


VEGETATIVE THREATS TO HISTORIC SITES AND STRUCTURES

FINAL REPORT

Soil Systems, Inc.

EDAW, Inc.

VEGETATIVE THREATS TO HISTORIC SITES AND STRUCTURES

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Abstract

This study of vegetative threats to buildings, structures, and landscapes within the National Capital Region of the National Park Services attempts to examine the preservation issues relative to the crucial point at which vegetation threatens to overwhelm and damage the integrity of historic resources. The purpose of this report is to provide the National Capital Region with suggestions for the formulation of a philosophy for vegetation management. Using specific site examples, a range of vegetative conditions and problems have been documented. Mitigation measures, preventive maintenance solutions, and management recommendations have been made bearing in mind the interpretive goals of each site.

Project History

Soil Systems, Inc. was selected by the National Park Service, National Capital Region to conduct this study of vegetative threats to historic structures and landscapes. A contract was awarded SSI in August, 1982 with the firm of EDAW, inc. as sub-contractors. SSI is a firm specializing in historic preservation and architectural historical consulting and EDAW, inc. is a specialist in landscape architecture. The two Alexandria, Virginia firms selected a project team of an architectural historian, landscape architect, and various technical advisers to perform the study. This project team worked in close association with Dr. Paul Goeldner, Chief of Historic Resources for the National Capital Region and Contracting Officer's Representative for this project. Mr. Anthony Mayo served as Contracting Officer for the National Park Service.

Acknowledgements

This study of vegetative threats to historic resources in the National Capital Region involved the cooperation of many people. Dr. Paul Goeldner, Chief of Historic Resources, conceived the project and obtained funding through the Regional Chief Scientists of the National Park Service. Dr. Goeldner's knowledge and enthusiasm for the study were ever present, and we were priviledged to have the opportunity to work with him.

Maintenance, interpretive, scientific, and administrative personnel throughout the National Capital Region are to be thanked for having lent their time and suggestions to the study. Among those particularly helpful: William Anderson, Sonny Aufdem-Brincke, Fred Bohannan, Donald Campbell, Harold Hagen, Jr., Richard Hammerschlag, Dan Hostler, Lynwood Jefferson, Al Korzan, Virgil Leimer, Jeff Lincoln, Mike Mastrangelo, Sam Nichols, William Ruback, James Sherald, Dick Stanton, Rolland Swain, and Harvey Sorenson.

Many professionals in a variety of fields were contacted during the study and deserve thanks for sharing their knowledge and suggestions. Donald H. Parker, Director, Landscape Architecture at Colonial Williamsburg took an interest in the project and offered examples of comparative problems and solution. National Park Service archeologist Stephanie Rodeffer and historian Edwin Bearss offered suggestions for using a vegetative cover to protect earthen fortifications and archaeological sites. Letitia Galbreath of Drayton Hall, the National Trust for Historic Preservation property in South Carolina, provided insight on the need for landscape management plans and the problems of vegetation management with limited financial and staff resources. Ann Giesecke of the Technical Preservation Services Division, National Park Service, was very helpful in locating literature sources pertinent to the study and suggested a number of personal contacts. Steve Wiesenthal of the Historic American Building Survey described vegetation problems encountered at the Lehigh Canal. Roger Cayer, Project Manager for the River House restoration at Harvard University described the methods for and the philosophy behind the recent removal of ivy from the walls of university buildings. James Goode, Curator, The Smithsonian Institution, shared information and photographs of vegetative threats at the Smithsonian Castle. John Monday, Assistant Horticulturalist at the Smithsonian, and Rogert Organ, Director of the Conservation Analytical Laboratory at the National Museum of American History provided additional information about the Castle. Donald Smith, Director of the Gardens, Dumbarton Oaks, suggested a means of maintaining historic but potentially damaging vegetation on or near buildings. Raymond Coppinger, Director of the New England Farm Institute, made suggestions concerning the use of sheep as a method of maintaining lawns of historic properties. Matt Kayhoe of the Preservation Technology Program, Department of Architecture, University of Virginia and Ben Howland of the University's Department of Landscape Architecture made valuable

suggestions from their experience in vegetation management. Reuben Rainey of the University of Virginia's School of Architecture kindly shared a draft article on battlefield preservation which is in press. John Stilgoe of Harvard University's Landscape Architecture Department and Thomas Schlereth, Director, American Studies at the University of Notre Dame, provided information on landscape preservation issues. Reuben Aragon of the U.S. Department of Agriculture Research Library, Thomas Hahn of the American Canal and Transportation Center, and Mark Nunn of the Brick Institute of America also lent their time and help to this study.

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1. INTRODUCTION AND GENERAL CONDITIONS

1.1 The Problem of Vegetative Threats

> Last night I dreamt I went to Manderley again. It seemed to me I stood by the iron gate leading to the drive, and for a while I could not enter, for the way was barred to me. There was a padlock and a chain upon the gate. I called in my dream to the lodge-keeper, and had no answer, and peering closer through the rusted spokes of the gate I saw that the lodge was uninhabited.
>
> No smoke came from the chimney, and the little lattice windows gaped forlorn. Then, like all dreamers, I was possessed of a sudden with supernatural powers and passed like a spirit through the barrier before me. The drive wound away in front of me, twisting and turning as it had always done, but as I advanced I was aware that a change had come upon it; it was narrow and unkept, not like the drive we had known. At first I was puzzled and did not understand, and it was only when I bent my head to avoid the low swinging branch that I realised what had happened. Nature had come into her own again and, little by little, in her stealthy insidious way had encrouched upon the drive with long tenacious fingers. The woods, always a menace even in the past, had triumphed in the end.[1]

Daphne du Maurier's evocative description of successive reforestation points to the major issue of vegetation management: nature exists on a dynamic level and, left to its own, can overcome the works of man. Implicit in du Maurier's description is the recognition of nature as a force larger than human events. Not unlike Manderley, certain historic resources within the National Capital Region are threatened by the encroachment of nature. Trees, shrubs, weeds, and vines are threatening the historical and structural integrity of buildings, structures, and landscapes throughout the holdings of the National Park Service in the Potomac River Valley. In the District of Columbia, native tree saplings have attained heights of ten feet atop the Jefferson Memorial. Along the 184 miles of the Chesapeake and the Ohio Canal, woody vines, shrubs, and seedlings have disturbed the masonary locks, aqueducts, and canal banks. At the Worthington House in the Monacacy National Battlefield near Frederick, Maryland, trees grow from rotted rain gutters and poison ivy roots have penetrated the brick walls. At Manassas National Battlefield in Virginia, the historic vegetative patterns of the Civil War period have been altered by successive reforestation.

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[1] Daphne de Maurier, Rebecca, New York: Avon Books, 1971 ed., p.1.

The basic problem is that plants, if not afforded the proper levels of management, can rapidly overtake an historic structure or landscape. Bernard Feilden's observation that "trees and plant growth can overwhelm historic buildings and sites in the tropics, where constant maintenance is required to hold them back"[2] might as well be applied to the fictional landscape of du Maurier or the Middle-Atlantic states where vegetative patterns may shift dramatically in a very short time. Reuben Rainey refers to vegetation as a fluid, dynamic factor upon the landscape, which can easily obscure an historic resource.

