is a symptoms of manganese deficiency. This problem occurs on soils with high pH, low manganese levels and or poor drainage. Trees with root disorders are more prone to nutrient deficiency. When soil pH is greater than 6.0, manganese is converted to forms which are not avaialble to the plant which increases the probability of chlorosis.



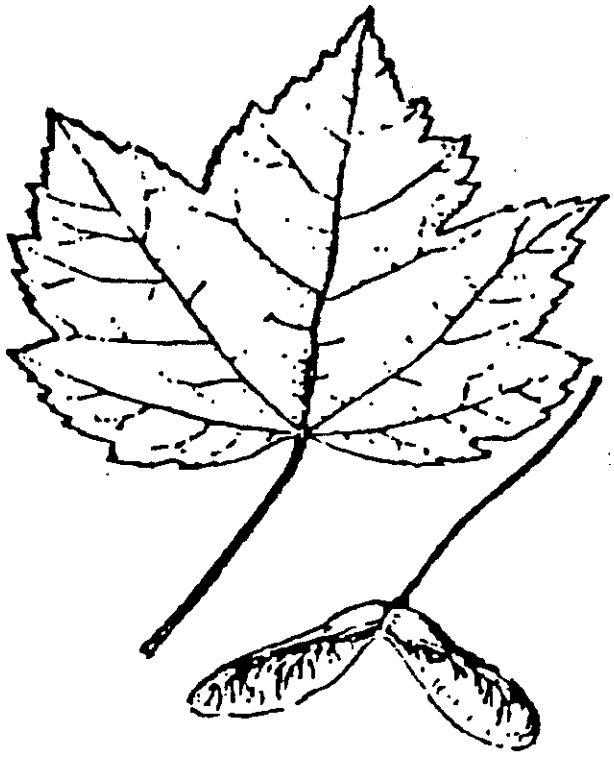
Red maple is susceptible to a number of leaf spot diseases which may disfigure leaves and cause early defoliation. Cankers, diseases of the bark, occur mainly after severe winters. They cause limb dieback and can kill the tree if they progress into the stem. Root and wilt diseases caused by *Verticillium, Phytophthora, Armillaria* and nematodes can cause dieback of the crown and eventual death. Red maple is susceptible to several important decay fungi which attack the wood. These fungi enter through improper pruning cuts and other injuries to the trunk and limbs. Decay can structurally weaken the trunk, increasing the potential for tree failure.

There are numerous insects and mites which may attack red maples. Leaf feeding caterpillars include gypsy moth (*Lymantria dispar*) and tent caterpillar (*Malacosoma distria*). Galls on the leaf are caused by a number of mites or midges which lay eggs early in the spring. White coatings on twigs is caused by the cottony maple scale (*Pulvinaria innumerabilis*). Aphids can also cause blackening of leaves (sooty mold) and reduction of vigor.

Sapsuckers and squirrels both attack red maples to drink the sweet sap. These wounds may girdle the trunk or provide entry for canker fungi.

Recommended Monitoring of Red Maple*

Timing	Treatment
Winter - spring	Corrective prune to remove dead, dying diseased limbs and interfering limbs. Inspect root collar, take soil sample. Apply sulfur and manganese chelate as needed. Inspect for scale, cankers and twig borers.Treat if needed.
Mid spring	Anthracnose and leaf spot suppression treatment, if needed. Trunk inject manganese, if needed.
Late spring	Monitor leaf feeding and scale insects. Repeat soil treatments as needed.
Early summer	Monitor leaf feeding and scale insects. Repeat leaf disease treatment if needed.
Summer	Monitor soil moisture, especially on newly planted trees. Inspect Inspect for and treat leaf feeding insects. Check mulch level, add mulch if needed.
Fall	Continue with soil treatments for pH problems. Fertilize as needed.



Systemic injections are available to treat manganese deficiency. This treatment is most effective when applied in early spring, prior or immediately after budbreak. It should be repeated more than once every 3 years. Soil applied systemic insecticides may be used in the fall to reduce the next years infestation of aphids, scale and midges.

Plant Health Care Program

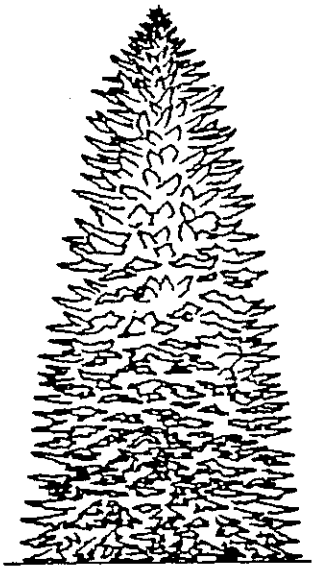
for

Spruce

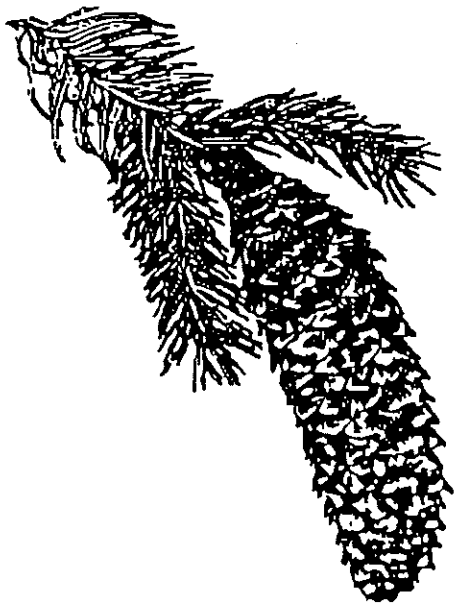
from the

Bartlett Tree Research Laboratories

Colorado blue spruce *(Picea pungens)* is a medium to large very formal tree often used as a specimen planting. Its dense pyramidal shape and bluish foliage often dominates the landscape. Norway spruce, *Picea abies*, is similar with green needles and more pendulous branchlets. Norways are very graceful at maturity and grow somewhat faster than blue spruce when young.



Spruce transplant moderately well due to their shallow root system. They grow best in full sun. Slightly acidic soils with a pH range of 6 to 7 are preferred for Blue Spruce. Norway spruce grows best when the pH is lower, 5 to 7. Maximum growth is achieved when the soil is rich, moist and well drained. They are, however, adaptable to all but extreme soil types. Irrigation is often required during summer drought.



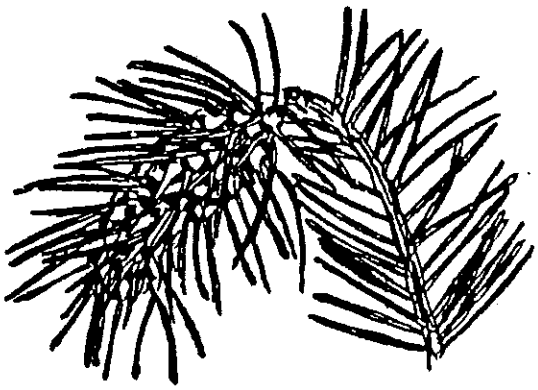
The most common disease of blue spruce is *Cytospora* canker. This fungus infects lower limbs of stressed trees causing branch dieback. If left untreated the canker may progress to the trunk, killing the tree. *Rhizosphaera* needlecast displays similar lower branch dieback symptoms but is more commonly found on Norway spruce. Decline of spruce is often traced to a soil or root problem. *Phytophthora* root rot and nematodes both attack roots. Mulch is very beneficial to spruce root systems. It protects shallow roots from temperature extremes, retains soil moisture, increases soil nutrients and aids in building soil structure.

Gall adelgids cause tip dieback and cone like swellings on branches. Heavy infestations damage the appearance of the tree and slows branch growth. Spruce spider mite feed on needles causing discoloration and premature defoliation. The white pine weevil attacks the growing tip in the spring causing it to dieback. This results in the formation of multiple leaders and weak codominant stems. Other insect pests include spruce bud scale, pineneedle scale and sawflies.

Recommended Monitoring for Spruce

Timing	Treatment
Winter	Corrective prune to remove dead, dying, diseased codominant leaders and interfering limbs. Sample soil for nutrient levels and pH.
Early Spring	Treat white pine weevil if symptoms are present from previous year. Monitor and treat mites.
Mid Spring	Treat Rhizosphaera needlecast if symptoms are present from previous year. Monitor and treat mites. Fertilize and treat pH problems as recommended on the soil sample report.
Late Spring	Monitor and treat pine needle scale and mites. Repeat Rhizosphaera needlecast treatment.
Early Summer	Monitor and treat spruce bud scale, sawfly, mites and soil moisture levels. Repeat Rhizosphaera needlecast treatment.
Mid Summer	Monitor and treat soil moisture, pine needle scale, mites, Phytophthora and nematodes. Prune out any terminals with white pine weevil injury.
Late Summer	Monitor and treat mites, check soil moisture, root collar and mulch level. Treat soil nutrient and pH problems as needed.
Fall	Monitor and treat gall adelgids and mites. Treat soil nutrient and pH problems as needed.

Gall adelgid



Spruce spider mite

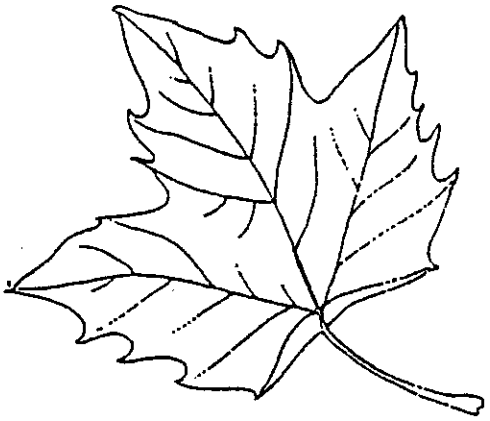
Plant Health Care Program

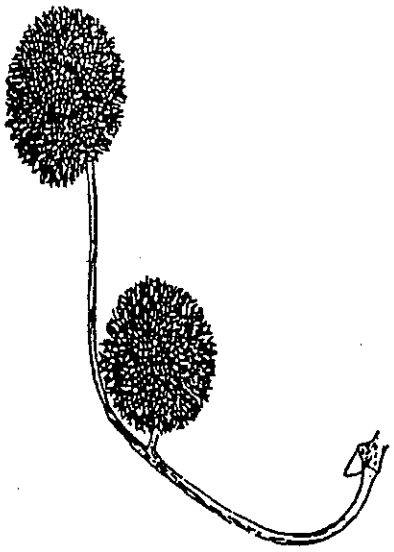
for

London Plane Tree

from the

Bartlett Tree Research Laboratories





London plane *(Platanus x acerifolia)* is a hybrid sycamore resulting from crosses of American sycamore and oriental sycamore. London plane is an important landscape tree because of its resistance to diseases and ability to grow rapidly in urban soils.

