Judd Gardens

Shenandoah National Park

Historic Vegetation Inventory and Management Plan

October 1997

Judd Gardens

Shenandoah National Park

Historic Vegetation Inventory and Management Plan

Submitted by the
Philadelphia Support Office
National Park Service
in cooperation with the
Morris Arboretum
of the University of Pennsylvania

October 1997

Table of Contents

Project Overview and
Inventory Description

Project Overview and Inventory Description

Project Background

In 1994, the Chesapeake System Support Office (CHSO) in Philadelphia entered into a cooperative agreement with the Morris Arboretum of the University of Pennsylvania to complete a historic plant inventory and management plan for Judd Gardens, located in Shenandoah National Park, Virginia. In the summer of 1994, the NPS worked jointly with the Morris Arboretum to develop a project methodology. In September 1994, the on-site inventory and condition assessment of historic canopy trees and shrubs within Judd Gardens was completed.

Site Description

The Judd Gardens is a 4.45 acre site located at the northeast corner of Skyland Resort in Shenandoah National Park. Skyland was a rustic camping retreat, started in 1887, and developed by George Freeman Pollock and others. Skyland provided opportunities for immersion in nature for a community of cultured, knowledgeable friends who visited the resort and purchased property there. George Judd and his wife purchased property at the north end of Skyland in 1910. Over the next 48 years, Judd built first a simple cabin, and then a larger one on a property that eventually totaled eighteen acres. During that time, Judd and his family developed a garden known for its abundant floral displays combining native Appalachian species with popular exotic plants. The gardens developed as a unique focal point and a significant part of the Skyland experience between 1910 and 1958. Today, overgrown native deciduous vegetation and introduced exotics appear to have almost consumed the gardens, which has become a little known enclave within the Skyland complex. A Cultural Landscape Report was completed for Judd Gardens in 1993 which provides a complete historical evaluation of the gardens and an analysis of its essential historic characteristics. One conclusion of the report is that the gardens, although overgrown, still retain design integrity. Moreover, it contains a horticultural collection, containing some rare species, that should be identified, labeled, and maintained.

Project Purpose

The purpose of this inventory and management plan is two fold:

1. To provide a thorough identification, documentation, and condition assessment of historic woody plant material within the boundaries of the Judd Gardens, and
2. To provide a management plan for the short and long-term that will assist the park in maintaining the long-term health of vegetation communities, to perpetuate the historic character of the landscape, and to provide for the safety of visitors.

Project Methodology

Bill Graham, Outreach Arborist from the Morris Arboretum, with the assistance of Shaun Eyring, Historical Landscape Architect from the Chesapeake Systems Support Office, performed an on-site inventory of canopy trees and shrubs within the boundaries of the Gardens. These native and exotic trees and shrubs, based on the findings of the Cultural Landscape Report, are believed to have been introduced to the gardens by the Judd family. 103 individual specimens and a grove (labeled as Hemlock Forest #97) were documented as historic plant material. For efficient data collection and future vegetation management, the site was broken into four numbered areas that generally correspond to the defined landscape character areas noted within the Cultural Landscape Report. Each tree was measured (height, diameter at breast height, spread) and assessed for general health, condition, form, and structural defects. Bill Graham, with the aid of binoculars, inspected each tree from the ground to determine both health and structural stability. This information was methodically recorded on prepared field inventory forms. Each tree was then assigned an inventory number which was keyed to existing conditions site plans.

Field data collected was entered into a database for maximum record keeping ability, allowing for the creation of specific management reports for immediate treatment of damaged or declining trees. AutoCAD drawings were developed that keyed each plant to a corresponding base map. From this information, a general management approach was developed for both the short-term and long-term care of the woody plant population on this significant historic site.

The information has been assembled into this handbook which can be used on a day-to-day basis by park managers and field staff.

Preserving the Cultural Landscape Character of the Judd Gardens Landscape

Although rapidly deteriorating plant material threatens the overall vegetative integrity of the gardens, many of the original plant specimens still survive. Years of neglect have diminished the integrity of workmanship, and the overgrown nature of the Gardens, due to a multitude of pioneered vegetative material, has also diminished the integrity of setting and feeling. However, Judd Gardens can still be recognized as a designed landscape. According to the Cultural Landscape Report, the site still possesses integrity of association, location, and feeling, and retains the ability to represent the horticultural showplace it was once within the Skyland community. Removal of pioneer plant material and appropriate vegetative management would likely enhance the design qualities of the Gardens as a whole.

The collection of historic trees and shrubs within Judd Gardens is a significant contributing feature to the landscape. Therefore, a management plan that focuses on the health and long-term maintenance of woody vegetation in the various garden areas is critical to preserving what remains of the general character of the historic landscape.

Evaluating the Historical Significance of Woody Plants at Judd Gardens.

Within the cultural landscapes of the National Park Service, each plant has a history of when and why it was planted on the site or why it was retained on the site. Identification of a designed landscape is often based on documentation which is more precise and extensive than that of a vernacular landscape. The Cultural Landscape Report for Judd Gardens identifies the particular trees and shrubs which likely existed during the Judd era. This information was used in determining which woody plants to evaluate within the Historic Vegetation Inventory and Management Plan. Of the existing vegetation within the Gardens, 104 woody plants likely date to the period of significance. These trees and shrubs are noted in the inventory.

Maintaining Healthy Landscapes at Judd Gardens

General Maintenance Approaches

In the recommendation section of the Judd Gardens Cultural Landscape Report, three management alternatives were offered: (1) No Intervention, (2) Restoration, and (3) Preservation and Future Rehabilitation. The preservation strategy was offered as the best choice.

Stabilization

Application of this strategy to Judd Gardens would best be characterized as stabilization. Under a vegetation stabilization plan, maintenance should be directed toward stabilizing the site conditions that existed during the period of significance. This primarily consists of: (1) managing the shade cast by trees that have volunteered since the actively maintained period, and (2) controlling or eradicating invasive exotic species. Use of vegetation stabilization strategies are a cost-effective approach because maintenance would be periodic rather than routine.

Initially, address public safety concerns and manage shade from the volunteer trees. Some original trees and shrubs may require selective pruning, especially when their canopies have significantly changed the shade conditions of the former garden. Maintaining the former sunlight conditions will give the greatest chance for the continued survival of remnant understory and groundcover garden vegetation and future interpretation. Exotic invasive control will require an initial removal strategy and follow-up treatments to achieve results.

The Sentinel Lodge Garden, the Lower Entry Garden, The Great Lawn, Stroll Garden, and the Jonquil and Herb Garden all were formerly characterized by nearly full sunlight exposure. The Western Forest, the Lower Hemlock and Pine Forest, and other natural forested areas bordered the full sun gardens and were characteristically closed-canopy.

A "glade", according to Webster's Seventh New Collegiate Dictionary, is "an open space surrounded by woods." The sunny areas of Judd Gardens are similar to glades. The changing shade conditions are pointed out in the Judd Gardens Cultural Landscape Report (1993, p. 28):

> Today more than 90% of the Gardens is under tree canopy..... While complete historic photographic coverage of the Gardens does not exist, an analysis of both available photographs and existing vegetation indicates that perhaps less than 50% of the Gardens was under tree canopy during the period of significance. Many of the plants are overgrown, and some have been lost as a result of natural shading as trees and shrubs have grown in height and breadth.

Managing the Glade for Increases Light Infiltration

Managing for increased light infiltration is most appropriate for the Sentinel Lodge Garden, the Lower Entry Garden, The Great Lawn, Stroll Garden, and the Jonquil and Herb Garden. Removing trees and shrubs that have volunteered or colonized from the adjoining forested areas will reestablish the original open character of the gardens. Some clone or seedling-origin garden species that are growing in paths and other inappropriate locations may need to be "weeded out" or transplanted to more appropriate positions. This may be necessary to stabilize, reestablish, or maintain the gardens' structural integrity. When "weeding out", it may be necessary or desirable to propagate exotic shrubs and trees, especially to produce replacement plants not readily found in nurseries.

Light infiltration management may involve pruning of old shrubs that have grown out of scale with the garden. Many of these are now competing for light or are crowding neighboring plants. Other light management will be necessary on trees at the edge of the glade where branches have overarched the glade space. This may involve raising the branch levels of the edge trees and thinning to admit more sunlight.

Managing the Closed Canopy Sections for Light Obstruction

The Western Forest and the Lower Hemlock and Pine Forest areas should be managed to maintain the low levels of light penetrating to the forest floor. Obstructing light will effective reduce vegetative growth on the forest floor, preventing invasive exotics from infiltrating the forest. It also maintains the integrity of the closed canopy in these areas. Actively manage deadwood and other dangerous trees, especially over or near paths, to reduce risks. Keep live-wood pruning to a minimum to block sunlight reaching the forest floor. When tree removals are necessary, remove them in a way that reduces injury to other trees and vegetation in the area. When gaps occur, encourage

younger trees to fill the gap as rapidly as possible. When there are few young trees in the area, plant saplings to grow into and fill the canopy gap.

Public Safety Tree Management

Especially where park visitors are invited to stroll through the historic garden, public safety must be considered. Section VI of this handbook contains condition assessment data, including specific recommendations for pruning, cabling, and removal. There are four trees recommended for removal. Two of these trees are found in the Stroll Garden and two are found in the Sentinel Lodge Garden. In the Sentinel Lodge Garden, White Pine #3 (CLR #A114) has poor form and is crowding a nearby Balsam Fir. Balsam Fir #7 (CLR #A101) has a significant cavity at its base. Within the Stroll Garden area, Eastern Hemlock #79 (CLR #A123) should be removed and Red Oak #94 (CLR #A118) has Armillaria Root Rot. Trees on the pruning list that have a "d" in the pruning column have deadwood that may be hazardous. Many important notes concerning pruning, including the danger factor, are found under the comment section of the field form. Eleven trees should have cable installations. Many of these trees have weak branches from weak leader junctions, cracks, or other defects. Between the time of this inventory and the time of plan implementation, other trees may have died or developed deadwood which will require removal.

View Restoration

The garden's forest opening (glade) and the Stony Man Mountain view were the defining garden elements during the period of significance. The view to Stony Man Mountain is highlighted in the Cultural Landscape Report. Photograph #11 in the *Judd Gardens Cultural Landscape Report* (1993, p.13) clearly shows Stony Man Mountain in the background framed on either side by the gardens edges that form the glade. The report says:

> The condition of views can be categorized as fair. Stony Man Mountain is still visible from the higher elevations of the gardens. Mature vegetation and infill by pioneering vegetation blocks the views to Kettle Canyon and Hawksbill Valley.
>
> Views retain integrity of location and association. The views to Stony Man Mountain and to Kettle Canyon and Hawksbill Valley retain integrity of design. Integrity of setting and feeling could be reestablished with appropriate treatments that would reestablish historic views within the gardens. (*Judd Gardens Cultural Landscape Report*, 1993, p.27)

Restoration of the view may require the selective removal of trees in the Western Forest area. Trees in the Western Forest were not part of the vegetation inventory. Selection of the trees for removal would require deciding the critical viewpoint and then carefully cutting the trees that mask the view.

Woody Plant Care and Management

This section focuses on tree management issues directed towards extending the useful life span of existing trees. This approach is aimed not only at preserving the character of the historic landscape at Judd Gardens, but also at providing for visitor safety. This inventory focuses on the trees within the garden, where public safety and visitor use add weight to woody plant care and management issues. This section has numerous suggestions and comments for setting up a comprehensive tree care program.

Preservation of Existing Woody Plants: A Comprehensive Management Program

A sound woody plant management program requires a multi-faceted approach that addresses issues of tree and shrub health, tree hazard control, historic landscape preservation, functional maintenance, aesthetics, and exhibits/interpretation. Any comprehensive woody plant management program must simultaneously balance all aspects of a program of care. It is important to initiate action to protect the safety of visitors and retard further decline and demise of the mature and over-mature trees and shrubs that provide today's landscape framework.

Tree Care Issues

Two fundamental issues regarding the preservation of existing woody plants are:

1. Biological Plant Health Care
2. Structural Support

Biologically, maintenance activities must focus on the protection and encouragement of the proper function of the plant's major organs: the root (absorption system), the stem (transport system), and the leaves (photosynthetic system). Structurally, maintenance activities must focus on protection, evaluation, and remediation of the support system: anchoring roots, main trunk, scaffold limbs, and twigs.

There are few differences in plant care strategies between shrubs and trees from a biological perspective. Tree and shrub preservation differ primarily on structural issues. This is primarily because of the difference in relative size. Shrubs by definition are smaller than trees and grow with many stalks or leaders originating at or near ground level. This is important because shrubs seldom become large enough to be considered hazardous, and storm broken limbs and stalks can be easily rejuvenated within the context of regular maintenance procedures. Also, shrubs are easier to maintain without specialized tools, equipment, and techniques.

On the other hand, trees can grow to be very large and are dependent on one or several main stems or leaders that must last its entire life span. Managing safety issues is a very important part of tree maintenance which often effects the biological systems. Trees are more difficult to maintain requiring specialized tools, equipment, and techniques.

Biological Plant Health Care

The goal of plant health care is to increase longevity. This is especially important on historic sites such as Judd Gardens where trees themselves may be historically significant. With or without historical significance, trees contribute aesthetically to the landscape context of historic sites and provide functional attributes such as cooling buildings during the summer and providing windbreaks that reduce heating loads. Increasing plant longevity is cost effective. Furthermore, large trees provide a scale and ambiance that can not be temporally replaced. Tree and shrub care should focus on effective treatments that have long term survival benefits.

1. Maintain Stable Environments

Maintenance programs that target tree longevity maximize the benefits of trees in the most cost effective way. Tree longevity depends on healthy biology, a stable environment, and a sound supporting structure. Given a stable environment, most properly located trees will adjust their growth to match the resources on the site. Protect the stable environment by avoiding any construction that encroaches within the drip line of trees. To keep trees healthy, avoid changing the landscape plantings and soil chemistry beneath trees. For instance, do not apply lime on lawns beneath trees when this has not been a regular cultural practice. Avoid planting annuals and performing extensive landscaping beneath trees that will cause root disturbance and abruptly change water relationships and nutrient levels.

2. Interrupt Prolonged Drought Stress

PROBLEM: Drought Stress:

The tree's biological system consists of the roots, the conductive tissues of the trunk and limbs, and the leaves. Stable environments allow trees to adjust to most site stresses. Occasionally unusual weather or climatic patterns may stress the biological system beyond its ability to cope. Climatic and human-caused tree stresses are major causes of decline which also include encouraging disease and insect infections and infestations. Prevention of unusual or prolonged stresses of all kinds is cost effective, whereas curative treatments are costly and frequently ineffective. Drought is the most common climatic tree stress.

SOLUTION: Supplemental Irrigation:

Proper supplemental irrigation can prevent permanent drought injury to roots, stems, and leave. Since trees establish and grow under normal climatic rainfall patterns for the region where they have been established, supplementary irrigation should mimic both pattern and quantity of rainfall. For example, if the normal rainfall for July is 4 inches, and this normally occurs during rain showers averaging once per week, then one inch of water is required per week. This can be a combination of natural rainfall plus supplementary irrigation each week. Supplementary water should be given in amounts of one inch or more and should soak deeply into the soil where it becomes a reservoir for watering requirements until the next rainfall or scheduled irrigation.

To supplement insufficient rainfall, first measure the precipitation with an on-site rain gauge. Irrigate as soon as practical following the precipitation event. Set out a rain gauge or open container under the sprinkler heads to measure the time required to deliver the target amount of water. Use this lapsed time for subsequent irrigation.

3. Mulching

Trees shed leaves and branches that then form a natural mulch layer beneath the tree canopy in the forested areas where trees evolved. The mulch is broken down into humus and mineral elements by soil microorganisms. Humus is an important ingredient of good soils. Mineral elements are absorbed by tree roots effectively recycling minerals from decomposing leaves and other tree parts.

Mulching aids trees by:

1. recycling nutrients
2. encouraging active microorganism populations including beneficial mycorrhizae associations between tree roots and fungus
3. conserving moisture
4. insulating the ground from extremes in temperature
5. preventing further compaction by absorbing and spreading weight
6. reducing soil erosion
7. protecting surface roots from mechanical damage such as that caused by mower equipment
8. reducing competition from other plants, especially grasses

PROBLEM: Mulch may not be historically appropriate:

Despite the many benefits of mulches in a comprehensive health care program, they may be interpretively inappropriate on historic sites such as Judd Gardens where this would not have been a historical tree care treatment.

SOLUTION: Selective Mulching:

Consider selectively mulching important landscape trees as a strategy for reversing decline until general health is restored. On newly planted trees, it could be an important factor in aiding establishment. Mulching could be abandoned after the establishment period.

Only mulch which has been processed correctly should be used. Mulching with wood chips is not a recommended practice. It has been found that as wood chips break down, the process can actually tie up valuable nutrients in the soil.

4. Fertilization Strategy

Chemical fertilization is not recommended for Judd Gardens due to the complex nutrient balance of forested sites.

PROBLEM: Overfertilization:

Fertilization of trees is a little understood and frequently over-emphasized tree care treatment when tree longevity is the desired long term goal. Woody plants adapt over their lifespan to the nutrient and water availability of the site where they establish. On poor dry sites, woody plants will grow slowly in balance with the availability of resources. Regular fertilization encourages plants to grow larger than might otherwise be supported on a given site. The plants may then become dependent on perpetual nutrient supplements and become nutrient stressed without them.

SOLUTION: Need-Based Fertilization:

Supplemental nutrients should only be applied to remedy properly diagnosed deficiencies causing tree or shrub stress. Nitrogen is an essential plant nutrient available in nature in limited quantities. The limited availability often dictates the amount of annual tree and shrub growth. In terms of increasing plant longevity, this is not necessarily bad. Restricting growth conserves available sugars and carbohydrates which are the energy supply required for plant cell maintenance, reproduction, and defense. When carbohydrate supplies are meager, defense against the attack of insects, other herbivores, plant diseases, and internal decay organisms is weak. Reserves carbohydrates are also emergency rations used to grow a new set of leaves in case of a catastrophe such as Gypsy Moth defoliation. Tree and shrub longevity, therefore, depend on the plant's carbohydrate reserves which is regulated, in part, by nitrogen.

5. Nitrogen Recycling

Nitrogen is an elemental gas present in air which chemically combines with other elements to form organic and inorganic compounds that become available in the soil for absorption by roots. Once absorbed, nitrogen is conserved and recycled by the plant. In the fall, much of the nitrogen is removed from the leaf and stored until growth resumes

in the spring. Some nitrogen and other nutrients are bound within the structures of the leaves and are shed with the falling leaves. These bound nutrients are recycled by the roots, reabsorbing nitrogen as it becomes available from decomposing leaves. Some nitrogen is lost from leaching with rainwater and is unavailable for reabsorption. It is estimated that this loss from leaching is regained from chemical compounds formed from atmospheric nitrogen that falls in winter snows, in summer thunderstorms, and from other sources. Nitrogen nutrient availability is stable on many sites.

PROBLEM: On-Site Removal of Decaying Organic Matter:

On landscape sites where leaves are collected and removed from the landscape, valuable recycled nutrients and organic matter are lost to the plant. Despite the loss of this recycled source, less than one pound of actual nitrogen per thousand square feet is removed from a typical site. Many tree fertilization programs will recommend up to six pounds of actual nitrogen per thousand square feet and turf fertilization programs often recommend rates around three pounds per thousand square feet.

SOLUTION: Do not remove organic matter from site.

If necessary, leaf litter may be removed, chopped using a chipper/shredder or lawn mower, and replaced as a mulch. This is likely to increase the decomposition rate, however, releasing nutrients at a greater rate than normal. Mulching lawnmowers should be used on lawns to keep organic matter in place.

6. *Pest Management*

PROBLEM: Pest and Disease Attacks:

Pests and diseases that attack leaves reduce the production of carbohydrates essential for long term health and survival. The effect of many insect and disease pests of trees and shrubs may be primarily aesthetic with little long term survival impact. Trees which are repetitively defoliated or trees stressed from other causes are vulnerable to serious long term damage or death. It is imperative to identify these trees at this critical point and intervene by controlling defoliating pests before the decline is irreversible.

SOLUTION: Integrated Pest Management:

IPM Defined:

Integrated Pest Management (IPM) is a strategy used to manage plant pests and diseases within the context of environmental sensitivity. The word integrate implies that many strategies are applied to keep pest and diseases below economic or aesthetic tolerance levels. IPM integrates biological, cultural, and chemical methods to achieve the desired result. Emphasis is placed on managing pest problems instead of exterminating them. Monitoring is the key to making decisions to achieve the integrated process. IPM does not mean, no chemical spray. Chemical sprays are used when and where they are appropriate and useful.

Benefits of IPM Approach:

In many cases, more effective control can be achieved with less environmental impact because chemical use is reduced or eliminated and chemicals chosen are less toxic and less persistent. With growing public sentiment and awareness of environmental issues, reducing or eliminating the use of chemicals is in keeping with public sympathies. This is especially true for the National Park Service and other government agencies.

Control can be more effective because IPM strategies work with the natural enemies of pests (when they are present and effective) by encouraging them to keep plant pests in check. This is achieved by judicious use of chemical sprays, cultural care, and other techniques to control pest population flare-ups instead of using chemical cover sprays that kill both pest and their enemies. In the old cover spray strategy, pest populations would explode when rid of their natural enemies. The cycle of cover sprays necessitated the use of more and more chemical solutions. IPM is a partnership with the natural enemies of pests in order to achieve lowered pest population levels that are tolerable by economic or aesthetic standards.

Commitment Required:

It is important to understand the commitment required to implement a successful IPM program, specifically within a historical site context. Fundamentally, IPM programs differ from modern traditional pest control techniques by the amount of intellect required at all steps in the process. Modern traditional control methods relied heavily on long

acting chemical cover sprays. This meant that with limited training in the biology and ecology of the pest and host plant(s), a spray technician, acquainted with the sprayer application equipment, could treat or attempt to treat pest problems.

The IPM process requires much more from the decision makers in terms of training and knowledge about the pest's biology, the host's cultural requirements, and the pest's natural enemies. If chemical sprays are required, it is important to know that newer, less toxic, short persistent chemicals have replace the older, more toxic, long persistent chemicals available for use in controlling pests. These new chemicals require precise timing of applications to be effective. Reaction time is reduced making it necessary to respond quickly to make effective treatments.

IPM strategies do not necessarily save time or money. More time is spent on monitoring pest populations and less time is spent on applying chemical sprays.

Contract or In-house Implementation of IPM:

Two options must be considered before implementing an IPM program: 1) whether it will be in-house, or 2) through contract with a tree care company specializing in IPM. The availability of qualified tree care contractors offering IPM services will vary greatly from region to region. Where available, contracting may be the best option because the network of trained professionals required to run a viable IPM program are already in place along with equipment necessary for monitoring and treating problems.

Setting up an Effective IPM Program:

If IPM will be done in-house or by a regional specialist employed by NPS, there are several steps required for implementing an effective IPM program. These include:

a. Correct identification of the host plant and familiarization with its cultural requirements. Meeting the cultural requirements of the plant is important to avoid pest problems. Most healthy plants are able to resist the attack or infection by insects and diseases. Keeping plants healthy is the first priority in an IPM program.

b. Determine whether the presence of a pest is a problem at all. Determine what damage is being done to the host plant and what the level of damage can be tolerated. In many instances, damage may be sporadic and occasional with minimal impact to the long term health and aesthetics of the plant. Doing nothing may be the best solution to many of the pest problems encountered.

c. Correct identification of the insect or disease pest and their natural enemies is essential before an environmentally sensitive solution can be developed. It is best for site personnel to develop some level of familiarization with the identification of common insect and disease problems. Training seminars are useful at the start of an IPM program. A library of resource publications geared to the park location is essential to expand the basis of understanding and to identify pests not seen before. Regional experts in arboreta or cooperative extension programs are a must to support field staff with correct pest identification.

d. Monitor and keep record for the presence of pests, pest enemies, and population levels. When to look can be determined by several methods:

    - Calendar date - the emergence date for insects and the infection dates for diseases will vary greatly between seasons and between different climatic regions. Differences in elevation and proximity to large bodies of water will influence temperature, moisture, weather patterns, etc. As little as 20 miles or less will often change the timing for monitoring of plant pests. Calendar dates should be considered a guide to inspection for pest problems.

    - Host plants - Specific pest problems can be keyed to host plants. Insect and diseases are usually host specific or specific to a narrow range of host plants. Weekly monitoring inspections can be geared to the inspection of host plants that have had a history of infection or infestation. This reduces the amount of plants monitored each week to those plants where pests are expected. Mapping locations of host plants will facilitate thoroughness and efficiency of monitoring inspections.

- Key plants - Plants are known to have been stressed or plants recently subjected to stress agents should be monitored more intensely until they have recovered.
- Degree days - Another new method of timing the monitoring of plant pests is called growing degree day measurement. On a calendar year basis, all the hours in which the temperature exceeds a certain base temperature are recorded. Careful monitoring by entomologists and cooperators in different regions have determined the degree days for different developmental stages of the plant pests. If the degree days are tracked for the specific park site, accurate emergence dates can be predicted. Information developed for the same pests from other regions can be shared and become site specific information on pest development.
- Insect Pheromone Traps - Insect traps have been developed for many economic insect pests such as beetles and moths. Traps lure insects by mimicking the scent of the female of a particular species with synthetically produced sexual attractants (pheromones). The males are then caught on the sticky surfaces of the traps. By monitoring the traps bi-weekly, the presence and population of the insect pest can be determined so that appropriate control strategies can be implemented.

e. Determining appropriate treatments: Generally, use the least toxic method of control which is still effective in mitigating the undesirable plant damage. Start by implementing proper cultural methods to improve the plant's general health. Use contact type chemicals such as soap and oil whenever effective in place of residual type pesticides. Treat only pest populations that are out of control, since biological control agents, if present on the untreated plants, will be the residual source for repopulation of sprayed areas. In some cases, biological augmentation may be appropriate. Sometimes mechanical removal of pests on small plants can be accomplished by hand picking or by pruning off an infected or infested branch.

f. Evaluate the effectiveness of the control strategy and make appropriate adjustments. It is essential that any pest control program be constantly evaluated and re-evaluated. Monitoring must be done to detect the presence of a pest, measure the pest population, determine the amount and extent of damage, if there are natural enemies of the pest, and determine the effectiveness of control strategies.

7. Pruning for Tree and Shrub Health

Pruning is an important cultural practice. PRUNING CAN INCREASE TREE LONGEVITY, BUT IS AN OFTEN ABUSED PRACTICE. Pruning often is a compromise between safety issues, plant health, aesthetics, and functional requirements in the landscape. In cultural landscapes, all these issues must be carefully balanced.

Functionally, it is important to resolve conflicts between plant needs and human requirements. Limbs that rub on the roofs of historic structures must be resolved. Limbs that limit or obstruct views of highways or have low clearances for traffic that frequent them, must be pruned to resolve the conflicts. Aesthetically, each tree or shrub performs a landscape function. Some plants provide visual screens, while others provide high canopy over out-door spaces. For the long term health of trees and shrubs, it is important that aesthetic and functional pruning be performed regularly to avoid heavy pruning adjustments. Heavy pruning to reduce or maintain size should be avoided. Plant the proper plant species for each landscape location. Safety pruning includes mostly removing dead and cracked branches and removing weak branch junctions. Safety issues will be discussed in more detail under the section of this report devoted to "Structural Support".

From a tree health perspective, there are only a few beneficial pruning treatments that promote tree health and increase tree longevity. Removing deadwood reduces decay organism innoculum and fosters good tree defense of its structural support tissues. Pruning can, sometimes, aid in the control of bark and twig canker diseases. Pruning can be used to remove nest forming caterpillars and other gregarious pests. With these exceptions, pruning is usually directed towards resolving human/plant conflicts and safety concerns or human aesthetic goals.

Given that conflict resolution and aesthetics are the primary goals of most pruning, The most important aspects are the amount of foliage removed per pruning and the position of the final pruning wounds.

PROBLEM: Incorrect Pruning Practices:

The amount of live-wood pruning is important because removing living branches reduces the amount of foliage available to produce the carbohydrates required for other life processes. In general, as the tree increases in age, the amount of live wood pruning should decrease proportionally. This is especially true on old or stressed trees where

heavy pruning could cause further decline or death. On these very old trees, it is best to remove only deadwood. If functional or aesthetic issues necessitate other pruning, keep the amount at any one pruning to a minimum. Routinely prune smaller amounts of live branches rather than prune more aggressively after longer pruning cycles.

The position of the final pruning cut is extremely important to aid the tree in defense of internal structural wood from invasion by decay organisms. If pruning cuts are made improperly, pruning can be more harmful than beneficial. Trees and shrubs produce protective chemicals at the base of branches that are very effective in limiting the invasion of decay organisms into the main trunk or larger limbs. Poor pruning wounds cut away this protective zone or leave large amounts of dead wood that support larger more aggressive colonies of decay organisms that may breach the woody plant's defensive system.

SOLUTION: Target Pruning:

Target pruning is the term used to describe the placement of the final pruning cut after the removal of a branch or limb. Always use tree care professionals that understand "target pruning" concepts. Critical target points are located and the pruning cut is aligned in relation to the targets. The first target point is the branch bark ridge. This ridge of raised bark is located at the juncture between two limbs or limb and trunk. The ridge can be identified from the textural and color changes to the bark. The pruning cut should begin just outside of this point.

The second target point is more subtle than the branch bark ridge but can be readily distinguished after careful observation and practice. This target is located where the swelling at the lower side of the branch ends. The branch usually becomes uniform in diameter at this point and there is often a textural and color change associated with it. The pruning cut should be made just outside of this subtle line which is often referred to as the trunk collar.

8. Construction Protection

PROBLEM: Construction Damage to On-Site Vegetation:

The protection from or the avoidance of construction near trees is crucial. Any construction that involves trenching, digging, earth moving, parking, vehicular traffic, storage of materials, and the dumping of chemicals near trees is likely to have damaging effects on the tree's root system. These and other construction activities may change the tree's environment by:

1. reducing the total root area
2. reducing the structural roots anchoring the tree
3. wounding individual roots
4. changing the water table and hydrology
5. causing soil compaction
6. causing chemical changes and toxicity to the soil

Just about all construction involving underground activities near trees will impact it in some way. Understanding the alternative construction techniques and the living requirements of trees and other plants is imperative to minimizing the biological compromises to them.

SOLUTION: Close Supervision of Construction Planning and Implementation:

A consulting arborist should be a member of the team of professionals that review and participate in planning and implementation stages of any construction project. The consulting arborist should review conceptual planning, especially in regard to locating features in relationship to major trees. Specifications for tree protection and all work near trees should be made and/or reviewed before bidding. On site supervision should take place routinely during the construction by those knowledgeable about construction impacts to trees.

Structural Support

If limbs and trunks fall onto people or valuable property, trees can be potential liabilities. Trees have evolved in forests where shedding limbs and other defects do not create hazards. When trees are planted in gardens or near buildings, potential conflicts arise unless they are managed and maintained. A major part of any tree care program must be focused on resolving tree-human conflicts and managing danger from falling tree parts. Trees must be maintained to minimize the hazards and damage to both people and property.

A Tree Hazard Management Program is a good starting point for tree care management when financial resources are limited. This provides for visitor safety and historic building preservation until a full tree management plan can be implemented to address multi-faceted issues.