Despite the preservationist's goal of creating and maintaining a static environment which portrays a slice in time, landscapes and their built components are in a constant state of change. Buildings are designed with a knowledge of their life expectancy and garden plants are planted with the knowledge that they will die. Neglect of maintenance requirements may result in the reduction of a building's useful life or in plants reaching the ungainly proportions described by du Maurier. The artifice, and the goal, of preservation is to maintain an historic building or garden and, in fact, extend its life far beyond the normal projection.

Maintenance of the built and natural components of an historic site requires an understanding of their separate needs. Maintenance techniques applied to one type of resource are seldom applicable to the other, yet the need exists for a unified plan so as to insure that the separate elements of a site are maintained to support its overall goals. Management of the natural components of a landscape may be as involved a process as the management of the built comonents; and, as illustrated in this report, may ultimately be essential to the preservation of the historic resource.

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[2] Bernard M. Feilden, Conservation of Historic Buildings, London: Butterworth Scientific, 1982, p.131.

1.2 Vegetation Management

For any historic or interpretive site, there should be a conscious decision made as to the appropriate role of vegetation to the site. Where this is not done, the vegetation is likely to become a problem or a hazard at some future point. Left to natural processes, almost all vegetation will encroach upon historic resources in the vicinity. The key to control and management of the vegetation is to interrupt the natural succession process at the appropriate stage and implement a maintenance program at that point.

There are basically two ways of managing vegetation which encroaches upon an historic resource to the point of causing physical damage. The first way is to overwhelm the current growth with man-power, machinery, and chemicals. This method of intensive control would be required in some situations to gain control and prevent further damage caused by vegetation. This approach of what one Park Service maintenance director called "fire-fighting" will always be more costly because of the incalculable value of the resource which has been damaged.

The second way to manage encroaching vegetation is to develop a plan of long-term reasonable maintenance which would provide for the protection of the resource from vegetative threats. The optimum application of this method would be the development of vegetative management guidelines for each discrete resource or group of resources within a park system. Park staff must ultimately make the decision to apply vegetation management measures within the context of the long-term management of all elements of a park. By using this method, vegetation management can be a preventive rather than a corrective measure, ultimately decreasing operational costs and benefiting the historic resources.

Vegetative threats can be grouped by several major plant types, each type of plant posing a specific problem or threat to an historic structure or landscape. While presented below by individual group, it should be noted that vegetative threats are frequently comprised of two or more plant groups in combination. The following overview of the major types of plants which may be threatening to historic resources focuses on a discussion of the methods and processes of vegetation control and management as applicable to the general problems identified in the site investigations.

Herbaceous plants include wildflowers, grasses, and weeds. These plants are generally considered less damaging than woody plants which have more invasive root systems. They can, however, pose a threat by developing in mortar joints or defects in masonry and by trapping moisture in these openings causing them to enlarge. This effect is particularly great in the Middle-Atlantic states where frequent freeze-thaw

cycles are often extreme. While most herbaceous plants will not cause severe damage, the threat lies in their ability to open way for other plant types. Their prolonged presence can result in a build-up of humus attractive to the development of larger plants potentially more harmful to a structure.

Native grasses or improved pastures may be maintained as fields most simply by preventing the encroachment of early successional shrubs and seedling trees. Removal of the encroachment by mowing at seasonal intervals is effective. Grazing livestock on such a site can reduce significantly the need for mowing.[1] In some situations where a carefully maintained lawn is required, a distinction may be made about the species of low plants permitted; dandelions, asters, and lamb's ears may be considered invasive plants in such a case.

For the most part, herbaceous plants are best removed by hand pulling or weeding. The application of approved herbicides is another solution, although less preferable due to its potential for long-term damage. Hand pulling also insures a closer level of inspection of the historic resource which can point to structural maintenance needs at an early stage in their development. The use of management fires[2] or approved broadleaf weed killers[3] are other, less preferable, control methods.

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[1] Mr. Ray Coppinger, Director of the New England Farm Center, is an advocate of utilizing sheep grazing at historic sites as a low cost maintenance measure. He calculates that 5-7 sheep can graze one acre without requiring any special type of grass. In winter months, however, their food may need to be supplemented. White grazing sheep (non-breeding stock) may be purchased for about $75. each. They require water if kept out all summer and must be tended. This may be done by dogs or maintenance staff. Protecting the sheep and checking them for parasite build-up is the major requirement; Coppinger recommends letting a local farmer tend the sheep in exchange for the lambs, although it is possible to maintain a single-sex flock. (Ray Coppinger: personal communication, 22 November, 1982.)

[2] See National Park Service, Management Policies, (National Park Services, 1978), p.IV-14, for a discussion of Management Fires. Despite their historical precedent as a means of vegetation management, they are not a preferred modern means due to the danger in attempting to control them.

[3] Ibid., p.IV-13; United States Department of the Interior, Stanley T. Albright, author, "Call for Certain FY 1983 Pesticide Use Proposals", (National Park Service, 21 October, 1982); U.S.D.O.I., Departmental Manual, Part 517, Pesticides, (14 July, 1981, #2336 replacing #2331 of 19 June, 1981); U.S.D.O.I., Russell E. Dickerson, author, "Update and Clarification of NPS Policy on the Use of Chemical Pesticides on Lands Administered by NPS", (NPS, 6 February, 1981).

Vines can be grouped into three types according to their method of climbing: some vines climb by twining petioles (porcelain berry); some climb by twisting, twining stems (wisteria, honeysuckle); and some climb by adventitious rootlets (poison ivy, English ivy, trumpet creeper), or disc-tipped tendrils (Boston ivy, Virginia creeper).

Vines can cause some of the most severe damage of any plant type through their tendency to create a damp area between their leaves and the walls of a building and their sometimes invasive root systems. Traditionally, vines requiring support, such as Clematis, have been considered less invasive because they do not grow directly on a structure. Other vines are less invasive, such as climbing hydrangea, but may cause blockage of gutters and damage to eaves as a result of their rapid growth. Vines growing directly on a structure can cause a variety of problems or threats. They may strangle a wooden or masonry structure, forcing apart its components, as when wisteria lifts off the roof of a wooden porch or lifts out the balusters from a limestone balcony. They may insert tendrils or aerial roots in the mortar or brick, weakening the mortar and masonry by increased exposure to freeze-thaw actions, or by enlarging the openings and dislodging stone or brick from a moisture damaged wall (poison ivy, English ivy, Boston ivy, honeysuckle). An enzyme from the roots which attacks the stability of lime may cause a disentegration of the mortar until only the sand remains (all vines).[4] They may grow between a window frame and wall causing moisture build-up and rot. A dense growth of vines on a wall prevents the sun from drying the wall: as moisture builds up, dry rot can occur in wood, and decay in mortar and masonry (primarily poison ivy, English ivy, Boston ivy, Virginia creeper, and honeysuckle).