London plane tree is easily transplanted, although care should be taken to ensure that trees are not planted too deeply. London plane prefers deep, rich, moist soils that are well drained. However, this species is able to withstand most soil conditions, including high pH and compaction.

London plane tree is attacked by a number of pests. The major foliage disease of sycamores is anthracnose, although several cultivars of London plane have resistance. Powdery mildew is also an important foliage disease, usually affecting the appearance of trees in late summer. London plane is attacked by several cankers, with canker stain a major problem in many areas. Bacterial leaf scorch is a serious disease which causes the trees to slowly decline and die.

Several insects are problems on London planes. The most common insect pest is sycamore lacebug, which has up to five generations per year. On the west coast, sycamore scale is a widespread pest of London plane. A borer commonly damaging London plane is the American plum borer, a caterpillar usually feeding around bark wounds.

London plane trees should be fertilized on a regular basis. They are often planted in areas with poor soil or limited rooting space, limiting the availability of nutrients. For these same reasons, irrigation and mulching are often important for reducing stress during dry periods.

Recommended Monitoring for London Plane

Timing	Treatment
Winter	Inspect for pest activity. Corrective prune crowns; remove dead, dying, diseased and levels.
Late Winter	Apply horticultural spray oil for overwintering pests. Inspect for borers, scale, aphids and other pests.
Early Spring	Inspect for lacebugs and other pests. Apply fungicide treatments as necessary to prevent anthracnose.
Mid Spring	Inspect for lacebugs and other pests. Apply preventive borer sprays for American plum borer. Apply fungicide treatments as necessary to prevent anthracnose.
Late Spring	Inspect for scales, lacebugs, mites and other pests. Apply fungicide as necessary to prevent anthracnose.
Early Summer	Inspect for scales, lacebugs and other pests. Inspect irrigation and soil moisture levels to reduce moisture stress.
Mid Summer	Inspect for scales, lacebugs and other pests. Apply fungicide as needed for powdery mildew.
Late Summer	Inspect for scales, lacebugs and other pests. Apply fungicide as needed for powdery mildew.
Early Fall	Inspect for scales, lacebugs and other pests. Inspect root collar and excavate as needed.
Late Fall	Inspect for scales, lacebugs and other pests. Fertilize tree and modify soil as indicated by soil samples. Mulch to depth of 4 inches.

Plant Health Care Program

for

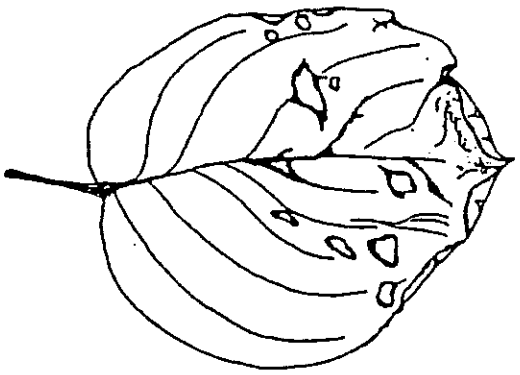
Dogwood

from the

Bartlett Tree Research Laboratories

Flowering dogwood (*Cornus florida*) is a small native tree that provides year round interest in the landscape. This species has white or pink showy flowers in spring, deep green leaves and red fruit in summer, burgundy red fall coloration and a unique branch structure and bark that dominates throughout winter months.

Dogwood thrives in areas with morning sun and afternoon shade. Soils should be well drained, slightly acid and rich in organic matter. The shallow root system is very sensitive to drought and competes poorly with turfgrass for water and nutrients. For this reason, dogwood performs best where there is a layer of organic mulch beneath its branches. Mulch also protects the trunk from wounds inflicted by mowers and string trimmers, wounds that often lead to serious insect and disease problems.



Early symptoms of dogwood anthracnose

The most serious pest of dogwood is anthracnose disease that causes blighting of flowers, leaves, twigs and branches. Left untreated, anthracnose can kill dogwood in as little as two years. Other pests of dogwood include leaf spots, flower blights, canker diseases and borers. Nitrogen and manganese deficiency are common on infertile soils, especially those that are alkaline or poorly drained.

Recommended Monitoring for Crabapple

Timing	Treatment
Winter	Corrective prune crown on trees where flower production is not a primary consideration. Otherwise delay pruning until after bloom.
Late Winter	Sample soil for nutrient and pH levels especially if deficiency symptoms are present. Prune out any deadwood. Apply horticultural oil for overwintering insects. Include bactericide with oil to suppress fireblight on susceptible varieties. Inspect root collar. Adjust or add mulch as necessary.
Early Spring	Apply first fungicide spray treatment to suppress scab and rust on susceptible varieties. Include bactericide with fungicide to suppress fireblight on susceptible varieties. Monitor for tent caterpillars, aphids, gypsy moth and other early season defoliators. Treat as necessary.
Mid Spring	Apply second fungicide spray treatment to suppress scab and rust. Monitor for aphids, scale crawlers, tent caterpilllars and other early spring defoliators. Treat as necessary. Fertilize or amend soil as specified in soil test report. Prune out and destroy shoots with fireblight symptoms.
Late Spring	Apply third fungicide spray treatment for scab and rust. Inspect for aphids, scale crawlers and spring defoliators. Treat as necessary. Prune out and destroy shoots with fireblight symptoms.
Early Summer	Corrective prune crown if not done in winter. Inspect for aphids, scale crawlers, mites and Japanese beetles. Treat as necessary. Monitor irrigation and soil moisture to prevent water stress.
Mid Summer	Inspect for aphids, scale crawlers, mites and Japanese beetles Treat as necessary. Monitor irrigation and soil moisture to prevent water stress.
Late Summer	Inspect for aphids, scale crawlers, mites and Japanese beetles. Treat as necessary. Inspect irrigation and soil moisture to prevent water stress.
Fall	Remove fallen leaves. A soil applied systemic insecticide can be applied to suppress scale and aphid population the next year. This is recommended when these pests have been exceptionally damaging. Apply additional mulch as necessary. Ensure root collars are free of soil and mulch.

Plant Health Care Program

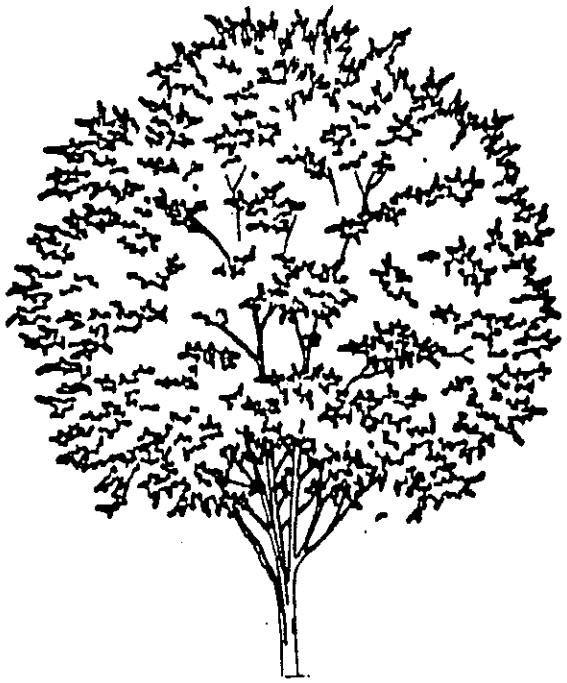
for

Crabapple

from the

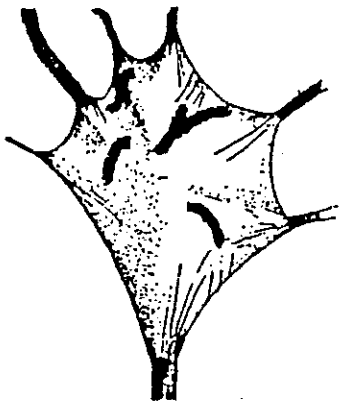
Bartlett Tree Research Laboratories

Crabapples (*Malus, sp.*) are a versatile and popular small tree for urban and suburban landscapes. More than 400 species and varieties of crabapple are available which represent a diversity of flowering and fruiting characteristics, growth forms and pest resistance.



Flowers produced in early spring are white, pink or red. Fruit which vary in size and color may cling to twigs into winter to provide interest and food for wildlife. Crown shape may be rounded, upright, spreading or weeping depending on variety. Dwarf crabapples which remain under ten feet in height are popular in containers where space is limited.

Crabapple is very tolerant of poor soils, heat and other adverse environmental conditions. For this reason, it is widely used in parking islands at shopping centers and as a street tree in narrow tree lawns beneath utility wires. This species is very tolerant of pruning and can be effectively espalliared on frames or fences. Crabapples perform best in full sun. In shaded locations, flowering is sparse and leaf disease can be severe.



As with most members of the rose family, crabapples are host to many insect and disease pests. Common leaf chewing insects include tent caterpillars, Japanese beetles, gypsy moth and cankerworms. Aphids, scale insects and spider mites damage leaves or branches by removing sap with their sucking mouthparts.

Fireblight is the most devastating disease of crabapple. Caused by a bacterium which infects through the blooms, fireblight causes branch dieback and even death of susceptible varieties. Foliage diseases including scab, rust and mildew can cause defoliation. While crabapple tends to tolerate these diseases, defoliation detracts from their appearance and vitality. Disease resistant varieties are available and should be utilized to reduce the impact of these diseases.