1. Tree Risk Management

Trees have been characterized by some as shedding organisms. During their lifetime, trees shed branches as well as leaves and other parts. When branches are shed or trees fall because of structural defects, they can cause considerable damage when people or valuable property beneath them become targets. Potential targets and tree defects are two essential elements to risk. A forest tree with a serious defect would present little risk since it lacks high value targets. To manage risks we must first identify trees with targets and inspect them for recognizable defects. An action plan must then be implemented within a reasonable time period. In case of law suits for injury or property damage, documentation must be kept on file to demonstrate follow-up action.

Reduction of liability is a product of good management of risks and documentation of a reasonable program of inspection and responsive action. Risks cannot be eliminated, but they can be managed through this kind of responsible approach.

2. Annual Tree Inspections

Significant hazardous new deadwood may necessitate that trees near high risk property and frequently visited out-of-door areas must be inspected annually in a careful and systematic manner. More frequent inspections may be necessary, if severe storms occur at the site. The inspection procedure, recommendations, and remedial actions must be documented as a means to reduce liability.

3. Hazard Management

Hazard management consists of defect prevention, target avoidance, defect remediation, and defect removal strategies. Future hazards can be eliminated, in some instances, by avoiding the planting of structurally weak tree species. Decay and cavity defects can be avoided by minimizing wounds such as those inflicted by lawn mowers to the base of trees and by hiring qualified professional arborists for pruning and other tree care.

4. Hazard Avoidance

Hazard avoidance can be as simple as moving a picnic table from beneath a hazardous tree or limb. Limiting parking beneath a potential hazard or restricting visitors to main paths avoid placing people at risk. Until remedial or removal strategy can be implemented, avoidance is a sound, low cost management strategy. If old, historically significant trees have hazardous structural defects, avoidance strategies may provide a method to retain them.

5. Flexible Wire Cables to Remediate Hazards

Installation of flexible wire cables is an example of remedial measures recommended in the appendices or this report. Cabling is a cost effective remedial option that reduces both risk and potential loss of historically significant trees. In many instances, heroic remedial measures coupled with avoidance strategies may both prolong the life of historic trees and postpone costly tree removal.

6. Further Hazard Inspections

To expedite the inspection of as many trees as possible within the scope of this report, tree were inspected from the ground only. In several cases, further inspection and/or measurement should be done to further evaluate defects. This means that these trees should be climbed to the defective point so that further evaluation can be performed. These inspections should be done before any significant tree care is invested in case removal is recommended.

7. Tree Removal

Tree removal is a last resort when individual old trees are no longer an asset, are too costly to maintain, or are too expensive to remediate. Strength formulas and guidelines for determining the percentage of weakening caused by decayed or hollowed trunks and limbs are given in *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas* written by Nelda P. Matheny and James R. Clark; International Society of Arboriculture, Urbana, IL; 1991. These formulas and guidelines have been used as criteria for tree removal or large limb removal recommendations.

8. Storm Damage

It must be realized that even with careful inspection and any subsequent remedial intervention, tree limbs and trunks may fail during severe storms. During storms, limb and trunk failures may occur even where no detectable weakness appears. The inspections conducted were targeted at evaluating recognizable tree defects such as poor limb attachment, structural wood decay, and vertical cracks. These recognized tree weaknesses and others are outlined in *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas* (1991).

9. Early Care of Structural Problems for Tree Longevity

A frequently encountered problem effecting tree longevity at Judd Gardens is associated with structural limb and trunk defects. Trees characteristically have trunks and major limbs which must support themselves throughout their lifetime. If defects weaken and cause major limb or trunk failure, the tree is lost. When risks are great near historic buildings or where staff and visitors frequent, removal may be the last but best choice.

Many structural weakness can be avoided by proper care and training of newly planted trees or stump sprouts. Grounds maintenance staff should be trained in proper pruning and training techniques and encouraged to inspect and prune new trees annually.

Plant Identification Data

Plant Identification Data

Legend:

PT#	Plant Identification Number
CLR#	Cultural Landscape Report Identification Number *
AR#	Area Number
DBH	Diameter at breast height (in.)
HT	Height (ft.)
SP	Spread (ft.)

Areas:

1	Sentinel Lodge Garden
2	The Western Forest
3	Lower Entry Garden
4	The Great Lawn Garden
5	Jonquil and Herb Garden
6	Stroll Garden
7	Lower Hemlock and Pine Forest

Type (TYP):

1	Deciduous Tree
2	Evergreen Tree
3	Shrub

Class:

A	Native species believed to predate or to have been introduced to the gardens by the Judd family
B	Exotic species believed to have been introduced to the gardens by the Judd family

* Note: Unlike the Plant Identification Numbers, assigned to individual specimens for the *Historic Vegetation Inventory and Management Plan*, the Cultural Landscape Report Identification Numbers are shared by plants which are of the same species and class (A or B). A third classification, C, was used in the *Cultural Landscape Report* to identify both native and exotic species believed to have pioneered the Judd Gardens after the Judd family era. Specimen #96, a Norway Spruce (*Picea abies*), was not identified in the *Cultural Landscape Report* and therefore has no CLR number.

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Plant Identification Data

PT#	CLR#	AR#	SCIENTIFIC NAME	COMMON NAME	TYP	DBH	HT	SP	CLASS
1	A101	1	Abies balsamea	Balsam Fir	2	8.2	25	16	A
2	A101	1	Abies balsamea	Balsam Fir	2	6	20	12	A
3	A114	1	Pinus strobus	White Pine	2	15.7	32	10	A
4	A118	1	Quercus rubra	Red Oak	1	32.2	45	55	A
5	A207	1	Sambucus pubens	American Red Elderberry	3	-	8	9	A
6	B206	1	Euonymus alata	Winged Spindle Tree	3	-	9	14	B
7	A101	1	Abies balsamea	Balsam Fir	2	16	45	15	A
8	A101	1	Abies balsamea	Balsam Fir	2	7.3	25	10	A
9	B215	1	Viburnum opulus	European Cranberrybush Viburnum	2	-	9	31	B
10	A207	1	Sambucus pubens	American Red Elderberry	3	-	9	8	A
11	A203	1	Kalmia latifolia	Mountain Laurel	3	-	8	10	A
12	A101	1	Abies balsamea	Balsam Fir	2	10.2	35	14	A
13	B207	1	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea	3	-	12	28	B
14	B216	1	Viburnum plicatum var. tomentosum	Doublefile Viburnum	3	-	8	6	B
15	B115	1	Taxus cuspidata	Japanese Yew	3	20	25	-	B
16	A103	1	Acer rubrum	Red Maple	1	26.7	30	33	A
17	B206	1	Euonymus alata	Winged Spindle Tree	3	-	9	12	B
18	B206	1	Euonymus alata	Winged Spindle Tree	3	-	9	12	B
19	B207	1	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea	3	-	8	12	B
20	B212	1	Syringa josikaea	Hungarian Lilac	3	-	20	31	B
21	B206	1	Euonymus alata	Winged Spindle Tree	3	-	-	-	B
22	B105	1	Fagus sylvatica	European Beech	1	17.2	50	20	B
23	B207	1	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea	3	-	8	1	B
24	A115	1	Quercus alba	White Oak	1	26.7	55	30	A
25	B102	1	Chamaecyparis obtusa	Hinoki Falsecypress	2	45.8	18	10	B
26	B206	1	Euonymus alata	Winged Spindle Tree	3	-	8	10	B
27	B212	1	Syringa josikaea	Hungarian Lilac	3	-	15	12	B
28	B108	1	Picea pungens	Colorado Blue Spruce	2	23	65	30	A
29	B108	1	Picea pungens	Colorado Blue Spruce	2	23	70	20	A
30	A118	1	Quercus rubra	Red Oak	1	19	40	30	A

LEGEND: PT# - Plant ID # CLR# - CLR Species ID# AR# - Area # TYP - Type DBH - Diameter at breast height (in) HT - Height (ft) SP - Spread (ft)

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Plant Identification Data

PT#	CLR#	AR#	SCIENTIFIC NAME	COMMON NAME	TYP	DBH	HT	SP	CLASS
31	A123	1	Tsuga canadensis	Eastern Hemlock	2	19	40	20	A
32	A114	1	Pinus strobus	White Pine	2	26.7	35	35	A
33	A114	1	Pinus strobus	White Pine	2	17.2	30	15	A
34	A115	1	Quercus alba	White Oak	1	23	50	26	A
35	A122	1	Tilia americana	Basswood	1	13.5	45	15	A
36	A118	1	Quercus rubra	Red Oak	1	21	55	26	A
37	A118	1	Quercus rubra	Red Oak	1	19	40	20	A
38	A117	1	Quercus prinus	Chestnut Oak	1	19	45	20	A
39	A117	1	Quercus prinus	Chestnut Oak	1	21	45	25	A
40	A118	1	Quercus rubra	Red Oak	1	30.5	65	45	A
41	A123	3	Tsuga canadensis	Eastern Hemlock	2	23	70	40	A
42	A103	3	Acer rubrum	Red Maple	1	21	40	20	A
43	B106	3	Fagus sylvatica 'Atropurpurea'	Purple Beech	1	22.2	75	35	B
44	B106	3	Fagus sylvatica 'Atropurpurea'	Purple Beech	1	38.2	75	45	B
45	A108	3	Fagus grandifolia	American Beech	1	26.7	45	40	A
46	B105	3	Fagus sylvatica	European Beech	1	17.2	60	65	B
47	A120	3	Sorbus americana	American Mountain Ash	3	2.6	8	8	A
48	B103	3	Chamaecyparis pisifera 'Squarrosa'	Sawara Cypress	2	26.7	40	35	B
49	B108	3	Picea pungens	Colorado Blue Spruce	2	23	70	20	A
50	B113	3	Taxus baccata	English Yew	3	9.5	18	18	B
51	A110	4	Ilex monticola	Mountain Winterberry	3	-	12	33	A
52	A110	4	Ilex monticola	Mountain Winterberry	3	-	12	20	A
53	A110	4	Ilex monticola	Mountain Winterberry	3	-	12	10	A
54	A121	4	Thuja occidentalis	American Arborvitae	2	-	20	10	A
55	B201	4	Berberis thunbergii	Japanese Barberry	3	-	4	5	B
56	B208	4	Kolkwitzia amabilis	Beautybush	3	-	6	8	B
57	B208	4	Kolkwitzia amabilis	Beautybush	3	-	8	8	B
58	B208	4	Kolkwitzia amabilis	Beautybush	3	8	8	-	B
59	A118	4	Quercus rubra	Red Oak	1	21	40	30	A
60	B215	4	Viburnum opulus	European Cranberrybush Viburnum	3	-	6	3	B

LEGEND: PT# - Plant ID # CLR# - CLR Species ID# AR# - Area # TYP - Type DBH - Diameter at breast height (in) HT - Height (ft) SP - Spread (ft)

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Plant Identification Data

PT#	CLR#	AR#	SCIENTIFIC NAME	COMMON NAME	TYP	DBH	HT	SP	CLASS
61	A117	4	Quercus prinus	Chestnut Oak	1	20	45	30	A
62	A118	4	Quercus rubra	Red Oak	1	23	55	35	A
63	A107	4	Cladrastis lutea	Yellowwood	1	4	15	15	A
64	B209	4	Philadelphus coronarius	Sweet Mock Orange	3	9	12	-	B
65	B213	4	Syringa vulgaris	Common Lilac	3	-	10	15	B
66	B215	4	Viburnum opulus	European Cranberrybush Viburnum	3	-	10	20	B
67	B213	4	Syringa vulgaris	Common Lilac	3	-	10	18	B
68	B215	4	Viburnum opulus	European Cranberrybush Viburnum	3	-	9	18	B
69	B112	4	Sorbus hybrida	Oakleaf Mountain Ash	1	30	40	45	A
70	A109	4	Fraxinus americana	White Ash	1	21	85	40	A
71	A118	4	Quercus rubra	Red Oak	1	17	85	50	A
72	A118	4	Quercus rubra	Red Oak	1	21	75	50	A
73	A123	4	Tsuga canadensis	Eastern Hemlock	2	21	85	32	A
74	A123	4	Tsuga canadensis	Eastern Hemlock	2	21	85	36	A
75	A123	4	Tsuga canadensis	Eastern Hemlock	2	21	85	36	A
76	A114	4	Pinus strobus	White Pine	2	18	55	15	A
77	A123	6	Tsuga canadensis	Eastern Hemlock	2	31	70	35	A
78	A103	6	Acer rubrum	Red Maple	1	12	45	25	A
79	A123	6	Tsuga canadensis	Eastern Hemlock	2	18	35	70	A
80	A205	6	Rhododendron maximum	Rosebay Rhododendron	3	-	9	8	A
81	A114	6	Pinus strobus	White Pine	2	14	20	50	A
82	A123	6	Tsuga canadensis	Eastern Hemlock	2	29	85	36	A
83	B207	6	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea	3	-	7	6	B
84	B101	6	Chamaecyparis nootkatensis	Nootka Cypress	1	12	45	15	B
85	B204	6	Cornus kousa	Kousa Dogwood	1	-	12	12	B
86	B208	6	Kolkwitzia amabilis	Beautybush	3	-	5	4	B
87	B215	6	Viburnum opulus	European Cranberrybush Viburnum	3	-	9	12	B
88	B208	6	Kolkwitzia amabilis	Beautybush	3	-	5	4	B
89	A114	6	Pinus strobus	White Pine	2	38	95	30	A
90	A114	6	Pinus strobus	White Pine	2	15	85	20	A

LEGEND: PT# - Plant ID # CLR# - CLR Species ID# AR# - Area # TYP - Type DBH - Diameter at breast height (in) HT - Height (ft) SP - Spread (ft)

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Plant Identification Data

PT#	CLR#	AR#	SCIENTIFIC NAME	COMMON NAME	TYP	DBH	HT	SP	CLASS
91	B204	6	Cornus kousa	Kousa Dogwood	1	4.5	30	15	B
92	A104	6	Acer saccharum	Sugar Maple	1	17	65	30	A
93	A118	6	Quercus rubra	Red Oak	1	13	65	20	A
94	A118	6	Quercus rubra	Red Oak	1	25	65	30	A
95	A118	6	Quercus rubra	Red Oak	1	35	65	30	A
96	-	6	Picea abies	Norway Spruce	2	24	99	30	B
97	A123	6	Hemlock Forest		2	-	-	-	A
98	A118	6	Quercus rubra	Red Oak	1	27	30	30	A
99	A110	1	Ilex monticola	Mountain Winterberry	3	-	9	25	A
100	A203	1	Kalmia latifolia	Mountain Laurel		-	-	-	A
101	A101	1	Abies balsamea	Balsam Fir	2	11	65	15	A
102	A202	1	Hamamelis virginiana	Common Witchhazel	3	-	15	10	A
103	A101	1	Abies balsamea	Balsam Fir	2	12	40	8	A
104	A202	1	Hamamelis virginiana	Common Witchhazel	3	-	18	15	A

LEGEND: PT# - Plant ID # CLR# - CLR Species ID# AR# - Area # TYP - Type DBH - Diameter at breast height (in) HT - Height (ft) SP - Spread (ft)

Condition Assessment Data

Condition Assessment Data

Legend:

PT#	Plant Identification Tag Number
CLR#	Cultural Landscape Report Identification Number *
AR#	Area Number
PR	Needs Pruning
CB	Needs Cabling
RE	Needs to be Removed
d	Contains Deadwood (shown in pruning column)

Areas:

1	Sentinel Lodge Garden
2	The Western Forest
3	Lower Entry Garden
4	The Great Lawn Garden
5	Jonquil and Herb Garden
6	Stroll Garden
7	Lower Hemlock and Pine Forest

Notes: Numbers included in the pruning and cabling columns indicate priority ranking. Trees and shrubs are listed by priority in Section VI, Action Priority Plan.

The notes column includes additional information specific to a particular tree or shrub. References may include specific removal instructions, damage locations, pest identification, or comments on general plant health and appearance.

* Unlike the Plant Identification Numbers, assigned to individual specimens for the *Historic Vegetation Inventory and Management Plan*, the Cultural Landscape Report Identification Numbers are shared by plants which are of the same species and class (A or B). A third classification, C, was used in the *Cultural Landscape Report* to identify both native and exotic species believed to have pioneered the Judd Gardens after the Judd family era. Specimen #96, a Norway Spruce (*Picea abies*), was not identified in the *Cultural Landscape Report* and therefore has no CLR number.

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Condition Assessment Data

PT#	CLR#	AR#	SCIENTIFIC NAME	COMMON NAME	PR	CB	RE	NOTES
1	A101	1	Abies balsamea	Balsam Fir	P-1			Remove overhanging oak limb.
2	A101	1	Abies balsamea	Balsam Fir	P-1			Remove overhanging oak limb.
3	A114	1	Pinus strobus	White Pine			Re	Poor form. Encourage adjacent Abies.
4	A118	1	Quercus rubra	Red Oak	P-1d			Remove leader with split.
5	A207	1	Sambucus pubens	American Red Elderberry				
6	B206	1	Euonymus alata	Winged Spindle Tree				
7	A101	1	Abies balsamea	Balsam Fir	P-3d		Re	Cavity at base.
8	A101	1	Abies balsamea	Balsam Fir				Basal bark wound, poor health.
9	B215	1	Viburnum opulus	European Cranberrybush Viburnum				
10	A207	1	Sambucus pubens	American Red Elderberry	P-3			Prune for separation.
11	A203	1	Kalmia latifolia	Mountain Laurel	P-2			Prune for rejuvenation.
12	A101	1	Abies balsamea	Balsam Fir				Poor health.
13	B207	1	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea	P-2			Prune for separation.
14	B216	1	Viburnum plicatum var. tomentosum	Doublefile Viburnum				Give more light.
15	B115	1	Taxus cuspidata	Japanese Yew	P-2			Prune broken top.
16	A103	1	Acer rubrum	Red Maple	P-2d			Power line topped. Poor pruning practices.
17	B206	1	Euonymus alata	Winged Spindle Tree				
18	B206	1	Euonymus alata	Winged Spindle Tree				
19	B207	1	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea	P-2			Prune for separation. Needs more light.
20	B212	1	Syringa josikaea	Hungarian Lilac				
21	B206	1	Euonymus alata	Winged Spindle Tree				
22	B105	1	Fagus sylvatica	European Beech				Leaves small and chewed. Confirm I D.
23	B207	1	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea				
24	A115	1	Quercus alba	White Oak	P-3d			Prune storm-broken limb and deadwood.
25	B102	1	Chamaecyparis obtusa	Hinoki Falsecypress	P-3d			Clear volume surrounding tree.
26	B206	1	Euonymus alata	Winged Spindle Tree	P-2			Remove volume surrounding shrub.
27	B212	1	Syringa josikaea	Hungarian Lilac				Remove volumes surrounding shrub.
28	B108	1	Picea pungens	Colorado Blue Spruce	P-1d			
29	B108	1	Picea pungens	Colorado Blue Spruce	P-1d			
30	A118	1	Quercus rubra	Red Oak	P-3d			

LEGEND: PT# - Plant ID# CLR# - CLR Species ID# AR# - Area# PR - Needs Pruning CB - Needs Cabling Re - Needs Removed d - Contains Deadwood

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Condition Assessment Data

PT#	CLR#	AR#	SCIENTIFIC NAME	COMMON NAME	PR	CB	RE	NOTES
31	A123	1	Tsuga canadensis	Eastern Hemlock				Adelgid. Lots of deadwood.
32	A114	1	Pinus strobus	White Pine	P-2d	C-1		Lots of deadwood in view.
33	A114	1	Pinus strobus	White Pine	P-1d	C-1		Deadwood and cracked limbs in view.
34	A115	1	Quercus alba	White Oak				Basal bark injury.
35	A122	1	Tilia americana	Basswood	P-1			Prune to reveal view.
36	A118	1	Quercus rubra	Red Oak	P-1d			
37	A118	1	Quercus rubra	Red Oak	P-2			Prune to reveal view.
38	A117	1	Quercus prinus	Chestnut Oak				
39	A117	1	Quercus prinus	Chestnut Oak	P-3			Prune small leader. Two leaders.
40	A118	1	Quercus rubra	Red Oak	P-2d			Large amount of deadwood.
41	A123	3	Tsuga canadensis	Eastern Hemlock	P-1d	C-1		Adelgid. Storm damage. Prominent location.
42	A103	3	Acer rubrum	Red Maple		C-1		Cracked leaders.
43	B106	3	Fagus sylvatica 'Atropurpurea'	Purple Beech				Leaves small and chewed.
44	B106	3	Fagus sylvatica 'Atropurpurea'	Purple Beech	P-3d	C-1		Leaves small and chewed.
45	A108	3	Fagus grandifolia	American Beech	P-3d	C-1		
46	B105	3	Fagus sylvatica	European Beech	P-2d	C-1		Large amount of deadwood.
47	A120	3	Sorbus americana	American Mountain Ash				Cut surrounding volunteers to give light.
48	B103	3	Chamaecyparis pisifera 'Squarrosa'	Sawara Cypress	P-1d			Remove dead vine. Top broken out. Great
49	B108	3	Picea pungens	Colorado Blue Spruce	P-2d			Remove vines.
50	B113	3	Taxus baccata	English Yew	P-1d			Remove vine.
51	A110	4	Ilex monticola	Mountain Winterberry	P-3d			Prune broken branches and vines.
52	A110	4	Ilex monticola	Mountain Winterberry	P-1d			Prune broken branches and vines.
53	A110	4	Ilex monticola	Mountain Winterberry	P-2			Prune broken branches and vines.
54	A121	4	Thuja occidentalis	American Arborvitae	P-1			Remove vines & deadwood. Very poor
55	B201	4	Berberis thunbergii	Japanese Barberry	P-3			Prune dead canes.
56	B208	4	Kolkwitzia amabilis	Beautybush				Remove vines.
57	B208	4	Kolkwitzia amabilis	Beautybush	P-1			Prune for rejuvenation.
58	B208	4	Kolkwitzia amabilis	Beautybush	P-1			Prune for rejuvenation.
59	A118	4	Quercus rubra	Red Oak	P-2d			Remove vines and overhanging branches.
60	B215	4	Viburnum opulus	European Cranberrybush Viburnum	P-3d			

LEGEND: PT# - Plant ID# CLR# - CLR Species ID# AR# - Area# PR - Needs Pruning CB - Needs Cabling Re - Needs Removed d - Contains Deadwood

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Condition Assessment Data

PT#	CLR#	AR#	SCIENTIFIC NAME	COMMON NAME	PR	CB	RE	NOTES
61	A117	4	Quercus prinus	Chestnut Oak	P-3d			
62	A118	4	Quercus rubra	Red Oak	P-3d			
63	A107	4	Cladrastis lutea	Yellowwood				Remove adjacent dead hemlock.
64	B209	4	Philadelphus coronarius	Sweet Mock Orange	P-1d			Remove dead hemlock for light.
65	B213	4	Syringa vulgaris	Common Lilac	P-2			Rejuvenate. Remove neighboring oak.
66	B215	4	Viburnum opulus	European Cranberrybush Viburnum	P-3d			
67	B213	4	Syringa vulgaris	Common Lilac	P-2			Rejuvenate.
68	B215	4	Viburnum opulus	European Cranberrybush Viburnum				
69	B112	4	Sorbus hybrida	Oakleaf Mountain Ash		C-1		
70	A109	4	Fraxinus americana	White Ash	P-3d			Remove dead low branch & other dead wood.
71	A118	4	Quercus rubra	Red Oak		C-2		Double leader. Split crotch.
72	A118	4	Quercus rubra	Red Oak	P-2			Major deadwood.
73	A123	4	Tsuga canadensis	Eastern Hemlock	P-2d			Adelgid. Prune deadwood for appearance.
74	A123	4	Tsuga canadensis	Eastern Hemlock	P-2d			Remove two smaller dead leaders.
75	A123	4	Tsuga canadensis	Eastern Hemlock	P-2d			
76	A114	4	Pinus strobus	White Pine	P-2d			
77	A123	6	Tsuga canadensis	Eastern Hemlock	P-2			Prune two splitty crotch branches near base.
78	A103	6	Acer rubrum	Red Maple	P-1d			
79	A123	6	Tsuga canadensis	Eastern Hemlock			Re	
80	A205	6	Rhododendron maximum	Rosebay Rhododendron	P-2d			
81	A114	6	Pinus strobus	White Pine	P-1d			Very spready crown. Large amounts
82	A123	6	Tsuga canadensis	Eastern Hemlock	P-3d			
83	B207	6	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea	P-3d			Remove adjacent hemlock to give light.
84	B101	6	Chamaecyparis nootkatensis	Nootka Cypress	P-2d			Remove volumes for more light.
85	B204	6	Cornus kousa	Kousa Dogwood	P-1			Prune overhanging hemlock branches.
86	B208	6	Kolkwitzia amabilis	Beautybush				Remove volumes & overhanging hemlock
87	B215	6	Viburnum opulus	European Cranberrybush Viburnum				Remove volunteers.
88	B208	6	Kolkwitzia amabilis	Beautybush				Remove volunteers.
89	A114	6	Pinus strobus	White Pine	P-2d	C-2		
90	A114	6	Pinus strobus	White Pine	P-2d	C-3		

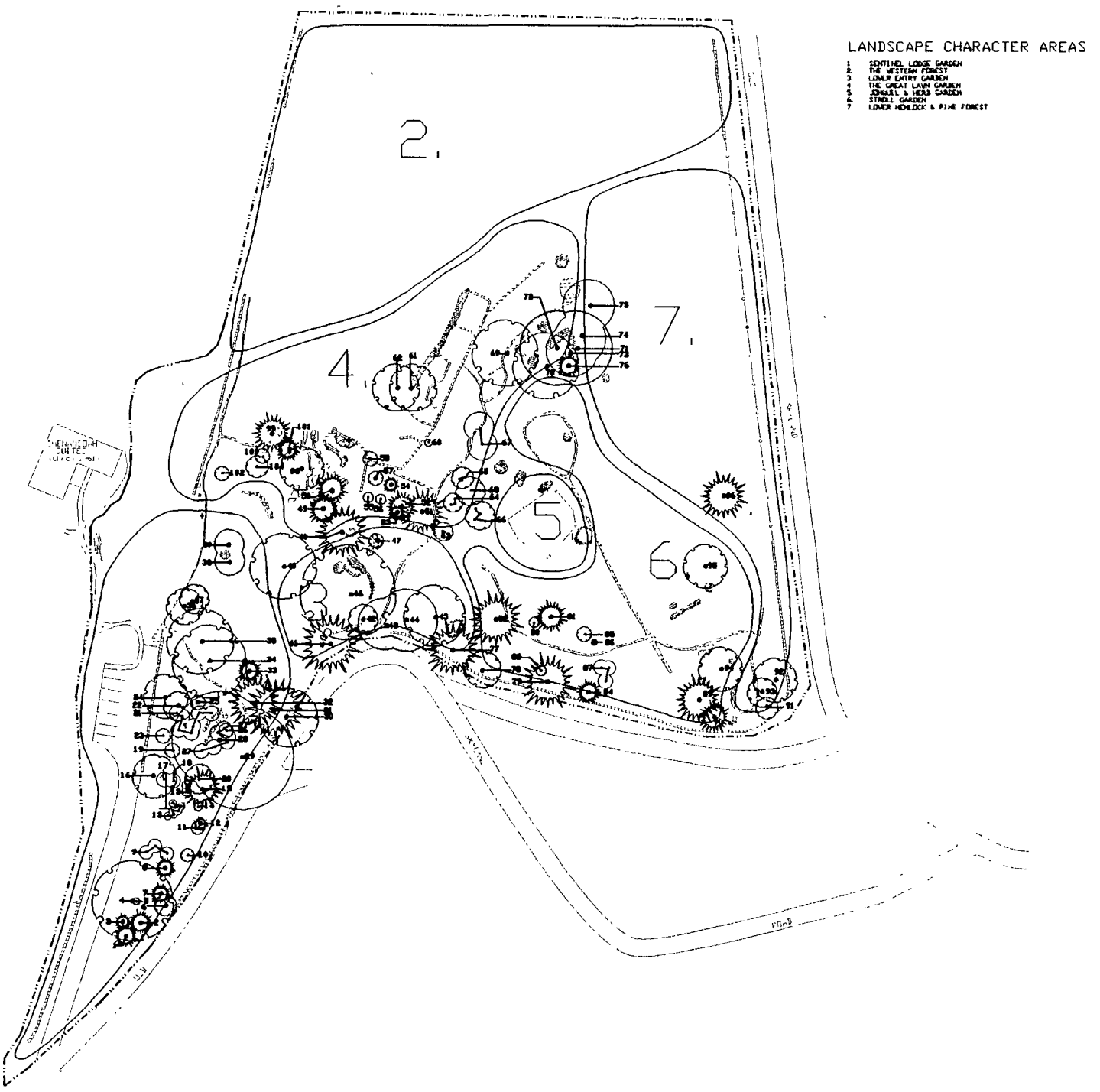
LEGEND: PT# - Plant ID# CLR# - CLR Species ID# AR# - Area# PR - Needs Pruning CB - Needs Cabling Re - Needs Removed d - Contains Deadwood

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Condition Assessment Data

PT#	CLR#	AR#	SCIENTIFIC NAME	COMMON NAME	PR	CB	RE	NOTES
91	B204	6	Cornus kousa	Kousa Dogwood	P-1d			
92	A104	6	Acer saccharum	Sugar Maple	P-2d			Basal bark wound and cavity.
93	A118	6	Quercus rubra	Red Oak				
94	A118	6	Quercus rubra	Red Oak			Re	Armallaria root rot.
95	A118	6	Quercus rubra	Red Oak	P-2d			Large walk in cavity.
96	-	6	Picea abies	Norway Spruce	P-3d			
97	A123	6	Hemlock Forest					Adelgid. Treatment plan needed.
98	A118	6	Quercus rubra	Red Oak	P-3d			Remove select branches to view from steps.
99	A110	1	Ilex monticola	Mountain Winterberry				Remove volumes for more light.
100	A203	1	Kalmia latifolia	Mountain Laurel				Remove fallen dead tree & vols. for more light.
101	A101	1	Abies balsamea	Balsam Fir	P-2d			Remove volumes for more light.
102	A202	1	Hamamelis virginiana	Common Witchhazel				Remove volumes for more light.
103	A101	1	Abies balsamea	Balsam Fir	P-1d			Poor health. Remove volumes for more light.
104	A202	1	Hamamelis virginiana	Common Witchhazel				Poor form. Remove volumes for more light.