Vines may be controlled by girdling or by cutting at the base (then left to dry, they should be carefully removed from the structure within a few weeks). Great care must be taken in removing vines so as not to disturb mortar and masonry.[5] Digging up roots will discourage further growth, but elimination of habitat will be required to eliminate all growth. Organic debris should then be cleared from around a structure allowing the surface to be exposed to sunlight and free air circulation. In some cases, a systemic herbicide may be recommended when a vine is severely damaging to a structure, and should be applied to roots and stems. In general, all vines

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[4] Ben Howland: personal communication, December, 1982.

[5] Feilden, p.131, Feilden notes that "fresh ivy tendrils can, when forcibly removed, pull off a weak surface of brickwork..., so the plant should be cut and killed and left for several weeks until it has lost its adhesive strength,"; see also Andy Davey, et al., The Care and Conservation of Georgian Houses, (London: The Architectural Press, 1978), p.74; and Brick Institute of America, "Ivy on Brick (Pro and Con)" in Engineering and Research Digest, (McLean, Virginia, 1 May, 1980).

should be denied the freedom to climb walls. This is best accomplished by routine weed trimming maintenance.

Where a vine is to be used as a part of the historical interpretation of a site, a strict grooming design and schedule should be followed. In such a case, intensive maintenance is the only acceptable solution to the threat of damage inherent in the growth of vines. Such maintenance can prevent damp pockets of air between the leaves and the walls of a structure: a close shaving in spring and repeated shearing during the summer months will allow for the penetration of sunlight. This method also promotes vigorous growth, and regular trimmings should be made to insure against accumulations of ivy at critical points such as roof and cornice features and window frames. This method of intensive maintenance should be used only in conjunction with regular and detailed inspections for structural damage. In this way, the need for repointing of masonry or removal of ivy can be assessed prior to excessive damage. Labor-intensive maintenance of this sort is practiced at Dumbarton Oaks in the District of Columbia. Here several types of ivy grow on many of the walls and other features of the house and gardens with no apparent damage caused to the structures.[6] Another solution to the question of how to utilize vines on an historic structure involves supporting the vines away from the wall so as to allow for the free circulation of air and to prevent the contact of the vine with the structure. Such a method is essential for vines such as wisteria with its great potential for damage. Historic methods for training vines include wood trellises (which offer the advantage of being removed from the wall to allow for inspection and maintenance) and the less favorable use of wire and other metal supports. One frequently seen method of encouraging ivy growth on the walls of masonry buildings is by means of heavy nails set into mortar joints. Wire is generally strung between the nails, thus encouraging ivy to grow vertically. This method is seen most often on college buildings. Should growth of ivy on a wall be necessary, the best method of maintaining it and preserving the building is by use of a trellis system which can be dismounted for regular pruning and building inspection and repair.

Lichens, mosses, and fungi represent a group of bacterial and plant growth which, although less visible than other vegetative threats, can be damaging to historic structures. As with herbaceous plants, lichens, mosses, and fungi seldom represent a serious threat in themselves. Rather, they are indicators that larger problems may be expected. Requiring continual dampness, their presence indicates a moisture problem inherent in a structure. Further, they may make way for more damaging plants by causing the accumulation of humus or by chemical reaction with masonry resulting in deterioration.

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[6]Donald Smith: personal communication, 8 December, 1982.

Acid-producing lichens and bacteria can react chemically with stone, lead, glass and other materials, causing structural damage. Mosses retain moisture against masonry or wood, and fungi, dependent upon plant life for their growth, can attack wood causing extensive rot.[7]

A variety of solutions including diluted ammonia, toxic washes, and herbicides can be applied to control growth. Preventive measures to allow for good air circulation should be practiced once the lichens, mosses, or fungi have been removed.

Shrubs pose many of the same problems and threats as trees to historic structures and sites. They may cause problems when their presence is invasive or when plantings have reached ungainly proportions. Shrubs in a garden setting can be lush, well-shaped plants if they are periodically pruned. Left unmanaged, however, most become tall, spindly, and unsightly. Those which become established in cracks, crevices, mortar joints and other undesirable places can develop particularly strong and damaging root systems.

Shrubs which grow from a seed left on a structure by a bird or other vector do not generally pose as great a threat as an unmanaged vine. The shrub roots are usually on the structure, and the shrub therefore has some limits on its ability to survive with restricted soil, nutrients, or water. Most plants with their entire morphology exposed to the elements would not survive to maturity. The presence of shrubs on an historic structure indicates, however, a serious condition and their removal is necessary. Their development is dependent upon an accumulation of organic material in excess of an acceptable level, generally indicating structural deterioration and the need for physical repairs.

As garden and particularly foundation plantings, shrubs must be checked at regular intervals to insure that they do not grow out of scale. Obstruction of historical vistas overgrowth in relation to structures are the major concerns in such a setting. Pruning, reshaping, replacing, or removal are the methods of treatment.[8]

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[7] See Feilden, pp. 131-133, for a more detailed discussion of "Botanical, biological, and microbiological causes of decay."

[8] See John J. Stewart, "A Short Note on Foundation Planting and the Problem of Overgrowth", in APT Bulletin, Vol. VIII, No. 3, (1976), pp.74-79. Stewart writes in response to a letter concerning the Frederick W. Vanderbilt Mansion at Hyde Park, New York, noting that the foundation plantings have reached a size incompatible with the original landscape design and the house; discusses the concept of foundation plantings as it emerged in the late nineteenth and early twentieth centuries. For further discussion of foundation plantings in their historical context, see Rudy J. and Joy Putnam Favretti, Landscapes and Gardens for Historic Buildings, (Nashville, Tennessee: AASLH, 1978), pp.43, 57, 71, 78.

In an instance where a shrub is invasive, as with growing on an historic earthen fortification or masonry wall, the potential for structural damage is greater and the need for management a more immediate concern. The shrub may need to be removed entirely, lifted out by its roots and the structure repaired. In other cases, the plant may be cut off at its base, when structural repair is not needed.

In an instance where successional shrubs and sapling trees are encroaching upon an historic meadow or farmland, regular mowing during the spring and summer months can be an effective treatment. Livestock grazing is an alternative to mowing which may be appropriate to the interpretive goals of some sites. Controlled burning or the application of approved broadleaf herbicides may also be used as treatments in extreme cases. Neither treatment is recommended as a general policy.

Trees by their ability to gain great heights and extensive root systems may pose a severe threat in proximity to an historic landscape. Management options for well established invasive trees are relatively few, generally requiring a decision to remove the tree or face continued damage to a structure.

Trees pose a threat by their invasive roots, by dropping leaves, by withdrawal of ground moisture. Tree growth is most damaging in constricted places where root expansion can force apart the structural elements of a building or historic feature, causing the entire structure serious damage. Foundations may be weakened by withdrawal of ground moisture in the summer months, resulting in foundation movement and wall cracks. The pressure of roots growing under or against a foundation may cause similar problems. Above ground, branches pose a constant threat in light of possible storm damage or roof damage due to dropping leaves, branches, and limbs.[9]

Invasive volunteer tree saplings or successional tree growth may disrupt a historical clearing or meadow. Species of trees which have naturalized in this country such as mulberries, tree-of-heaven, and catalpa pose serious threats in that they respond to cutting by suckering or the issuance of more stems. Certain native plants such as red maples and black locust will also sucker. These plants should be grubbed out and their roots removed entirely. Repeated mowing may eventually weaken their root systems and cause the decline of the plant. Systemic herbicides are another alternative to their management.