Recommended Monitoring of Dogwood

Timing	Treatment
Late Winter	Prune out dead and diseased twigs and branches. Inspect root collar: Excavate mulch and soil to expose flare as necessary. Apply additional mulch as necessary.
Early Spring	Apply first fungicide treatment to suppress anthracnose, leaf spots and flower blight. Install pheromone trap.
Mid Spring	Apply second fungicide treatment to suppress anthracnose, leaf spots and flower blight. Monitor for dogwood borer and caterpillar defoliators. Treat as necessary.
Late Spring	Apply third fungicide treatment to suppress anthracnose, leafspots and flower blight. Monitor for dogwood borer and caterpillar defoliators. Treat as necessary. Sample soil for nutrient levels and pH especially if deficiency symptoms are present.
Early Summer	Apply additional anthracnose treatments if weather conditions have been exceptionally moist. Monitor for dogwood borer. Treat as necessary. Inspect irrigation and soil moisture to reduce water stress and prevent root disease. Corrective prune crown and remove watersprouts as necessary.
Mid Summer	Prune out watersprouts. Inspect irrigation and soil moisture to reduce water stress and prevent root disease. A fungicide treatment to suppress anthracnose is necessary only if weather conditions have been cool and wet.
Late Summer	Prune out watersprouts. Inspect irrigation and soil moisture to reduce water stress and prevent root disease.
Early Fall	Fertilize and apply amendments per soil test results. Inspect root collar and excavate soil and mulch to expose flare . Inspect irrigation and soil moisture to reduce water stress and prevent root disease.

Plant Health Care Program

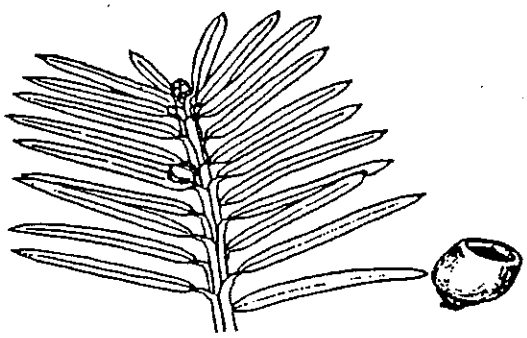
for

Taxus

from the

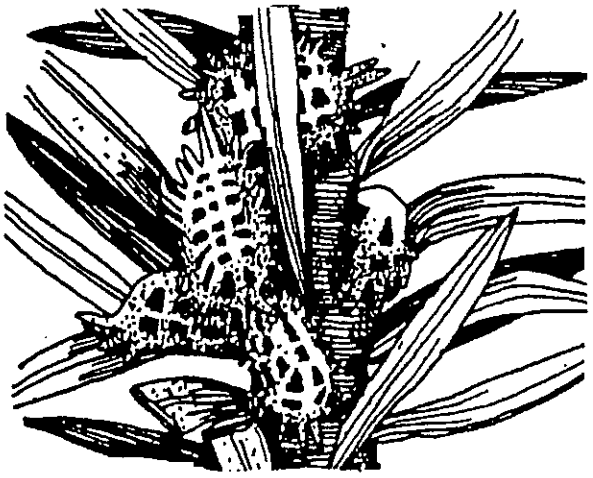
Bartlett Tree Research Laboratories

Taxus (Yews) are among the most popular evergreens for foundations, hedges and group plantings. The Japanese Yew (*Taxus cuspidata*), English Yew (*Taxus baccatta*) and a hybrid between these species known as Anglojap Yew (*Taxus x media*) are the most widely planted species. More than 100 cultivated varieties of these species are commercially grown. Taxus is prized for its compact growth habit, deep green foliage, and wide diversity of growth forms.



Taxus is relatively easy to grow but it does have specific cultural requirements. Taxus requires well drained, fertile soil with neutral pH. It performs well in both sun and shade. Unlike other narrow leaf evergreens, Taxus tolerates heavy pruning and shearing. It is frequently sheared into "tight" formal shapes. A more natural appearance is obtained if the plants are pruned, rather than sheared, in early spring and again in summer to maintain the desired form.

The most common cause of decline and death of Taxus is excessive soil moisture. This condition usually occurs on heavy, clay soils, low areas where drainage is impeded or where excessive irrigation or runoff occurs. On wet sites, roots are more prone to disease caused by the fungus *Phytophthora*.



Taxus is very intolerant of bark injuries on branches and twigs. Bark wounds resulting from snow and ice accumulation in winter are common causes of branch and twig dieback Usually this dieback becomes evident in spring or summer following the injury.

Principal insect pests include mealybugs, scale and weevils. Scale and mealybugs feed on twigs by inserting their sucking mouthpart into plant cells and removing the contents. Heavy infestation can significantly reduce plant vitality and growth. Weevils feed on Taxus roots in the larval stage and on the foliage as adults. Foliage injury is evident from semi-circular notches in leaves. Taxus is a preferred food source by white-tailed deer. In areas with even light to moderate populations, browse injury can severely disfigure plants.

Recommended Monitoring for Taxus

Timing	Treatment
Winter	Inspect plants for deer browse. Apply repellents as needed.
Late Winter	Sample soil for nutrient and pH levels especially if nutrient deficiency symptoms are evident. If plants exhibit decline, sample roots or root collar for *Phytophthora* root rot. Apply horticultural oil for overwintering pests (scale and mealybugs). Corrective prune to maintain size, remove undesirable growth, and shape crowns.
Early Spring	Apply fungicide soil treatment on plants with *Phytophthora* root rot. Adjust irrigation, divert runoff or improve soil drainage as necessary to reduce soil moisture levels. Inspect root collars. Excavate soil and mulch to expose flare. Apply additional mulch as necessary.
Mid Spring	Inspect for mealybugs, scale crawler and weevils. Treat as needed. Apply fertilizers and soil treatments to adjust pH based on soil test results. Monitor soil moisture levels and irrigation as necessary to reduce water stress and prevent root disease.
Late Spring	Inspect for mealybugs, scale crawlers and weevils and treat as needed. Monitor irrigation and soil moisture levels to reduce water stress and prevent root disease.
Early Summer	Inspect for scale crawlers and weevils. Treat as necessary. Corrective prune crown to maintain size and shape as necessary. Monitor irrigation and soil moisture levels to reduce water stress and prevent root disease.
Mid Summer	Inspect for scale crawlers and weevils. Treat as necessary. Apply second fungicide soil treatment on plants with *Phytophthora* root rot. Monitor irrigation and soil moisture levels to reduce water stress and prevent root disease.
Late Summer	Inspect for weevils and treat as needed. Monitor irrigation and soil moisture levels to reduce water stress and prevent root disease.
Early Fall	Inspect for weevils and treat as needed. Ensure root collars are free of soil and mulch . Monitor irrigation and soil moisture levels to reduce water stress and prevent root disease.
Fall	Inspect for deer browse and apply repellents as necessary. Ensure adequate soil moisture prior to onset of winter.Where plants are subject to ice and snow loads (eg. near building overhangs), tying up crowns can minimize breakage. Mulch root zone as needed.

Appendix 5

Brewster Corridor Overlay District

ARTICLE XII
Corridor Overlay Protection District
[Added 5-9-1994 ATM, Art. 24]

§ 179-63. Findings.

A. Brewster's numerous road corridors contain valuable historic, environmental, cultural and scenic resources and serve as major transportation routes throughout the town.

B. The 1992 Route 6A Corridor Study was conducted to identify potential threats from future development upon the town's resources and to assess the future ability of the town's road network to serve as a safe and efficient transportation system. Study results indicate that a considerable amount of development is still possible in Brewster which, if realized, would result in unacceptably low levels of service along Route 6A as well as several other road corridors, resulting in increased congestion and safety hazards.

C. Poorly designed development which is not compatible with the character of the corridors threatens their valuable historic, cultural and scenic resources.

D. If the town's numerous road corridors, including Route 6A, are to continue to serve as viable transportation routes as well as historic and cultural assets to the Town of Brewster, comprehensive performance and design standards for development are necessary.

§ 179-64. Purpose.

The purpose of this Article is to protect public health, safety and welfare through the preservation of the town's transportation corridors and protection of its historic and ultural assets for the residents and visitors of the Town of Brewster. The designation of the Corridor Overlay Protection District and careful regulation of development activities within he district can reduce the potential number of vehicular trips

along the town's road systems, thereby reducing congestion and improving safety. The adoption of standards for transportation, access, parking, landscaping and appearance is necessary to ensure that future development will not degrade the existing character of the town's roadways and will maintain or enhance the ability of the corridors to serve as cultural assets for the residents and visitors of the Town of Brewster.

§ 179-65. Applicability.

The Corridor Overlay Protection District shall be superimposed over any other district established in this chapter and shall include all land identified on the Town of Brewster Zoning Districts Map.[8] Land in the Overlay District may be used for any purpose otherwise permitted in the underlying district, subject to the restrictions described in this Article XII.

§ 179-66. Use regulations.

A. Permitted uses: one-family dwellings; one-family dwelling unit for the protection of property allowed in the C-H and V-B Districts; buildings and structures accessory to residential use and two-family dwellings do not require a special permit under this section.

B. Special permit uses.

(1) An increase of floor area by more than five hundred (500) square feet through either a new principal building; a new accessory building; or an addition to a preexisting building shall be allowed only if granted a special permit in accordance with this § 179-66 and § 179-51.

(2) The special permit granting authority (SPGA) shall be the Planning Board.

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[8] **Editor's Note: Said map is on file in the Town Clerk's office.**

(3) Such special permit shall be granted if the SPGA determines that the intent, purposes and standards of this Article XII and § 179-51, Special permits, are met.

(4) When a project requires a permit for a change in nonconforming use authorized by § 179-28 of the Zoning Bylaw, as well as a special permit under a separate section of this Article, the proponent shall be able to obtain a single special permit, provided that the proposed use meets the conditions of this Article. In this instance only, the Board of Appeals shall be the SPGA.

(5) Uses requiring a special permit under this section may also be required to apply to the Development Plan Review Committee as set forth in Chapter 83, Development Plan Review (Article 11 of the 1990 STM).

(a) For projects generally recognized as large or complicated, and at the applicant's request, the SPGA and the Development Plan Review Committee shall conduct a joint hearing on an application pending before the SPGA and the Development Plan Review Committee.

§ 179-67. Transportation, trip reduction, access, parking, landscaping and appearance standards.

The purpose of these standards is to improve roadway safety and internal site circulation, aesthetics and retention of historic character. All uses requiring a special permit under this Article shall meet the following standards as a condition of approval.