LEGEND: PT# - Plant ID# CLR# - CLR Species ID# AR# - Area# PR - Needs Pruning CB - Needs Cabling Re - Needs Removed d - Contains Deadwood

Historic Vegetation Inventory Map



Historic Vegetation Inventory Plant List: Native & Exotic Species

TREES

PTS	CLRS	SCIENTIFIC NAME	COMMON NAME
1	A101	Abies balsamea	Balsam Fir
2	A101	Abies balsamea	Balsam Fir
3	A114	Pinus strobus	White Pine
4	A118	Quercus rubra	Red Oak
7	A101	Abies balsamea	Balsam Fir
8	A101	Abies balsamea	Balsam Fir
12	A101	Abies balsamea	Balsam Fir
16	A103	Acer rubrum	Red Maple
22	B105	Fagus sylvatica	European Beech
24	A115	Quercus alba	White Oak
25	B108	Chamaecyparis obtusa	Hinoki Falsecypress
28	B108	Picea pungens	Colorado Blue Spruce
29	B108	Picea pungens	Colorado Blue Spruce
30	A118	Quercus rubra	Red Oak
31	A123	Tsuga canadensis	Eastern Hemlock
32	A114	Pinus strobus	White Pine
33	A114	Pinus strobus	White Pine
34	A115	Quercus alba	White Oak
35	A122	Tilia americana	Basswood
36	A118	Quercus rubra	Red Oak
37	A118	Quercus rubra	Red Oak
38	A117	Quercus prinus	Chestnut Oak
39	A117	Quercus prinus	Chestnut Oak
40	A118	Quercus rubra	Red Oak
41	A123	Tsuga canadensis	Eastern Hemlock
42	A103	Acer rubrum	Red Maple
43	B106	Fagus sylvatica 'Atropurpurea'	Purple Beech
44	B106	Fagus sylvatica 'Atropurpurea'	Purple Beech
45	A108	Fagus grandifolia	American Beech
46	B105	Fagus sylvatica	European Beech
48	B103	Chamaecyparis pisifera 'Squarrosa'	Sawara Cypress
49	B108	Picea pungens	Colorado Blue Spruce
54	A121	Thuja occidentalis	American Arborvitae
59	A118	Quercus rubra	Red Oak
61	A117	Quercus prinus	Chestnut Oak
62	A118	Quercus rubra	Red Oak
63	A107	Cladrastis lutea	Yellowwood
69	B118	Sorbus hybrida	Oakleaf Mountain Ash
70	A109	Fraxinus americana	White Ash
71	A118	Quercus rubra	Red Oak
72	A118	Quercus rubra	Red Oak
73	A123	Tsuga canadensis	Eastern Hemlock
74	A123	Tsuga canadensis	Eastern Hemlock
75	A123	Tsuga canadensis	Eastern Hemlock
76	A114	Pinus strobus	White Pine
77	A123	Tsuga canadensis	Eastern Hemlock
78	A103	Acer rubrum	Red Maple
79	A123	Tsuga canadensis	Eastern Hemlock
81	A114	Pinus strobus	White Pine
82	A123	Tsuga canadensis	Eastern Hemlock
84	B101	Chamaecyparis nootkatensis	Nootka Cypress
85	B204	Cornus kousa	Kousa Dogwood
89	A114	Pinus strobus	White Pine
90	A114	Pinus strobus	White Pine
91	B204	Cornus kousa	Kousa Dogwood
92	A104	Acer saccharum	Sugar Maple
93	A118	Quercus rubra	Red Oak
94	A118	Quercus rubra	Red Oak
95	A118	Quercus rubra	Red Oak
96	-	Picea abies	Norway Spruce
98	A118	Quercus rubra	Red Oak
101	A101	Abies balsamea	Balsam Fir
103	A101	Abies balsamea	Balsam Fir

SHRUBS

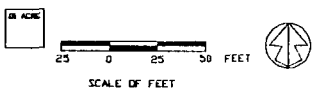
PTS	CLRS	SCIENTIFIC NAME	COMMON NAME
5	A207	Sambucus pubens	American Red Elderberry
6	B206	Euonymus alata	Winged Spindle Tree
9	B215	Viburnum opulus	European Cranberrybush Viburnum
10	A207	Sambucus pubens	American Red Elderberry
11	A203	Kalmia latifolia	Mountain Laurel
13	B207	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea
14	B216	Viburnum plicatum var. tomentosum	Doublefile Viburnum
15	B115	Taxus cuspidata	Japanese Yew
17	B206	Euonymus alata	Winged Spindle Tree
18	B206	Euonymus alata	Winged Spindle Tree
19	B207	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea
20	B212	Syringa josikaea	Hungarian Lilac
21	B206	Euonymus alata	Winged Spindle Tree
23	B207	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea
26	B206	Euonymus alata	Winged Spindle Tree
27	B212	Syringa josikaea	Hungarian Lilac
47	A120	Sorbus americana	American Mountain Ash
50	B113	Taxus baccata	English Yew
51	A110	Ilex montana	Mountain Winterberry
52	A110	Ilex montana	Mountain Winterberry
53	A110	Ilex montana	Mountain Winterberry
55	B201	Berberis thunbergii	Japanese Barberry
56	B208	Kolkwitzia amabilis	Beautybush
57	B208	Kolkwitzia amabilis	Beautybush
58	B208	Kolkwitzia amabilis	Beautybush
60	B215	Viburnum opulus	European Cranberrybush Viburnum
64	B209	Philadelphus coronarius	Sweet Mock Orange
65	B213	Syringa vulgaris	Common Lilac
66	B215	Viburnum opulus	European Cranberrybush Viburnum
67	B213	Syringa vulgaris	Common Lilac
68	B215	Viburnum opulus	European Cranberrybush Viburnum
80	A205	Rhododendron maximum	Rosebay Rhododendron
83	B207	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea
86	B208	Kolkwitzia amabilis	Beautybush
87	B215	Viburnum opulus	European Cranberrybush Viburnum
88	B208	Kolkwitzia amabilis	Beautybush
99	A110	Ilex montana	Mountain Winterberry
100	A203	Kalmia latifolia	Mountain Laurel
102	A202	Hamamelis virginiana	Common Witchhazel
104	A202	Hamamelis virginiana	Common Witchhazel

LEGEND

- Topography 1' Contour Interval
- Judd Gardens Study Area
- Rock Outcrop
- Rock Pile
- Stone Wall (Circa 1910)
- Stone Steps (Circa 1910)
- Post & Wire Fence Remnant (Circa 1920)
- Post & Rail Fence Remnant (Circa 1920)
- Bench Remnant (Circa 1980)
- Road Remnant (Circa 1980)
- Path Remnant (Circa 1980)
- Irrigation System Remnant (Circa 1920)
- Planting Bed (Circa 1920)
- Parking Area
- Man Hole Cover
- Fire Hydrant
- Equipment Enclosure
- Existing Building

●	■	• Trees
•	•	• Shrubs
○	□	△ Herbaceous Material (Individuals)
		Herbaceous Material (Massings)
●	■	▲ Dead Plant Material
A	B	C

All plant nomenclature used in the plant list for the Judd Gardens report is acceptable nomenclature referenced in Grays Manual of Botany, Hortus Third, A Concise Dictionary of Plants Cultivated in the United States and Canada, and as reviewed by Peter Hatch, botanist at the U.S. National Arboretum in Washington, D.C.



BASE MAP SOURCE:
EXISTING CONDITIONS INFORMATION IS BASED ON USGS SURVEY, BIG MEADOWS, VIRGINIA QUADRANGLE, 1965, REVISED 1979, AND FIELD WORK UNDERTAKEN BY HABS/HAER WITH LAND AND COMMUNITY ASSOCIATES, SPRING 1989

THIS MAP IS FOR PLANNING PURPOSES ONLY

LANDSCAPE DRAWINGS PREPARED FOR NATIONAL PARK SERVICE PHILADELPHIA, PENNSYLVANIA BASEMAP PREPARED BY LAND AND COMMUNITY ASSOCIATES CHARLOTTESVILLE, VIRGINIA PH 804/296-3808 JUNE 1989 BASEMAP EDITED BY NATIONAL PARK SERVICE CHESAPEAKE SYSTEM SUPPORT OFFICE-1997	LOCATION WITHIN PARK JUDD GARDENS PROPOSED SKYLAND HISTORIC DISTRICT NAME OF PARK SHENANDOAH NATIONAL PARK REGION: MID-ATLANTIC COUNTY: PAGE STATE: VIRGINIA	SUB SHEET NO	TITLE OF SHEET HISTORIC PLANTING A & B CLASSES	DRAWING NO. PKG. NO. — SHEET — OF —

Action Priority Plan

This report emphasizes the immediate management needs of significant trees and shrubs at Judd Gardens, combined with a realistic approach towards tree hazards that may pose a threat to visitor safety. The following reports have been generated from the database of information collected at both the plant identification and condition assessment phases.

1. Pruning Report: There are 68 trees and shrubs that are recommended for pruning. Each plant has been assigned a priority rating from 1 to 3 to indicate the urgency for pruning with 1 being the most urgent.
2. Cabling Report: There are 11 trees having one or more weak junctions which can be effectively strengthened through the use of flexible steel wire cables. This is important to reduce hazard potential and to conserve the tree. Like the pruning data, each plant has been assigned a priority rating from 1 to 3 to indicate the urgency for cabling with 1 being the most urgent.
3. Removal Report: 4 trees are recommended for removal.

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Pruning Priority

PT#	CLR#	AR#	SCIENTIFIC NAME	PRIORITY
1	A101	1	Abies balsamea	P-1
2	A101	1	Abies balsamea	P-1
35	A122	1	Tilia americana	P-1
54	A121	4	Thuja occidentalis	P-1
57	B208	4	Kolkwitzia amabilis	P-1
58	B208	4	Kolkwitzia amabilis	P-1
85	B204	6	Cornus kousa	P-1
			PRIORITY COUNT	7
4	A118	1	Quercus rubra	P-1d
28	B108	1	Picea pungens	P-1d
29	B108	1	Picea pungens	P-1d
33	A114	1	Pinus strobus	P-1d
36	A118	1	Quercus rubra	P-1d
41	A123	3	Tsuga canadensis	P-1d
48	B103	3	Chamaecyparis pisifera 'Squarrosa'	P-1d
50	B113	3	Taxus baccata	P-1d
52	A110	4	Ilex monticola	P-1d
64	B209	4	Philadelphus coronarius	P-1d
78	A103	6	Acer rubrum	P-1d
81	A114	6	Pinus strobus	P-1d
91	B204	6	Cornus kousa	P-1d
103	A101	1	Abies balsamea	P-1d
			PRIORITY COUNT	14
11	A203	1	Kalmia latifolia	P-2
13	B207	1	Hydrangea paniculata 'Grandiflora'	P-2
15	B115	1	Taxus cuspidata	P-2
19	B207	1	Hydrangea paniculata 'Grandiflora'	P-2
26	B206	1	Euonymus alata	P-2
37	A118	1	Quercus rubra	P-2
53	A110	4	Ilex monticola	P-2
65	B213	4	Syringa vulgaris	P-2
67	B213	4	Syringa vulgaris	P-2
72	A118	4	Quercus rubra	P-2
77	A123	6	Tsuga canadensis	P-2
			PRIORITY COUNT	11
16	A103	1	Acer rubrum	P-2d
32	A114	1	Pinus strobus	P-2d
40	A118	1	Quercus rubra	P-2d
46	B105	3	Fagus sylvatica	P-2d
49	B108	3	Picea pungens	P-2d

LEGEND: PT# - Plant Identification Tag Number CLR# - CLR Species Identification Number AR# - Area Number

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Pruning Priority

PT#	CLR#	AR#	SCIENTIFIC NAME	PRIORITY
59	A118	4	Quercus rubra	P-2d
73	A123	4	Tsuga canadensis	P-2d
74	A123	4	Tsuga canadensis	P-2d
75	A123	4	Tsuga canadensis	P-2d
76	A114	4	Pinus strobus	P-2d
80	A205	6	Rhododendron maximum	P-2d
84	B101	6	Chamaecyparis nootkatensis	P-2d
89	A114	6	Pinus strobus	P-2d
90	A114	6	Pinus strobus	P-2d
92	A104	6	Acer saccharum	P-2d
95	A118	6	Quercus rubra	P-2d
101	A101	1	Abies balsamea	P-2d
			PRIORITY COUNT	**17**
10	A207	1	Sambucus pubens	P-3
39	A117	1	Quercus prinus	P-3
55	B201	4	Berberis thunbergii	P-3
			PRIORITY COUNT	**3**
7	A101	1	Abies balsamea	P-3d
24	A115	1	Quercus alba	P-3d
25	B102	1	Chamaecyparis obtusa	P-3d
30	A118	1	Quercus rubra	P-3d
44	B106	3	Fagus sylvatica 'Atropurpurea'	P-3d
45	A108	3	Fagus grandifolia	P-3d
51	A110	4	Ilex monticola	P-3d
60	B215	4	Viburnum opulus	P-3d
61	A117	4	Quercus prinus	P-3d
62	A118	4	Quercus rubra	P-3d
66	B215	4	Viburnum opulus	P-3d
70	A109	4	Fraxinus americana	P-3d
82	A123	6	Tsuga canadensis	P-3d
83	B207	6	Hydrangea paniculata 'Grandiflora'	P-3d
96	-	6	Picea abies	P-3d
98	A118	6	Quercus rubra	P-3d
			PRIORITY COUNT	**16**

LEGEND: PT# - Plant Identification Tag Number CLR# - CLR Species Identification Number AR# - Area Number

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Cabling Priority

PT#	CLR#	AR#	SCIENTIFIC NAME	PRIORITY
32	A114	1	Pinus strobus	C-1
33	A114	1	Pinus strobus	C-1
41	A123	3	Tsuga canadensis	C-1
42	A103	3	Acer rubrum	C-1
44	B106	3	Fagus sylvatica 'Atropurpurea'	C-1
45	A108	3	Fagus grandifolia	C-1
46	B105	3	Fagus sylvatica	C-1
69	B112	4	Sorbus hybrida	C-1
			PRIORITY COUNT	**8**
71	A118	4	Quercus rubra	C-2
89	A114	6	Pinus strobus	C-2
			PRIORITY COUNT	**2**
90	A114	6	Pinus strobus	C-3
			PRIORITY COUNT	**1**

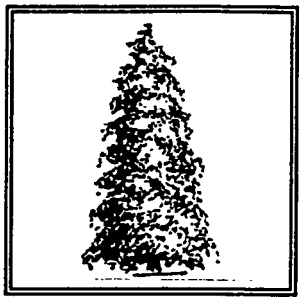
LEGEND: PT# - Plant Identification Tag Number CLR# - CLR Species Identification Number AR# - Area Number

Judd Gardens - Shenandoah National Park
Historic Vegetation Inventory - Removal Data

PT#	CLR#	AR#	SCIENTIFIC NAME	REMOVALS
3	A114	1	Pinus strobus	Re
7	A101	1	Abies balsamea	Re
79	A123	6	Tsuga canadensis	Re
94	A118	6	Quercus rubra	Re
			TOTAL REMOVALS	4

LEGEND: PT# - Plant Identification Tag Number CLR# - CLR Species Identification Number AR# - Area Number

Chamaecyparis nootkatensis (*Nootka Falsecypress*):



Origin: Coastal Alaska to Washington, Cascades to Oregon. Introduced in 1853.

Relationship: A member of family Cupressaceae. Leaves are scale like, opposite, 1/8-1/4" long, and smell rank when bruised. Color is dark blue green to grey green. Cones are 1/3-1/2" across and ripen in the second year. Branches are graceful and pendulous with rich foliage.

Ecology: Requires abundant soil and atmospheric moisture, full sun, cool temperatures, and protection from drying winds.

Propagation: Seed germination is low due to poor seed quality and embryo dormancy factors. Seeds need 2-3 months at 41 degrees F. Cuttings are principal method.

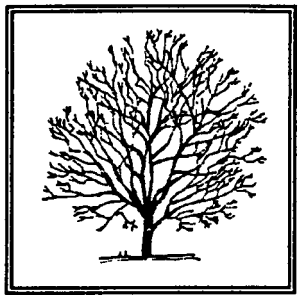
Utility: As a genus, Chamaecyparis is less important landscape-wise than Thuja, Juniperus, and Taxus. It is more environmentally demanding. Can provide good hedges and screens, sometimes fine specimen plantings.

Insects: None serious

Disease: Blight, Witches Broom, Gall

Other: Pruning is best accomplished in the spring although branches can be removed at any time. If not properly cared for, Falsecypress can become a bit ratty.

Cladrastis kentukea (*American Yellowwood*):



Origin: North Carolina to Kentucky and Tennessee. Scattered east of the Mississppi River. Introduced in 1812.

Relationship: A member of the Fabacea family. Leaves are alternate, odd-pinnate compound with 7-9 leaflets. Bark is smooth and gray to light brown, resembling that of a Beech. Flowers in 8-14" long panicles in May to early June. Bees frequent the white, fragrant bloosoms. Flowers yield a 2 1/2-4" brown pod in October containing 2 flat seeds.

Ecology: Native to rich, well-drained limestone soils along cliffs and ridges. Tolerates variety in pH. Requires full sun.

Propagation: Scarify seed with sulfuric acid for 30-60 minutes in addition to scarification in moist sand or peat for 90 days at 41 degrees F. Seed coats are extremely hard and must be rendered impermeable.

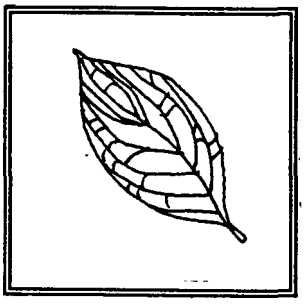
Utility: Excellent native tree for flowers and foliage. Nice fall color. May fix atmospheric nitrogen.

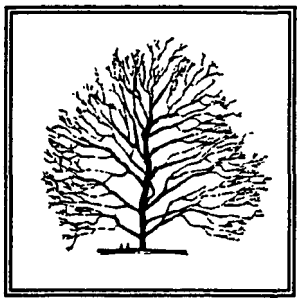
Insects: None serious

Disease: None serious

Other: Prune only in summer as Yellowwood bleeds profusely during winter and spring. Bad crotches may develop which are vulnerable to storm damage.

Cornus kousa (*Kousa Dogwood*):





Origin: Japan, Korea, China. Introduced in 1875.

Relationship: A member of family Cornacea. Dark green leaves are opposite and simple. Bark exfoliates with age and becomes richly mottled. Very horizontal lines become evident with age. Flowers are borne in a white infloresence in June. Pink red to red 1/2-1" drupe follws in late August to October.

Ecology: Absolutely requires acid, well-drained soil. Performs best in sandy soil with lots of organic matter. Requires a sunny location. Relatively drought resistant.

Propagation: Cuttings are difficult. However, seeds are easily germinated in 3 months at 41 degrees F.

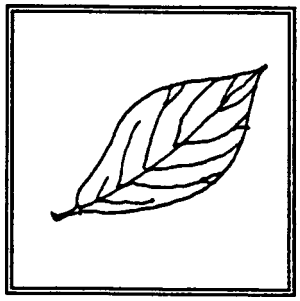
Utility: A handsome specimen tree, Kousa Dogwood also successfully breaks up large expanses of wall and vertical elements with its horizontal branching pattern. Works well in a shrub border.

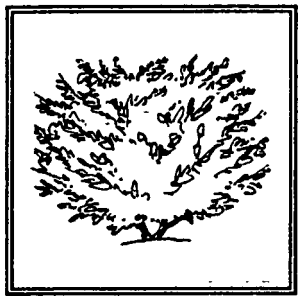
Insects: Borer

Disease: None serious

Other: This is a very handsome tree in winter due to its branching character.

Euonymus alatus (*Winged Euonymus*):





Origin: Introduced in 1860 from Northest Asia and Central China.

Relationship: A member of family Celatraceae. Winged Euonymus has opposite, simple medium green leaves and stems armed with 2 to 4 corky wings. The wings are 1/4-1/2" broad.

Ecology: This is a plant that is very adaptable. It does well in heavy shade and adapts well to pH levels. It does not tolerate water logged soils.

Propagation: Seeds need to be provided with 1-3 months of cold, moist stratification. Cuttings can be taken at any time when the plant is in mid-leaf with a 1000 ppm to 3000 ppm IBA quick dip. In 90-120 days bud break of the terminal and lateral buds should take place at 40 degrees F.

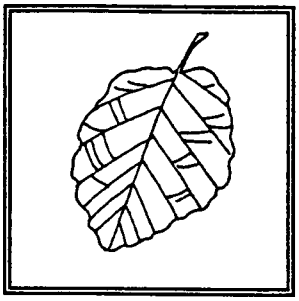
Utility: Winged Euonymus has both a handsome form and a brilliant red fall color which causes it to be much overused. It is an excellent plant for hedging and screening, as it is dense in texture in all seasons.

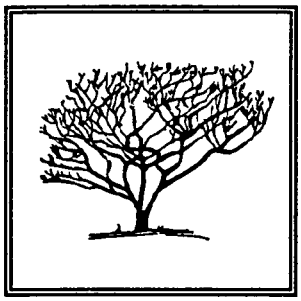
Insects: None serious

Disease: None serious

Other: Ideally, this plant needs to be watered and mulched in hot, dry conditions. It withstands heavy pruning.

Hamamelis virginiana (*Common Witchhazel*):





Origin: Canada to Georgia, west to Nebraska and Arkansas. Introduced in 1736.

Relationship: A member of family Hamamelidacea. Alternate, coarsely edged, thin leaves. Irregular form and open crown. Yellow, fragrant flowers appear in November. Dry, brown capsule is 1/2" long and discharges seed with a pop.

Ecology: Native to the inundated banks of streams. Requires moist soil and avoidance of drought conditions. Tolerates full sun or shade.

Propagation: Seed is difficult due to dormancy requirements. 60 days at 68 degrees F and 90 days at 41 degrees F .

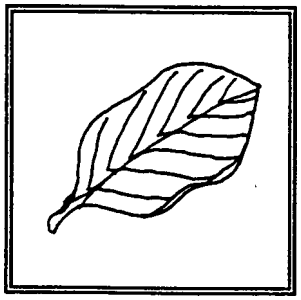
Utility: Witchhazel extract is distilled from the bark of young stems and roots. Valuable in naturalized situations. The leaves turn a lovely golden yellow in the fall. Flowers add winter color to the landscape.

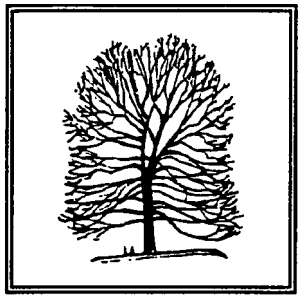
Insects: None serious

Disease: None serious.

Other: Witchhazel tends towards gangly openness but is still an attractive shrub.

Fagus sylvatica 'atropurpurea' (*Purple Leaf Beech*):





Origin: Thuringia, before 1772.

Realtionship: A member of the Fagacea family. Alternate, simple leaves are often black-red when young, changing to purple-green with age. Tends to branch towards the ground. Smooth gray bark is distinctive. Two triangular nuts, each 5/8" long, are enclosed in a long 4-lobed husk covered in bristles.

Ecology: Well-drained, acid soil is preferable. Will not tolerate wet or compacted soils. Due to a shallow root system, grass is difficault to grow underneath a Beech. Best in full sun, but tolerates shade.

Propagation: Seed should be stratified 3-5 months at 41 degrees F or fall sown. Reproduces somewhat true to type.

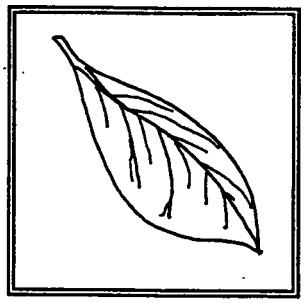
Utility: An extremely fine specimen tree. Beautiful color. High value to wildlife.

Insects: None serious

Disease: Beech Bark Disease

Other:

Kalmia latifolia (*Mountain Laurel*):



Origin: Quebec and New Brunswick to Florida, west to Ohio and Tennesee. Introduced in 1734.

Relationship: A member of family Ericacea. A broadleaf evergreen. Leathery leaves are alternate and simple, but appear whorled. Color is dark green above and yellow green below. With age, Mountain Laurel develops its characteristic gnarled trunks and limbs. In May to June, flowers are borne in 4-6" corymbs. Color may range from white to deep rose.

Ecology: Prefers acid, cool, moist, well-drained soil. Tolerates full sun or deep shade. Mulch to keep soil moist.

Propagation: Seed should be directly sown on peat with lights to stimulate growth after germination. Cuttings are extremely difficult to root.

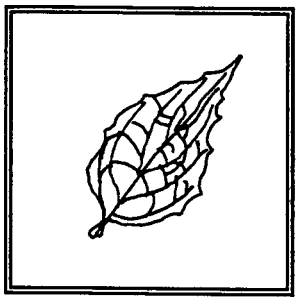
Utility: One of our best loved native shrubs.Mountain Laurel is terrific in masses and excellent for naturalizing

Insects: Whitefly, Scale, Lacebug, Azalea Stem Borer, Rhododendron Borer.

Disease: Leaf Spot, Blight, Flower Blight

Other: Winter foliage color is usually a dark green but in sun will become yellowish. Flowers best in sunny locations. Remove flowers after they have faded.

Kolkwitzia amabilis (*Beautybush*):



Origin: Central China. Introduced in 1901.

Relationship: A member of the family Caprifoliacea. Leaves are opposite, simple, 1-3" long, dull green, and sparingly hairy. Pink bell shaped flowers arranged in 2-3" corymbs are in evidence in May-June. Bark is exfoliating. After flowering, a bristly, ovoid capsule is persistent.

Ecology: Beautybush is easily transplanted into well-drained soil. Requires full sun for best flowering. pH adaptable.

Propagation: Best to use softwood cuttings which root readily.

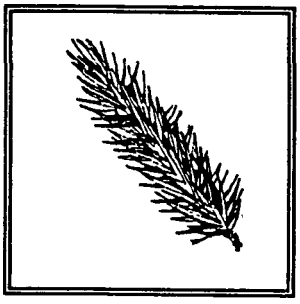
Utility: Beautybush is seldom encountered in todays modern American landscape. It is a coarse plant, but lovely in flower.

Insects: None serious

Disease: None serious

Other: Older stems need pruning every other year. Renew plant by pruning to the ground after flowering. Flowers on old wood.

Picea pungens (*Colorado Spruce*):



Origin: Southwest US. Rocky Mountains from Colorado, and Utah to New Mexico and Wyoming. Introduced in 1862.

Relationship: A member of the Pinacea family. Needles are rigid and prickly with 4 distinct sides. Color ranges from dull green to blue or silver white. Cylindrical cones are 2-4" long. Pale, shiny brown scales are wavy and jaggedly toothed at the apex.

Ecology: Prefers rich, moist soil in full sun. Colorado Spruce is naturally found on moist valley slopes and cool bottms along streams. However, it is very adaptable and more drought tolerant than others of the species. It is sensitive to air pollution.

Propagation: Seed requires no pre-treatment. Most cultivars are grafted onto seedling understock.

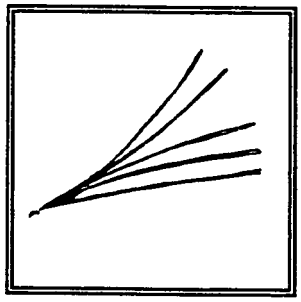
Utility: This spruce is much overused as a landscape specimen plant, particularly in residential environments. It is common to midwestern windbreaks and has high value for songbirds, small mammals and hoofed browsers.

Insects: Spruce Gall Aphid (Tips of branches die)

Disease: Canker, Needle Casts, Rust, Wood Decay

Other: Long lived. Common to survive more than 400 years. Lower limbs are often defoliated. More difficult to transplant than other spruces.

Pinus strobus (*Eastern White Pine*):



Origin: Native from Newfoundland to Manitoba and south to Georgia, Illinois and Iowa. Introduced around 1705.

Relationship: A member of the Pinaceae family,Eastern White Pine has 2-4" bluish-green needles in bunches of five. The tan, cylindrical cones are 6-8" long and slightly curved. The mature form is generally assymetrical and very distinctive when compared with other conifers.

Ecology: White Pine demands hight light levels and a humid atmosphere and the best growth occurs in a fertile, well-drained soil. It is extremely intolerant of air pollution and salts.

Propagation: Seeds require stratification for 60 days. Cuttings are difficult to root. In the wild, White Pine is an extremely agressive self-seeder.

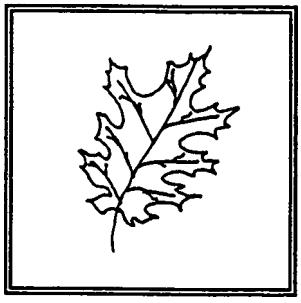
Utility: A handsome and ornamental specimen, White Pine is one of our most beautiful and fastest growing native pines. The cones are produced at an early age and are valued by all kinds of wildlife as a reliable food source.

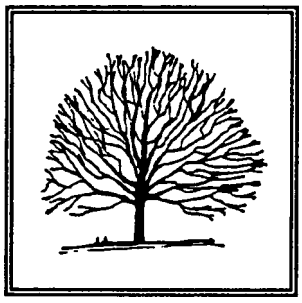
Insects: White Pine Weevil (kills terminal shoots and deforms the tree).

Disease: White Pine Blister Rust (bark disease that eventually kills the tree).

Other: White Pines are very susceptible to wind. Branches are often lost in stormy weather. Chlorosis may develop in high pH soils.

Quercus rubra (*Red Oak*):





Origin: Nova Scotia to Pennsylvania and west to Minnesota and Iowa. Introduced in 1800.

Relationship: A member of the Fagaceae family, Red Oak has alternate, sharply lobed dark green leaves. The medium brown nut is 3/4-1" long and enclosed at the base in a flat, saucer-shaped cup.

Ecology: Red Oak transplants easily and prefers well- drained, acid soils with full sun. It tolerates air pollution well.

Propagation: Seeds require 30-45 days at 41 degrees F.

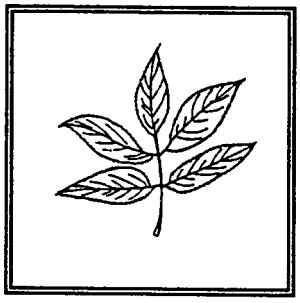
Utility: Red Oak is a valuable, fast growing species which is often used as a street tree. It has a high wildlife value for a wide variety of wildlife.

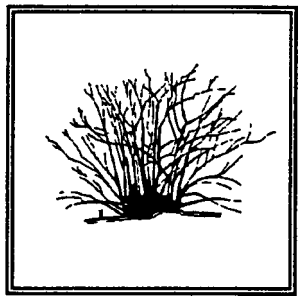
Insects: None serious

Disease: None serious

Other: Hybridizing occurs frequently with Black Oak. Chlorosis may develop in high pH soils.

Sambucus pubens (*Scarlet Elder*):





Origin: Newfoundland to Alaska, south to Georgia and Colorado. Introduced in 1812.

Relationship: A member of the Caprifoliacea family. Leaves are opposite, pinnate compound with 5-7 leaflets. Flowers are yellowish white and appear in May. Red drupes, 1/5-1/4" diameter, follow in June and July.

Ecology: Naturally found in rocky wooded area. Transplants well, does best in moist soils but does tolerate drier conditions. Thrives in acid or alkaline soil.

Propagation: Softwood cuttings root well. Seeds need to be germinated in moist sand for 60 days at 68 degrees F plus 90 to 150 days at 41 degress F.

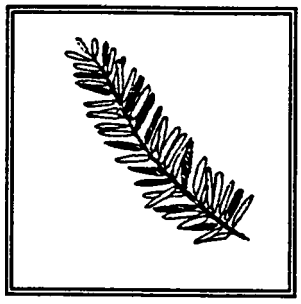
Utility:. Fruit is good for making preserves, wine and attracting birds. It can have a somewhat scraggly habit, but is very handsome when fruiting and is best used in a naturalized situation.

Insects: Borers

Disease: Cankers, Leaf Spot, Powdery Mildew

Other: Needs attention in order to control suckers and keep in a neat condition

Tsuga canadensis (*Canadian Hemlock*):



Origin: Native from Nova Scotia to Minnesota and south to Alabama and Georgia.

Relationship: A member of th family Pinacea. Two ranked lustrous dark green needles are 1/4- 2/3" long and have 2 whitish bands located on their lower surface. Small, ovoid cones are light to medium brown and 1/2-1" long.