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[9] At Colonial Williamsburg, the primary goal is the preservation of the architectural components of the complex. Trees are invariably removed where their presence may jeopardize the physical condition of an historic building. Trees maintenance crews are constantly alert for overhanging branch problems. In addition to visible threats, the problem of root expansion, much greater in a contained situation, is watched carefully. (Donald H. Parker, FASLA, Director, Landscape Architecture, The Colonial Williamsburg Foundation: personal communication, 8 November, 1982).

For long-term management of a property, a buffer or management zone should be designated around historic structures, buildings, gardens and historic vistas. Any tree which could cause a threat over its lifetime and its full size should be removed as soon as possible. The buffer or management zone should be designated taking into account potential root and limb spread.

With trees, methods of removal are limited and must be considered on an individual basis. When trees are removed from proximity to a structure, physical repairs to the structure may be required. As extensive roots decay, foundation settling can occur, requiring continued checks for repair needs. In certain cases, mature trees are best left in place where they serve as support to an historic structure or as a guard against erosion. Ultimately, their removal is necessary for the survival of the historic resource; but, this should not be done until extensive repairs may be planned in conjunction with tree removal. In the case of ruinous structures, an interpretive strategy might be designed to allow for the retention of some trees and the removal of others. Again, a management zone should be designated around the structure and only those trees whose removal would be more damaging to the ruins than their retention should be allowed to remain.

In summary, the discussion of plant types and their potential for damage is generally applicable to situations of a single-source vegetative threat. Most of the problems encountered in this study, however, involved threats having multiple elements. Single-source threats are more likely to occur in more controlled situations, and might often involve an ornamental plant growing beyond its design intent. In any case, a number of factors should be considered in designing a program for vegetation management at a particular site.

1.3 Historical Perspective

Past and current methodologies, policies, research, and positions for the treatment of destructive vegetation on historic structures and landscapes were reviewed. The Technical Preservation Services Library of the National Park Service was the primary source for published sources on this subject. These sources tended to be works of broad focus, published primarily during the 1970s frequently in Britain, on the conservation of building materials rather than a discussion of specific cases in which damage had been caused by vegetation. Much of the literature was aimed at achieving optimum states of preservation that are beyond the scope of this project. However, all of the sources recognized the potential for harmful effects of vegetative growth and identified the following major problems:

a. Damage including the destruction of mortar, bricks and stone by penetrating root systems and the introduction of moisture associated with the growth of vining vegetation like ivy on masonry walls.[1]

b. The growth of small trees which take root in areas such as gutters and roofs where pockets of soil have collected.[2]

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[1]As early as 1932, the damaging effects of ivy growth on masonry walls was mentioned in a publication concerning building materials. In his work entitled The Weathering of Natural Building Stone, R. J. Schaffer noted that ivy cuts off air circulation and retains moisture. The roots he indicated eventually crumble stone and mortar. (pp. 12-13) R. J. Schaffer, The Weathering of Natural Building Stone, Special Report #18, Department of Scientific and Industrial Research (London: His Majesty's Stationary Office, 1932) pp. 12-13 as cited in Gerald A. Sleater, A Review of Natural Stone Preservation (Washington, D.C.: Center for Building Technology, Institute for Applied Technology National Bureau of Standards, December 1973), p. 7. More recent sources have also recognized the damaging effects of vining vegetation on walls, e.g., Andy Davey, Bob Heath, Desmon Hodges, Roy Milne and Mandy Palmer, The Care and Conservation of Georgian Houses (London: The Architectural Press, 1978), p. 74; Dan Maciejak, "Twining Vines," The Old-House Journal October 1981, p. 227; Bernard M. Feilden, Conservation of Historic Buildings (London: Butterworth Scientific, 1982), p. 131.

[2]Ashurst and Dimes noted that organic growths such as lichens and algae may be soil forming thus creating a root hold for higher vegetative growth. John Ashurst and Francis G. Dimes, Stone in Building: Its Use and Potential Today (London: The Architectural Press Ltd., 1977), p. 48.

c. Cracking of foundations and walls by root invasion and excessive withdrawal of ground moisture resulting in ground shrinkage and foundation movement.[3]

d. Blockage of gutters by leaves.[4]

e. Decay of building materials resulting from the growth of lichens, algae, mosses and fungi. This growth can result in damaging chemical reactions, moisture retention and staining of walls.[5]

f. Corrosion and discoloration of building materials by toxic substances used for the removal of lichens, algae, mosses and fungi or for killing vegetation.[6]

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[3]Feilden, Conservation of Historic Buildings, p. 131. Feilden also discusses other problems associated with roots and trees and bushes. Roots can cause blockages and local ground dampness by penetrating rainwater drains. In instances where these drains are broken, leaking water can cause sandy soils to wash away from below foundations.

[4]For example see, Feilden, Conservation of Historic Buildings, p. 131 and Davey, Heath, Hodges, Milne, Palmer, The Care and Conservation of Georgian Houses, p. 137.

[5]The effects of these types of growth received the most extensive discussion in the sources examined. Lichens, a combination of fungi and algae, is more harmful to masonry than either of its components alone. Like mosses, it is capable of secreting acids which react chemically causing deterioration of building materials. Spalling may occur with both. Algae alone is less damaging generally causing staining of masonry, but it is an indication that moisture is already present in considerable quantities. Fungi is especially damaging to wood with its most damaging form found in dry rot. For a sampling of discussions on the damaging effects of these organisms, see Feilden, Conservation of Historic Buildings, pp. 131-134; T. G. Bidwell, The Conservation of Brick Buildings: The Repair and Restoration of Old Brickwork, August 1977, pp. 18-19; Davey, Heath, Hodges, Milne and Palmer, The Care and Conservation of Georgian Houses, pp. 73-74.

[6]Ashurst and Dimes, Stone in Building: Its Use and Potential Today, pp. 43-44.

g. Overgrowth of foundation plantings and other vegetation which alter the appearance and/or character of buildings and historic landscapes.[7]

Bernard M. Feilden's recent Conservation of Historic Buildings is a good example of this type of source work discussing the problems and their solutions in general terms.

While the aesthetic appeal of vegetative growth on or around structures was recognized in several of the sources reviewed, the general consensus was for careful removal and prevention of future growth. For example, lichens may have an aesthetic appeal on rustic stonework in rural settings,[8] but the potential for damage outweighs this appeal. Vines growing on masonry walls can likewise form a pleasing aspect, but unless chosen carefully can cause far reaching damage and destruction of walls.[9]

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[7]A good example of the overgrowth of foundation plantings was illustrated in APT Bulletin in 1976. In this case, the plantings at the Frederick W. Vanderbilt Mansion in Hyde Park, N.Y. had grown to a size totally out of scale with the mansions facade thus "shielding a sizeable portion of the structure from public view." John J. Stewart, "A Short Note on Foundation Planting and the Problems of Over-growth," APT Bulletin, Vol VIII #3 1976, pp. 74-79.