A. Transportation standards.

(1) Proposed uses shall not degrade the existing levels of service of surrounding roads and intersections, including Route 6A, below Level of Service (LOS) C, based on summer peak-hour traffic volumes. This

level of service for Brewster's roadways and intersections surrounding Route 6A and for Route 6A has been defined in the Route 6A Corridor Study, prepared by TAMS Consultants, Inc., June 1992. This study is available in the town offices (Planning Board and Board of Selectmen). When the existing LOS is below LOS C, the proponent shall maintain or improve performance indicators.

(2) Sight distance at any driveway serving at least twenty (20) trips per day shall meet American Association of State Highway and Transportation Officials standards as well as those set forth in Brewster's Sight Line Bylaw (Chapter 157, Article VI, of the Town Code).

B. Trip reduction standards. All retail and service uses and wholesale and manufacturing uses (see § 179-11, Table 1, Use Regulations) located in the Corridor Overlay Protection District shall prepare a trip reduction plan as a condition for issuance of a special permit. The trip reduction plan shall describe traffic impact mitigation strategies designed to reduce traffic generation and may include strategies such as company-sponsored carpooling/vanpooling; bicycle and pedestrian incentive measures; and/or variable work hour or flex-time programs. The applicant shall also present a plan for future enforcement of proposed trip reduction measures following permit issuance.

C. Access standards.

(1) The number of curb cuts on Route 6A, Route 134, Route 137, Underpass Road and Tubman Road shall be minimized. To the extent feasible, access to businesses shall be provided through one (1) of the following means:

(a) Access through a common driveway serving adjacent lots or premises;

(b) Access through an existing side or rear street; or

(c) Access through a cul-de-sac or loop road shared by adjacent lots or premises.

(2) The special permit granting authority may relax setback requirements to accommodate joint driveways in cases where it is deemed advantageous to the town.

(3) Existing businesses are encouraged to consolidate existing access points, especially in cases where separate parcels are assembled under one (1) purpose, plan, entity or usage.

(4) Businesses shall be permitted one (1) access driveway by right. Two (2) driveways shall be permitted only when deemed necessary by the SPGA and shall be clearly marked "entrance" and "exit."

(5) Driveways shall be designed to provide exiting motorists with safe sight distance.

(6) Internal circulation shall be provided, to the greatest extent possible, among adjoining premises to encourage internal property-to-property pedestrian, bicycle and vehicular movements.

(7) An occupancy permit shall not be issued for proposed developments requiring access on a state highway until a permanent state curb cut permit is issued and all necessary site improvements are completed.

(8) All access drives shall be separated by at least one hundred twenty (120) feet in the C-H District and V-B District, as measured between the center line of each access drive at the street line. This standard may only be modified in cases where the SPGA believes it is in the best interest of the town to do so.

D. Parking design standards.

(1) The Town of Brewster recognizes that reliance on rigid parking and loading lot standards precludes the development of parking lots that are sensitive to the town's historic and rural character. Yet, it also recognizes that some standards for parking and loading lot design are required, provided that they can be administered with flexibility given the individual requirements of development proposals and the parcels on which they are proposed.

(2) The SPGA is authorized to relax any and all of the numerical standards established by § 179-23 (Parking and loading lot standards), provided that the SPGA believes that:

(a) Such relaxation will not conflict with the minimum standards established by this Article or the purpose of this Article; and

(b) It will result in a development that is at least as beneficial to the Town of Brewster as the development without a relaxation of the numerical standards.

(3) The following guidelines are set forth to assist the applicant and the SPGA:

(a) Loading and unloading areas shall be provided of a sufficient size to accommodate the numbers and types of vehicles likely to use the premises, given the nature of the development proposed. Loading and unloading areas shall be located and designed to allow vehicles to safely maneuver to and from a public right-of-way and to prevent obstruction or interference with a public right-of-way, parking space or parking aisle.

(b) Loading areas shall be provided to the rear of the lot, wherever possible.

(c) Parking areas shall be located to the side or rear of the structure. No parking is permitted in

the required front yard setback for the structure.

(d) To the extent possible, parking areas shall be shared with adjacent businesses and should be situated to the side and rear of the lot (frontage on Route 6A shall be considered the "front" of the lot).

(e) In cases where shared parking is provided, the SPGA may permit a reduction in necessary spaces since complementary uses may require less total parking area than each use individually.

(f) Bicycle users shall be accommodated by provision of on-site bicycle parking storage and bicycle and walking paths.

(g) Drainage facilities shall be designed and constructed for parking areas in such a way as to contain and treat stormwater runoff on the premises, as well as comply with design standards referred to in § 179-57 of the Zoning Bylaw.

E. Landscaping, design and appearance standards.

(1) A landscaped buffer strip shall be provided adjacent to any public road to visually separate parking and other uses from the road, where feasible and without interfering with vehicular or pedestrian safety. The buffer strip shall be approximately fifteen (15) feet in depth and planted with a combination of grass, medium-height shrubs [approximately two to eight (2 to 8) feet tall, evergreen varieties preferred] and shade trees [planted at least every forty to sixty (40 to 60) feet along the road frontage]. Trees and shrubs shall be set back at street and driveway entrances, exits or intersections to allow adequate sight distance and ensure vehicular and pedestrian safety while

entering or exiting the site. Applicants are encouraged to review Brewster's Sight Line Bylaw, Chapter 157, Article VI, of the Town Code, pri to designing parking lot landscaping plans.

(2) A landscaped buffer strip of approximately ten-foot depth shall be provided adjacent to adjoining es, excluding areas providing shared access nd parking. The buffer strip shall be planted with a combination of grass, medium-height sh bs (evergreen varieties preferred) and shade trees.

(3) Large parking areas shall be interrupted with landscaped islands such that no parking su ace exceeds sixty (60) feet in width, not including he area(s) used for parking aisles/stalls. A minimum of one (1) shade tree shall be provided per fiv (5) parking spaces to be placed in a protective perv us plot of at least sixty (60) square feet in area.

(4) Exposed storage areas, machinery, service a as, truckloading areas, utility buildings and struct es and other unsightly uses shall be screened from view from neighboring properties and streets u ng plantings, a wall or tight fence complemented th plantings or through some other means deemed acceptable to the permit granting authority.

(5) All landscaped areas shall be maintained. Sh bs and trees which die shall be replaced within one (1) growing season.

(6) Buildings and architectural design shall be compatible with the character and scale of the adjacent roadway and surrounding neighborhood.

(7) Structures shall be sited so as to allow separat ns between buildings, particularly to encourage open space in the site and reduce massiveness in he project.

(8) The use of bituminous paving shall be minimized.

(9) Old, well-established trees shall be protected by siting buildings and parking around or within the existing landscape.

(10) Building design shall adhere to the guidelines of the Brewster Historic District Committee in locations subject to review by the Committee. Of significant concern to the Committee are the issues of mass and size, impact of projects on sites and settings, harmony of design and detail within the project and setting and compatibility of projects, while encouraging variety and diversity.

§ 179-68. Severability.

The provisions of this Article are severable from each other, and the invalidity of any provisions or sections shall not invalidate any other provision or section thereof.

ARTICLE XIII
Amendment and Validity
[Amended 5-9-1994 ATM, Art. 24]

§ 179-69. Amendments.

This chapter may be amended from time to time in accordance with Section 5 of the Zoning Act.

§ 179-70. Validity.

The invalidity, unconstitutionality or illegality of any provision of this chapter or boundary shown on the Zoning Map shall have not any effect upon the validity, constitutionality or legality of any other provision or boundary.

Appendix 7

Massachusetts Environmental Policy Act Threshold for Tree Cutting

11.27: continued

units; a nonresidential project having 25,000 square feet or more of gross interior space, or 200 or more parking spaces; or any project generating 1000 or more vehicle trips per day.

b. Use of any state funds for a project which will:

i. increase the total pavement width of a road 4 feet or more for an aggregate of 1000 feet or more;

ii. alter the bank or terrain (other than alteration of bank or terrain required for the installation of equipment or structures) at a distance of 10 feet or more from the existing pavement;

iii. require the cutting of 5 or more living trees, fourteen inches or more in diameter at breast height; or

iv. eliminate 300 feet or more of stone wall.

3. Massachusetts Aeronautics Commission. Any replacement, rehabilitation or reconstruction of a runway which involves any expansion of or deviation from the existing paved surface.

(b) Otherwise, maintenance, repair, minor alteration, and rehabilitation of existing structures, facilities, or equipment, which does not involve substantial change in the purpose or capacity or such structures, facilities, or equipment, do not require an ENF.

(4) Construction, Replacement, Reconstruction, Conversion, Expansion, or Demolition.

(a) The following require an ENF:

1. Any project with total project cost (including design and engineering, excluding land acquisition) $1 million or more, involving the construction, replacement, reconstruction, conversion, expansion, or demolition of structures or facilities other than housing, schools, roads, rail, or runway.

2. Housing. A project yielding 100 or more new residential units (which may include up to 10,000 s.f. ancillary commercial space), other than through rehabilitation or reconstruction of existing units.

3. Schools. The provision by the School Building Assistance Bureau of $10 million or more.

4. Roads.

a. Any project which will:

i. increase the total pavement width of a road 4 feet or more for an aggregate of 1000 feet or more;

ii. alter the bank or terrain (other than alteration of bank or terrain required for installation of equipment or structures) 10 feet or more from the existing pavement;

iii. require the cutting of 5 or more living trees fourteen inches or more in diameter at breast height; or

iv. eliminate 300 feet or more of stone wall.

b. construction of a parking lot with a capacity of 50 cars or more.

5. Rail. Any project with a total project cost of $1 million or more, involving construction, replacement, conversion, expansion, or demolition of structures or facilities, other than existing track and rail bed.

6. Runway.

a. any construction, replacement, rehabilitation, extension, or abandonment of a runway; any project which requires deactivation of a runway for more than one week.

b. any installation of a new runway lighting system or instrument landing system.

(b) Otherwise, the construction, replacement, reconstruction, expansion, or demolition of structures or facilities, the construction, replacement, reconstruction, expansion, acquisition, or installation of necessary equipment or support facilities, and the conversion of existing structures and facilities to new uses, do not require an ENF.