Ecology: Prefers moist, well-drained soils and tolerates shade well. In fact, it grows well in full sun only if has good drainage, organic matter in the soil, and there are no strong, drying winds. It does not tolerate wind or drought, and needs to be planted in sheltered locations. More lime tolerant than other hemlocks.

Propagation: It is best to stratify seed for 2 to 4 months at about 40 degrees F. Cuttings need hormonal treatment to root.

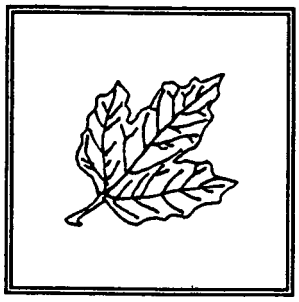
Utility: Often used as a specimen, hedge or screen. Will not tolerate city conditions but remains the most commonly planted hemlock and a beautiful, popular evergreen.

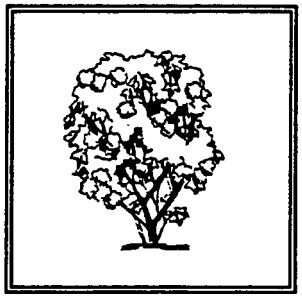
Insects: Hemlock Borer, Bagworm, Gypsy Moth, Hemlock Sawfly, many Scales and Mites.

Disease: None serious

Other: Is extremely susceptible to sunscorch when temperatures reach 95 degrees F and above (ends of branches may be killed back several inches). Drought injury is common and plants may die in extended dry conditions.

Viburnum opulus (*European Cranberrybush Viburnum*):





Origin: Native to Europe, North Africa, and North Asia

Relationship: A member of the family Caprifoliacea. This plant has opposite, toothed, lobed leaves that are dark green above, pubescent below. White flower cymes, 2-3" in diameter, appear in May. In September, 1/4" red, berry-like drupes ripen and persist into winter.

Ecology: Viburnum opulus is one of the easiest Viburnums to grow. It is adaptable to extremes. It tolerates part shade, but fruits best in full sun.

Propagation: Softwood and greenwood cuttings are easy to root. Seed needs 60 to 90 days at 68 to 86 degrees F followed by 30 to 60 days at 41 degrees F.

Utility: Used extensively for screening and massing. Appreciated for its flower and fruit display which, like most Viburnums, causes the plant to be of high value to wildlife, especially birds.

Insects: Aphids, Borer

Disease: None serious.

Other: Large canes should be thinned out.

Sources:

1. Dirr, Michael A., *Manual of Woody Landscape Plants*, Stipes Publishing Co., 1990.

2. Hightshoe, Gary L., *Native Trees, Shrubs, and Vines for Urban and Rural America*, Van Nostrand Reinhold, 1988.

Appendix B: Selecting Tree
Health Care Professionals

Selecting Tree Health Care Professionals

Selecting Tree Consultants

Arboricultural consultants can provide objective tree care surveys that can serve as the basis for bids and contracts. Consultants can provide expertise not resident in the institution and can supervise and inspect work done by arborist companies to insure both quality and thoroughness. The best assurance of a qualified arboricultural consultant is membership in the American Society of Consulting Arborists (ASCA). Members should have a membership card and should be listed in the ASCA Membership Directory.

Selecting Tree Care Companies

Even when strong wooded tree species are planted, improperly pruned branches can promote internal decay. Although poor pruning cuts do not weaken the tree significantly immediately following the surgery, decay organisms colonize the wound area and progressively deteriorate the internal structural wood. Selecting a knowledgeable, caring arborist is an important hazard prevention strategy. Tree care supervision by an unbiased consulting arborist can insure that high quality is maintained.

The best assurance of a qualified arborist is the International Society of Arboriculture's Certified Arborist Program. Members have a tree year minimum number of years experience and have taken a test that assures basic level arboricultural knowledge. The following list of ISA Certified Arborists was obtained from the International Society of Arboriculture web page located at http://www.ag.uiuc.edu/~isa/ .

INTERNATIONAL SOCIETY OF ARBORICULTURE

Certified Arborist Search Results

ISA Certified Arborist List as of October 3, 1997. (270 Certified Arborists were found in the state of Virginia)

Mark S. Adwell
804-556-3345
Maidens, VA 23102
Henrico USA
Chapter: MA

Mark R. Allen
703/836-6276
Alexandria, VA 22314
USA
Chapter: MA

Jason D. Anderson
804/261-4890
Richmond, VA 23226-0622
Hanover USA
Chapter: MA
F.A. Bartlett Tree Expert Co.

Anthony J. Angelo
703/471-4018
Chantilly, VA 22022
Loundon USA
Chapter: MA
The Davey Tree Expert Co.

Lyndon R. Arbogast
703/342-2847
Vinton, VA 24179
USA
Chapter: MA

Scott Archer
804/589-6924
Louisa, VA 23093
Louisa USA
Chapter: MA

Thomas K. Armstrong
703/364-2401
Marshall, VA 20116-0398
Fauquier USA
Chapter: MA
F.A. Bartlett Tree Expert Co.

James W. Asberry Jr.
703/342-4485
Roanoke, VA 24014
Roanoke USA
Chapter: MA
Stacey's Tree Service, Inc.

Jeffrey Aten
703/263-0147
Haymarket, VA 22069-2207
Fairfax USA
Chapter: MA

Thomas Aurelio
Haymarket, VA
20169-2931
Prince William USA
Chapter: MA

Karen R. Bailey
540-463-1953
Lexington, VA 24450
Rockbridge USA
Chapter: MA
KB Landscapes

Zdenko Bandula
757-220-0850
Williamsburg, VA 28185
USA
Chapter: MA

James M. Banister
804/574-6867
Prospect, VA 23960
USA
Chapter: MA
Virginia TreeScape

Jay S. Banks
703/665-2779
Winchester, VA 22602
Frederick USA
Chapter: MA
Four Oaks Consulting

Jeffrey W. Bartholomew
703-273-6111
Alexandra, VA 22310
USA
Chapter: MA
Quality Tree Care Inc.

Jay S. Bassett
703/77-0457
Leesburg, VA 22075
Loudoun USA
Chapter: MA
VA. Dept. of Forestry

William A. Beach
703/922-0660
Fairfax, VA 22031-2200
Fairfax USA
Chapter: MA
Lancaster Landscapes

James L. Beaty
703/237-0928
Falls Church, VA 22042
Fairfax USA
Chapter: MA

Paul Beaumont
804/479-0080
Chesapeake, VA 23320
Currituck USA
Chapter: MA
Colonial Tree Care

William N. Becker
703/330-5204
Manassas, VA 20111
Prince William USA
Chapter: MA
Becker Landscaping & Tree Serv

James L. Belsha
919-380-9602
Norfolk, VA 23503
Wake USA
Chapter: MA

James C. Benkelman
703/437-8733
Herndon, VA 22071
Fairfax USA
Chapter: MA
The Care of Trees

Mark Bennett
804/288-2602
Richmond, VA 23230
Henrico USA
Chapter: MA
The Davey Tree Expert Co.

Jackson R. Bird
540-694-7881
Stuart, VA 24171
Patrick USA
Chapter: MA

Robert K. Boeren
540/387-5461
Salem, VA 24153
Roanoke USA
Chapter: MA
Virginia Dept. of Forestry

David J. Bogdan
703/920-0270
Arlington, VA 22204
Arlington USA
Chapter: MA
E.G. Reinsch, Inc.

John D. Bolton
703/339-0414
Lorton, VA 22079
Fairfax USA
Chapter: MA
Bolton's Tree Care, Inc.

Jeffrey W. Brower
540-885-8471
Staunton, VA 24401
Augusta USA
Chapter: MA

Jerry Brown
804/977-1675
North Garden, VA
22959-1824
Albemarle USA
Chapter: MA

Michael Brucato
804/771-3072
Richmond, VA 23261
Chesterfield USA
Chapter: MA
Virginia Power

G. Stewart Bunn
703/256-3229
Alexandria, VA 22312
Fairfax USA
Chapter: MA
Guardian Tree Experts

Timothy C. Bushnell
703/818-1246
Centreville, VA 22020
Fairfax USA
Chapter: MA
Professional Tree Care, Inc.

Steven D. Buzzoni
703/554-2217
Bluemont, VA 22012
Clarke USA
Chapter: MA

Michael G. Calley
540-338-4830
Round Hill, VA 20142
Loudoun USA
Chapter: MA
M.C. Services

James T. Cantelmo
804/270-3092
Richmond, VA 23294
Henrico USA
Chapter: MA

Myron R. Carlson
703/257-8374
Manassas, VA 22110
Prince William USA
Chapter: MA
City of Manassas

Richard F. Carpenter
703-368-9166
Manassas, VA 20110-4886
Prince USA
Chapter: PD
Arbortech Tree Specialists

James L. Carter
804-838-2793
Hampton, VA 23666
USA
Chapter: MA

Sten Cempe
703/337-4588
Stuarts Draft, VA 24477
Augusta USA
Chapter: MA
Big 'O' Tree & Lawn Service

Mohamad A. Chamaa
703-378-2327
Chantilly, VA 20151
Fairfax USA
Chapter: MA

Joseph M. Christopher
703/591-1774
Fairfax, VA 22031
Fairfax USA
Chapter: MA

Charles D. Christy
703/471-4018
Chantilly, VA 22022
Fairfax USA
Chapter: MA
The Davey Tree Expert Co.

Mario Cipriano
703/471-4018
Chantilly, VA 22022
Fairfax USA
Chapter: MA
The Davey Tree Expert Co.

Gary R. Cissel
703-849-1299
Vienna, VA 22180
USA
Chapter: MA

Brian L. Clifton
757-499-1143
Virginia Beach, VA 23454
USA
Chapter: MA

Keith Cline
703/437-8733
Catharpin, VA 22018
Prince William USA
Chapter: MA
N. Virginia Arborists, Inc.

Peter J. Coates
302/995-7562
Roanoke, VA 24035
New Castle USA
Chapter: MA
F.A. Bartlett Tree Expert Co.

Sean Cochran
703/818-8228
Chantilly, VA 20151-1029
Fairfax USA
Chapter: PN
Growing Earth Pro Tree Care

James Cody
804-744-8499
Midlothian, VA 23112
Nassau USA
Chapter: NY
J.S. Cody Tree Service

Durward S. Collins
703/257-0764
Herndon, VA 22071
Prince William USA
Chapter: MA
The Care of Trees

Anthony Craig
804/966-2855
Lanexa, VA 23089
New Kent USA
Chapter: MA

Terry O. Dailey
757/363-8266
Virginia Beach, VA 23455
USA
Chapter: MA

Kristin Dameron
410/000-0000
Fairfax, VA 22030
Queen Anns USA
Chapter: MA

J. Peter Deahl
703/437-8733
Herndon, VA 22071
Prince William USA
Chapter: MA
Care of Trees

Neil J. Dearborn
804-850-8430
Hampton, VA 23669
USA
Chapter: MA

C. Ray DeJarnette Jr.
804/735-8552
Red Oak, VA 23964
Charlotte USA
Chapter: MA

Wendy A. Delbrook
703-569-9516
Sprinfield, VA 22153
Fairfax USA
Chapter: MA
Merrifield Garden Center

Will Delbrook
703/569-9516
Springfield, VA 22153
Fairfax USA
Chapter: MA

Xavier E. Desrosiers
703-758-0975
Reston, VA 22091
USA
Chapter: MA

Jerry C. Dieruf
703/335-9325
Manassas, VA 22110
Prince William USA
Chapter: MA

Jo F. Dimmock
804/441-2435
Norfolk, VA 23509
USA
Chapter: MA
City of Norfolk

Daniel M. Docker
804/295-6062
Charlottesville, VA
22902-8785
USA
Chapter: MA

James E. Donegan
703/327-6675
Leesburg, VA 22075
Loudoun USA
Chapter: MA
Donegan's Tree Service, Inc.

Michael A. Douglas
804-358-7594
Richmond, VA 23220
USA
Chapter: MA
S.L. McCarthy Tree Service Inc

Cara L. Ducharme
540-427-3734
Roanoke, VA 24022-2121
Roanoke USA
Chapter: MA
ACRT/AEP

John Louis Dudzinsky
703/787-7380
Herndon, VA 22070
Fairfax USA
Chapter: MA
Town of Herndon

Dennis B. Duff
540-384-7285
Salem, VA 24153
Roanoke USA
Chapter: MA

Michael J. Duffin
703/473-1437
Fincastle, VA 24090-4249
USA
Chapter: MA

Michael J. Duh
540-942-2523
Waynesboro, VA 22980
Augusta USA
Chapter: MA
Treeworks

Diane D. Dunaway
804/823-6685
Mechanicsville, VA 23111
Albemarle USA
Chapter: MA

William L. Duvall
703/878-2267
Stafford, VA 22554-6116
Prince William USA
Chapter: MA

Thomas Eaton
804/393-8481
Portsmouth, VA 23704
Rockingham USA
Chapter: MA
City of Portsmouth

Kimberly A. Edwards
757-464-5564
Virginia Beach, VA 23455
USA
Chapter: MA
McDonald Garden

Randall L. Elliott
804/266-6017
Richmond, VA 23227
Henrico USA
Chapter: MA
Elliott's Tree Service

Frank V Emmerson III
804-294-3149
Surry, VA 23883
Surry USA
Chapter: MA

Anthony M. Failing
804/739-1264
Midlothian, VA 23112
Chesterfield USA
Chapter: MA

Rob W. Farrell
540/231-8942
Blacksburg, VA
24061-0324
Montgomery USA
Chapter: MA
Forestry Dept. VA Tech

Julia Flanagan
703-691-2002
Fairfax, VA 22030
Fairfax USA
Chapter: MA
New Earth Consulting

Thomas John Ford Jr.
703/364-1586
Fairfax, VA 22035-5503
Fairfax USA
Chapter: MA
Fairfax County Dpt. Env. Mgt.

Dennis K. Fox
804/737-4791
Sandston, VA 23150
Henrico USA
Chapter: MA
Virginia Dept. of Forestry

Erik W. Fox
804/451-0082
Norfolk, VA 23503
Norfolk USA
Chapter: MA

Robert Gallant
804/479-0080
Chesapeake, VA 23320
Chesapeake USA
Chapter: MA
Colonial Tree Care

Dennis C Gaston
804-966-2209
Providence Forge, VA
23140
New Kent USA
Chapter: MA
VA Dept of Forestry

Thomas C. George
703/943-9153
Waynesboro, VA 22980
Augusta USA
Chapter: MA

Jerry E. Gibson
804/288-2891
Richmond, VA 23226
Henrico USA
Chapter: MA
The Country Club of Virginia

Paul R. Gilbert
703/242-9674
Oakton, VA 22124
Montgomery USA
Chapter: MA

Donald J. Goebel
804/985-4318
Ruckersville, VA
22968-9505
Greene USA
Chapter: MA

Bonnie J. Gonzalez
703/430-4545
Sterling, VA 20167
Loudoun USA
Chapter: MA
Hortservices

Jo Anne Gordon
804/441-2435
Norfolk, VA 23509
Norfolk USA
Chapter: MA
City of Norfolk

John D. Grant
703/363-4046
Waynesboro, VA 22980
Augusta USA
Chapter: MA

Alan G. Gray
703/635-4486
Huntly, VA 22640
Warren USA
Chapter: MA
Grays Tree/Landscape

Wesley Greene
757-565-8678
Williamsburg, VA 23187
Williamsburg USA
Chapter: MA
Colonial Williamsburg Found.

Gary T. Greenwald
703/372-1110
Fredericksburg, VA 22404
Stafford USA
Chapter: MA
City of Fredericksburg

Kristine P. Hall
804/722-7954
Hampton, VA 23661
Hampton USA
Chapter: MA

Tom J. Haworth
703-352-7555
Oakton, VA 22124
USA
Chapter: MA
STM Landscape Services Inc.

Ronald J. Hendron Jr.
757-595-8733
Newport News, VA
23601-1734
York USA
Chapter: MA
Hendron Tree & Landscape Inc.

Joseph W. Hertzler
757/229-1690
Williamsburg, VA
23187-0457
James City USA
Chapter: MA
Green Guard Associates

Craig Herwig
703/437-8733
Herndon, VA 22071-3713
Prince William USA
Chapter: MA
Care of Trees

Mark F. Heywood
703/273-7660
Fairfax, VA 22030
Marion USA
Chapter: MA
Fairfax Tree Service, Inc.

Daryl S. Hillman
703/330-7993
Manassas, VA 22110
Prince William USA
Chapter: MA

Randy A. Hilton
757-499-1143
Virginia Beach, VA
USA
Chapter: MA
Nuckols Tree Care

Ralph K. Hite
703/427-3657
Roanoke, VA 24022-2121
Roanoke USA
Chapter: MA
Appalachian Power Co.

Audrey F. Hodges
804-464-3229
Virginia Beach, VA 23455
USA
Chapter: MA

John Holtzapfel
703/471-7607
Chantilly, VA 22021
Fairfax USA
Chapter: MA
Northern Virginia Tree Experts

Donald W. Hoover
804-745-0530
Richmond, VA 23236
Chesterfield USA
Chapter: MA

Robert E. Horne Jr.
703/342-7901
Roanoke, VA 24014
Roanoke USA
Chapter: MA

Jack M. Howard
703/821-1332
Fairfax, VA 22031
Fairfax USA
Chapter: MA
C&D Tree Service, Inc.

Fred B. Howes
804/441-2435
Norfolk, VA 23509
USA
Chapter: MA
City of Norfolk

John E. Hubbard
804/595-4096
Newport News, VA 23601
USA
Chapter: MA

Steven A. Hubner
757-445-2370
Norfolk, VA 23511-2699
Norfolk USA
Chapter: MA
Atlantic Division Naval Fac.

Timothy Andrew Hughes
804/971-9587
Charlottesville, VA 22911
Albemarle USA
Chapter: MA
City of Ch'vlle-Parks Division

James T. Hullett
703/890-6550
Blue Ridge, VA 24064
Bedford USA
Chapter: MA
Paul Bunyan's Tree Serv., Inc.

David Hunt
804/479-0080
Chesapeake, VA 23320
USA
Chapter: MA
Colonial Tree Care

Clinton A. Hunt Jr.
804/479-0080
Chesapeake, VA 23320
USA
Chapter: MA
Colonial Tree Care

David M. Hyland
Virginia Beach, VA 23425
USA
Chapter: MA
Arbor Tree Expert

Christopher Irmen
804-979-6288
Viewtown, VA 22746
Culpeper USA
Chapter: MA

John M. Jeffers Jr.
703/248-7505
Waynesboro, VA 22980
Augusta USA
Chapter: MA

Scott W. Johnston
703/364-1687
Markham, VA 22643
Warren USA
Chapter: MA
Johnston Tree Care

Steven Jones
703/971-6258
Alexandria, VA 22310
Fairfax USA
Chapter: MA
Audubon Tree Experts

Richard A. Jones
804/237-2326
Forest, VA 24502
Campbell USA
Chapter: MA

Alan H. Jones
804/971-3020
Charlottesville, VA 22902
Albemarle USA
Chapter: MA
F.A. Bartlett Tree Expert Co.

Lloyd C. Jordan
757-851-6037
Hampton, VA 23669
USA
Chapter: MA
Tree Surgeons Unlimited

Craig R. Kaderavek
540-962-9748
Covington, VA 24426
Alleghany USA
Chapter: MA

Keith K. Kanzler
703/435-6559
Reston, VA 22090-3228
Fairfax USA
Chapter: MA
Reston Association

Robert Kelley
804/428-2068
Virginia Beach, VA 23451
USA
Chapter: MA

James L. Kelly Jr.
703/771-2639
Leesburg, VA 22075
Loudon USA
Chapter: MA

Patricia K. Kerr
804/441-2435
Langley, VA 23662-2775
USA
Chapter: MA
Langley AFB

John T. King
757-382-6378
Chesapeake, VA 23328
USA
Chapter: MA
City of Chesapeake, VA

Orvin H. Kiser Jr.
703/337-4588
Stuarts Draft, VA 24477
Augusta USA
Chapter: MA
Big 'O' Tree & Lawn Service

Michael Knapp
703/324-1770
Fairfax, VA 22035-5503
Fairfax USA
Chapter: MA
Urban Forestry Branch

Jeffrey W. Knies
804/263-8507
Lovingston, VA 22949
Nelson USA
Chapter: MA

Joel Koci
804-261-6858
Richmond, VA 23228
Henrico USA
Chapter: MA

Andrew J. Koenig
804/249-3120
Williamsburg, VA 23188
York USA
Chapter: MA

Edward F. Kowalski
540/543-2458
Culpepper, VA 22701
Madison USA
Chapter: MA

Jeffrey P. Lange
703/818-8477
Centreville, VA 22022
Fairfax USA
Chapter: MA

K. Thomas Lawson
804/293-3134
Charlottsville, VA 22902
Albemarle USA
Chapter: MA
Bartlett Tree Expert

Elden E. LeBrun
703/943-4372
Waynesboro, VA
Augusta USA
Chapter: MA

Jonathan K. Lenthall
757-229-4750
Williamsburg, VA 23187
USA
Chapter: MA
Tree Services Inc.

Miklos Lestyan
804/471-5658
Virginia Beach, VA 23464
Virginia Beach USA
Chapter: MA

Betty M. Light
804/775-5260
Richmond, VA 23261
Powhatan USA
Chapter: MA
Virginia Power

John R. Lloyd
703/953-3924
Blacksburg, VA
24062-1016
Montgomery USA
Chapter: MA
Tech Tree Experts Inc

D. Brent Lohr
804/296-2130
Madison, VA 22727
Albemarle USA
Chapter: MA

John H. Loveless
703/573-4217
Fairfax, VA 22030-2929
USA
Chapter: MA
Lovely Tree & Landscape

Barbara Y. Lupfer
703-777-2925
Leesburg, VA 20176
Loudoun USA
Chapter:

James M. Martin
703/354-2778
Springfield, VA 22151
Fairfax USA
Chapter: MA

Paul F. Martin
703/222-5372
Centreville, VA 22020
Fairfax USA
Chapter: MA

John J. Martin
703/818-8228
Centreville, VA 22020
Fairfax USA
Chapter: MA
Professional Tree Care, Inc.

Dean T. Massey
703/471-4018
Chantilly, VA 22021
Fairfax USA
Chapter: MA
The Davey Tree Expert Co.

Michael Mayeux
703/998-5127
Alexandria, VA 22311
Fairfax USA
Chapter: MA

Patricia McAleer
703-324-5370
Fairfax, VA 22035-1109
Fairfax USA
Chapter: MA
Cooperative Extension

Michael C McCarron
804-877-8205
Neport News, VA 23608
USA
Chapter: MA

Sean L. McCarthy
804/358-7594
Richmond, VA 23220
Henrico USA
Chapter: MA
Sean L. McCarthy Tree
Service

Porter M. McCown
804-591-0015
Newport News, VA 23606
USA
Chapter: MA

Kathy N. McDaniel
804/771-4482
Richmond, VA 23261
Chesterfield USA
Chapter: MA
Virginia Power

Ronald N McGaw
703/471-1427
Herndon, VA 22071
Fairfax USA
Chapter: MA
The Care of Trees

Donald W. McKelvey
804/229-1000
Williamsburg, VA 23187
Williamsburg USA
Chapter: MA
Colonial Williamsburg
Found.

Kenneth R. McWain
804/436-1401
Chesapeake, VA
23320-7322
USA
Chapter: MA
Ken's Tree Care

James R. McWilliams Jr.
540-832-2839
Barboursville, VA 22923
Orange USA
Chapter: MA
James R. McWilliams Lawn
Serv.

Abel F. Medina
703/471-1427
Herndon, VA 22071
Montgomery USA
Chapter: MA
The Care of Trees

Edward Milhous
703/754-2222
Catharpin, VA 20143
Prince William USA
Chapter: MA
Edward P. Milhous, Inc.

Lee T. Mills
703/953-1173
Blacksburg, VA 24060
Montgomery USA
Chapter: MA

Neil F. Mitchell
703/590-6651
Woodbridge, VA
22192-4903
USA
Chapter: MA

Michael B. Mitchell
703/659-6519
Stafford, VA 22554
Stafford USA
Chapter: MA
Mithcell Tree & Stump Service

Kurt Mohr
703/256-3229
Alexandria, VA 22312
Fairfax USA
Chapter: MA
Guardian Tree Experts

Paul M. Morey
703/471-4018
Chantilly, VA 22021
Portage USA
Chapter: MA
The Davey Tree Expert Co.

John N. Moss
703/471-4018
Chantilly, VA 22021
Loudon USA
Chapter: MA
The Davey Tree Expert Co.

Walter S. Mowry
804/229-1366
Williamsburg, VA 23185
York USA
Chapter: MA

Eric J. Muller
703-846-0944
Remington, VA 22734
USA
Chapter: MA

William J. Munt
703-352-7555
Oakton, VA 22124
Fairfax USA
Chapter: MA
STM Landscape

Michael Neal
804-295-8626
Faber, VA 22938
Nelson USA
Chapter: MA
Arboristry Associates, Inc.

Joseph M. Neiberger
540-338-3861
Purcellville, VA 20132
USA
Chapter: MA

Jerry L. Neri
703/501-5442
Sumerduck, VA 22742
Fauquier USA
Chapter: MA
Neri's Tree-N-Trade Svc., Inc.

Steven L. Newman
703-352-0377
Fairfax, VA 22030
Fairfax USA
Chapter: MA

Gregory R. Nichols
703-941-6117
Fairfax, VA 22030-5532
Fairfax USA
Chapter: MA

Michael R. Nickle
703/582-5742
Spotsylvania, VA 22553
Spotsylvania USA
Chapter: MA
VA Dept of Forestry

John C. Noelle
703/750-7863
Alexandria, VA 22312
Fairfax USA
Chapter: MA

Tim Nuckols
804/499-1143
Virginia Beach, VA 23462
Virginia Beach USA
Chapter: MA
Nuckols Tree Care

Philip J. Ofrias III
804-973-1154
Charlottesville, VA 22905
USA
Chapter: MA
JW Townsend Inc

Daniel R. Olsen
804/295-7720
Keswick, VA 22947
USA
Chapter: MA

Mark T. Olsen
703/257-1101
Manassas, VA 22110
Prince William USA
Chapter: MA
Olde Towne Landscaping

Michael C. Orrison
703-742-3329
Herndon, VA 20170
Fairfax USA
Chapter: MA

Thomas K. Pace
540-957-1969
Ridgeway, VA 24148
Henry USA
Chapter: MA

David R. Pail
73-450-4475
Great Falls, VA 22066
Fairfax USA
Chapter: MA
Potomac Lands Tree & Shrub

Robert W. Parlett
804-253-3066
Williamsburg, VA 23185
Gloucester USA
Chapter: MA
ISS Landscape Mgt. Service

Todd M. Patten
703-273-1090
Fairfax City, VA 22030
Fairfax USA
Chapter: MA

Phillip R. Pernell
804/898-3517
Newport News, VA 23609-0427
York USA
Chapter: MA
F.A. Bartlett Tree Expert Co.

Steven C. Piccinino
703/818-9484
Fairfax, VA 22033
Fairfax USA
Chapter: MA
Virginia Tree Masters

William J. Poad Jr.
804/261-4890
Richmond, VA 23226
Henrico USA
Chapter: MA
F.A. Bartlett Tree Expert Co.

Linda B. Porter
540/338-2124
Paeonian Springs, VA 20129
Loudoun USA
Chapter: MA
Porter Tree Nursery

James Luther Powell IV
804/293-3134
Mount Pelier, VA 23192
Albemarle USA
Chapter: MA
Arbor Life - Professional Tree

Jeffrey H. Racey
703/754-6753
Manassas, VA 22110
Prince William USA
Chapter: MA
NOVEC

J. Richard Ramirez
919/553-1071
Clarksville, VA 23927
Johnston USA
Chapter: MA

George W. Reed
804/495-8501
Virginia Beach, VA 23462
USA
Chapter: MA
Beach Tree Service

Joseph Keith Reid
804/467-8021
Virginia Beach, VA 23464
USA
Chapter: MA
Bioscape

James L. Reilly
703/960-4249
Alexandria, VA 22310
Fairfax USA
Chapter: MA

Richard D. Reuse
804/796-4360
Chesterfield, VA 23838
Chesterfield USA
Chapter: MA
VA Dept of Forestry

Oscar W. Richardson III
804/479-0080
Chesapeake, VA 23320
Chesapeake USA
Chapter: MA
Colonial Tree Care

Duane A. Richardson
813/787-7460
Centervile, VA 20121-3550
Pinellas USA
Chapter: MA

Michael T. Richardson
540-953-3924
Blacksburg, VA 24062-1016
Montgomery USA
Chapter: MA
Tech Tree Experts Inc.

Patricia A. Richerson
703/354-3464
Oakton, VA 22124
Fairfax USA
Chapter: MA

Gregory E. Ridgeway
703/560-2948
Falls Church, VA 22046
USA
Chapter: MA

Michael R. Rigby
Charlottesville, VA 22901
Albemarle USA
Chapter: MA
ARA mark

Bettina Kay Ring
804/977-6555
Charlottesville, VA 22903
Albemarle USA
Chapter: MA
VA Dept of Forestry

Paul D. Roark
804/591-4844
Newport News, VA 23606
Newport News USA
Chapter: MA
City of Newport News

Ronald L. Robinson
804/441-2435
Norfolk, VA 23509
USA
Chapter: MA
City of Norfolk

Todd E. Rodgers
703/777-1890
Leesburg, VA 20175-4306
Loudoun USA
Chapter: MA

William D. Roesch
804/465-6840
Portsmouth, VA 23701
Rockingham USA
Chapter: MA
Virginia Dept. of Forestry

David L. Rosene
804/293-3134
Charlottesville, VA 22902
Albemarle USA
Chapter: MA
Van Yahres Tree Company

Englebert Roth
703-815-3909
Centreville, VA 20121
USA
Chapter: NY

Ron Rubin
703/471-1427
Herndon, VA 22071
Fairfax USA
Chapter: MA
The Care of Trees

Matthew Saenz
703/764-0332
Fairfax, VA 22032
Fairfax USA
Chapter: MA

Antonia Sanderson
804/465-6840
Portsmouth, VA 23701
USA
Chapter: MA
VA Dept. of Forestry

Michael A. Santucci
Chatam, VA 24531
Pittsylvania USA
Chapter: MA
VA Dept of Forestry

Budd Sawyer
Alexandria, VA 22308
Fairfax USA
Chapter: MA
Budd Sawyer

Jerry C. Schiller
804/985-3545
Dyke, VA 22935
Greene USA
Chapter: MA

Steven H. Seeba
703/241-4461
Falls Church, VA 22042
Fauquier USA
Chapter: MA
First Virginia Banks, Inc.

Garry P. Senato
804/425-1995
Virginia Beach, VA 23454
Virginia Beach USA
Chapter: MA
Arbor Tree Experts, Inc.