[8]Ashurst & Dimes, Stone in Buildings, pp. 43-44.

[9]Maciejak discusses the late Victorian and Edwardian passion for vines, different types of vines and the proper methods for growing vines on or near walls. He also notes that vines may be beneficial for masonry since they may keep pH higher and possibly counter-balance acidic rainfall. Maciejak, "Twining Vines", pp. 225-228. Feilden cautions that in some cases, vines may be the only thing holding a masonry wall together and that care should be taken to study the wall structure before removal of the vegetation. Feilden, Conservation of Historic Buildings, p. 131.

Fewer studies detailing vegetative damage in specific cases were found. One, a study of the Lehigh Canal in Pennsylvania, was published by the Heritage Conservation and Recreation Service (HCRS) of the Department of the Interior.[10] An HCRS summer team which investigated this 150-year-old engineering work for its potential as a recreation/cultural trail encountered similar problems with vegetation to those found at sites examined in this study. These included the growth of vegetation on or around the canal walls and ruins adjacent to the canal. The proposed solution was for careful removal of vegetation with subsequent clearing at 3-4 year intervals.[11]

Because of the dearth of published information directly applicable to this study, personal interviews were conducted with experts in various aspects of cultural resources management. Particularly useful were discussions with historic site administrators who noted the need for this study in light of declining maintenance budgets. Administrators frequently noted the need to rely on "common sense" application of vegetation management in the absence of previous management studies. That vegetation management has not been included in long-term maintenance programs became apparent in nearly all interviews.

Most of the discussions were of particular relevance to this study. In his account of earthen fortifications of the Civil War period around the city of Washington, D.C., National Park Service historian Edwin C. Bearss noted that trees and underbrush are the worst enemies of the preservation of these delicate resources and that grass cover, e.g., Bermuda grass, is the best method of preservation. He cited the partial restoration of Fort Stevens (near Fort DeRussy) where grass cover was used as a good example of this type of preservation.[12] Professor Reuben Rainey of the University of Virginia's School of Architecture emphasized that an accurate recreation of battlefields is essential to a visitor's understanding of the action of battles.

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[10]Heritage Conservation and Recreation Service. Department of the Interior, Lehigh Canal: An HCRS Project Report, HCRS Publication #36

[11]Ibid, p. 79.

[12]Edwin C. Bearss: personal communication, 18 November, 1982.

Dr. Rainey's discussion applies to the problem of vegetative encroachment upon the battlefields at Manasses.[13] Stephanie Rodeffer, archaeologist for the National Park Service's Middle-Atlantic Regional Office, noted that the removal of trees from earthen works is often more damaging than their retention, and suggested careful consideration of their maturity, size, and potential for damage before the removal of advanced growths.[14]

Letitia Galbreath, property manager for Drayton Hall, and Donald H. Parker, Director of Landscape Architecture at Colonial Williamsburg, both noted that their properties are without detailed written plans for vegetation management. The varying complexity of the two sites is evident in comparing the maintenance staffs. At Colonial Williamsburg, maintenance is divided into 1) mechanical/utility, 2) landscape, 3) building/signage, and 4) outdoor furniture. Several problems of current concern include ivy on several major buildings, tree root and trunk competition with brick walls, and overhanging branches.[15] At Drayton Hall, with its much smaller single-component staff and lack of documentation on the historical landscape, efforts have focused on catching-up to existing problems. The National Trust for Historic Preservation has not developed a policy for the restoration of the landscape to any one period, with the result of somewhat arbitrary clearing in some areas.[16]

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[13] Reuben Rainey: personal communication, 23 November, 1982. Dr. Rainey kindly supplied an article, "The Memory of War: Reflections on Battlefield Preservation", op cit., scheduled for publication in 1983.

[14] Stephanie Rodeffer: personal communication, 18 November, 1982. Ms. Rodeffer wrote a section on vegetative cover for the Secretary's Standards for Preservation of Archeological Properties in which she suggested planting cover crops to restrict visibility of site vandalism exits. Her comments on earthen fortifications were based on her experience at the 96 National Historic Site, a National Park Service property in South Carolina.

[15] Donald H. Parker: personal communication, 19 October, 1982, and letter of 8 November, 1982.

[16] Letitia Galbreath: personal communication, 10 November, 1982.

Several individuals were interested in the problems of ivy-covered walls. James Goode, Curator, The Smithsonian Institution, supplied information and photographs on ivy damage discovered recently at The Castle. This information has been included in this report as a comparison study. Roger Cayer, Project Manager for the River House Restoration at Harvard University, discussed the decision to remove the growth of ivy from historic structures that had become part of Harvard's image.[17] Robert Organ, Director of the Smithsonian Institution's Conservation Analytical Laboratory noted the past studies which have been concerned with the threats posed by ivy.[18]

It is interesting to note through the interviews the range in levels of maintenance and preservation achieved at various places. Colonial Williamsburg with its optimum state of maintenance goes so far as to allow for "controlled negligence", an attempt at realism in which areas are allowed to appear somewhat unkempt on a cyclical basis. Dumbarton Oaks also has a very high level of maintenance and is able to grow ivy on walls and buildings without any apparent damage resulting.[19] Some sites such as Drayton Hall face serious challenges in light of limited funds. At other sites, the problem of vegetative threats has only come to the attention of site administrators in within the last one or two years (e.g. Smithsonian). Plans for vegetation management are scarcer than solutions with even Colonial Williamsburg achieving a high level of maintenance without a written plan.

In addition to the aforementioned sources, the management policies of the National Park Service were examined. Little information is contained in these policies pertinent to vegetation management, with even less in the way of guidelines applicable to the problems of many of the sites visited in this study. The 1978 Management Policies handbook does not address the control of native species of plants which may pose a threat to historic resources. Only in a 1981 update and clarification on the use of chemical pesticides is the question of control of non-exotic species addressed. A bias toward natural resources is evident throughout the policies. This bias may be related to the historical development of the National Park Service with its dual commitment to preserving the natural and cultural landscapes (the commitment to natural resources preservation being the older of the two) and the vast differences between the landholdings in the western states

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[17] Roger Cayer: personal communication, 30 November, 1982.

[18] Robert Organ: personal communication, 22 November, 1982. Mr. Organ supplied a bibliography on ivy-covered walls from the Smithsonian's computer search system.

[19] Donald Smith: personal communication, 8 December, 1982.

(primarily natural resources) and in the eastern states (primarily cultural resources). As with the body of preservation literature, there is a gap in the information: while ample guidance exists as to the preservation of historic gardens, buildings and structures, and natural areas, there is nothing to suggest the encroachment of threating vegetation upon an historic landscape or structure.