(5) Acquisition or Disposition of Interests in Real Property.

(a) The following require an ENF:

1. Disposition by an agency other than Massport, MBTA, EOTC, DPW, MTA, MDC, DEM, or DFW of 25 or more contiguous acres to one or more

11.26: continued

(12) Department of Community Affairs.
(a) Approval of M.G.L. c. 121A non-residential projects with total project cost of $10 million or more.
(b) Approval of M.G.L. c. 121A residential projects of 100 or more new residential units (which may include up to 10,000 s.f. ancillary commercial space).
(c) Approval of urban renewal plans or urban revitalization and development projects under M.G.L. c. 121B, or of any major plan changes in urban renewal plans.

(13) Boston Redevelopment Authority. Approvals by the BRA, acting as an authority, of:
(a) Any non-residential project with total project cost (including architectural and engineering, excluding land acquisition cost or linkage payments) of $10 million or more; or
(b) Residential projects of 100 or more new residential units (which may include up to 10,000 s.f. ancillary commercial space);
(c) New urban renewal plans or urban revitalization and development projects under M.G.L. c. 121B or any major plan changes in urban renewal plans.

(14) Housing Appeals Committee. Decision on appeal of local order allowing 100 or more new residential units (which may include up to 10,000 s.f. ancillary commercial space).

11.27: Review Thresholds for Agency Actions and Financial Assistance.

This section identifies agency actions or projects seeking agency financial assistance which require an ENF. Note also that such action or project may require an ENF if it is categorically included (301 CMR 11.25), if it requires a permit needing an ENF (301 CMR 11.26), if it is in an ACEC (301 CMR 11.15), or if the Secretary has called for fail-safe review (301 CMR 11.03(6)).

(1) Planning, Research, Surveying, Evaluation, and Information Gathering.
(a) The following requires an ENF: Promulgation of regulations which lessen the stringency of existing regulations of which a primary purpose is to protect the environment.
(b) Otherwise, planning, design, policy development, setting of standards, promulgation of regulations, budget development, research, surveying and sampling, information gathering, evaluation, and giving of technical advice do not require an ENF.

(2) Operations.
(a) The following require an ENF:
1. Massachusetts Bay Transit Authority. Systemwide fare increases, cumulative over three years, of 30% or more. Systemwide service reductions, cumulative over three years, of 20% or more.
2. Executive Office of Transportation and Construction. Expansion of rail transportation services provided by EOTC pursuant to M.G.L. c. 161, where the resultant service exceeds an average of seven round trips per week.
(b) Routine operations of agencies which are not addressed by other subsections of 301 CMR 11.27, or by 301 CMR 11.26, do not require an ENF.

(3) Maintenance, Rehabilitation, Repair, and Minor Alteration.
(a) The following require an ENF:
1. Massachusetts Port Authority. Any replacement, rehabilitation, or reconstruction of a runway. Any work performed on a runway which requires deactivation of a runway for more than one week.
2. Department of Public Works, Metropolitan District Commission (roads).
a. On a state highway, construction of turning lanes, median alterations, lane widening, or installation of new traffic control signals to service a residential project having 50 or more dwelling

Appendix 8

The Public Shade Tree Act, M.G.L. Chapter 87

CHAPTER 87

SHADE TREES

Section
1. Public shade trees; definition.
2. Powers of tree wardens.
3. Cutting of public shade trees; public hearing; damages to fee owner.
4. Cutting down or removing public shade trees; approval of selectmen or mayor.
5. Cutting down, trimming or removing bushes and small trees.
6. Penalty for violation of sections 3, 4 and 5.
7. Planting of shade trees.
8. Trees on state highways.
9. Signs or marks on shade trees.
10. Injury to trees on state highways.
11. Injury to trees of another person.
12. Injury to shrubs, trees or fixtures.
13. Powers and duties of tree wardens in cities.

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The section headings for Massachusetts General Laws Annotated have been editorially supplied.

§ 1. Public shade trees; definition

All trees within a public way or on the boundaries thereof shall be public shade trees; and when it appears in any proceeding in which the ownership of or rights in a tree are material to the issue, that, from length of time or otherwise, the boundaries of the highway cannot be made certain by records or monuments, and that for that reason it is doubtful whether the tree is within the highway, it shall be taken to be within the highway and to be public property until the contrary is shown.

Historical and Statutory Notes

St.1899, c. 330, § 2.
R.L.1902, c. 53, § 12.
St.1908, c. 296, § 2.
St.1910, c. 321.
St.1915, c. 145, §§ 2, 13.

Cross References

Trees used as highway boundaries, see c. 86, § 1.

Library References

Municipal Corporations ⇨678.
WESTLAW Topic No. 268.
C.J.S. Municipal Corporations § 1093.

Notes of Decisions

In general 1
Local officers 2
Presumption of lawful planting 3

1. In general

"Public shade trees" within this section are trees within a public way, other than a state highway, or on its boundaries, and includes trees on a "boulevard," since a "boulevard" is a "public way." City of Medford v. Metropolitan District Commission (1939) 22 N.E.2d 110, 303 Mass. 537.

Power of board of public works in respect of trees in street was controlled by general law where charter of city so provided. Graham v. Board of Public Works of Pittsfield (1934) 189 N.E. 820, 285 Mass. 544.

St.1899, c. 330, defining public shade trees, in effect relieved the board of agriculture from the obligation, imposed by St.1890, c. 196, as amended by St.1891, c. 49, to supply M-spikes to towns for the purpose of designating such shade trees as are to be considered public shade trees. 2 Op.Atty.Gen.1900, p. 191.

2. Local officers

G.L. (Ter.Ed.) 1932, c. 92, § 35 committing preservation and care of boulevards to the Metropolitan District Commission to the exclusion of cities and towns expresses legislative intent to vest control in the commission with respect to the removal of trees on a boulevard, although such power is not expressly given by said section, and this chapter placing control of public shade trees within control of city or town officers does not apply. City of Medford v. Metropolitan District Commission (1939) 22 N.E.2d 110, 303 Mass. 537.

The local officers, rather than cities and towns as such, have control of public shade trees within town or city. City of Medford v. Metropolitan District Commission (1939) 22 N.E.2d 110, 303 Mass. 537.

In the case of Donahue v. Newburyport (1912) 98 N.E. 1081, 211 Mass. 561, the court said: "Shade trees, though not originally the subject of legislative action, have been regulated to a very considerable and increasing extent by statute in recent years, until now the whole range of municipal action respecting them is covered. There is little if anything left to local control. The definition of public shade trees is statutory, and the discretion and sound judgment of an officer appointed by local authority controls wholly their care, preservation and removal."

3. Presumption of lawful planting

Evidence that shade trees have been suffered to stand more than 20 years where they were planted, in a public way, raises the presumption that they were planted under lawful authority. Bliss v. Ball (1868) 99 Mass. 597.

§ 2. Powers of tree wardens

The tree warden of a town may appoint and remove deputy tree wardens. He and they shall receive such compensation as the town determines or, in default thereof, as the selectmen allow. He shall have the care and control of all public shade trees, shrubs and growths in the town, except those within a state highway, and those in public parks or open places under the jurisdiction of the park commissioners, and shall have care and control of the latter, if so requested in writing by the park commissioners, and shall enforce all the provisions of law for the preservation of such trees, shrubs and growths. He shall expend all money appropriated for the setting out and maintenance of such trees, shrubs and growths, and no tree shall be planted within a public way without the approval of the tree warden, and in towns until a location

therefor has been obtained from the selectmen or road commissioners. He may make regulations for the care and preservation of public shade trees and establish fines and forfeitures of not more than twenty dollars in any one case for violation thereof; which, when posted in one or more public places, and, in towns, when approved by the selectmen, shall have the effect of town by-laws.

Historical and Statutory Notes

St.1896, c. 190, §§ 2, 4.
St.1897, c. 428, § 1.
St.1899, c. 330, §§ 1, 2.
R.L.1902, c. 53, § 12.
St.1908, c. 296, § 2.
St.1910, c. 321.
St.1915, c. 145, §§ 2, 13.

Cross References

Duties and powers, foliage-destroying pests, aiding in suppressing, see c. 132, § 25.
Election and term of office, see c. 41, § 1.
Parks commission, jurisdiction of, see c. 92, § 33.
Road commissioners, powers and duties, see c. 41, § 64.
Selectmen authorized by vote to appoint, see c. 41, §§ 21, 23, 106.

Library References

Municipal Corporations ⇨678.
WESTLAW Topic No. 268.
C.J.S. Municipal Corporations § 1693.

Notes of Decisions

In general 1
Nature and scope of power 2

1. In general

Municipal tree wardens, for whose appointment provision is made by St.1910, c. 363, and by R.L.1902, c. 53, §§ 12, 13, as amended by St.1908, c. 296, §§ 2, 3, are public officers, and not "servants" or "agents," within R.L.1902, c. 171, § 2, as amended by St.1907, c. 375, which authorizes recovery for negligent death caused by a person or corporation or their "agents or servants." Donahue v. City of Newburyport (1912) 98 N.E. 1081, 211 Mass. 561.

St.1899, c. 330, which makes it obligatory upon towns to elect a tree warden, superseded the authority over such trees conferred by earlier statutes upon selectmen or other town officers. 2 Op.Atty.Gen.1900, p. 191.

2. Nature and scope of power

In the case of Donahue v. City of Newburyport (1912) 98 N.E. 1081, 211 Mass. 561, the court said: "These two sections confer upon the tree warden absolute power respecting the setting out, care, maintenance and removal of shade trees and the enforcement of all provisions of law for their preservation, with the exception of trees under the jurisdiction of park commissioners, but of those also upon request of the park commissioners, and with the further exception that no shade trees shall be planted within a public way without license from the selectmen or road commissioners where such authority has been vested in them. These sections define the power and authority of the tree warden respecting shade trees. They leave substantially nothing in this regard for the municipal action of such cities as have no special charter provision touching the subject."

Tree wardens, elected under provisions of St. 1899, c. 330, may not interfere with or overrule the authority of the highway commission, but, subject to their right, their duty of police jurisdiction over shade trees in state highways is the same as that with relation to other public shade trees in the towns. 2 Op.Atty.Gen.1901, p. 244.