George F. Sephton
703/971-6258
Alexandria, VA 22310
Fairfax USA
Chapter: MA
Audubon Tree Experts

Joseph W. Sergewich
540/338-5519
Hamilton, VA 20158
USA
Chapter: MA

Glen W. Shelton
703/385-7995
Fairfax, VA 22030
Fairfax USA
Chapter: MA
City of Fairfax

William T. Shelton
703-213-6258
Fairfax, VA 22030
Washington USA
Chapter: MA
Capitol Tree Care

Kevin D. Sigmon
540/676-4176
Abingdon, VA 24210
Washington USA
Chapter: MA
Appalachian Power

Gordon W. Silver
703/372-1110
Fredericksburg, VA 22404
Stafford USA
Chapter: MA
City of Fredericksburg

Danny B. Sink
703/387-5461
Salem, VA 24153
Roanoke USA
Chapter: MA
VA Dept. of Forestry

David B. Sivyer
804/483-4132
Suffolk, VA 23435
Suffolk USA
Chapter: MA

William G. Skidmore
202/426-6788
Hamilton, VA 22068
Loudoun USA
Chapter: MA

Burton W. Smeltzer
703/680-6914
Montclair, VA 22026
Prince William USA
Chapter: MA

Jeffrey I. Smith
804/421-3252
Chesapeake, VA 23322
USA
Chapter: MA

Mark Snyder
703/358-6527
Arlington, VA 22210
Arlington USA
Chapter: MA
Arlington County Parks Dept.

Bernard Spigt
703/471-7607
Chantilly, VA 22021
Fairfax USA
Chapter: MA
Northern Virginia Tree Experts

Daniel J. Spoden
703/349-8386
Nokesville, VA 22123
Fairfax USA
Chapter: MA

Robert D. Springer Jr.
703/860-8439
Reston, VA 22091
Fairfax USA
Chapter: MA

Richard L. Starnes
804-645-7892
Crewe, VA 23930
Nottoway USA
Chapter: MA

Gary J. Stasko
804/293-3431
Charlottsville, VA 22902
USA
Chapter: MA
Van Yahre's Tree Co.

Michael R. Stevens
703/992-2035
Frontville, VA 24175
USA
Chapter: MA
Michael Stevens

Robert C. Stief
703/330-1929
Merrifield, VA 22116
USA
Chapter: MA
Gethsemane Garden & Tree

David L. Stone
804/977-5193
Louisa, VA 23093-0218
Louisa USA
Chapter: MA
VA Dept of Forestry

Roxanne J. Stonecypher
804/421-3843
Chesapeake, VA 23322
USA
Chapter: MA

James P. Stuart
703/204-2291
Falls Church, VA 22042
Fairfax USA
Chapter: MA

William Edward Tanis
703-878-6579
Dumfries, VA 22026
Prince William USA
Chapter: MA

Roy C. Tatum
703-985-2630
Roanoke, VA 24022
USA
Chapter: MA
Appalachian Power Company

David H. Terwilliger
804/737-4791
Sandston, VA 23150
Henrico USA
Chapter: MA
Virginia Dept. of Forestry

Jason A. Tingle
703/494-2667
Woodbridge, VA 22192
Prince William USA
Chapter: MA

John R. Trammell Sr.
804/372-2111
Chase City, VA 23924
Mecklenburg USA
Chapter: MA
Monroe Tree Service

Matthew Trowbridge
804/221-2275
Williamsburg, VA 23187-8795
USA
Chapter: MA
College of William & Mary

Anthony C. Tuck
757-499-1143
Virginia Beach, VA 23454
USA
Chapter: MA

Stephen C. Tuggle
916-0927
Southampton, VA 18966-4050
Butte County USA
Chapter: WC
Environmental Consultants, Inc

Thomas M. Turner
703-273-8873
Fairfax, VA 22031
Fairfax USA
Chapter: MA
Blade Runners, Inc.

Richard M. Turschmann
703/866-3940
Springfield, VA 22153
Fairfax USA
Chapter: MA

David S. Vandergriff
757-382-6348
Chesapeake, VA 23320
USA
Chapter: SO
Virginia Coop. Ext.

Samuel B. Vaughan
804/857-2251
Norfolk, VA 23509-2606
Norfolk USA
Chapter: MA
Virginia Power

Aimee L. Vosper
703/532-6163
Falls Church, VA 22046
Fairfax USA
Chapter: MA
Walter L. Phillips, Inc.

Peter C. Waas
703/373-8750
Fredericksburg, VA 22404
Stafford USA
Chapter: MA

Johnnie G. Wallin
804/775-5200
Richmond, VA 23261
Chesterfield USA
Chapter: MA
Virginia Power

Kenneth E. Watson
804-392-8976
Farmville, VA 23901
Prince Edward USA
Chapter: MA

Terry L. Welch
703/476-3739
Alex, VA 22310
Fairfax USA
Chapter: MA
Quality Tree Care

David N. Wesley
703/883-1133
Centreville, VA 20122
Fairfax USA
Chapter: MA
Atlantic Tree Service, Inc.

John B. Wharton
703/222-8770
Chantilly, VA 20151
Fairfax USA
Chapter: MA
Fairfax Co. Park Authority

Michael J. Whetzel
703/471-4018
Chantilly, VA 22022
Warren USA
Chapter: MA
The Davey Tree Expert Co.

Barbara White
703/257-8374
Manansas, VA 22110
Prince William USA
Chapter: MA
City of Manassas

Hugh C. Whitehead
703/759-2119
Herndon, VA 22071
Loudoun USA
Chapter: MA
The Care of Trees

John S. Whitehurst
804/642-9330
Hayes, VA 23072
Glouster USA
Chapter: MA

Mary J. Wikswo
804-253-3072
Williamsburg, VA 23058
Gloucester USA
Chapter: MA
ISS Landscape Mgt. Service

Lawrence J. Wiltshire
703-352-7555
Oakton, VA 22124
Fairfax USA
Chapter: MA
STM Landscape Services

Lyttelton Wood
703/675-1088
Washington, VA 22747
Rappahannock USA
Chapter: MA
Tree Works, Inc.

Dana G. Woolsey
703-978-8662
Springfield, VA 22151
Fairfax USA
Chapter: MA

Gary M. Yew
540/459-3151
Woodstock, VA 22664
Shenandoah USA
Chapter: MA
Virginia Dept. of Forestry

Donald E. Zimar
703/330-2635
Manassas, VA 22111
Prince William USA
Chapter: MA

William D. Zimar
703/722-3956
Winchester, VA 22603
Frederick USA
Chapter: MA

John Zuiker
703/324-1770
Fairfax, VA 22035
Fairfax USA
Chapter: MA
Fairfax County Park Authority

Appendix C: Field Data

(1)

Historic Plant Inventory
Field Identification Sheet

Park Name: Shen · Judd garden
Date: 9·27·94

	Plant Type	Field ID#	Plant Name (gen, spec, cv)	Size (Cbh, Hgt, Sprd)	Age	Condition (gd,fr,pr)	Notes	Pt#
(1)	2	1	Abies balsima	2.2" cbh 25' HT 16' sprd.	J	G	cluster @ center garden	1,2
1	2	2	Abies balsima	1'6" cbh 20' ht 12' sprd	J	G		
1	2	3	Pinus strobus	4'1" cbh 32' ht 10' sprd	J	pr		
1	1	4	Quercus rubra	8'5" cbh 45' ht 55' sprd	J		adjusted measurement (3' mark)	3,4
1	3	5	Sambucus Pubens	8' HT 14' sprd				
1	3	6	Euonymous alata	9' ht 14' sprd	J		multistemmed	5
1	2	7	Abies balsima	45' ht 4'2" cbh 15' sprd	J		Rotted cavity. Lopsided canopy.	
	2	8	Abies balsima	1'11" cbh 25' ht 10' sprd	J			
1	3	9	Viburnum opulus	31' sprd 9' ht	J		has spread by layering	6
1	3	10	Sambucus Pubens	8' sprd 9' ht	J			
1	3	11	Kalmia latifolia	10' sp 8' ht	J			
1	2	12	abies balsima	2'8" cbh 35' HT 14' sprd	J	Pr		
1	2	13	Hydrangea paniculata	12' ht 28' sprd	J		9 separate shrubs	
1	2	14	Viburnum plic ~~tom~~ var tom.	8' ht 6' sprd.	J		I.D. questionable	

Plant Type:

1 = Deciduous tree
2 = Evergreen Tree
Shrub
4 = Hedge, vine
5 = Herbaceous plant
6 = Lawns, meadows

(2)

Historic Plant Inventory
Field Identification Sheet

Park Name:
Date:

Area #	Plant Type	Field ID#	Plant Name (gen, spec, cv)	Size (Cbh, Hgt, Sprd)	Age	Condition (gd,fr,pr)	Notes
1	2	15	Taxus cuspidata	5' CBH 25' ht	J		7
1	1	16	acer rubrum	7' CBH 30' ht 33' sprd	J		incorrectly named Topped.
1	3	17	Euonymous alata	9' ht 12' sprd			
1	3	18	Euonymous alata	9' ht 12' sprd			
1	3	19	Hydrangea Paniculata	8' 12 sprd			
1	3	20	Syringa Josikaea	31' spd. 20' ht	J		Japanese lilac - multistem
1	3	21	Euonymous alata				
1	1	22	Fagus sylvatica	4½ CBH 50' ht 20' spr.			
1	3	23	Hydrangea Paniculata	8' ht 10' sprd			
1	1	24	Quercus alba	7' CBH 55 ht 30 spd	J		
1	2	25	Chamaecyparis Obtusa	2' CBH, 12 CBH, 18' ht 10' sprd			questionable I.D. 2 stems
1	B	26	Euonymous alata	8' ht 10' sprd.			
1	3	27	Hydrangea Syringa Arborescens Jack	5' ht 12' spd			
1	2	28	Picea pungens	6' CBH 30' spd 65' ht			10

Plant Type:

1 = Deciduous tree
2 = Evergreen Tree
3 = Shrub
4 = Hedge, vine
5 = Herbaceous plant
6 = Lawns, meadows

Historic Plant Inventory
Field Identification Sheet

Park Name: Sten. Judd
Date: 9.28.94

	Plant Type	Field ID#	Plant Name (gen, spec, cv)	Size (Cbh, Hgt, Sprd)	Age	Condition (gd,fr,pr)	Notes	Ph
1	2	29	~~6' CBH Picea 20' Spr~~ pungens	6' CBH 20' sprd 70' ht				10
1	1	30	Quercus rubra	5' CBH 30' sprd 40' ht			~~not on map~~	
1	2	31	Tsuga canadensis	5' CBH 20' sprd 40' HT		pr		11
1	2	32	Pinus strobus	7' CBH 35' sprd 35' ht		pr		
1	2	33	Pinus strobus	4½' CBH 30' HT 15 sprd				
1	1	34	Quercus alba	6' CBH 26' Sprd 57' HT			mislabled	
1	1	35	Tilia am.	3½' CBH 15 sprd 45' ht				13
	1	36	Quercus rubra	5½' CBH 55' HT 26 sprd				
1	1	37	Quercus rubra	5' CBH 40' ht 20' sprd			cluster of seedling red oaks in area. Hickory. Native growing	
1	1	38	Quercus primus	5' CBH 45' ht 20 Spd				14, 15
1	1	39	Quercus primus	5½' CBH, 3½' CBH. ~~45' HT, 25' Sprd.~~			double lead	
1	1	40	Quercus rubra	8' CBH 65' HT ~~45' Sprd~~				16-20
~~3~~ 2	2	41	Tsuga canadensis	6' CBH 70' HT 40 Spd			4 leader trees (pick 1 leader)	↓
~~3~~ 2	1	42	Acer rubrum	5½' CBH 40' HT 20' Spd				

Plant Type:

1 = Deciduous tree
2 = Evergreen Tree
Shrub
4 = Hedge, vine
5 = Herbaceous plant
6 = Lawns, meadows

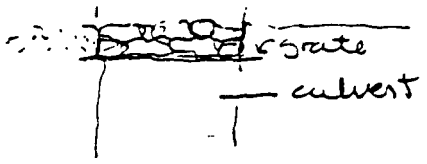
Historic Plant Inventory
Field Identification Sheet

Park Name: Sthen · Judd
Date: 28 Sept

Area #	Plant Type	Field ID#	Plant Name (gen, spec, cv)	Size (Cbh, Hgt, Sprd)	Age	Condition (gd,fr,pr)	Notes	#
2,3	1	43	Fagus 'atropurp'	5'8" CBH 75' HT 35' Spd				
2,3	1	44	Fagus 'atropurp'	10' CBH 75' HT 45 Spd			Taken @ diff. pt where branches swell	
3	1	45	Fagus grandiflora	7' CBH 45 HT 40' Spd.				21
3	1	46	Fagus sylvatica	4½ CBH 60 HT 65 Spd			multi stemmed (1 stem measured)	
3	1	47	Sorbus americana	7" CBH 8 sprd				
3	2	48	Chamaecyparis pisifera	7' CBH 40 Ht 35' Spd			Topped Tree. Has suckers coming up. Can be replacement	
3	2	49	Picea pungens	6' CBH 70 Ht 20' Spr				
3	2	50	Taxus baccata	2½' CBH 28' HT 16' Spd		pr	multi. stemmed. covered by bittersweet-	
4	3	51	ILEX MONTICOLA	12' HT 33' Spd.				22
4	3	52	ILEX MONTICOLA	12' HT. 20' Spd.				
4	3	53	ILEX MONTICOLA	12' HT. 10' Spd.				23
4	2	54	THUJA OCCIDENTALIS	3'6" CBH 20' HT. 10' Spd.		PR.		24
4	3	55	BERBS THUNBERGIA	4' HT 5' Spd				25
4	3	56	KOLKWITZIA AMABILIS	6' HT 8' Spd				26

Plant Type:

1 = Deciduous tree
2 = Evergreen Tree
3 = Shrub
4 = Hedge, vine
5 = Herbaceous plant
6 = Lawns, meadows



Historic Plant Inventory
Field Identification Sheet

Park Name:
Date:

	Plant Type	Field ID#	Plant Name (gen, spec, cv)	Size (Cbh, Hgt, Sprd)	Age	Condition (gd,fr,pr)	Notes
4	3	57	Kolkwitzia Amabilis	8' HT 8' Spd			
4	3	58	Kolkwitzia Amabilis	8' HT. 8 Spd.			
4	21 1	59	quercus Rubra	6' CBH. 40' HT 30' Spd.			
4	3	60	Viburnum opulus	6' HT 3' Spd			incorrectly labelled
4	1	61	Quercus primo	68" CBH 45' HT 30 Spd	✓		Large
4	1	62	Quercus rubrum	7'1" CBH 55' HT 35' Spd			
4	1	63	Cladrastis kentuckia	1'3 CBH 15' Ht. 15' Spd.			12" above grd measurement taken
4	3	64	Philadelphus coronarius	9' ~~CBH~~ HT 12' Spd.			
4	3	65	Syringa vulgaris	10' Ht 15' Spd			
4	3	66	Viburnum opulus	10' HT 20' Spd			Large clump (3 plants)
4	3	67	Syringa vulgaris	10' HT 18 Spd			clump (2 plts)
4	3	68	Viburnum opulus	9' Ht 18' Spd.			
4	1	69	Sorbus hybrida	8' 3' CBH 40 HT 45 Spd			
4	1	70	Fraxinus americana	5' 6" CBH 85 HT			

29
31
(bed)
32-3
34, 3
PH
1+2

Plant Type:

1 = Deciduous tree
2 = Evergreen Tree
– Shrub
4 = Hedge, vine
5 = Herbaceous plant
6 = Lawns, meadows

6

Historic Plant Inventory
Field Identification Sheet

Park Name: Gren. Judd
Date:

Area #	Plant Type	Field ID#	Plant Name (gen, spec, cv)	Size (Cbh, Hgt, Sprd)	Age	Condition (gd,fr,pr)	Notes	
4	1	71	Quercus rubra	6'5" CBH 85 HT 50' spd			Double lead (1 measure)	
4	1	72	Quercus rubra	6'1" CBH 75' HT 50' Spd				
4	2	73	Tsuga canadensis	6'4" CBH 85' HT 32 Spd				
4	2	74	Tsuga canadensis	6'10 CBH 90' HT 36' Spd			multi-leader	
4	2	75	Tsuga canadensis	6'2" CBH 85' HT 36' Spd				
4	2	76	Pinus Strobus	5'1" CBH 55' HT 15' Spd.				
6	2	77	Tsuga canadensis	8' CBH 70' HT 35 spd				
6	1	78	Acer rubrum	4'4" CBH 45' HT 25' Spd			incorrectly labelled 2 Leaders	
6	2	79	Tsuga canadensis	7'2 CBH 35' Spd 70' HT				
6	2	80	Rhododendron maximum	9' HT 8 Spd.				5
6	2	81	Pinus strobus	6'1/2' CBH 20' Spd 50' HT		pr		4-5
6	2	82	Tsuga canadensis	7'8' CBH 36' Spd 85 HT				
6	3	83	Hydrangea Paniculata grandiflora	7' HT 6' Spd			in flower	6
6	2	84	Chamaecyparis nootka	4'3" CBH 15' Spd 45' HT				7,8

Plant Type:

1 = Deciduous tree
2 = Evergreen Tree
3 = Shrub
4 = Hedge, vine
5 = Herbaceous plant
6 = Lawns, meadows

Historic Plant Inventory
Field Identification Sheet

Park Name: Shen. Judg
Date:

PH #

#	Plant Type	Field ID#	Plant Name (gen, spec, cv)	Size (Cbh, Hgt, Sprd)	Age	Condition (gd,fr,pr)	Notes	
6	1	85	Cornus kousa	12' HT 12' Spd				6
6	3	86	Kolkwitzia amabilis	5' Ht 4' Spd			small spindly	
6	3	87	Viburnum opulus	9' HT 12' Spd				
6	3	88	Kolkwitzia amabilis	6' HT 3' Spd			small spindly	
6	2	89	Pinus Strobus	95 HT 10' CBH 30' Spd.			Double leader	
6	2	90	Pinus Strobus	6 1/2' CBH 20' Spd 85 HT			Double leader	
6	1	91	Cornus kousa	1'4" CBH 30' HT 15' Spd.			large, two leader	
	1	92	acer saccharum	5' CBH 30' Spd 65' HT				
6	1	93	Quercus rubrum	4'1/2' CBH 65' HT 20' Spd				
6	1	94	Quercus rubrum	6'1/2 CBH 65 HT 30 Spd			anularia root rot	
6	1	95	Quercus rubrum	12' CBH 65' HT 30' Spd				
6	2	96	Picea abies	6'1/2 CBH 100' HT 30' Spd			cluster of laurels	
6		97	Hemlock Forest				several conifers of Hemlocks, pines conif	
6	1	98	Quercus rubra	7'1/2' CBH 30' Spd. 30' ht				13, H

Plant Type:

1 = Deciduous tree
vergreen Tree
rub

4 = Hedge, vine
5 = Herbaceous plant
6 = Lawns, meadows

Historic Plant Inventory
Field Identification Sheet

Park Name:
Date:

Area #	Plant Type	Field ID#	Plant Name (gen, spec, cv)	Size (Cbh, Hgt, Sprd)	Age	Condition (gd,fr,pr)	Notes
1	3	99	Ilex monticola	9' HT 25' ~~Sprd~~			
1	3	100	Kalmia latifolia				
1	2	101	abies balsimea	4' CBH 65 HT 15' Spd.			
1	1	102	Hamamelis virginiana	15' HT. 10' Spd.			
1	2	103	Abies balsamae	3'10" CBH 40' Ht. 8' spi			
1	1	104	Hamamelis Virginiana	18' Ht. 15' Spi.			

Plant Type:

1 = Deciduous tree
2 = Evergreen Tree
3 = Shrub
4 = Hedge, vine
5 = Herbaceous plant
6 = Lawns, meadows

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Field Inventory Assessment Forms:																
2	(Revised September 6,1994)																
3																	
4	Area	Plant	Inv													P	
5	No.	Type	No.	Photo	Plant Name	CBH	Ht.	Sprd.	Age	Re	C	Pr.	Fm.	Pests	M/St	Pr.	Comments:
6			(1)		Abies balsamae							P-1					Remove oak limb Rot overhang
7			(2)		Abies balsamae	1'6"						P-1					Remove oak limb Rot overhang
8			(3)		Pinus strobus	4'1"				Re			Poor				encourage Abies
9			(4)		Quercus rubra	3'5"	45'	55'				P-1d					Remove one leader w/ split
10			(5)		Sambucus pubens		8'										
11			(6)		Euonymus alatus		9'	14'									
12			(7)		Abies balsamae	4'2"	45'			Re		P-3d					cavity at base
13			(8)		Abies balsamae												basal bark wounded
14		OK	9		Viburnum opulus (clusters)												
15			10		Sambucus pubens							P-3					Prune V. opulus for separation
16			11		Kalmia latifolia							P-2	Fair	Minate	Prune		Prune V. opulus for separation
17			12		Abies balsamae									Poor Health			
18	Cluster		13		Hydrangea paniculata grandiflora							P-2					dead wood / Prune V. opulus for sep.
19			14	CK I.D.	Viburnum plicatum Tomentosum												give more light
20			15		Taxus cuspidata							P-2					P- broken top
21			16		Acer rubrum	—	Poor	Pruning	—			P-2d					Poor limb Hazard
22		OK	17		Euonymus alatus												
23		OK	18		Euonymus alatus												
24			19		Hydrangea PG		Prune	[illegible]				P-2					Prune Vol. or light
25			20		Syringa Josikaea												
26			21		Euonymus alatus (cluster)												
27			22	F.D.	Fagus Sylvatica									Lvs chewed			Lvs - small
28			23		Hydrangea PG												Prune Euonymus for separation
29			24		Quercus alba							P-3d					P- Storm broken limb + dead wood
30	[illegible]	ns	25	I.D.[?]	Chamaecyparis (Hinoki)							P-3d					Clear Vol. surrounding it
31			26		Euonymus alatus							P-2					Remove Vol surrounding it
32			27		Syringa josikaea (cluster)												Remove Vols.
33			28		Picea Pungens							P-1d					
34			29		Picea Pungens							P-1d					
35			30		Quercus rubra							P-3d					dead wood over road
36			31		Tsuga canadensis									Adelgid			Lots of dead wood
37			32		Pinus strobus						C	P-1d					Lots of dead wood - in view
38			33		Pinus strobus						C	P-1d				P	dead wood & cracked limbs in view
39			34		Quercus alba												basal bark injury
40			35		Tilia americana							P-1				P	Prune to Reveal View

Vine w/ maple like leafs / Red Stems

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	**Field Inventory Assessment Forms:**																
2	(Revised September 6,1994)																
3	Inv.																
4	*Area*	*Plant*	*Inv*													**P**	
5	*No.*	*Type*	*No.*	*Photo*	*Plant Name*	*CBH*	*Ht.*	*Sprd.*	*Age*	*Re*	*C*	*Pr.*	*Fm.*	*Pests*	*M/St*	*Pr.*	*Comments:*
6	36		~~1~~		Quercus rubra							P-1				P	deadwood
7	37		~~2~~		Quercus rubra (cluster of 3)							P-2				P	for view
8	38		~~3~~	OK	Quercus prinus												
9	39		~~4~~		Quercus prinus (2 leaders)							P-3					Prune smaller leader off
10	40		~~5~~		Quercus rubra							P-2	d				Large deadwood
11	41		6		Tsuga canadensis (4 leaders)						C	P-1	d	Adelgid		P	Storm damage - Prominent location
12	42		7		Acer rubrum						C-1						cracked leaders
13	43		8		Fagus sylvatica atropurpurea												lvs small & chewed
14	44		9		Fagus sylvatica atropurpurea						C-1	P-3	d				lvs small & chewed
15	45		10		Fagus grandiflora						C-1	P-3	d				
16	46		11		Fagus sylvatica (5 leaders)						C-1	P-2	d				large deadwood
17	47		12		Sorbus americana												cut volunteers to give light
18	[illegible]		13		Chamaecyparis pisifera squarrosa	(7')						P-1	d	Remove dead Vine			Top broken out/great pot
19	[illegible]		14		Picea pungens							P-2	d				Remove Vines
20	5[illegible]		15		Taxus baccata	(2½')						P-1	d				Remove Vine
21	[illegible]		16		Ilex monticola							P-3	d				Remove Vine
22	[illegible]		17		Ilex monticola							P-1	d				Prune broken branches + Vines
23	[illegible]		18		Ilex monticola							P-2					Prune broken branches + Vines
24	[illegible]		19		Thuja occidentalis							P-1	[illegible]			/	Very poor condition
25	[illegible]		20		Berberis thunbergii							P-3					P- dead canes
26	[illegible]		21		Kolkwitzia amabilis												Remove Vines
27	[illegible]		22		Kolkwitzia amabilis							P-1					Rejuvenate Prune
28	58		23		Kolkwitzia amabilis							P-1					Rejuvenate Prune
29	59		24		Quercus rubra	(6')	40'	30'				P-2	d				Remove vine + lower hanging branches
30	60		25		Viburnum opulus							P-3	d				
31	61		26		Quercus prinus							P-3	d				
32	62		27		Quercus rubra							P-3	d				
33	63		28		Cladrastus kentuckea												Remove dead Hemlock next to it
34	64		29		Philadelphus coronarius (3 plants)							P-1	d				Remove Some dead hemlock for light
35	65		30		Syringa vulgaris							P-2		Rejuvenate		/	Remove oak next to it for light
36	66		31		Viburnum opulus							P-[illegible]	d				
37	[illegible]		32		Syringa vulgaris (2 Plants)							P-[illegible]		Rejuvenate			
38			33	OK	Viburnum opulus												
39	[illegible]		34		Sorbus hybrida						C-1						
40	[illegible]		35		Fraxinus americana							P-3	d				Remove dead low

G + other br[illegible]

Pa

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Field Inventory Assessment Forms:																
2	(Revised September 6,1994)																
3																	
4	Area	Plant	Inv													P	
5	No.	Type	No.	Photo	Plant Name	CBH	Ht.	Sprd.	Age	Re	C	Pr.	Fm.	Pests	M/St	Pr.	Comments:
6	71		~~1~~		Quercus rubra (double	Lead)					C-2						split in crotch
7	~~72~~		~~2~~		Quercus rubra							P-2					Major deadwood
8	73		3		Tsuga canadensis							P-2	d	Adelgid			Declining w/ appearance
9	74		4		Tsuga canadensis (3 leaders)							P-3	d	Remove			two small lateral leaders
10	75		5		Tsuga canadensis							P 2	d				
11	76		6		Pinus strobus							P-	2d				
12	77		7		Tsuga canadensis	9'	70'	35'				P-2		Prune		two	split crotched branches near base
13	78		8		Acer rubrum	4'4"						P-1	d				
14	79		9		Tsuga canadensis					Re							
15	80		10		Rhododendron maximum							P-2	d				
16	81		11		Pinus strobus							P-1	d				Very spready crown / large amt. Deadwood
17	82		12		Tsuga canadensis	7'8"						P-3	d				
18	83		13		Hy hangea P G							P-3	d				Removing hemlock branches will give light
19	84		14		Chamaecyparis NootKatensis	4'3"						P-2	d				Remove Vols. for more light
20	85		15		Cornus Kousa							P-1		* Prune overhanging hemlock branches			
21	86		16		Kolkwitzia amabilis									Remove Vol. overhanging hemlock branches			
22	87		17		Viburnum opulus									Remove volunteers			
23	88		18		Kolkwitzia amabilis									Remove volunteers			
24	89		19		Pinus strobus (double	leader)					C-2	P-2	d				
25	90		20		Pinus strobus (double	leader)					C-3	P-2	d				
26	91		21		Cornus Kousa							P-1	d				
27	92		22		Acer saccharum							P-3	d				basal dark wound & cavity
28	93		23		Quercus rubra												
29	94		24		Quercus rubra					Re							Armillaria Root Rot
30	95		25		Quercus rubra							P-2	d				large basal cavity
31	96		26		Picea abies	6'6"	100'					P-3	d				
32	97		27		Tsuga canadensis grove /	woo	lla	d						Adelgid			Treatment/care Plan
33	98		28		Quercus rubra							P-3	d	Remove			select branches to view from steps
34	99		29		Ilex Monticola									Remove Vols. to give more light			
35	100		30		Kalmia latifolia									Remove			Remove dead + remove vols for more lig.
36	101		31		Abies balsamea							P-2	d	Remove			Vols. to give light
37	102		32		Hamamelis Virginiana								P	Remove			Vols. to give light
38	103		33		Abies balsamea							P-1d	Pood	[illegible]	Remove		Vols. to give light
39	104		34														
40	105		35														

Appendix D: Technical Data

Pruning
Deciduous Trees

Morris Arboretum of the University of Pennsylvania

The official arboretum of the Commonwealth of Pennsylvania

Compiled by:
A. William Graham, Jr.
Outreach Arborist / Horticulturist
Morris Arboretum of the U. of Pa.
9414 Meadowbrook Avenue
Philadelphia, Pa. 19118

(215) 247-5777 Extension 144

(revised October 1993)

BEFORE YOU PRUNE THAT BRANCH:

[ ] Understand C.O.D.I.T. concepts that protect the tree from decay.

[ ] Understand Target Pruning Concepts that work with the tree's decay defense system.

[ ] Recognize the target points for different branch joints.

- [ ] Deadwood.
- [ ] Subordinate limb
- [ ] Co-dominate stems
- [ ] Pruning dominate tops to subordinate limbs.

[ ] Understand how tipping leads to branch failures.

[ ] Understand how topping leads to decay and branch and trunk failures.

[ ] Understand how pruning effects tree health.

AFTER YOU PRUNE THAT BRANCH:

[ ] Inspect the pruning cut to verify that you hit the target points.

[ ] Following the next growing season, verify that the woundwood is circular indicating that All target points were hit.

[ ] **Do Not** use pruning paint (wound dressing) that is unnecessary and may encourage decay.