Several points in the management policies are significant to the recommendations made in this study:

- "Grazing and raising of livestock is ...permitted in historic zones where desirable to perpetuate and interpret the historic scene;"[20]
- "Reintroduction of native species is encouraged...;"[21]
- "...non-native species that are a desirable part of a domestic historic scene being represented in an historic zone may be introduced...;"[22]
- Exotic species "disrupting the faithful presentation of the historic scene" or "damaging historic and archaeological features" may be manipulated in population numbers or eradicated;[23]
- "Chemical pesticides of any type will be used only where feasible alternatives are not available or acceptable;"[24]
- Management fires are to be limited to natural zones where they may be used only if determined that there is no feasible alternative;[25]
- "Trees, (and) other vegetation in a historic zone shall be managed to reflect the historical scene which prevailed during the historic period;"[26]
- "Native species may be subject to control on historic ...zone lands if the ...resource management plan identified a need for such control."[27]

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[20] U.S. Department of the Interior, National Park Service, Management Policies, 1978, p. IV-5.

[21] Ibid., p. IV-10.

[22] Ibid., p. IV-11a.

[23] Ibid., p. IV-12.

[24] Ibid., p. IV-13.

[25] Ibid., p. IV-20.

[26] Ibid., p. IV-20.

[27] U.S. Department of the Interior, "Update and Clarification of NPS Policy on the Use of Chemical Pesticides on Lands Administered by NPS", February 6, 1981, (p. 3).

1.4 Summary Findings and Recommendations

In summary, vegetative threats may be examined in several ways. Causes of vegetative damage are best viewed in relation to maintenance problems rather than by plant type. This is a solution-oriented perspective which allows that vegetation is seldom the intrinsic cause of a loss of structural or interpretive value; rather, it is unmanaged vegetation that is the cause of this damage. Sites examined within this study have been grouped by primary type of problem or threat suggesting a level of maintenance appropriate to the problem. Finally, the maintenance problems associated with the sites in the National Capital Region correspond to a need for clarified or improved management policy for the National Park Service.

Damage caused by vegetation at the historic sites included in this study may be grouped by three maintenance problems. At many sites, the nebulous character of the area surrounding an historic resource has resulted in that resource's susceptibilty to vegetative encroachement. At Virginius Island, Worthington House, Potomac Canal, the earthen embankments at Fort Washington, and Fort DeRussy, the ill-defined edges of the area of the site to be managed have resulted in the encroachment of vegetation inappropriate to the goals of the site. The need in these cases is for a clear definition of the management area followed by an intensive clean-up and then regularly scheduled maintenance.

Neglect of an historic building or structure can result in the appearance and development of vegetation which further damages the resource. The Worthington House roof, Fifteen-Mile Creek, the Jefferson Memorial, and the Batteries at Fort Washington are all examples of this problem. A program of responsible structural maintenance would serve to eliminate the invitation to invasive vegetation at sites such as these. In these cases particularly, vegetation is symptomatic of a more serious structural problem and any program of vegetation management must be accompanied by an improvement of structural conditions.

An absence of human management at an historic site can result in plants quickly resuming a pattern of natural growth contrary to the goals of a site. The problem in this case is not limited to volunteer plants but may include ornamentals which have exceeded their design intent. Examples include Manassas Battlefield, Antietam Cemetery, the Yellow Barn at Glen Echo, Clara Barton House, Four Locks, Carderock, and Widewater. The comparative examples of the Smithsonian Castle and Harvard University, each involving the damaging effects of ornamental Boston ivy are additional instances. In these cases, the need is for an improved maintenance program within a clearly defined area.

The National Park Service sites were grouped in four categories according to their primary problem and need. Each category suggests a different level and type of corrective treatment. The four groups are: Sites with Structural Damage, Sites with Maintenanace Demands, Sites with Threatening and Beneficial Vegetation, and Sites with

Interpretive Opportunities. Again, these categories suggest a primary problem and need, and overlapping problems are frequently the case.

Sites with structural damage comprised the largest and most varied group,with vegetation being either the cause or the symptom of the damage. Foundation and wall disturbance, roof damage, and masonry disruption were the most common problems. Physical defects in a structure frequently made way for volunteer vegetation further aggravating the problem. In other cases, plants appropriate to the general site setting but growing too close to a building or structure were the cause of damage. The interaction of inherent structural damage and plant damage was the rule rather than the exception. Prescription of a method of treatment required a consideration of the dual components of the problem; and most of the sites require extensive levels of maintenance merely to correct the existing conditions.

Sites with maintenance demands were of a more moderate need for corrective measures. These sites have simple problems which could be solved through an adjusted program of scheduled maintenance. Long-term plans for the three sites within this group would provide the most effective means of eliminating the vegetative threats resulting in improved structural conditions and interpretive possibilities.

Sites with beneficial and threatening vegetation pose special problems in considering solutions. In these cases, vegetation often inappropriate to the historical character of a site has grown to such an extent that its removal might be more damaging to a resource than its retention. Trees are the primary problem within this group, and they are usually found on or very near the historic resources. Removal of the vegetative problem is not the solution in itself; rather, the need is for selective removal in conjunction with structural repairs and implementation of a program of regularly scheduled maintenance.

Sites with interpretive opportunities comprise a sort of miscellaneous category. In the two examples within this group vegetation is not so much a problem as a potential solution to improving the interpretive qualities of the sites. Whereas corrective measures to meet immediate needs are necessary at the other site categories, vegetation may be used in the interpretive category to insure structural integrity and improve visitors' appreciation of the historic sites.

In the area of management policy, several problems and needs were apparent. With a lack of clear policy as to the management of vegetation at or in the vicinity of historic sites, Park Service staff are faced with a dilemma of managing both natural and man-made elements of a landscape. The need for definition of site areas is a recurrent one throughout the sites examined in this study. Further, goal clarification is needed for a number of these sites to determine the direction of vegetation management. In general, management policy should be enlarged at least to the point of acknowledging the range of vegetative threats to historic

sites. Improved general maintenance plans and educational programs for park maintenance supervisors and staffs might ultimately address specific problems and solutions at particular parks.

The National Park Service, with its mandate to preserve and manage natural, recreational, and historic resources, faces a dilemma in the management of vegetation at historic sites. Management of the natural and the cultural landscape has traditionally been the preserve of professionals in two separate disciplines who sometimes develop conflicting goals and policies. This may become apparent in the areas of overlap between the natural and cultural landscapes. Resources such as battlefields and cemeteries which,although cultural landscapes, are comprised largely of natural elements, are prime examples. It is in areas such as these, and in prescribed zones around other, more discrete resources, that the need is for melding the goals of historic preservation and presentation with the goals of maintaining natural elements within a landscape.

Structures and buildings have very different preservation and management needs than do plants on an historic site. Yet, the ideal goal is for all elements within such a setting to reflect the overall significance of the historic site. The need for goal clarification is apparent at many of the sites where vegetation is inconsistant with the very purpose of the sites. Plants on an historic site need to be supportive of the goals in preserving the site. It should be restated that all of the sites examined within this study were historic sites, despite their varying levels of significance. Plants, far from incidental to an historic site, can enhance their interpretive and aesthetic value when properly managed. Some sites such as Manassas Battlefield are significant more for their vegetation than for their buildings and structures. At Manassas, the historic pattern of vegetation is what serves to unite otherwise disparate elements and present a sense of the area's historical association. Historic sites, then, must be defined by a purpose and their associated vegetation managed to support that purpose.