§ 3. Cutting of public shade trees; public hearing; damages to fee owner

Except as provided by section five, public shade trees shall not be cut, trimmed or removed, in whole or in part, by any person other than the tree warden or his deputy, even if he be the owner of the fee in the land on which such tree is situated, except upon a permit in writing from said tree warden,

nor shall they be cut down or removed by the tree warden or his deputy or other person without a public hearing and said tree warden or his deputy shall cause a notice of the time and place of such hearing thereof, which shall identify the size, type and location of the shade tree or trees to be cut down or removed, to be posted in two or more public places in the town and upon the tree at least seven days before such hearing and published in a newspaper of general circulation in the city or town once in each of two successive weeks, the first publication to be not less than seven days before the day of the hearing or if no such local newspaper exists then in accordance with the provisions of section six of chapter four; provided, however, that when a public hearing must be held under the provisions of this section and under section fifteen C of chapter forty prior to the cutting or removal of a tree, such hearings shall be consolidated into a single public hearing before the tree warden and the planning board, or if there is no planning board, the selectmen of a town or the city council of a city, and notice of such consolidated public hearing shall be given by the tree warden or his deputy as provided herein. Any person injured in his property by the action of the officers in charge of the public shade trees as to the trimming, cutting, removal or retention of any such tree, or as to the amount awarded to him for the same, may recover the damages, if any, which he has sustained, from the town under chapter seventy-nine.

Amended by St.1978, c. 114; St.1979, c. 552, § 2.

Historical and Statutory Notes

St.1867, c. 242, § 1.
P.S.1882, c. 54, §§ 10, 11.
St.1896, c. 190, § 3.
St.1897, c. 428, § 1.
St.1899, c. 330, § 3.
R.L.1902, c. 53, § 13.
St.1908, c. 296, §§ 3, 4.
St.1915, c. 145, §§ 3, 13.

St.1978, c. 114, approved April 28, 1978, rewrote the first sentence, which prior thereto read, "Except as provided by section five, public shade trees shall not be cut, trimmed or removed, in whole or in part, by any person other than the tree warden or his deputy, even if he be the owner of the fee in the land on which such tree is situated, except upon a permit in writing from said tree warden, nor shall they be cut down or removed by the tree warden or his deputy or other person without a public hearing at a suitable time and place, after notice thereof posted in two or more public places in the town and upon the tree at least seven days before such hearing, and after authority granted by the tree warden therefor."

St.1979, c. 552, § 2, approved Aug. 20, 1979, in the first sentence, added the proviso.

Cross References

Eminent domain proceedings where trees involved, see c. 79, § 1.

Law Review Commentaries

Delegation of discretion in Massachusetts licensing statutes. (1929) 43 Harvard L.Rev. 302.

Library References

Municipal Corporations ⇨678.
WESTLAW Topic No. 268.
C.J.S. Municipal Corporations § 1693.

WESTLAW Electronic Research

See WESTLAW Electronic Research Guide following the Preface.

Notes of Decisions

Hearings 3
Liability of town 4
Public works board 2
Tree wardens 1

1. Tree wardens

Public shade trees may generally be removed only by the tree warden, and not by him without a public hearing, and not by him without approval by the selectman or mayor if written objection has been made. City of Medford v. Metropolitan District Commission (1939) 22 N.E.2d 110, 303 Mass. 537.

In the case of Jones v. Inhabitants of Town of Great Barrington (1931) 174 N.E. 118, 273 Mass. 483, the court said: "The tree warden in performing his duties is a public officer. Donahue v. Newburyport, 98 N.E. 1081, 211 Mass. 561. His power to remove a public shade tree or to authorize its removal is somewhat limited and prescribed by the provisions of G.L. c. 87, § 3, requiring a public hearing before he acts or authorizes action in the matter."

Power of tree warden to remove public shade tree is limited by this section requiring public hearing before action is taken. Jones v. Inhabitants of Town of Treat Barrington (1931) 174 N.E. 118, 273 Mass. 483.

2. Public works board

Holyoke City Charter, § 37, by providing its board of public works shall have the powers imposed by law on road commissioners, gives their authority, under St.1893, c. 423, § 23, and St.1885, c. 123, § 2, R.L.1902, c. 51, § 10, and c. 25, § 83, as to removing shade trees. Whiting v. Woods (1915) 109 N.E. 728, 222 Mass. 22.

3. Hearings

In the case of Graham v. Board of Public Works of Pittsfield (1934) 189 N.E. 820, 285 Mass. 544, the court said: "In view of the design and purpose of the board to make available for public travel a larger portion of the land already within the boundaries of the way as previously laid out, the proper procedure for dealing with the trees was by holding a public hearing under G.L. (Ter.Ed.) c. 87, §§ 3 and 4."

Damages by fall of tree in street cannot be recovered under Eminent Domain Act (G.L. 1921, c. 79), in absence of public hearing required before removal. Cody v. City of North Adams (1928) 164 N.E. 83, 265 Mass. 65.

4. Liability of town

Recovery of damages resulting when public shade trees fell upon dwelling cannot be predicated upon town's negligent failure to keep public way in repair. Jones v. Inhabitants of Town of Great Barrington (1930) 174 N.E. 118, 273 Mass. 483.

Liability of town as owner or in control of public streets for failure to remove decayed public shade trees constituting nuisance to adjoining landowner does not rest upon negligence. Jones v. Inhabitants of Town of Great Barrington (1930) 174 N.E. 118, 273 Mass. 483.

Liability of town for failure to remove decayed public shade trees from public highway rests upon facts showing maintenance of such trees constitutes nuisance to adjoining landowner. Jones v. Inhabitants of Town of Great Barrington (1930) 174 N.E. 118, 273 Mass. 483.

City officer was not negligent in not removing tree from street, in absence of showing that decay was visible. Cody v. City of North Adams (1928) 164 N.E. 83, 265 Mass. 65.

§ 4. Cutting down or removing public shade trees; approval of selectmen or mayor

Tree wardens shall not cut down or remove or grant a permit for the cutting down or removal of a public shade tree if, at or before a public hearing as provided in the preceding section, objection in writing is made by one or more persons, unless such cutting or removal or permit to cut or remove is approved by the selectmen or by the mayor.

Historical and Statutory Notes

St.1915, c. 145, § 4.

Library References

Municipal Corporations ⇨678.
WESTLAW Topic No. 268.
C.J.S. Municipal Corporations § 1693.

Notes of Decisions

Construction and application 1
Notice and hearing 2
Removal orders 4
Unauthorized removal 3

1. Construction and application

In the case of Whiting v. Woods (1915) 109 N.E. 728, 222 Mass. 22, the court said: "The legislation concerning public shade trees has been enacted from time to time not merely to satisfy the desire of cities and towns for the conservation in their thoroughfares of shade and ornamental trees, in many instances a legacy from the past or the gift of public-spirited citizens, but for the benefit and enjoyment of all the inhabitants of the commonwealth having occasion to use the public ways. St.1915, c. 145, pursuant to this long-established policy, is applicable to the municipality of Holyoke which is not in terms excepted from its provisions."

2. Notice and hearing

G.S.1860, c. 46, § 6, protects all shade trees which were standing within the limits of public ways in any city or town when the General Statutes took effect (June 1, 1860), from mutilation, destruction, or removal, except by adjudication of the mayor and aldermen, or the selectmen, upon a complaint on which the owner of the tree is entitled to notice and an opportunity to be heard. White v. Godfrey (1867) 97 Mass. 472; Bliss v. Ball (1868) 99 Mass. 597.

In the case of Graham v. Board of Public Works of Pittsfield (1934) 189 N.E. 820, 285 Mass. 544, the court said: "In view of the design and purpose of the board to make available for public travel a larger portion of the land already within the boundaries of the way as previously laid out, the proper procedure for dealing with the trees was by holding a public hearing under G.L. (Ter.Ed.) c. 87, §§ 3 and 4."

3. Unauthorized removal

Only the mayor and aldermen, or selectmen, have authority to cause shade trees lawfully standing in a public way to be removed against the will of the person whose private property they are to be taken to be under G.S.1860, c. 46, § 6; and one who assumes, without such authority, to remove or destroy such trees, on the ground that they are a public nuisance, is liable in damages to such person. White v. Godfrey (1867) 97 Mass. 472; Bliss v. Ball (1868) 99 Mass. 597.

4. Removal orders

Trial judge's report, made at request of board of public works, that chairman of board testified that object of order that trees be removed from highway was extension of traveled portion of highway must be accepted where record of board stated no reason for order and judge found that trees did not obstruct, endanger, or incommode travelers. Graham v. Board of Public Works of Pittsfield (1934) 189 N.E. 820, 285 Mass. 544.

Where purpose of board of public works for order that trees not endangering travelers be removed was mere extension of traveled portion of highway, order not approved by the mayor never became effective. Graham v. Board of Public Works of Pittsfield (1934) 189 N.E. 820, 285 Mass. 544.

§ 5. Cutting down, trimming or removing bushes and small trees

Tree wardens and their deputies, but no other person, may, without a hearing, trim, cut down or remove trees, less than one and one half inches in diameter one foot from the ground, and bushes, standing in public ways; and, if ordered by the mayor, selectmen, road commissioners or highway surveyor, shall trim or cut down trees and bushes, if the same shall be deemed to obstruct, endanger, hinder or incommode persons traveling thereon or to obstruct buildings being moved pursuant to the provisions of section eighteen of chapter eighty-five. Nothing contained in this chapter shall prevent the trimming, cutting or removal of any tree which endangers persons traveling on a highway, or the removal of any tree, if so ordered by the proper officers for

the purpose of widening the highway and nothing herein contained shall interfere with the suppression of pests declared to be public nuisances by section eleven of chapter one hundred and thirty-two, including the Dutch elm disease.

Amended by St.1941, c. 490, § 18; St.1949, c. 761, § 12; St.1961, c. 265.

Historical and Statutory Notes

St.1915, c. 145, § 5.

Cross References

Duty to suppress foliage-destroying pests, see c. 132, § 25.

Library References

Municipal Corporations ⇐678.
WESTLAW Topic No. 268.
C.J.S. Municipal Corporations § 1693.