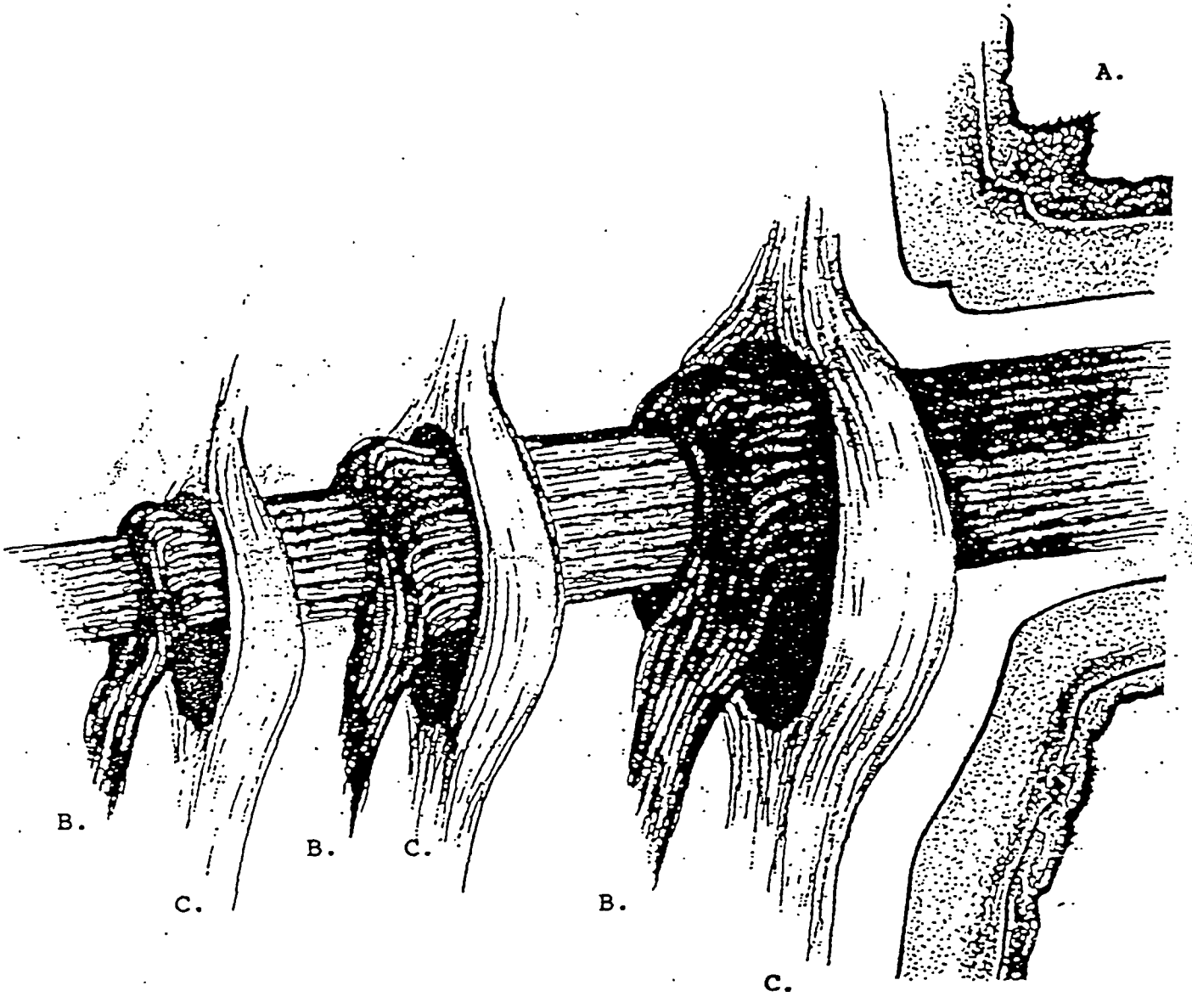
[ ] Following the next growing season, look for excessive sprouting that:

- [ ] Indicates that too much foliage was removed at one pruning.
- [ ] Indicates that pruning targets may not have been hit.
- [ ] Indicates that the tree may be declining.

[ ] Learn from pruning mistakes to increase craftsmanship and to help trees.

By A. William Graham, Jr. Outreach Arborist / Horticulturist, Morris Arboretum of the U. of Pa.

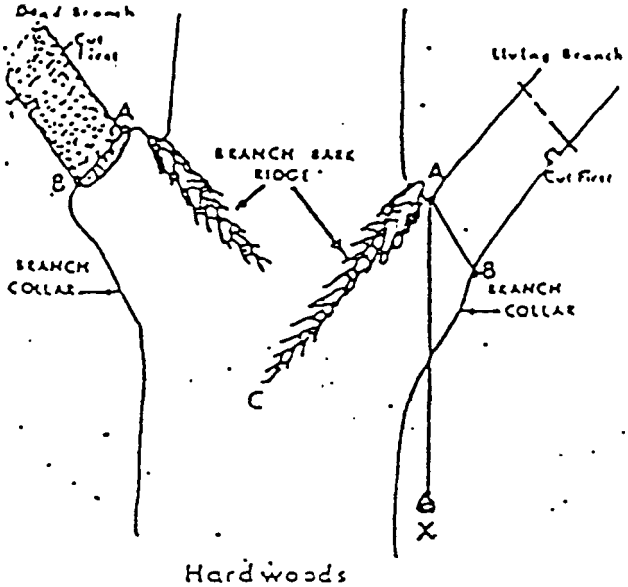
BRANCH ATTACHMENT TO TRUNK



A = Branch Bark Ridge. B = Branch Tissue. C = Trunk Tissue. This diagram, for illustration purposes, telescopes tissues in the branch-trunk joint. Understanding its structure and defense against decay is the basis for target pruning. Pruning cuts must target the branch without injuring tissues belonging to the trunk.

Diagram by Alex L. Shigo

NATURAL TARGET PRUNING



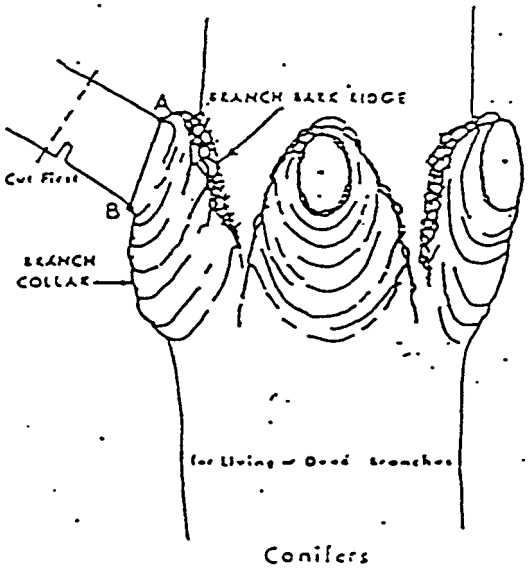
Hardwoods

NATURAL PRUNING STEPS

1. LOCATE THE BRANCH BARK RIDGE
2. FIND <u>TARGET A</u> – OUTSIDE OF BRANCH BARK RIDGE
3. FIND <u>TARGET B</u> – SWELLING WHERE BRANCH MEETS BRANCH COLLAR
4. IF B IS HARD TO FIND – DROP A LINE AT AX. ANGLE XAC = TO ANGLE XAB.
5. STUB BRANCH TO BE PRUNED
6. MAKE CUT AT LINE AB

DO NOT

- CUT BEHIND THE BRANCH BARK RIDGE
- LEAVE STUBS
- CUT BRANCH COLLAR
- PAINT CUTS – EXCEPT FOR COSMETICS
- LEAVE FLAT TOP WHEN TOPPING



Conifers

Best Time To Prune

LATE DORMANT SEASON OR <u>EARLY</u> SPRING BEFORE LEAVES FORM

By Dr. Alex Shigo

TARGET PRUNING

Four Steps to Quality Pruning Cuts

* To Hit The Targets You Must:

1. Place the saw on the line separating the trunk collar and the branch.

2. Adjust the handle angle to match that of the trunk collar line.

3. Look on the far side of the branch to note the position of the trunk collar line.

4. Twist the blade left or right to adjust the cut alignment to hit the far side trunk collar target.

By A. William Graham, Jr. Outreach Arborist / Horticulturist, Morris Arboretum of the U. of Pa.

TARGET PRUNING ALIGNMENTS

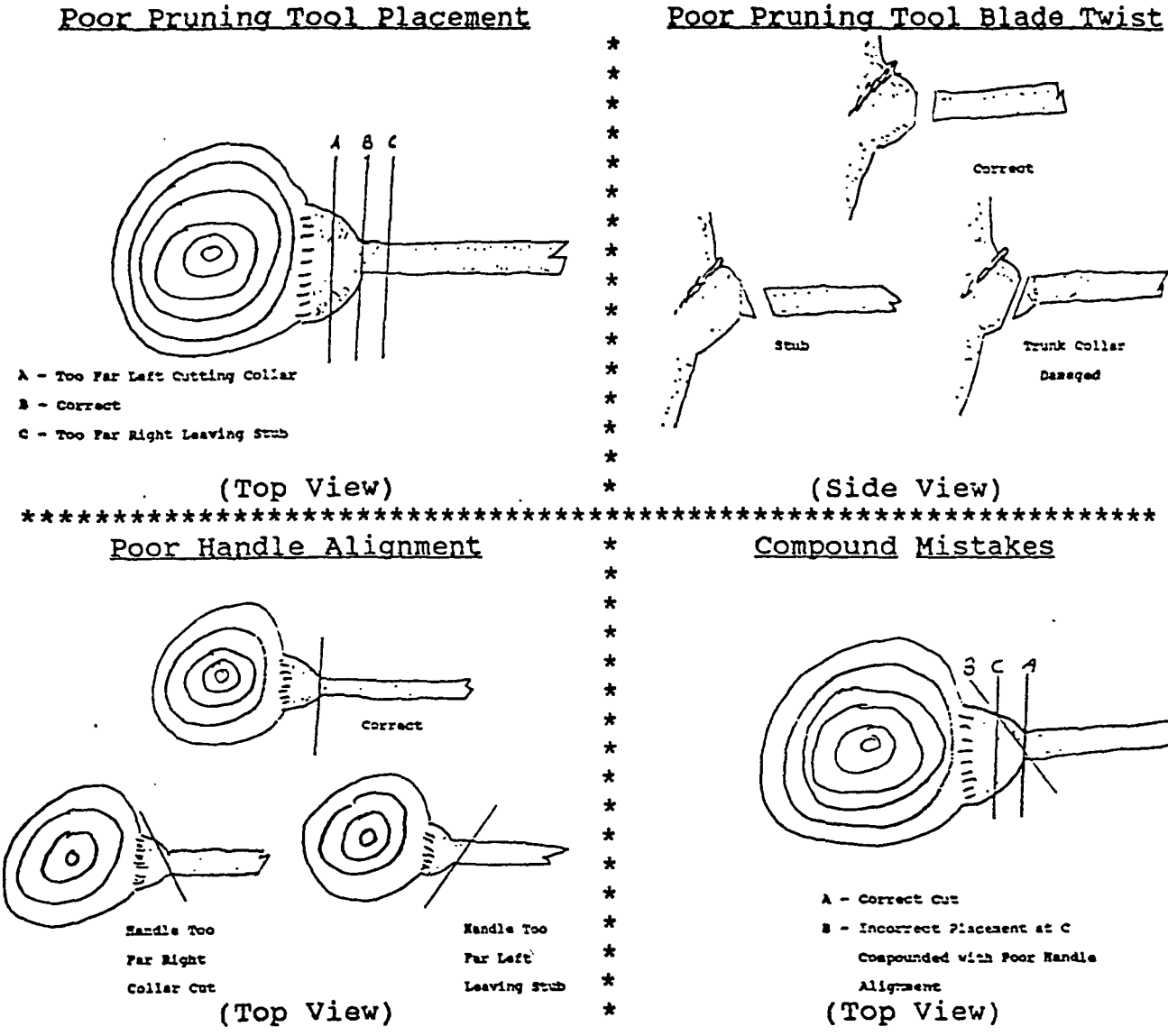
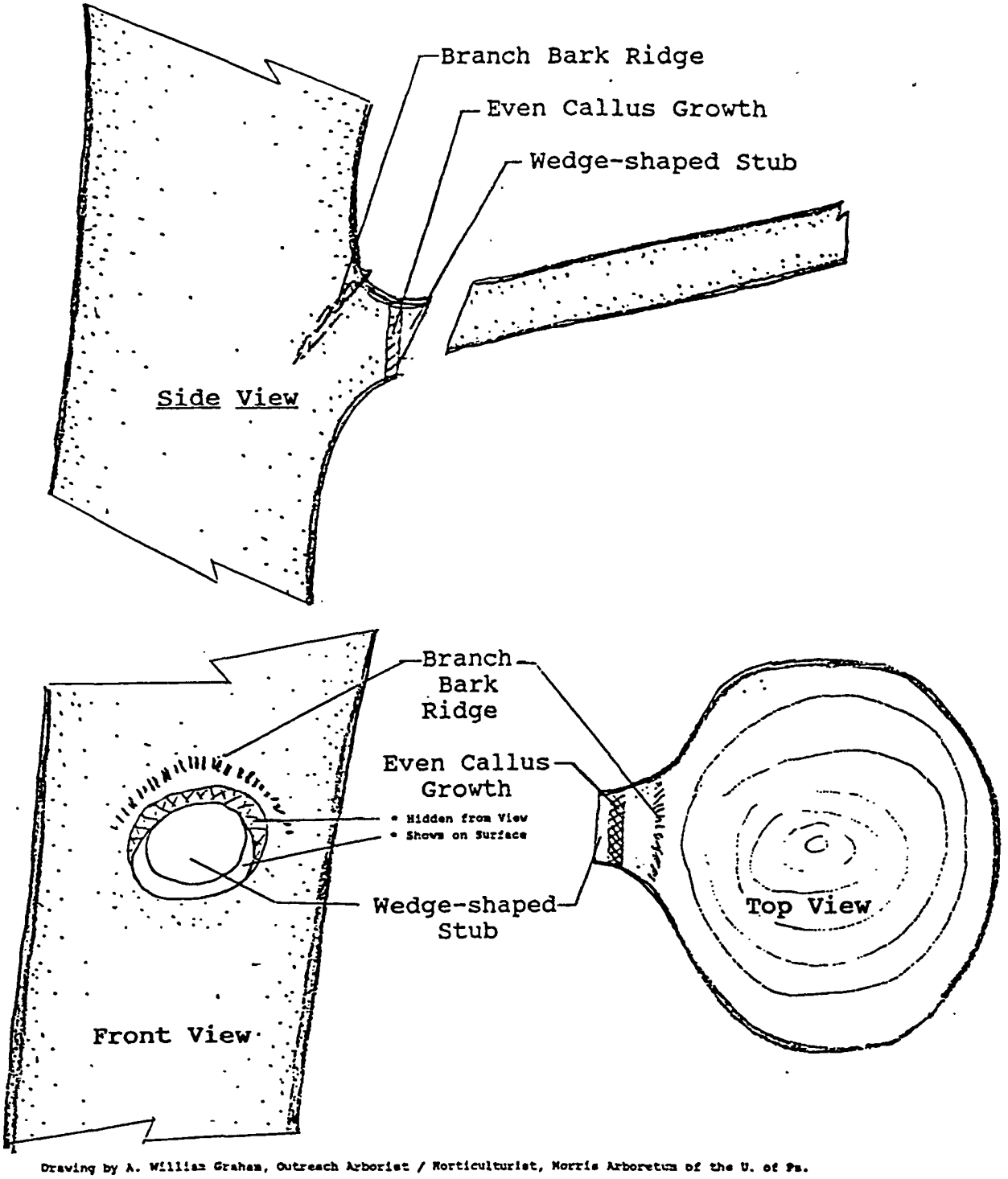


Figure 2. - Target pruning requires a lot of skill. There are three fundamental pruning tool adjustments necessary to control when removing a branch properly. Illustrated above are the possible fundamental pruning tool adjustment errors. These are: two wrong pruning tool placement mistakes, two wrong handle angle alignments, and two wrong blade twist mistakes. If you added to these the possible compound errors (errors combining two or more basic pruning tool adjustments), there are 26 adjustment mistakes possible. There is only one correct cut. It takes a lot of knowledge, skill, and caring to help the tree without causing injury: Knowledge, because you must recognize and properly identify the target points; skill, because you have a greater chance of doing it wrong than doing it right; and caring, because you must look for the target points before you cut and aim carefully every time.

Drawing by A. William Graham, Outreach Arborist / Horticulturist, Morris Arboretum of the U. of Pa.

CALLUS GROWTH AFTER AN IMPROPER PRUNING CUT

(After one year's growth)



Drawing by A. William Graham, Outreach Arborist / Horticulturist, Morris Arboretum of the U. of Pa.

Pruning at Planting

Pruning at planting may provide little or no improvement in growth and survival, particularly if plants have vigorous root growth and were planted well in advance of new spring top growth. Richardson (1958) found that removing the terminal bud of a one-year-old sugar maple seedling whip (single stem) just as it was beginning to grow delayed the initiation of root growth until another bud developed. When pruning removes most terminal buds, therefore, the reduction in potential leaf area may be accompanied initially by a smaller root system. When six species of dormant bare root trees were pruned when spring planted in Oklahoma, Whitcomb (1979b) found that nearly all the trees survived, but none benefited from the pruning. Whitcomb examined trees whose tops had been pruned back (probably headed) 0, 15, 30, and 45 percent, respectively. Those pruned back 30 or 45 percent did not have a growth form typical of the species.

In most cases, pruning of bare root and B & B plants after planting should be restricted to the removal of damaged branches and the correction of structural weaknesses. If you remove about 25 percent of the leaf area or potential leaf area of container-grown plants by removing entire shoots and leaving others with terminal buds intact, the plant will appear to be full size but will have fewer leaves, which might reduce transpiration somewhat. The unpruned terminals may favor more rapid root development.

Harris, Richard W.; Arboriculture: Care of Trees, Shrubs, and Vines in the Landscape; Prentice-Hall, Inc.; New Jersey; 1st ed.; 1983; page 407.

PRUNING SHRUBS

Morris Arboretum of the University of Pennsylvania

The official arboretum of the Commonwealth of Pennsylvania
9414 Meadowbrook Avenue, Philadelphia, PA 19118 (215) 247-5777

by
Andrew William Graham, Jr.
Outreach Arborist/Horticulturist
March, 1992

PRUNING DECIDUOUS SHRUBS

by

Andrew William Graham, Jr.

Outreach Arborist/Horticulturist

There is no doubt that people who earn their living at an occupation should know their trade and I am certain that when it comes to tree pruning, our Penn-Del Chapter members are well practiced. There are a lot of satisfied customers that can attest to this, but frequently clients will have other pruning needs. Since you earn a large portion of your living from tree pruning, most clients assume you can also prune their deciduous shrubs. This is not always the case because a lot of arborists (and nurserymen) don't understand the differences between pruning deciduous shrubs and pruning trees.

Let's begin by looking at a few of the differences between trees and shrubs. One of the main differences is in the longevity of the tree's trunks and scaffold limbs. Trees form permanent trunks that must last the lifetime of the plant. The trunk and main scaffold limbs are formed while the tree is still quite young. Special pruning care of the young tree is necessary to insure that the tree forms strong limb connections, otherwise the massive scaffold limbs of the mature trees may fail during storms.

Shrubs, by definition, never get so large as to pose a danger from their weight. The older stalks or stems of deciduous shrubs are usually removed on a regular basis to keep them vigorous and bearing flowers and/or fruit. Keeping this difference in mind will help you to understand the reasons for pruning the two groups differently.

A common mistake when pruning shrubs is to remove new canes. Sometimes new canes are referred to as suckers which leads to confusion and misunderstanding. To be accurate, the term sucker should be applied only to grafted trees and shrubs. It is, however, common to refer to the young vigorous shoots that arise from roots, or from the above and below ground portions of the lower trunk as suckers. On trees, these are always removed to keep the trunk clean and free of crossing limbs and weak branch attachments. On deciduous shrubs, these vigorous shoots are the replacements for older canes and are more appropriately referred to as new or replacement canes. New canes should be thinned for spacing and the remaining canes pruned randomly to different heights to promote branching throughout the shrub crown.

When cutting back these vigorous shrub sprouts, cut approximately a quarter inch above a primary bud. Primary buds are the large over-wintering buds. If they are not apparent, prune above a leaf base. This is true when pruning back new growth on trees, as well. When it is necessary to shorten tree and shrub branches beyond the new growth that developed last season, prune back to the joint where it originates from the main trunk or scaffold limbs. Good target pruning concepts should be applied to shrubs as well as trees.

Tight narrow-angled branch joints on trees are often referred to as v-shaped crotches. Not all v-shaped limbs are weak. If a ridge of bark is raised in the crotch between the two branches, the joint is strong and it is optional whether it should be removed. Crotches without a branch bark ridge are weak and should be avoided by removing one of the young branches. On shrubs, these weak joints are not an important pruning decision. The consequences of a split or torn limb on shrubs is not catastrophic as it would be on trees. Split deciduous shrub limbs will probably occur on the older heavier stalks that should be removed periodically. Pruning away the entire damaged stalk will help in the rejuvenation process and will have minor aesthetic consequences.

Pruning an older stalk on deciduous shrubs to the ground is a lot like leaving a stub in a tree. In trees, we understand that this is a very poor practice. Leaving a one or two inch stub, when removing old shrub stalks, stimulates formation of young replacement shoots necessary for proper shrub maintenance.

To preserve the flower display on flowering trees and shrubs you must understand when they flower. Spring blooming shrubs and trees are those that bloom before June 30th in the Delaware Valley area. These set their flower buds on new growth formed during the previous growing season. If spring blooming shrubs are pruned after flowering, the new growth stimulated by pruning, will usually set flower buds during the same growing season. Summer flowering shrubs and trees set their flowers on new growth formed the same season and do not carry them over and winter. In the Delaware Valley area, they bloom after June 30th. This group is best pruned hard during the winter or early spring in order to stimulate an abundance of new spring growth.

Light thinning and dead-wooding is usually all the pruning that is required on flowering trees. Timing, therefore, is not critical. Light maintenance pruning of flowering shrubs, likewise, does not sacrifice many blooms. Heavy rejuvenation pruning of flowering shrubs may remove a large portion of the bloom. If flowers are desired the following season, the timing is critical and the June 30th must be carefully observed.

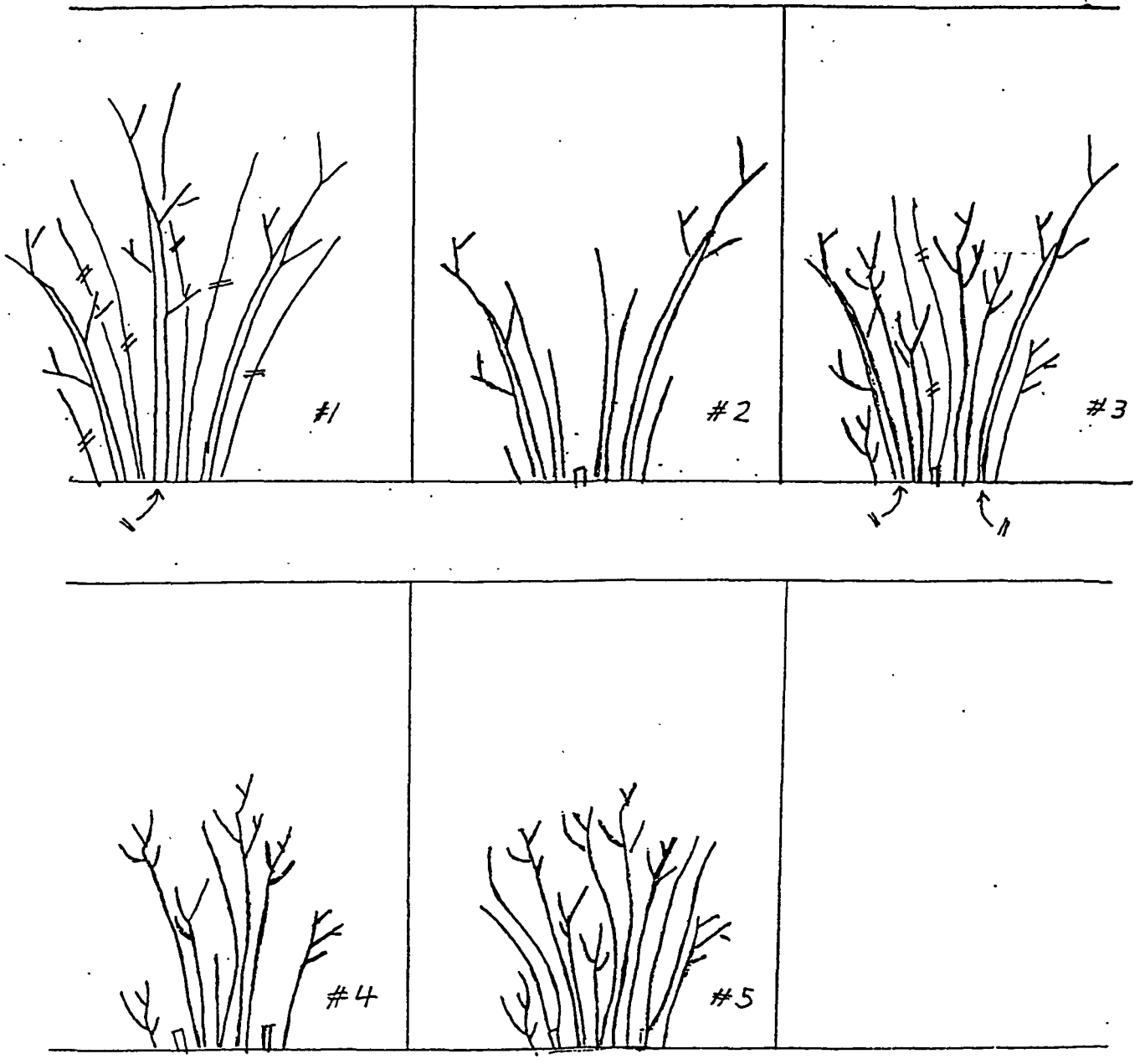
REJUVENATING OLD SHRUBS

Most overgrown deciduous flowering shrubs and many broad-leaved evergreen shrubs may be completely rejuvenated in two or three seasons. The first season one third to one half of the old canes are removed, any young canes are thinned and cut randomly at various heights, and the general outline of the shrub gently shaped. Overhanging upper branches must be shortened to admit sunlight to lower branches, otherwise they will die and the shrub will become vase shaped. The final pruned shrub's form should be mound-shaped with the lowest branches spreading the widest.

During the season following the start of rejuvenation, the pruned young growth will branch where it was headed back and will partially fill in the lower portion of the shrub. New sprouts will also form on the stumps where old canes were removed and aid in replacing the pruned old canes. Pinching the top-most portion of the shoots periodically during the first month of the growing season will encourage branching, but is not imperative.

Before the beginning of the next growing season another one third or the remaining one half of the old canes are removed and the young shoots are again thinned and pruned to various heights. Thus, rejuvenating an old shrub can be accomplished in two to three years.

Rejuvenation of an Over-grown Shrub



By A. William Graham, Jr. Outreach Arborist / Horticulturist. Morris Arboretum of the U. of Pa.

This rejuvenation procedure is ideal for flowering shrubs such as Lilacs (Syringa sps.). Be cautious on the Hybrid Lilacs to determine whether they are grafted or on their own roots. If they are on their own roots, rejuvenate as described. Make sure that some scion wood remains on grafted shrubs and inspect to insure that new growth is removed from below the graft union. Pruning shrubs during flowering will quickly sort out understock sprouts, since the flower color and type is easily distinguished.

Sometimes it is desirable to sacrifice flowers for a growing season. This may be done to lengthen the pruning season or to better schedule available personnel during a less demanding part of the year. It may also be desirable to shorten the rejuvenation cycle by getting started before the appropriate season. Bridal Wreath Spirea (*Spirea prunifolium*) and Mock Orange (*Philadelphus* sp.) are best cut completely to the ground before spring growth starts to rejuvenate them in one growing season. These and other deciduous shrubs that have thin pencil-size stems do not lend themselves to the thinning style of rejuvenation described earlier. When thinning, the stalks of these shrubs fall over without the mutual support of their neighbors.

Trees and shrubs differ in the frequency of pruning. Trees can be left three to four year between pruning without detrimental effects. Many flowering shrubs need yearly maintenance to keep them in top form. An example is Viburnums and other spring flowering shrubs that have attractive fruit. These pose a dilemma since pruning after flowering removes part of the fruit display and pruning after the fruit display removes flower buds set for the following spring. Regular maintenance insures that some flowers or some fruit remains after pruning.

CONTROLLING THE SIZE OF SHRUBS

Several other pruning problems occur on some types of shrubs, especially in the flowering shrub classification. Some flowering shrubs will propagate themselves by tip layering when the branch ends form roots in contact with the soil. Forsythia is an example. Where there is ample room and branch tips are permitted to lay freely on the ground, Forsythia and others will form large thickets. If space is limited, tip layering of these shrubs must be controlled by cutting the layered tips from the plant and digging the rooted plantlets for discard or replanting elsewhere. Layering may be discouraged by shortening or removing canes that make ground contact.

Another common flowering shrub problem occurs when fruit falls beneath the canopy of the mother shrub and germinates. Protected from lawn mowers by the established canopy, they frequently develop into large plants which increases the shrub's width. It is necessary to dig out the seedling plants regularly to control the size of the planting. Viburnums commonly must be watched for this problem.

Some shrubs increase in size by crown division. The ever increasing clump may need control in situations where landscape space is limited. This can be remedied by digging away outside divisions with a sharp nursery spade and occasional help by sharp pruning tools. Sometimes the best solution is to dig up the entire clump, divide it into smaller sections, then replant a smaller and more juvenile division. This is the best solution for Japanese Flowering Quince (*Chaenomeles japonica*).

Some shrubs divide by underground stems called stolons. Red Osier Dogwood (*Cornus sericea*) commonly spreads by this manner. Control these by removing outside divisions or replace the entire plant with an outside division.

Pruning of deciduous shrubs is quite different from pruning trees, but by understanding a few basic principles, it is not difficult. Most arborists can easily add deciduous shrub pruning to the list of their services. The tools and equipment are the same and with a basic understanding of pruning objectives, the arborist can do a great service to both their customers and shrubs.

(1shrub)

Pruning Conifers and Broad-Leaved Evergreens
by A. William Graham, Jr.
(Published as the feature article in *Landscape & Irrigation* Magazine, December 1994)

PRUNING IS BOTH FUNDAMENTAL AND AN ESSENTIAL TO MAINTAIN LANDSCAPES WITH EVERGREEN. EVERGREENS GROW AND RESPOND DIFFERENTLY TO PRUNING IS OFTEN MISUNDERSTOOD WHICH CAN AND FREQUENTLY DOES LEAD TO THEIR RUIN. THE PURPOSE OF THIS ARTICLE IS TO POINT OUT BASIC PRUNING PRINCIPLES AND MAKE SOME OBSERVATIONS USEFUL IN MAINTAINING CONIFERS AND BROAD-LEAVED EVERGREENS.

A key to pruning evergreens is an understanding of buds. All temperate-climate trees begin their spring growth from buds. The fat swollen spring buds on deciduous trees are very apparent. Although they frequently go unnoticed, needle-leaved evergreens also begin spring growth from buds formed the previous summer. Broad-leaved evergreens, likewise, begin their growth from over-wintering buds. On Rhododendrons, there are two types of buds present: vegetative and flowering. Vegetative buds are small and slender compared with flowering buds. Rhododendron vegetative buds are found at the base of each flower bud, but may occur singly as terminal buds.

Most pruning cuts that head back or reduce the length of an individual branch should be made approximately an inch above an over-wintering bud, also called a primary bud. Heading back causes the buds directly beneath the cut to begin growth and to grow more vigorously that they would if left unpruned.

Deciduous trees and broad-leaved evergreens differ from most needle-leaved evergreens by their ability to grow from latent buds and adventitious buds. Latent buds are primary or over-wintering buds on deciduous and broad-leaved evergreen trees that do not grow or develop into branches in the year following their formation. Latent buds may be stimulated to grow by heading back a branch beyond the primary buds.

An adventitious bud is another type of bud that occurs primarily on deciduous and broad-leaved evergreen trees and shrubs that may be stimulated into formation and growth by excessively heavy pruning, improper pruning, or by a catastrophic event like breakage during storms. Leaving a long branch stub after removing the rest of the limb will stimulate a horde of vigorous whip-like sprouts that are crowded together with narrow v-shaped crotches without branch bark ridges. This type of growth is unnatural in appearance, and years later, is prone to splitting in storms. Topping and improper removal of branches leaving long branch ends or stubs should be avoided on all trees.

NEEDLE-LEAVED EVERGREENS

Pines (*Pinus species*), Spruce (*Picea species*), Fir (*Abies species*), Hemlock (*Tsuga species*), true Cedars (*Cedrus species*), and Douglas Fir (*Pseudotsuga menziesii*) are examples of a group of needle-leaved evergreens that do not have the ability to produce adventitious or

latent buds except for a very short time during rapid spring growth. If the terminal bud is removed from the leader or side branches after the tissue has become woody, no growth will be formed on that particular branch again. Removing all terminal shoots from a branch will cause it to die.