The need for definition of edge conditions or the delineation of management zones at historic sites is tied closely to the need for goal clarification. Once the purpose of a site is established, a management zone should be defined in which vegetation will be managed to support the goals of the historic building, structure, or landscape feature. In some instances, the management zone may not be as large as the physical bounds of the property. This would certainly be the case at sites along the C&O Canal, largely a swath of historic resources within a larger swath of natural resources. At other sites, the management zone should be established to support the preservation if not the interpretation of historic resources. An example would be Virginius Island, where a management zone consisting of 20-30' around the historic industrial ruins would aid in their long-term preservation and serve to make them more accessible to visitors.

At all sites except Antietam Cemetery, the need is for more intensive maintenance. The need may be answered in some cases by an adjustment in existing maintenance schedules. More commonly,

the need is for additional and extensive maintenance. Most of the recommendations made in this report are designed primarily to correct and stabilize existing vegetative threats. Bringing the sites to the point at which preventive maintenance could be implemented would require staff resources well beyond the existing conditions at many of the parks and sites. Again, recommendations to this end are best accomplished in individual general management plans after a clear assessment of site goals and definition of management zones.

While not of direct concern to this study, interpretive problems were encountered at several sites. Often, there was a need for additional interpretation in light of vegetative overgrowth. Potomac Canal, with some of the best interpretive signs of any of the sites examined, was still difficult to understand simply because the limits of the historic resources and the surrounding forest were often indistinguishable. Virginius Island was sorely lacking in signs which might aid a visitor's understanding of the historic ruins. Trails at this site were indistinct and, overall, required determination and perserverence on the part of the visitor. At Fort DeRussy, the site is marked only by a discrete bronze plaque set in a boulder. With vegetative overgrowth so advanced, the configuration of the fort is almost impossible to sense without examining historic photographs or plans. A marker reproducing such a plan and accompanied by text would enhance site appreciation. Ultimately, vegetation offers an interpretive opportunity in itself when supportive of the historic value of a site. Most of the sites, however, are far from a position of being able implement an historic garden plan.

Management policy within the National Park Service should be adjusted to recognize more fully the possibility of vegetative threats to historic sites. The Management Policies handbook of 1978 does not recognize that native plants can pose a threat to historic sites; this point is only noted in a policy clarification statement in 1981. The existing policies recognize historic gardens but do not prescribe a means of managing vegetation at an historic site yet not within an historic garden. The overlap of natural elements and cultural landscapes is seldom addressed, thus ignoring one of the most sensitive issues in maintenance and management of Park Service properties.

Chemical control of vegetative threats was firmly recommended for only one of the sites examined. In the case of the Worthington House the threat was considered so severe and alternatives infeasible that a program of herbicide use was believed to be the best method by which to regain control of the property. Park Service policies are such that even the most prudent use of herbicides is allowed only where it may be demonstrated that"(a) there is clear and present danger to the health and safety of man; and/or (b) that there is danger of damage or destruction of significant property or resources and the control methods of no action, mechanical, cultural and/or biological control are non-existant, unavailable or unacceptable." Further, herbicide use "is <u>not</u> to be based upon consider-

tions of available funds or staff costs."[1]

Chemical control of vegetative threats is possible under the existing guidelines, with clearance through the National Capital Region's Ecological Services section taking approximately one week or less. Applications for herbicide use must meet existing stipulations and must be project specific in their intent. In general, however, there is considerable reluctance to use such control methods on Park Service properties. As with the other management policies, the issue of vegetative threats to historic sites has not been fully addressed within the context of chemical control and warrants further consideration.

The overall management policies of the Park Service should reflect the problem of vegetative threats to historic sites, acknowledging the sensitivity which must be used in managing such sites. More precise guidelines should be expressed in the general management plans for the individual parks, with a discussion of site goals, management zones, and means of managing vegetative threats specific to the resources within a particular park. Seminars and presentations on various control problems and solutions consistant with Park Service policy might be planned for management and staff at parks where vegetative threats are prevalent. Such a program could be designed to meet immediate, "fire-fighting" needs or long-term goals. Again, implementation of such a program, while ultimately cost-effective and beneficial to the historic resources, would probably require funding beyond existing levels.

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[1]U.S. Department of the Interior, "Update and Clarification of NPS Policy on the Use of Chemical Pesticides on Lands Administered by NPS", February 6, 1981, (p.3).

2. CASE STUDIES

> ...I saw that the garden had obeyed the jungle law, even as the woods had done. The rhododendrons stood fifty feet high, twisted and entwined with bracken, and they had entered into alien marriage with a host of nameless shrubs, poor, bastard things that clung about their roots as though conscious of their spurious origin. A lilac had mated with a copper beech, and to bind them yet more closely to one another the malevolent ivy, always an enemy to grace, had thrown her tendrils about the pair and made them prisoners. Ivy held prior place in this lost garden, the long strands crept across the lawns, and soon would encroach upon the house itself.
>
> -Daphne du Maurier, 1938

Methodology

The project was divided into two phases. The first included prefieldwork research and visits to the fifteen sites. Field investigations were conducted by a team of an architectural historian and a landscape architect and were coordinated with the interpretive and maintenance staffs at each park. Where possible, the project team was accompanied by National Park Service personnel. A summary of problems and conditions noted in this phase was presented in a pre-draft report.

The second phase included technical preservation research, interviews with administrators of historical properties, and the development of recommendations for the sites visited.

An outline of the sites included in this investigation follows:

1. Fifteen Mile Aqueduct
(C & O Canal: mile 140.9 at Little Orleans)

Resource: the aqueduct and associated towpath in the immediate vicinity
Problem: vegetation is growing on the walls of the aqueduct (which is of stone construction) and is also encroaching upon the towpath of the canal
Objective: to identify and assess the subject vegetation and its effects upon the structural condition of the aqueduct and the continuity of the towpath
Notes: this site is classified as a ZONE E site within the C & O Canal National Historical Park -- a site with limited accessibility and minimal interpretation.

2. Four Locks
(C & O Canal: mile 108.6 - 109.3 vic. Williamsport)

Resource: four locks of the C & O Canal and a cluster historic buildings
Problem: vegetation poses a threat to the continuity of the towpath and the structural condition of the locks
Objective: to identify and assess the subject vegetation and its effects upon the towpath and locks
Notes: this site is classified as a ZONE A site within the C & O Canal National Historic Park -- a site readily accessible and of interpretive significance; as such, it offers a point of comparison with the ZONE E site Fifteen Mile Creek Aqueduct, suggesting different levels of maintenance appropriate to the individual resources and the manage-

ment policies at the two sites; there is a wood structure at this site which will offer a comparison with stone and brick structures at other sites.