Notes of Decisions

Hearings 4
Liability 5
Scope of authority 1
Trees endangering public travel 3
Widening of highways 2

1. Scope of authority

R.L.1902, c. 51, § 10, providing that the officer having charge of trees belonging to a municipality may, and if required by the surveyors or road commissioners shall, trim trees, except public shade trees in towns, and bushes standing in ways, etc., does not authorize a tree warden to cut down trees on private lands nor to cut off parts of such trees extending over the street. Com. v. Byard (1908) 86 N.E. 285, 200 Mass. 175.

2. Widening of highways

This section dispensing with public hearing and mayor's approval of order for removal of trees for purpose of "widening the highway" was inapplicable to mere widening of traveled portion of highway. Graham v. Bd. of Public Wks. of Pittsfield (1934) 189 N.E. 820, 285 Mass. 544.

"Widening the highway" as used in this section dispensing with public hearing and mayor's approval of order for removal of trees for "widening the highway" signifies change in location of highway or extension of its boundaries by bringing more of the earth's surface within that location by means of exercise of eminent domain; term "widening" being often comprehended in the broader term, "alteration". Graham v. Bd. of Public Wks. of Pittsfield (1934) 189 N.E. 820, 285 Mass. 544.

3. Trees endangering public travel

Designated town officials without notice or hearing were bound to order warden to trim or remove tree dangerous to public travel. Jones v. Town of Great Barrington (1930) 168 N.E. 779, 269 Mass. 202.

Under St.1915, c. 145, §§ 3, 5, if a shade tree endangers persons traveling on a highway, it may be trimmed, cut, or removed by a tree warden or his deputy, without notice and hearing; but no other person is empowered so to act, the power of the mayor and aldermen, selectmen, road commissioners, or highway surveyor, named in § 5, being limited to ordering removal of a tree by the warden. Valvoline Oil Co. v. Winthrop (1920) 126 N.E. 895, 235 Mass. 515.

Where the limb of a tree over a highway grew so low and it was an obstruction to public travel, it was the duty of some town official, named in St.1915, c. 145, § 5, to order the tree trimmed or removed by a tree warden or deputy and in the meantime the town was required to do what was reasonably necessary to protect travelers, in view of Rev.Laws, c. 51, § 1. Valvoline Oil Co. v. Winthrop (1920) 126 N.E. 895, 235 Mass. 515.

4. Hearings

Tree wardens of town cannot remove trees over specified diameter without public hearing, even though endangering persons lawfully traveling on public way. Jones v. Town of Great Barrington (1929) 168 N.E. 779, 269 Mass. 202.

5. Liability

In the case of Jones v. Town of Great Barrington (1930) 168 N.E. 779, 269 Mass. 202, the court said: "Failure of the town officials named in G.L., c. 87, § 5, to cause the tree warden to remove a tree within the public highway or the limbs of such a tree, which tree or limbs obstruct, endanger, hinder or incommode travellers will render the town liable in an action of tort for damages which result from such failure."

§ 6. Penalty for violation of sections 3, 4 and 5

Violations of any provision of the three preceding sections shall be punished by forfeiture of not more than five hundred dollars to the use of the city or town.

Historical and Statutory Notes

St.1915, c. 145, § 6.

§ 7. Planting of shade trees

Towns may appropriate money to be expended by the tree warden in planting shade trees in the public ways, or, if he deems it expedient, upon adjoining land, at a distance not exceeding twenty feet from said public ways, for the purpose of improving, protecting, shading or ornamenting the same; provided, that the written consent of the owner of such adjoining land shall first be obtained.

Historical and Statutory Notes

St.1915, c. 145, § 7.

Cross References

Towns may appropriate moneys for planting, see c. 40, § 5.

Library References

Municipal Corporations ⇐678.
WESTLAW Topic No. 268.
C.J.S. Municipal Corporations § 1693.

§ 8. Trees on state highways

The department of highways, in this chapter called the department, shall have the care and control of all trees, shrubs and growths within state highways, and may trim, cut or remove such trees, shrubs and growths, or license the trimming, cutting or removal thereof. No such tree, shrub or other growth shall be trimmed, cut or removed by any person other than an agent or employee of the department, even if he be the owner of the fee in the land on which such tree, shrub or growth is situated, except upon a permit in writing from the department. Any person injured in his property by the action of the department as to the trimming, cutting, removal or retention of any such tree, shrub or other growth, may recover the damages, if any, which he has sustained, from the commonwealth under chapter seventy-nine.

Amended by St.1991, c. 552, § 58.

Historical and Statutory Notes

St.1905, c. 279, § 1.
St.1908, c. 297, § 1.
St.1915, c. 145, §§ 8, 13.
St.1931, c. 394, § 4o.

St.1991, c. 552, § 58, approved Jan. 9, 1992, in the first sentence, substituted "department of highways" for "department of public works".

Cross References

Permit of department necessary to plant or remove trees, see c. 81, § 21.
Removal of trees dangerous to travel on state highway, see c. 81, § 14.

Library References

Highways ⇐105(1).
WESTLAW Topic No. 200.
C.J.S. Highways § 177 et seq.

Notes of Decisions

In general 1

1. In general

A "boulevard" is a "public way" although it is not a "state highway," the removal of shade trees from which is entrusted to the department of public works. City of Medford v. Metropolitan District Commission (1939) 22 N.E.2d 110, 303 Mass. 537.

§ 9. Signs or marks on shade trees

Whoever affixes to a tree in a public way or place a notice, sign, advertisement or other thing, whether in writing or otherwise, or cuts, paints or marks such tree, except for the purpose of protecting it or the public and under a written permit from the officer having the charge of such trees in a city or from the tree warden in a town, or from the department in the case of a state highway, shall be punished by a fine of not more than fifty dollars. Tree wardens shall enforce the provisions of this section; but if a tree warden fails to act in the case of a state highway within thirty days after the receipt by him of a complaint in writing from the department, the department may proceed to enforce this section.

Historical and Statutory Notes

St.1893, c. 403.
St.1899, c. 330, §§ 5, 8.
R.L.1902, c. 208, § 104.
St.1905, c. 279, § 2.
St.1915, c. 145, §§ 9, 13.
St.1931, c. 394, § 47.

Library References

Malicious Mischief ⇐1.
WESTLAW Topic No. 248.
C.J.S. Malicious or Criminal Mischief or Damage to Property §§ 2 to 5.

§ 10. Injury to trees on state highways

Whoever without authority trims, cuts down or removes a tree, shrub or growth, within a state highway or maliciously injures, defaces or destroys any such tree, shrub or growth shall be punished by imprisonment for not more

than six months, or by a fine of not more than five hundred dollars to the use of the commonwealth.

Historical and Statutory Notes

St.1905, c. 279, § 3.
St.1908, c. 297, § 2.
St.1915, c. 145, §§ 10, 13.

Cross References

Removal of trees without a permit is prohibited, see c. 81, § 21.

Library References

Malicious Mischief ⇐1.
WESTLAW Topic No. 248.
C.J.S. Malicious or Criminal Mischief or Damage to Property §§ 2 to 5.

§ 11. Injury to trees of another person

Whoever willfully, maliciously or wantonly cuts, destroys or injures a tree, shrub or growth which is not his own, standing for any useful purpose, shall be punished by imprisonment for not more than six months or by a fine of not more than five hundred dollars.

Historical and Statutory Notes

St.1698, c. 7, § 1.
St.1785, c. 28, § 1.
St.1829, c. 63.
R.S.1836, c. 126, § 42.
G.S.1860, c. 161, § 82.
St.1868, c. 321.
P.S.1882, c. 203, § 95.
R.L.1902, c. 208, § 100.
St.1902, c. 544, § 30.
St.1915, c. 145, § 11.

Cross References

Liability in tort for willfully cutting trees of another, see c. 242, § 7.
Wilful destruction of trees, penalties for, see c. 266, §§ 113, 114.

Library References

Malicious Mischief ⇐1.
WESTLAW Topic No. 248.
C.J.S. Malicious or Criminal Mischief or Damage to Property §§ 2 to 5.

Notes of Decisions

In general 1

1. In general

Where A. conveyed by warranty deed to a town a parcel of land within the limits of the town and contiguous to a county road, and the town bought the land for the purpose of using it in straightening and grading the road, and for obtaining the material to be used in the grading; but this purpose did not appear in the deed, and the purchase was not authorized by a vote of the town, and the town constructed a road over the land, but did not legally lay out the road, nor was it so laid out by the county commissioners, on an indictment, under this section, against A. for cutting down a tree that stood on the land conveyed by him to the town, his deed was not void, and the town became lawfully seised of the land, and that, if A. cut down the tree wantonly and without cause, the indictment could be maintained. Com. v. Wilder (1879) 127 Mass. 1.

§ 12. Injury to shrubs, trees or fixtures

Whoever wantonly injures, defaces or destroys a shrub, plant or tree, or fixture of ornament or utility, in a public way or place or in any public enclosure, or negligently or wilfully suffers an animal driven by or for him or belonging to him to injure, deface or destroy such shrub, plant, tree or fixture, shall be punished by a fine of not more than five hundred dollars, and shall in addition thereto be liable to the town or any person for all damages to its or his interest in said shrub, plant, tree or fixture caused by such act. Whoever by any other means negligently or wilfully injures, defaces or destroys such a shrub, plant, tree or fixture shall likewise be liable to the town or any person for all damages to its or his interest in said shrub, plant, tree or fixture caused by such act.

Historical and Statutory Notes

St.1856, c. 256, § 2.
G.S.1860, c. 46, § 7.
P.S.1882, c. 54, § 7.
St.1899, c. 330, §§ 6, 7.
R.L.1902, c. 208, §§ 101, 102.
St.1902, c. 544, §§ 31, 32.
St.1915, c. 145, §§ 12, 13.
St.1926, c. 311.

Library References

Malicious Mischief ⇐1.
WESTLAW Topic No. 248.
C.J.S. Malicious or Criminal Mischief or Damage to Property §§ 2 to 5.

§ 13. Powers and duties of tree wardens in cities

The powers and duties conferred and imposed upon tree wardens in towns by this chapter shall be exercised and performed in cities by the officers charged with the care of shade trees within the limits of the highway.

Historical and Statutory Notes

St.1910, c. 363, § 1.
St.1915, c. 145, §§ 1, 13.