Pines should be pruned when the new growth is in the process of expansion. This stage is known as the candle stage because of the resemblance of the shoots to wax candles. At this time, from one-third to two-thirds of the length of each candle can be easily snapped off with the fingers. The terminal shoot should be left longer than any of the side candles. Pines pruned or "pinched" in this manner will develop thick, full crowns.

Yew (*Taxus species*), Junipers (*Juniperus species*), Arborvitae (*Thuja species*), and False-Cypress (*Chamaecyparis species*) are examples of a group of needle-leaved and scale-like leaved evergreens that vary in their ability to produce growth from latent and adventitious buds. Some Yews will sprout growth very nicely when pruned back to old wood, while others may not. Health, vigor, species variation, and wood maturity may account for this variation. *Chamaecyparis lawsoniana* cultivars will not break from old wood according to Charles R. Harrison, *Ornamental Conifers*, Hafner Press, New York, 1975). Caution with this group is the best advice. Do not head back excessively. Make most cuts to lateral branch junctions.

BROAD-LEAVED EVERGREENS

Broad-leaved evergreens have the ability to grow from primary, latent, and adventitious buds. This is both an advantage and disadvantage. Water sprouts, which are growth from adventitious or latent buds (often erroneously referred to as suckers), frequently develop in American Holly causing double leaders and/or crossing limbs. This ability is also an advantage when trying to reduce the size of the plant or when filling gaps left from branch die-back or breakage of side limbs.

Some broad-leaved evergreens are tree-like in their growth patterns and some are shrub-like. A few examples of shrub type broad-leaved evergreens include Rhododendrons, Inkberry Holly (*Ilex glabra*), Cherry Laurel (*Prunus laurocerasus*), Japanese Andromeda (*Pieris japonica*), Japanese Skimmia (*Skimmia japonica*), and Mountain Laurel (*Kalmia latifolia*).

Pruning shrub-like broad-leaved evergreens is comparable to pruning deciduous flowering shrubs. Rejuvenating overgrown plants should be done over two, three, or more seasons. Pruning prior to new growth in the spring is desirable for broad-leaved evergreen shrubs that are not grown for their flowers. Prune those whose flowers are desired immediately after flowering. The resultant new growth may set flower buds for the following season. It is not detrimental to the plant, if the flowers are sacrificed by pruning before spring growth.

REJUVENATION TYPE PRUNING

Start rejuvenation by removing one-third to one-half of the large, old canes or stems to ground level. Any long, pencil-size, young growth should be pruned randomly to different heights. Cut approximately 1/4 inch above a primary bud found at the base of each leaf. Two or three buds below the pruning cuts will be stimulated into branching growth during the following season. By cutting randomly to varying heights, branching occurs throughout the shrub crown forming a dense, natural appearance.

The second year (if the shrub is to be rejuvenated in three years), another 1/3 of the large old canes are removed to the ground. Thin the number of young canes for better spacing and repeat the random height pruning.

Finally, the third year the remaining old canes are removed leaving a young, well-branched shrub.

SPECIAL CONSIDERATIONS

Tree-like broad-leaved evergreens include American Holly (*Ilex opaca*), Evergreen Magnolia (*Magnolia grandiflora*), and English Holly (*Ilex aquifolium*). Pruning these small trees should include structural pruning to remove double leaders, crossing branches, water sprouts, and dead wood. Some shaping using pole pruners or a ladder is helpful, but care should be exercised not to create an artificially perfect geometric shape.

Double leaders or codominant stems in any kind of tree frequently lack a branch bark ridge and are weak and susceptible to storm breakage, especially after many years of growth have added substantial weight and leaf surface. Leaf surfaces collect extra snow and ice, often testing and stressing the weak wood of these narrow crotches.

Double leaders are best removed when young to reduce the wound size and to preserve the symmetry of the tree. When double leader removal will create a serious imbalance in the tree crown, one leader may be topped to a side branch.
Annual pruning of this topped branch is necessary to prevent an adventitious or latent shoot from becoming dominant and to prevent the subordinate leader form regrowing. The reduced growth of the subordinate leader reduces or eliminates the chance of storm damage due to poor branch attachment.

Yews, Arborvitae, Junipers, and False Cypress are frequently used for formal and informal hedges. They are more tolerant of clipping or hedging because they have some ability to produce adventitious buds.

Hedges should be sheared so that the base is slightly wider than its top. This allows adequate light for proper growth to reach the bottom branches and results in a thick, full hedge all the way to the ground. String lines should be used as an aid to maintain hedge height and alignment on formal hedges.

A MISUSED PRUNING TOOL

Hedge shears are often misused in pruning. Hedge shears are appropriate for use on formal hedges and topiary. Topiary is a hedging style where plants are sculpted into animals, objects, and geometric shapes. They are not appropriate for most residential properties.

Japanese gardens also use sculpted forms maintained by utilizing hedge shears. Rounded forms that have pleasing relationships with one another are used to symbolize rocks. Other evergreens symbolize drifting clouds and have sheared masses at the ends of long trunks and branches. All side branches are pruned from the base of trunks and major branches. These symbolic sheared forms are appropriate for this garden style. Since few residences have Japanese style gardens or formal gardens, hedge shears should find infrequent use in pruning.

Aesthetically, "golf ball", "hockey puck", and "lollypop" forms, resulting from the overuse of hedge sears, are in poor taste. Hand pruners, lopping shears, and small pruning saws are the proper tools for most residential pruning.

Pruning is primarily a thinning process, when done properly. Branches, ranging in size from large scaffold limbs to pencil size twigs, should be removed by cutting back to the next lateral branch, main trunk, or scaffold limb. This technique is often referred to as drop-crotching.

REMOVING BRANCHES AND LIMBS

Proper removal of limbs and branches is very important to prevent decay from entering the main trunk. Twigs and small branches should be cut off at the line formed between the trunk and limb by a technique called "target pruning". This lie is often referred to as the "trunk collar", "limb collar", or "shedding line". "Target pruning" concepts require identifying target points near the branch base where it joins that trunk or larger branch. Ont of the target points is called the "branch bark ridge". This is a build up of bark which forms a ridge line between the branch and trunk. On white barked birch trees, it is easily seen as a dark line in sharp contrast to the birch's white bark. Make sure not to cut through the branch bark ridge.

Other target points are more difficult to identify, but can be found on most branch junctions. Scrutinize the branch base near the area where the limb base stops rapidly tapering. Often there is a textural change and a color change to the bark that indicates a line where the final pruning cut should be made. With practice, identifying the target points becomes easier.

Care should be exercised not to cut too far beyond the trunk collar. Branch stubs detract from the natural lines of the limb and trunks. On broad-leaved evergreens, they will sometimes resprout forming ugly crowded tufts of weak-crotched branches. Usually

stubs die back leaving dead protruding wood that interferes with callusing over or bark closure of the wound and encourages wood rotting decay organisms to colonize.

Large branches (those that are longer than can be easily hand held) should be removed by a three-step process. First, make an undercut one to two feet from where the final flush cut will be made. Cut approximately one third of the way through the limb from the bottom to prevent the bark from being ripped or pulled down beyond the under cut. After the limb weight is removed, the stub can be target pruned to the trunk collar. Hold the stub with one hand when finishing the cut to prevent the bark form tearing.

REPAIRING WOUNDS

Tree wound paints are no longer recommended. Researchers have found them ineffective in preventing the entry of wood rotting microorganisms. In fact, sealing the wound may create a moist environment ideal for fungal growth. When applying thick asphalt tree paints with a brush, infected sawdust may be transferred from cut to cut and tree to tree causing the spread of disease. If desired for aesthetic reasons, apply thin aerosol spray type tree paint to darken the wound.

PRUNE ACCORDING TO FUNCTION

The function of evergreens in the landscape may change dramatically how they are pruned. A pine that acts as a windbreak, noise barrier, or visual screen should receive little thinning and should be pruned and pinched to thicken and maximize its screening effect. The same species used as an accent plant or specimen may be thinned to reveal the beauty and line of its trunk.

Thinning pines and other needled evergreens must be done with caution as the branches tend to mutually support one another. This reduces snow and ice damage. When thinned (and sometimes just thoroughly dead wooded) each branch length should be shortened to reduce leverage exerted by snow and ice loads. Japanese gardeners meticulously remove needles and small shoots that further reduce surfaces for snow loading. Finally, some props, braces, or cable systems should be considered to reduce winter breakage.

Diseased limbs, dead wood, cracked limbs, and stubs from storm damage can be removed at any time on all evergreens.

Reversion growth on dwarf conifers and unstable bud sports should be removed to preserve the desirable horticultural form. Do not be confused by juvenile and mature foliage found on cultivars of many kinds of Junipers, False Cypress, and some Arborvitae. Mature foliage is usually scale-like and soft to the touch whereas juvenile foliage is usually awl-shaped and prickly. Both types may be found together on the same branch.

Conifers have difficulty in producing new leaders when the leader is destroyed by improper pruning, disease, insects, or storm damage. As many conifers do not produce adventitious buds, one of the lateral branch shoots must become a dominant vertical leader. It takes many years for this to occur unless aided by pruning and training. Many leaders will develop from lateral branches, id no pruning or training is done.

Missing leaders can be repaired by the use of a splint. A splint can be made by tying a vertical stake so that half its length is securely tied in several places to the main trunk below the point where the old leader was lost. A side branch can then be selected and tied up to the upper portion of the stake. Pruning to encourage branching should be done annually in the spring until the pyramidal habit is restored. Check the splint ties every six months to assure they are not restricting stem growth. In one ore two years the splint can be removed.

SPECIAL TECHNIQUES

This splinting method is very necessary with undamaged weeping conifers to achieve the desired height. New growth on weeping conifers is too flexible and limber to stand upright on its own. That is why the branches weep. Training on a stake or splint for a year or less allows the twig to become woody and stiffen. Once it is stiff enough to stand erect, the stake can be removed.

Gaps or holes caused from the loss of side branches on needled evergreens can often be repaired or restored by "borrowing" branches. Gaps at the bottom of an evergreen may be filled by pulling a lower branch down. Secure the branch by using a wire tied to a stake driven into the ground beneath the tree or perhaps to the base of the trunk. Sometimes a branch can be moved to the side to fill gaps by tying it to a neighboring branch.

The method of attachment of the wire depends on the length of time required to train the branch in its new position. Short pieces of old garden hose can be used to attach the wire to the branch. Do not pass the wire through the hose. Bend the hose piece around the branch and use a small bolt to join the hose ends together. Secure the wire to the bolt. Special strap-type ties can be purchased commercially. Another alternative is to cut strips of used truck inner tube to use as strapping and make grommet holes in both end for the wire attachment. Research has found that a wire that passes through the hose exerts as much pressure on the branch as without the hose.

For long term training, it is necessary to install a permanent system that will not interfere with the radial growth of the tree trunk or branch. Small limbs can be secured using appropriate size screw eyes and bolts from the local hardware store. Larger branches may require special hardware purchased from an arborist supply. Holes should be drilled into or through the limb to install the hardware. Galvanized wire can be used to secure the branch being trained. As the tree grows, new wood will grow around the hardware and strengthen the anchorage without choking and restricting growth.

Good pruning and training is essential for healthy, well formed evergreens to serve aesthetic landscape functions in the landscape. This can be accomplished by observing a few basic pruning rules and by acquiring knowledge about when and how pruning should be accomplished.

(arborage)

Tree

Cabling and Bracing

Morris Arboretum of the University of Pennsylvania

The official arboretum of the Commonwealth of Pennsylvania

Compiled by:
A. William Graham, Jr.
Outreach Arborist/Horticulturist
Morris Arboretum of the U. of PA
9414 Meadowbrook Avenue
Philadelphia, PA 19118

(215) 247-5777 extension 144

Cabling Systems

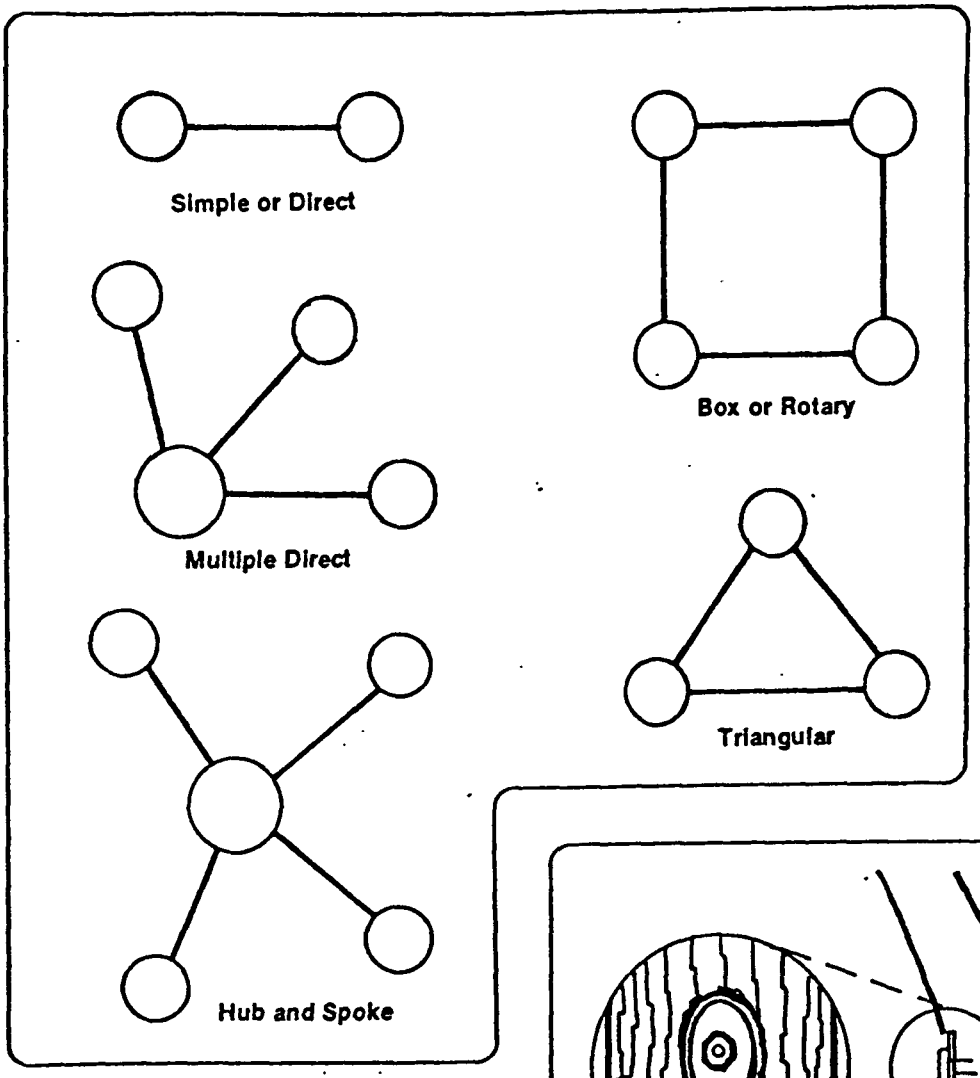


Figure 10.28.
Cabling systems

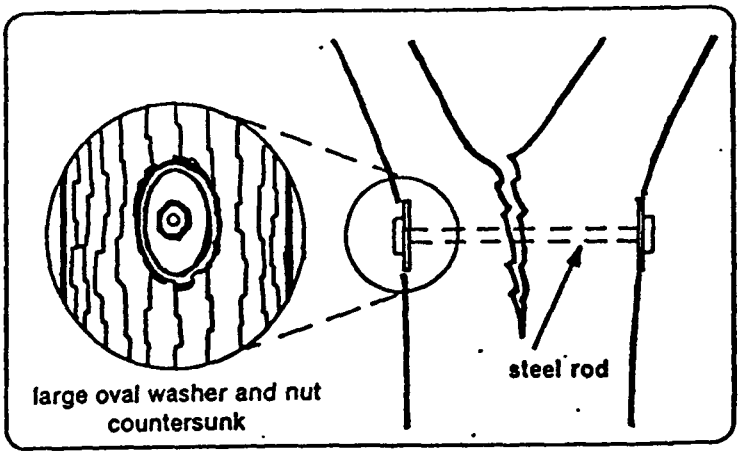
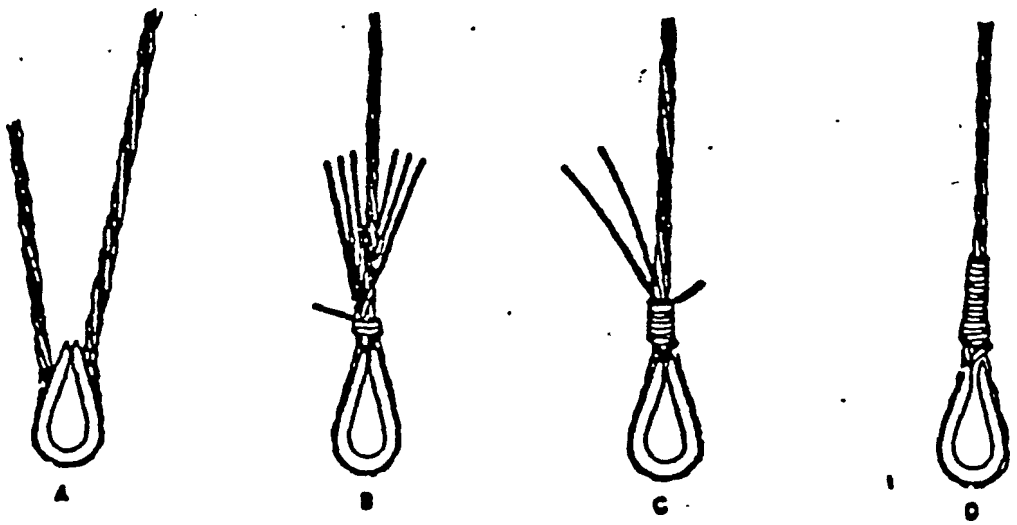


Figure 10.29. Bracing a split crotch

Smithyman, S.J.; *The Tree Worker's Manual*, Ohio Agricultural Education Curriculum Materials Service; Columbus, OH; 1985.

Eye Splice in Softwire Seven Wire Strand Cable

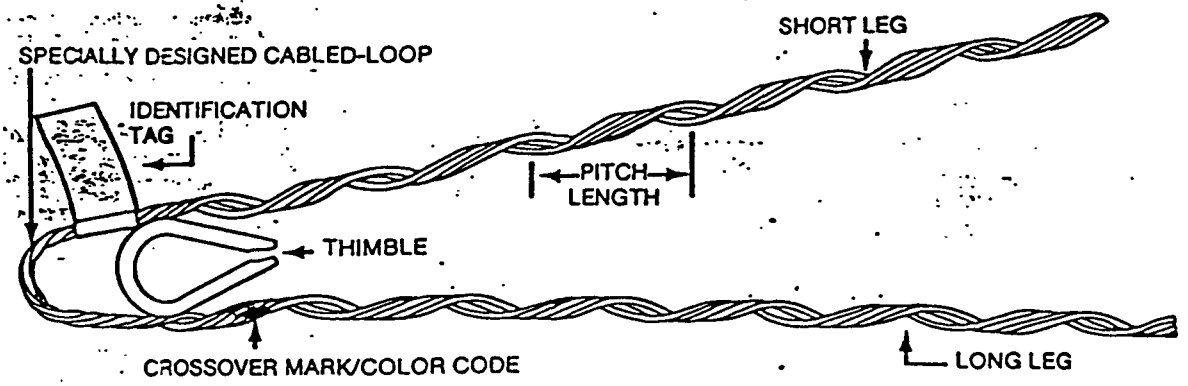


A. Timble is inserted in a loop in the cable.
B. One strand is selected and wrapped twice around the other six.
C. Strand which has been wrapped is cut and the same procedure is followed for the remaining six strands.
D. Completed eye splice.

Figure 3. Steps in Making an Eye Splice in Seven Wire Strand

APPLICATION PROCEDURE & SAFETY CONSIDERATIONS **PREFORMED** LINE PRODUCTS

TREE-GRIP DEAD-ENDS



Be sure to completely read and understand this procedure before applying product.

TREE-GRIP DEAD—ENDS 1250 and 1251 are applied to extra high strength (EHS) strand. TG-1250 for use on 3/16" EHS strand. TG-1251 for use on 1/4" EHS Strand.

When installing "cabling" between two boughs or branches using TREE-GRIP dead-ends, follow normal installation procedures.

1) Match the correct (EHS) strand size needed for the job with the corresponding TREE-GRIP dead-end making sure the strand is left hand lay. Then tape the area of the strand to be cut. This will prevent the individual wires from separating after the cable cutter cuts the strand.

The PREFORMED Safety Guy Wire Dispenser, Catalog No. SGD-0700, is a perfect accessory when carrying and working with extra high strength strand.

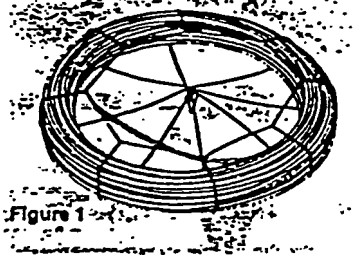
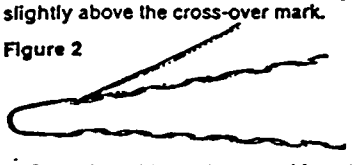


Figure 1

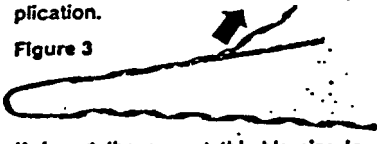
2) Lay the taped end of the cable in the TREE-GRIP dead-end's short leg, slightly above the cross-over mark.

Figure 2



3) Once the cable has been positioned correctly, continue to wrap the short leg of the TREE-GRIP dead-end around EHS strand within two wraps (pitch lengths) of completion. (Figure 3) During the wrapping procedure be sure to pull the legs away from strand. This will facilitate the ease of application.

Figure 3



4) Insert the correct thimble size in the TREE-GRIP dead-end's cabled-loop and cross the longer leg with the already completed short leg at the cross-over mark. The thimble is now secured and cannot fall.

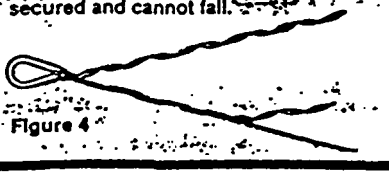


Figure 4

5) Now continue wrapping the lo leg around the strand within two pit lengths of completion. (Figure 5)

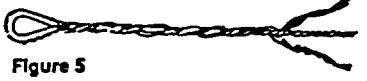


Figure 5

Note - To facilitate the ease of application of the last two pitch lengths of both short and long leg of the TREE-GRIP dead-ends, split each leg into two groups (subsets) and wrap each subset individually to completion. (Figure 6)

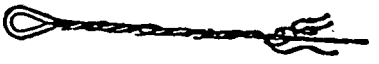


Figure 6

BE SURE ALL LEG ENDS ARE SNAPPED PROPERLY ON THE STRAND. IF NOT THE RODS MAY UNWIND FROM THE STRAND.

6) Completed Application- If less tension is ever desired after the initial installation, follow this procedure: Unwrap both legs of the TREE-GRIP dead-end within 2 pitch lengths of the cross-over mark and allow the strand to slowly slide through the legs until the desired tension is achieved. Then simply wrap both legs back on strand to completion.

SELECTING THE CORRECT MATERIALS FOR A CABLING SYSTEM

Since cables are being installed in a tree to help strengthen it, then it becomes very important that the proper types and sizes of materials are used.

Try to match up eyebolts, cables and so forth of equal working loads. The working load is generally considered to be 1/5th of the tensile strength. Most manufacturers will publish the tensile strength of a material which has been determined by an engineering test. These test results are then referred to as the "Published Breaking Strength."

Note that on the charts on the accompanying pages, the published rated breaking strengths are listed for the most commonly used cabling materials.

To use as an example in referring to the charts, consider the following: If one were to wish to support a 24" limb, then a 5/8 eyebolt, washer and nut or a 3/4" threaded rod with amon nut, washer, and nut would be selected. 5/16" extra high strength cable would be used with a 5/16" TG1252 tree grip.

In referring to these charts, one will see that of all the components of this system, the weakest point should be in the 5/16 EHS cable which has a published breaking strength of 11,200 lbs. Note that the safe working load for this system is 2,240 lbs. or 1/5th of the P.B.S.

In dealing with smaller limbs and loads, smaller cables may be used. Often there are choices whether to use common grade 7-strand cable or EHS cable, or to use lag hooks rather than eyebolts, etc.

PREFORMED TREE GRIP

Size	Published Rated Breaking Strength	Safe Working Load
3/16" TG 1,250	3,990	798 lbs.
1/4" TG 1,251	6,650	1,330 lbs.
5/16" TG 1,252	11,200	2,240 lbs.

STRENGTH OF CABLING HARDWARE

DROP FORGED EYEBOLT

(Please note: as the angle of pull varies from 0°, breaking strength of hardware decreases).

Size	Published Rated Breaking Strength	Safe Working Load* lb. at 0°	45°	90°
3/8"	7,000	1,400	280	210
1/2"	13,000	2,600	520	390
5/8"	20,000	4,000	800	600
3/4"	30,000	6,000	1,200	900

*USAS B 18.15 - 1969

COMMON GRADE 7 - STRAND CABLE

Diameter	Published Rated Breaking Strength	Working Load	Approx. weight lbs./100 ft.
3/16"	1,150	230	7
1/4"	1,900	380	12
5/16"	3,200	640	21
3/8"	4,250	850	27
7/16"	5,700	1,140	40
1/2"	7,400	1,480	52

STRENGTH OF CABLING HARDWARE (CONTINUED)

Extra High Strength (EHS) Cable, 7 x 19-Strand

Diameter	Published Rated Breaking Strength	Working Load	Approx. weight lbs./100 ft.
3/16"	3,900	798	7
1/4"	6,650	1,330	12
5/16"	11,200	2,240	21
3/8"	15,400	3,080	27
7/16"	20,800	4,160	40
1/2"	26,900	5,380	52
ANSI/ASTM	A 4.75-78		

CONTROL OF HEMLOCK WOOLLY ADELGID USING SOIL INJECTIONS OF SYSTEMIC INSECTICIDES

by V. Bruce Steward and Tracy A. Horner

The hemlock woolly adelgid (*Adelges tsugae*) is a severe pest on eastern hemlocks (*Tsuga canadensis*) in the eastern United States. Alternatives to foliar sprays, implants, and trunk injections to manage this pest are needed. Soil injection of pesticides can eliminate the problems associated with foliar applications of pesticides, such as drift and dermal exposure, and does not wound the tree as implants or trunk injections can. Thus, a study was initiated to evaluate soil injections of Merit 2F (imidacloprid) for control of hemlock woolly adelgids on eastern hemlocks. Merit 2F is a systemic and contact insecticide exhibiting low mammalian toxicity which is from a new class of insecticides known as the Chloronicotinyls.

The experiment was conducted at Longwood Gardens, Inc., Kennett Square, Pennsylvania, and all trees used for the study were heavily infested and showed signs of damage and decline, indicated by discolored foliage and dead branches. Soil injections 15 to 23 cm deep were made around the drip line of hemlocks between 18 to 21 May, 1993, from 6:00 a.m. to 9:00 a.m. A Hypro Corp diaphragm sprayer operating at 100 psi with a Deep Root Feeding Gun was used to perform the injections. For each 2.5 cm (1 inch) of tree diameter at breast height (dbh), 3.8 liters (1 gallon) of water and either 7.4 ml of Merit 2F or 44.4 ml of Metasystox-R2, respectively, were injected around each tree. Two injections per 2.5 cm of dbh were made for each tree. For each treatment, 11 trees were used and tree dbh ranged from 8 to 99 cm.

Treatments were evaluated from 18 to 26 Oct., 1993, by randomly sampling five branches from the bottom half and five from the top half of each tree. The first 100 adelgids on the new growth of each branch were examined microscopically and recorded as dead or alive; 11,000 adelgids were examined for each treatment.

Merit 2F significantly reduced the adelgid population, with 95.9% mortality resulting (Table 1). Mortality was not significantly different from sample location on the trees. Metasystox-R2 also provided effective control (84.9%), but resulted in significantly lower mortality than supplied by Merit 2F. Uniform control was not achieved throughout the tree with Metasystox-R2; adelgid mortality was significantly higher on the top half of the tree. A high level of adelgid mortality (56.5%) occurred on the untreated trees; however, McClure (1,2,3), reported that 37.3 to 68.7 % natural mortality

Table 1. Percent mortality of hemlock woolly adelgid 5 months after soil injections were made around hemlocks using Merit 2F and Metasystox-R2.

	% Mean mortality (±SD)		
		Sample location[b]	
Treatment	Total	Top	Bottom
Merit 2F	95.9 ± 12.5a[a]	96.2 ±11.9a	95.6 ± 13.0a
Metasystox-R2	84.9 ± 13.4b	87.0 ± 12.7a	82.8 ± 13.8b
Control	56.5 ± 19.5c	58.8 ± 22.0a	54.3 ± 16.3a

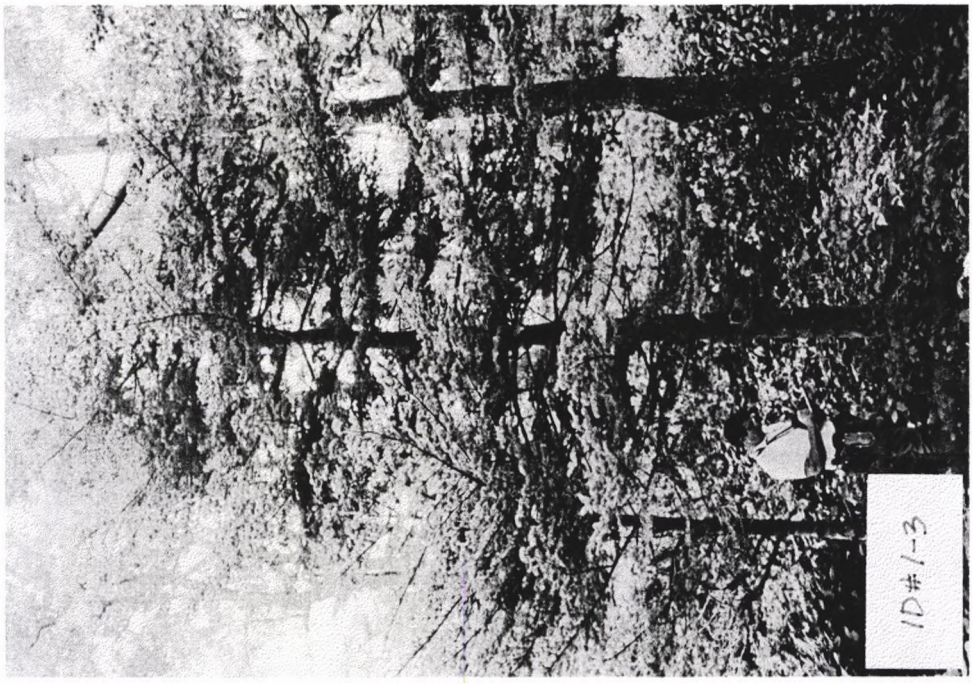
a Means within column sharing the same letter are not significantly different, (P<0.05; ANOVA/Fisher's protected LSD).
b Pairs in row sharing the same letter are not significantly different, (P<0.05; ANOVA).

occurred in his studies [Insect & Acaracide Tests 14: 346-347; J. Arboric. 17: 227-229; J. Econ. Entomol. 85: 468-472].

Soil injections of Merit 2F were more effective than Metasystox-R2 in controlling adelgids. The oral and dermal LD50 for Merit 2F are >4000 and >2000 mg/kg, respectively, while those of other systemic insecticides such as Cygon 2E and Metasystox-R2 are <215 and <610 mg/kg, respectively. Merit 2F is considerably safer than other presently available systemic insecticides and could prove useful in managing the hemlock woolly adelgid without the potential drawbacks that can result from foliar sprays, implants, or trunk injections.

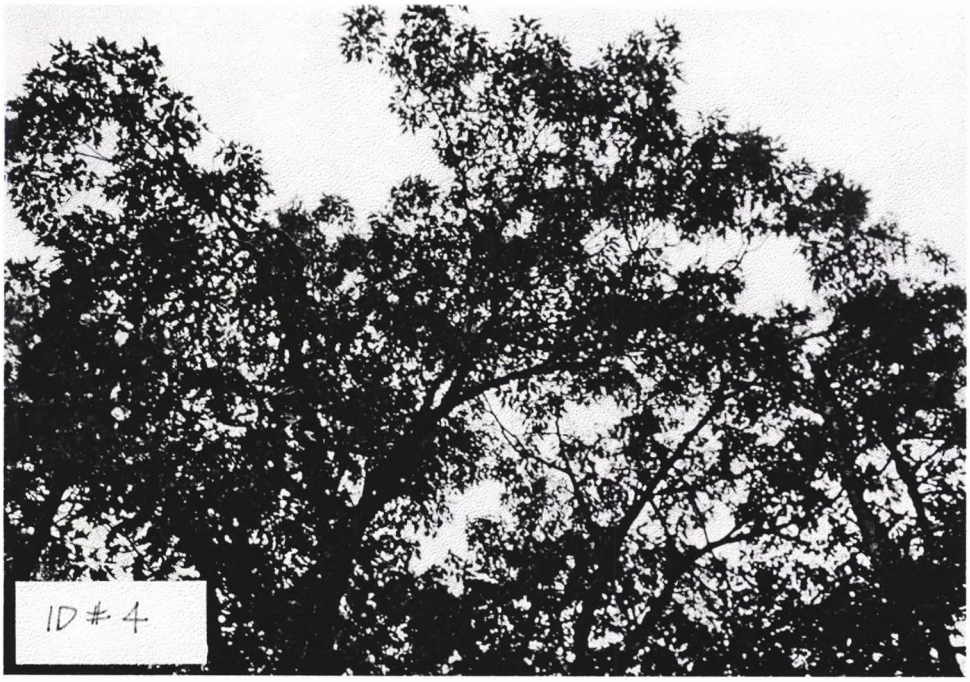
IPM Coordinator
Horticulture Department
Longwood Gardens, Inc.
P.O. Box 501
Kennett Square, PA 19348

Appendix E: Site Photographs

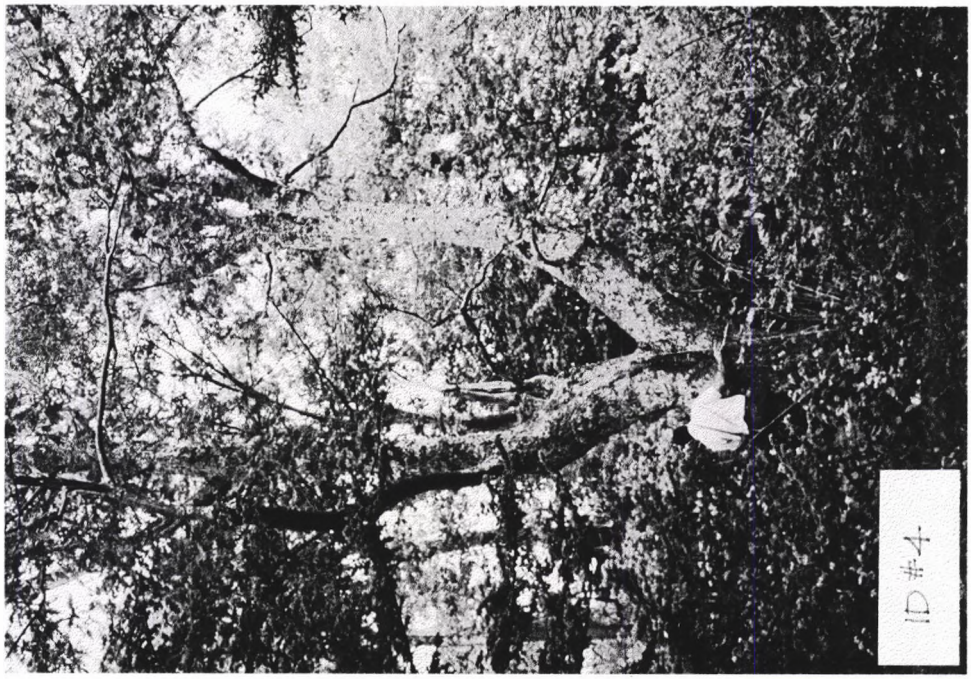


Abies balsamea #1 & #2 (CLR #A101) & Pinus strobus #3 (CLR #A114) (Photograph #01)

Abies balsamea #1 & #2 (CLR #A101) & Pinus strobus #3 (CLR #A114) (Photograph #02)

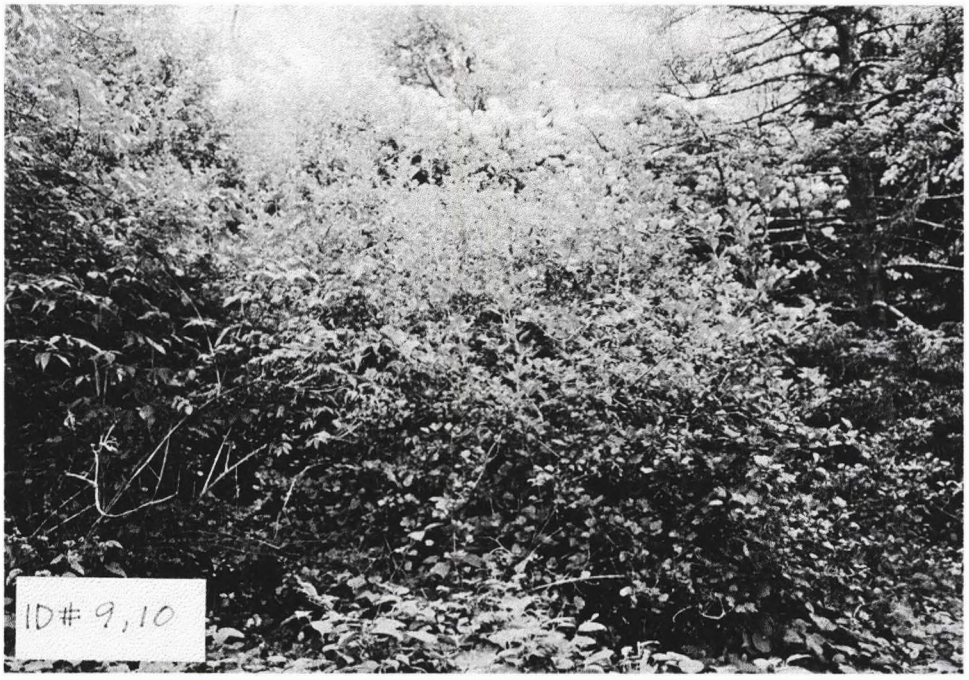


Quercus rubra #4 (CLR #A118) (Photograph #03)



Quercus rubra #4 (CLR #A118) (Photograph #04)

Euonymus alata #6 (CLR #B206) (Photograph #05)



Viburnum opulus #9 (CLR #B215) & Sambucus pubens #10 (CLR #A207) (Photograph #07)

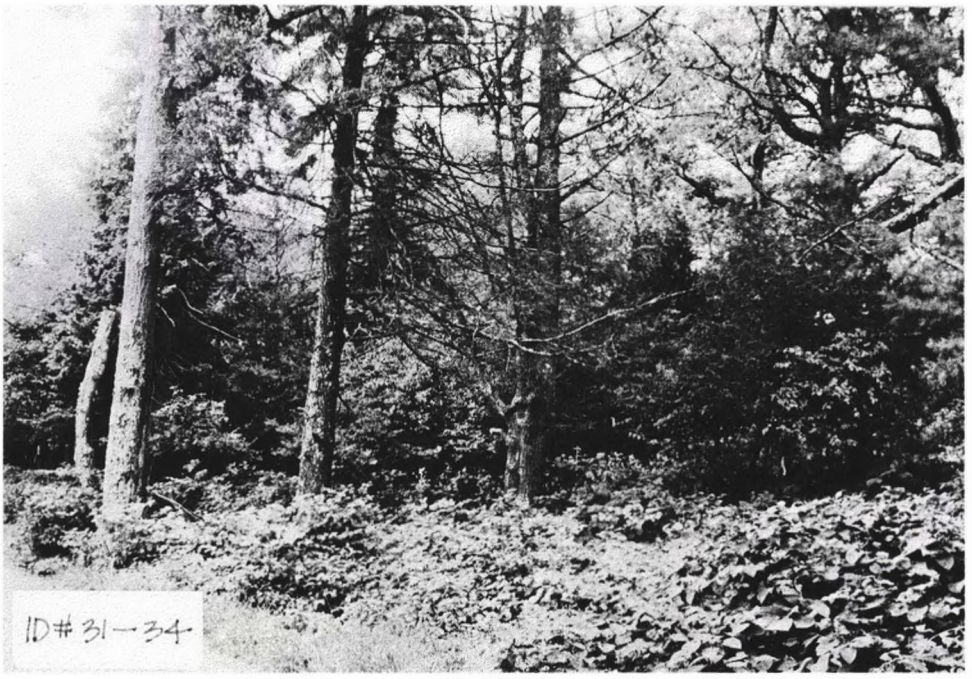
Abies balsamea #12 (CLR #A101) (Photograph #06)

Taxus cuspidata #15 (CLR #B115) (Photograph #08)

Euonymus alata #17 (CLR #B206) (Photograph #09)

Picea pungens #28 & #29 (CLR #B108) (Photograph #10)

Tsuga canadensis #31 (CLR #A123), Pinus strobus #32 & #33(CLR #114), & Quercus alba #34 (CLR #115) (Photograph #11)



Tsuga canadensis #31 (CLR #A123), Pinus strobus #32 & #33(CLR #114), & Quercus alba #34 (CLR #115) (Photograph #12)

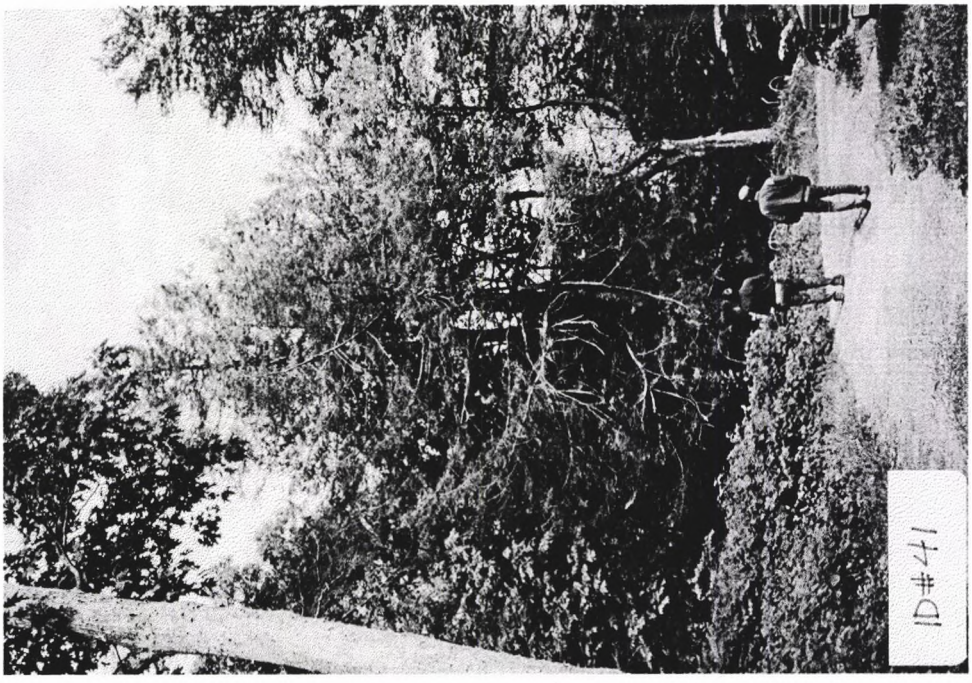
Tilia americana #35 (CLR #A122) (Photograph #13)

Quercus prinus #38 (CLR #A117) (Photograph #14)

Quercus prinus #38 (CLR #A117) (Photograph #15)

Tsuga canadensis #41 (CLR #A123) (Photograph #16)

Tsuga canadensis #41 (CLR #A123) (Photograph #17)

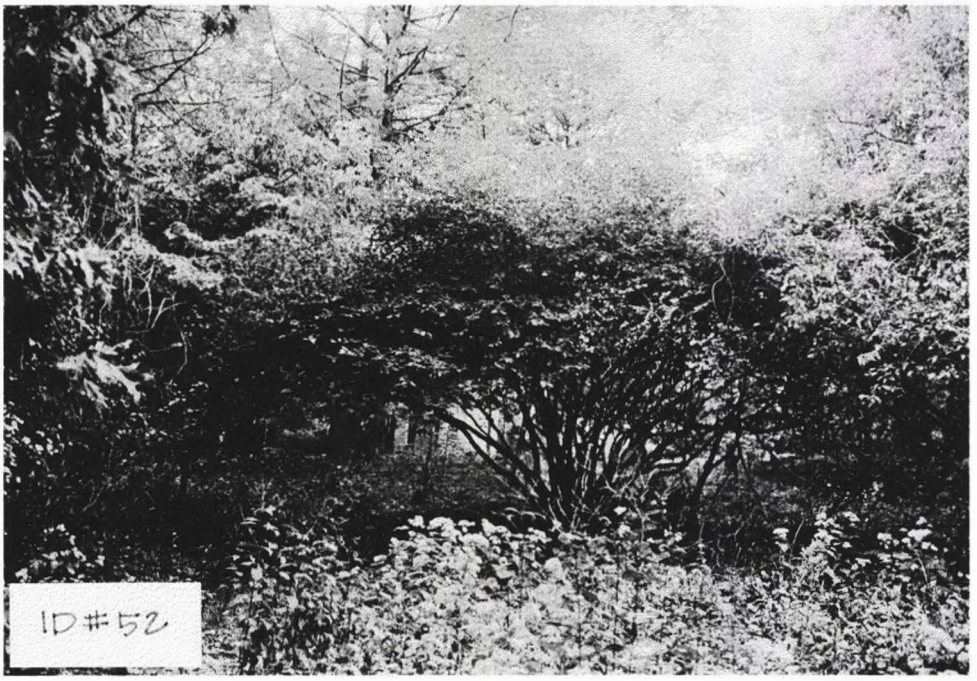


Tsuga canadensis #41 (CLR #A123) (Photograph #18)

Tsuga canadensis #41 (CLR #A123) (Photograph #19)

Fagus sylvatica 'Atropurpurea' #43 & #44 (CLR #B106) & Fagus 0grandifolia #45 (CLR #A108) (Photograph #20)

Fagus sylvatica #46 (CLR #B105) (Photograph #21)

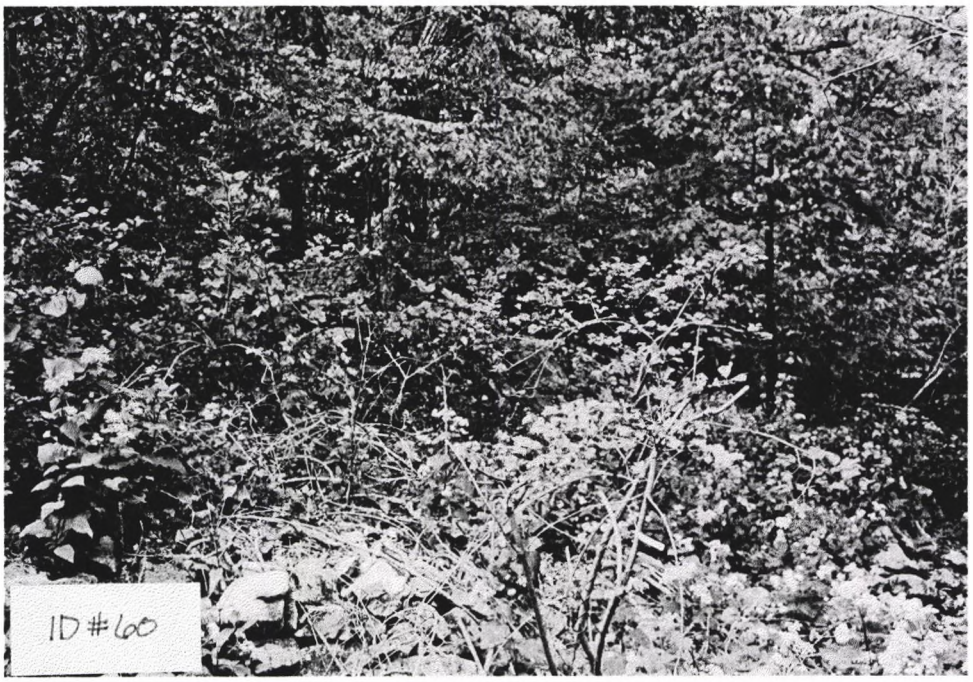


Ilex monticola #52 (CLR #A110) (Photograph #24)

Thuja occidentalis #54 (CLR #A121) (Photograph #22)

Thuja occidentalis #54 (CLR #A121) (Photograph #23)

Viburnum opulus #60 (CLR #B215) (Photograph #29)



Viburnum opulus #60 (CLR #B215) (Photograph #31)

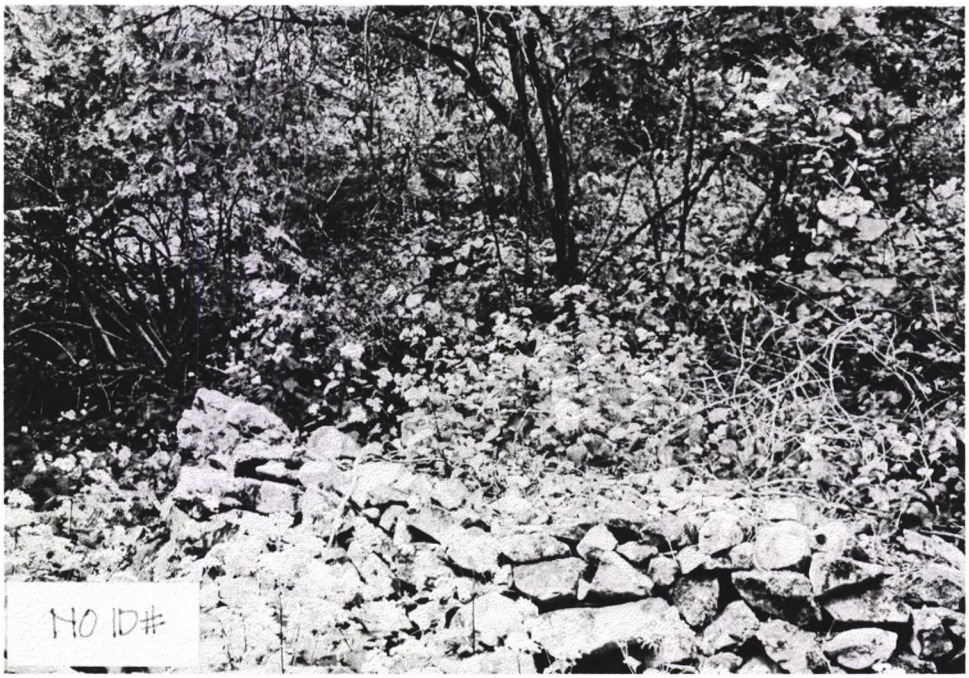
Quercus prinus #61 (CLR #A117) (Photograph #32)

Quercus prinus #61 (CLR #A117) (Photograph #33)

Cladrastis lutea #63 (CLR #A107) (Photograph #34)

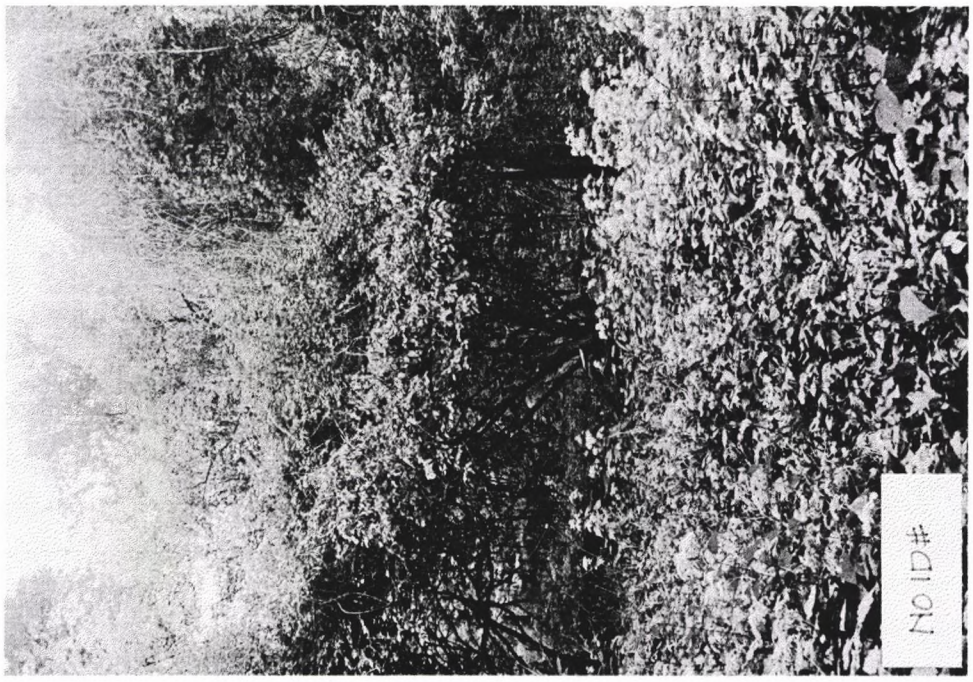
Cladrastis lutea #63 (CLR #A107) (Photograph #35)

Undocumented Vegetation (Photograph #28)



Undocumented Vegetation (Photograph #30)

Undocumented Vegetation (Photograph #27)



Undocumented Vegetation (Photograph #25)

Undocumented Vegetation (Photograph #26)

Note: Photographs included in this appendix are ordered according to the identification tag number(s) of the vegetation pictured. The photograph numbers given at the end of each caption are by order taken and match the numbers on the negatives. Original color photographs and negatives are included in the three-ring bound copy of the *Judd Gardens: Historic Vegetation Inventory and Management Plan* held at Shenandoah National Park.

SHEN.025
CRBIB #402325
134 / 134100

Map

LANDSCAPE CHARACTER AREAS

1. SENTINEL LODGE GARDEN
2. THE WESTERN FOREST
3. LOWER ENTRY GARDEN
4. THE GREAT LAWN GARDEN
5. JONQUIL & HERB GARDEN
6. STROLL GARDEN
7. LOWER HEMLOCK & PINE FOREST

Historic Vegetation Inventory Plant List: Native & Exotic Species

TREES

PT#	CLR#	SCIENTIFIC NAME	COMMON NAME
1	A101	Abies balsamea	Balsam Fir
2	A101	Abies balsamea	Balsam Fir
3	A114	Pinus strobus	White Pine
4	A118	Quercus rubra	Red Oak
7	A101	Abies balsamea	Balsam Fir
8	A101	Abies balsamea	Balsam Fir
12	A101	Abies balsamea	Balsam Fir
16	A103	Acer rubrum	Red Maple
22	B105	Fagus sylvatica	European Beech
24	A115	Quercus alba	White Oak
25	B102	Chamaecyparis obtusa	Hinoki Falsecypress
28	B108	Picea pungens	Colorado Blue Spruce
29	B108	Picea pungens	Colorado Blue Spruce
30	A118	Quercus rubra	Red Oak
31	A123	Tsuga canadensis	Eastern Hemlock
32	A114	Pinus strobus	White Pine
33	A114	Pinus strobus	White Pine
34	A115	Quercus alba	White Oak
35	A122	Tilia americana	Basswood
36	A118	Quercus rubra	Red Oak
37	A118	Quercus rubra	Red Oak
38	A117	Quercus prinus	Chestnut Oak
39	A117	Quercus prinus	Chestnut Oak
40	A118	Quercus rubra	Red Oak
41	A123	Tsuga canadensis	Eastern Hemlock
42	A103	Acer rubrum	Red Maple
43	B106	Fagus sylvatica 'Atropurpurea'	Purple Beech
44	B106	Fagus sylvatica 'Atropurpurea'	Purple Beech
45	A108	Fagus grandifolia	American Beech
46	B105	Fagus sylvatica	European Beech
48	B103	Chamaecyparis pisifera 'Squarrosa'	Sawara Cypress
49	B108	Picea pungens	Colorado Blue Spruce
54	A121	Thuja occidentalis	American Arborvitae
59	A118	Quercus rubra	Red Oak
61	A117	Quercus prinus	Chestnut Oak
62	A118	Quercus rubra	Red Oak
63	A107	Cladrastis lutea	Yellowwood
69	B112	Sorbus hybrida	Oakleaf Mountain Ash
70	A109	Fraxinus americana	White Ash
71	A118	Quercus rubra	Red Oak
72	A118	Quercus rubra	Red Oak
73	A123	Tsuga canadensis	Eastern Hemlock
74	A123	Tsuga canadensis	Eastern Hemlock
75	A123	Tsuga canadensis	Eastern Hemlock
76	A114	Pinus strobus	White Pine
77	A123	Tsuga canadensis	Eastern Hemlock
78	A103	Acer rubrum	Red Maple
79	A123	Tsuga canadensis	Eastern Hemlock
81	A114	Pinus strobus	White Pine
82	A123	Tsuga canadensis	Eastern Hemlock
84	B101	Chamaecyparis nootkatensis	Nootka Cypress
85	B204	Cornus kousa	Kousa Dogwood
89	A114	Pinus strobus	White Pine
90	A114	Pinus strobus	White Pine
91	B204	Cornus kousa	Kousa Dogwood
92	A104	Acer saccharum	Sugar Maple
93	A118	Quercus rubra	Red Oak
94	A118	Quercus rubra	Red Oak
95	A118	Quercus rubra	Red Oak
96	-	Picea abies	Norway Spruce
98	A118	Quercus rubra	Red Oak
101	A101	Abies balsamea	Balsam Fir
103	A101	Abies balsamea	Balsam Fir

SHRUBS

PT#	CLR#	SCIENTIFIC NAME	COMMON NAME
5	A207	Sambucus pubens	American Red Elderberry
6	B206	Euonymus alata	Winged Spindle Tree
9	B215	Viburnum opulus	European Cranberrybush Viburnum
10	A207	Sambucus pubens	American Red Elderberry
11	A203	Kalmia latifolia	Mountain Laurel
13	B207	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea
14	B216	Viburnum plicatum var. tomentosum	Doublefile Viburnum
15	B115	Taxus cuspidata	Japanese Yew
17	B206	Euonymus alata	Winged Spindle Tree
18	B206	Euonymus alata	Winged Spindle Tree
19	B207	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea
20	B212	Syringa josikaea	Hungarian Lilac
21	B206	Euonymus alata	Winged Spindle Tree
23	B207	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea
26	B206	Euonymus alata	Winged Spindle Tree
27	B212	Syringa josikaea	Hungarian Lilac
47	A120	Sorbus americana	American Mountain Ash
50	B113	Taxus baccata	English Yew
51	A110	Ilex monticola	Mountain Winterberry
52	A110	Ilex monticola	Mountain Winterberry
53	A110	Ilex monticola	Mountain Winterberry
55	B201	Berberis thunbergii	Japanese Barberry
56	B208	Kolkwitzia amabilis	Beautybush
57	B208	Kolkwitzia amabilis	Beautybush
58	B208	Kolkwitzia amabilis	Beautybush
60	B215	Viburnum opulus	European Cranberrybush Viburnum
64	B209	Philadelphus coronarius	Sweet Mock Orange
65	B213	Syringa vulgaris	Common Lilac
66	B215	Viburnum opulus	European Cranberrybush Viburnum
67	B213	Syringa vulgaris	Common Lilac
68	B215	Viburnum opulus	European Cranberrybush Viburnum
80	A205	Rhododendron maximum	Rosebay Rhododendron
83	B207	Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea
86	B208	Kolkwitzia amabilis	Beautybush
87	B215	Viburnum opulus	European Cranberrybush Viburnum
88	B208	Kolkwitzia amabilis	Beautybush
99	A110	Ilex monticola	Mountain Winterberry
100	A203	Kalmia latifolia	Mountain Laurel
102	A202	Hamamelis virginiana	Common Witchhazel
104	A202	Hamamelis virginiana	Common Witchhazel

LEGEND

- Topography: 1' Contor Interval
- Judd Gardens Study Area
- Rock Outcrop
- Rock Pile
- Stone Wall (Circa 1912)
- Stone Steps (Circa 1912)
- Post & Wire Fence Remnant (Circa 1922)
- Post & Rail Fence Remnant (Circa 1922)
- Bench Remnant (Circa 1922)
- Road Remnant (Circa 1900)
- Path Remnant (Circa 1922)
- Irrigation System Remnant (Circa 1930)
- Planting Bed (Circa 1922)
- Parking Area
- Man Hole Cover
- Fire Hydrant
- Equipment Enclosure
- Existing Buildings
- Trees
- Shrubs
- Herbaceous Material (Individuals)
- Herbaceous Material (Massings)
- Dead Plant Material

A B C

All plant nomenclature used in the plant list for the Judd Gardens report is accepted nomenclature referenced in Grays Manual of Botany, Hortus Third, A Concise Dictionary of Plants Cultivated in the United States and Canada, and as reviewed by Peter Mazzeo, botanist at the U.S. National Arboretum in Washington, D.C.

.01 ACRE

25 0 25 50 FEET

SCALE OF FEET

BASE MAP SOURCE:
EXISTING CONDITIONS INFORMATION IS BASED ON USGS SURVEY, BIG MEADOWS, VIRGINIA QUADRANGLE, 1965, REVISED 1979, AND FIELD WORK UNDERTAKEN BY HABS/HAER WITH LAND AND COMMUNITY ASSOCIATES, SPRING 1989.

THIS MAP IS FOR PLANNING PURPOSES ONLY.

LANDSCAPE DRAWINGS
PREPARED FOR
NATIONAL PARK SERVICE
PHILADELPHIA, PENNSYLVANIA
BASEMAP PREPARED BY
LAND AND COMMUNITY ASSOCIATES
CHARLOTTESVILLE, VIRGINIA
PH: 804/295-3880 JUNE 1993
BASEMAP EDITED BY
NATIONAL PARK SERVICE
CHESAPEAKE SYSTEM SUPPORT OFFICE-1997

LOCATION WITHIN PARK
JUDD GARDENS
PROPOSED SKYLAND HISTORIC DISTRICT
NAME OF PARK
SHENANDOAH NATIONAL PARK
REGION: MID-ATLANTIC
COUNTY: PAGE
STATE: VIRGINIA

SUB SHEET NO.

TITLE OF SHEET
HISTORIC PLANTING: A & B CLASSES

DRAWING NO.

PKG. NO. SHEET
OF