Library References

Municipal Corporations ⇐678.
WESTLAW Topic No. 268.
C.J.S. Municipal Corporations § 1693.

Notes of Decisions

In general 1
Purpose of law 2

1. In general

In cities other officers may be charged with the duties of tree wardens. City of Medford v. Metropolitan District Commission (1939) 22 N.E.2d 110, 303 Mass. 537.

2. Purpose of law

In the case of Whiting v. Woods (1915) 109 N.E. 728, 222 Mass. 22, the court said: "The legislation concerning public shade trees has been enacted from time to time not merely to satisfy the desire of cities and towns for the conservation in their thoroughfares of shade and ornamental trees, in many instances a legacy from the past or the gift of public-spirited citizens, but for the benefit and enjoyment of all the inhabitants of the commonwealth having occasion to use the public ways. St.1915, c. 145, pursuant to this long-established policy, is applicable to the municipality of Holyoke which is not in terms excepted from its provisions."

Appendix 9

Town of Barnstable Shade Tree Ordinance

Charles Genatossio
Tree Warden

BARNSTABLE TOWN COUNCIL

ITEM NO: 94-093
INTRO: 12/16/93
ADOPTED: 3/117/94

TOWN OF BARNSTABLE GENERAL ORDINANCE AMENDMENT

ORDERED:

That the Town Council amend the General Ordinances of the Town by amending Chapter III Public Health, Safety, Welfare, Convenience And Good Order, initially adopted by the Town Council on September 6, 1990, by adding Article LIV Municipal Trees as follows:

ARTICLE LIV. MUNICIPAL TREES

SECTION 1. PURPOSE

The purpose of this ordinance is to regulate the planting, maintenance and removal of trees, shrubs and other plants on public property and trees on private property that may cause a hazard to the public in the town right of way.

Section 2. DEFINITIONS

Unless the context specifically indicates otherwise, the meaning of terms used in this ordinance shall be as follows:

Street Trees - trees, shrubs, bushes and all other vegetation growing between property lines on either side of all streets, avenues, or ways within the town.
Park Trees - trees, shrubs and bushes and all other woody vegetation in public parks having individual names and all public property owned by the town and to which the public has free access such as a park.
Public Property - those town owned lands other than those managed by the Conservation Commission.
Tree Topping - the severe cutting back of limbs to stubs larger than three inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree.
Vision Clearance - that area included within the street lines at points which are twenty (20) feet distant from their point of intersection measured along said street lines which will materially obstruct the view of a driver of a vehicle approaching a street intersection.

SECTION 3. PLAN FOR CARE OF STREET AND PARK TREES

The Tree Warden shall develop, update annually, and administer a comprehensive plan for the care, preservation, pruning, planting, replanting, removal or disposition of trees and shrubs in parks, along streets, and in other public property. The plan shall be submitted in June of each year to the Town Manager via the Superintendent of Public Works and upon their acceptance and approval shall constitute the official tree plan for the Town of Barnstable. The standards and specifications contained within the plan shall apply not only to work performed by town forces but any private individuals or contractors who perform work on public property.

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SECTION 4. LISTING OF TREES ACCEPTABLE FOR PLANTING

The Tree Warden shall develop and maintain an up to date listing of trees considered most desirable for new plantings along streets in the following three size classes based on mature height:

small (under 20 feet)
medium (20 to 40 feet)
large (over 40 feet)

is there a list of what trees are in each class?

Lists of trees not suitable for new plantings will also be developed and maintained current by the Tree Warden.

SECTION 5. SPACING BETWEEN STREET TREES

Street trees shall be planted on public property no closer together than the following:

small size class - 30 feet
medium size class - 40 feet
large size class - 50 feet

An exception may be made to the above spacings for special plantings if authorized by the Tree Warden.

SECTION 6. PLANTINGS NEAR CURBS AND SIDEWALKS

Street trees may be planted on public property no closer to any curb or sidewalk than the following:

small size class - 2 feet
medium size class - 3 feet
large size class - 4 feet.

An exception may be made to the above spacings for special plantings if authorized by the Tree Warden.

SECTION 7. PLANTINGS NEAR STREET CORNERS AND FIRE HYDRANTS

No street tree shall be planted on public property to obstruct visual clearance of any street corner, measured from the point of nearest intersecting curbs or curb lines nor within 10 feet of any fire hydrant.

SECTION 8. PLANTINGS NEAR OVERHEAD UTILITIES

No street tree other than those species listed as small trees in Section 4 of this ordinance may be planted on public property under or within 10 feet of any overhead utility wire.

SECTION 9. TRIMMING STREET TREES BY UTILITY COMPANIES

Public utility companies shall notify the Tree Warden in writing prior to any routine pruning and trimming of any tree located on town owned property for the purpose of maintaining safe line clearance. All such work shall be performed in accordance with accepted arborcultural standards set forth by the National Arborist Association.

A utility tree trimming policy must be developed by the utility company and approved by Town Tree Warden prior to any trimming by the utility company.

SECTION 10. PLANTING, MAINTENANCE AND REMOVAL

The Town shall have the right to plant, maintain, and remove trees, plants and shrubs within the lines of all town owned streets, alleys, avenues, lanes, squares and other public property that may be necessary to insure public safety or to preserve or enhance the symmetry and beauty of such public property.

The Tree Warden may remove or order to remove any tree or part thereof which is in an unsafe condition or which by reason of its nature is injurious to sewers, electric power lines, gas lines, water lines or other public improvements, or is affected with any injurious fungus, insect or other pest.

This section does not prohibit the planting of street trees within the road layout by abutting property owners providing the Tree Warden grants approval and that the selection and location of said trees are in accordance with the provisions of this ordinance.

SECTION 11. TOPPING OF TREES

Unless otherwise authorized by the Tree Warden, it shall be unlawful as a normal practice for any person or firm to top any street tree, park tree, or other tree on public

property. Trees severely damaged by storms or other causes, or certain trees under utility wires or other obstructions where other pruning practices are impractical may be exempted from this ordinance at the determination of the Tree Warden.

SECTION 12. HARMING TOWN OWNED TREES

It shall be unlawful for any person or firm to trim, prune or remove any town owned tree on public property without the approval of the Tree Warden or to harm a town owned tree by removing or otherwise damaging the bark and by attaching signs or any other item to any part of the tree using nails or other device that punctures the bark.

SECTION 13. PRUNING OF PRIVATELY OWNED TREES

The Town shall have the right to prune any tree or shrub on private property when it interferes with the proper spread of light along the street from a street light, or interferes with visibility of any traffic control device or sign or sight distance at intersections. All pruning shall be performed in accordance with accepted arborcultural standards.

SECTION 14. DEAD OR DISEASED TREE REMOVAL FROM PRIVATE PROPERTY

A tree located on private property which constitutes a hazard to life and property in the town right of way or adjacent private property, or harbors disease for which the removal of such tree will eliminate a potential threat to other trees within the town shall be removed by the owners at their expense within 60 days following written notification by the Tree Warden. In the event the owners fail to comply with such notification, the town shall have the right to remove or cause to have removed such trees and charge the cost of removal to the owners.

Any person owning property in the town and who qualifies on the basis of 125% of the Federal Poverty Guidelines may petition the Town Manager for removal of a diseased tree or one which constitutes a hazard to life and limb by town forces at no charge.

SECTION 15. REMOVAL OF TREE STUMPS

Stumps of street and park trees shall be removed below the surface of the ground so that the top of the stump shall not project above the surface of the ground.

Town of Barnstable Planting Specifications
for Municipal Shade Trees

Planting Specifications

A. Planting methods and techniques
1. No plant pits shall be dug or prepared until their location is approved by the Town Tree Warden.
2. Circular pits with sloping sides shall be excavated for all balled, burlapped and container plants. All pits should be 50% wider than the ball and at least the depth of the soil ball.
3. The Tree Warden will decide if the existing soil at each location is adequate for use in backfill or if the soil will have to be brought in.
4. All plants shall be centered in the pit and set at the depth of the ball or slightly higher than they were in the nursery.
5. Tree wraps, wire cage, manmade burlap will be removed from the root ball as well as any rope or twine wrapped on the root collar.
6. Check with utility companies for underground electric or telephone lines, gas lines, water lines or any other improvements, public or private, before planting has begun.
7. An approximate 8" watering dike will be constructed around all new tree and shrub plantings when determined by the Town Tree Warden.

B. Planting Standards and Workmanship
1. Trees and shrubs should not be dug, balled, burlapped or moved with a tree spade during the active growth period unless the ball is large enough to insure survival.
2. Plant material shall be handled in a manner so as to cause the least amount of damage during the planting process.
3. Bare root plants shall have their roots either covered with a moist tarp or mulch while they being transported to and being held at the planting site.
4. Balled and burlapped and container plants shall always be handled by the soil ball.
5. In cases where trees and shrubs are in a loose soil ball, the ball shall be secured with twine or burlap before transplanting.
6. Plant material shall be planted the day it is taken to the planting site.
7. Any abrasions of the bark or broken limbs or branches caused in the planting operation

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SECTION 16. INSTALLATION OF TREE LIGHTS

With the approval of the Town manager and the Tree Warden, decorative lights may be installed in town owned trees on public property for periods which will not interfere with the proper growth and maintenance of the trees and when the occasion for the lights is deemed appropriate.

Unless otherwise authorized, holiday lights shall be installed no earlier than November 1 and removed no later than March 15.

SECTION 17. PENALTY

Any person, firm or corporation violating any applicable provision of this ordinance shall be issued an initial citation in the form of a warning for the offense. If, however, the violator fails to take corrective action deemed satisfactory to the tree warden within sixty (60) days of the initial citation or following corrective action violates the same provision and or violates any other applicable provision of this ordinance within twelve (12) months of the initial citation, the violator may be fined not more than two hundred ($200) dollars for each offense.

should be treated or corrected immediately.

8. Excavated plant pits that shall be left open when work is not in progress or pose an immediate or considerable hazard to traffic shall be adequately barricaded with qualified warning devices.
9. The work area shall be kept safe at all times until the cleanup operations are completed. Under no condition shall the accumulation of soil, branches or other debris be allowed upon a public property in such a manner as to result in a public hazard.

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