3. Antietam Cemetery
(Antietam National Battlefield: Maryland)

Resource: cemetery
Problem: maintenance of the cemetery is expensive due to the time and effort required to cut grass around the irregularly placed markers
Objective: to assess alternative means of maintaining the vegetation around the markers while insuring the integrity of the historic resources
Notes: at Antietam, the historic vegetation pattern of farmland is basically maintained with a goal of revegetating areas in accord with their appearance at the time of the Civil War.

4. Virginius Island
(Harper's Ferry National Historic Park, West Virginia)

Resource: historic industrial archaeological ruins on Virginius Island
Problem: trees are growing around and over the ruins of the industrial structures
Objective: to examine the debate over whether the trees are a destructive or a mitigating force in the preservation of historic resources: are the trees destroying the ruins? or are they useful in serving as a precaution against the ravages of potential flooding?
Notes: it was extensive flooding that destroyed the structures in the industrial heart of Harper's Ferry.

5. Worthington House
(Monacacy National Battlefield: vic. Frederick, Maryland)

Resource: brick house
Problem: poison ivy covering the house has permeated the mortar and brick with its fine roots
Objective: to assess the nature of the damage caused by the vegetation and suggest possible solutions
Notes: this is the most severe example of vegetation which threatens the physical condition of an historic structure within this study; there is the possibility of funds being scheduled for the house in 1983; access to the property must be arranged.

6. Yellow Barn at Glen Echo
(Glen Echo Park, George Washington Parkway System)

Resource: frame building with stone facing associated with Glen Echo Amusement Park
Problem: a large Sycamore tree is growing from the base of the wall
Objective: to determine the effects of the tree upon the structural condition of the building
Notes: the Barn is now rented by NPS to artisans.

7. Potomac Canal at Great Falls
(George Washington Parkway system: Great Falls)

Resource: canal and surrounding area including structures
Problem: heavily wooded areas encroaching upon structures
Objective: to determine whether the removal of selected trees would be more damaging to the existing structures than leaving them intact or with regularly scheduled maintenance
Notes: this site offers a basis of comparison with problems at Virginius Island and other canal sites.

8. Fort DeRussy
(Rock Creek Park: Military Road and Oregon Avenue)

Resource: Civil War fortification earthworks
Problem: potential loss of visibility of the earthworks due to extensive vegetation
Objective: to maintain the visibility of the earthworks through a careful plan of plantings that are conducive to the preservation of the delicate historic resource
Notes: this is one of seventeen such forts administered by NPS; as the Rock Creek Park was created in the 1890's, it is one of the best preserved; brush and trees now threaten the earthworks.

9. Jefferson and Lincoln Memorials
(District of Columbia)

Resource: Jefferson Memorial; Lincoln Memorial
Problem: trees that grow on the roof of the Jefferson Memorial & have the potential to develop on the Lincoln Memorial
Objective: to examine means by which to prevent these seedlings from starting to grow in places where their presence is not immediately detected; to determine a maintenance schedule for removal

Notes: contract cleaning of these structures does not allow for the recognition of this problem; the problem must be anticipated and prevented.

10. Fort Washington
(National Capital Parks -- East)

Resource: masonry walls of Fort; and concrete batteries, c. 1900; Commandant's House

Problem: the walls of the Fort are covered with ferns and other vegetation; the concrete batteries are in poor condition aggravated by vegetation; large weeds have grown around the Commandant's House

Objective: to determine appropriate types and levels of vegetation in such proximity to the historic resources and suggest a maintenance schedule

Notes: some of the structures were designed to allow for vegetation (grass growing on top of some of the fortifications, for example); the poor condition of the batteries requires that they be fenced off from visitor access; there are four more concrete batteries of the same type across the Potomac at Fort Hunt.

11. Marshall Hall

Resource: recently burned ruins of an early eighteenth century house

Problem: ruined state of the house with its maintenance and interpretive problems

Objective: to suggest a means by which vegetation might be incorporated into the interpretation of the ruins, in a way that would not be detrimental to the structural remains and would allow for ease of maintenance

Notes: letting grass grow between the ruined walls to be mown by sheep?

12. Manassas National Battlefield Park

Resource: areas which are now forested that were cultivated fields at the time of the two battles of the Civil War fought here; Stonewall Jackson monument

Problem: to address the change in the historic landscape from cultivated land to forest and the problems inherent in interpreting a forested area as a battlefield; to suggest a means by which the areas may be revegetated as appropriate to the Civil War period of significance; to consider

the question of whether vegetation can be an effective means in preventing damage to an historic monument, in this case, the Stonewall Jackson statue -- can vegetation be appropriate to the historic landscape and serve as a deterent to excessive human wear on monuments?

13. Widewater (C & O Canal, Maryland)

Resource: portion of the canal which utilizes a natural body of water resulting in its unusual width; the towpath associated with the canal includes earthen and stone supporting walls

Problem: to address the question of trees disturbing the continuity of the towpath in growing between it and the canal and to assess the level of physical damage caused by their presence; question: in some cases, is the vegetation a deterent to erosion?

14. Carderock (C & O Canal, Maryland)

Resource: portion of the canal system which is raised dramatically above the elevation of the Potomac River and supported by a stone wall about thirty feet in height

Problem: the dry laid stone wall is endangered by the growth of trees at its top at the elevation of the canal and towpath; also, the trees obstruct a dramatic vista.

15. Clara Barton House
(George Washington Parkway System)

Resource: Historic house museum

Problem: foundation plantings have attained inappropriate size and may pose threats to the building

Objective: to assess the desirability of retaining, replacing, or maintaining existing paintings

Notes: there is historical precedent for the removal of harmful foundation plantings at this site- Clara Barton wrote of removing a tree that had allowed squirrels access to the house.

A checklist including questions on the type of vegetative problem (destructive or obstructive), causes of the problems, and initial impressions and recommendations was used at each site to record the data (see checklist example, (next page)). The problems were documented using black-and-white 35mm photographs

Name of Site: _____

Location: _____

Resource: a) general description _____
b) w/in framework of park _____

Problem: _____
_____

Objective: _____
_____

Determine vegetative damage or obstruction

- destructive vegetation
- obstructive vegetation
- historically appropriate
- invasive or volunteer
- damage or threat of damage
  - type
    - erosion
    - foundation disruption
    - masonry damage
    - wood damage
  - extent
    - advanced
    - moderate
    - recent
  - potential
    - abated
    - continuing
    - accelerated
- obstruction or threta of obstruction
  - type
    - blocked views/vistas
    - overgrowth
    - ecological succession
    - disruption
  - extent
    - advanced or total
    - moderate
    - seasonal
    - single or multiple element
  - potential
    - continuing
    - advancing
    - abating

Identification of vegetation: destructive or obstructive

name and type: _____
location/position: _____
intentionally placed or invasive: _____
age/level of maturity: _____
height/spread/coverage: _____
typical habit or character: _____
historical character/use: _____
type of damage/obstruction potential: _____

Summary Analysis Statement:

Solution or Recommendation

- chemical control
- removal and/or replacement
- scheduled maintenance
- utilization of alternate species
- structural repair
  aesthetic repair
  historical reconstruction
- prevention

Recorder: _____

Date: _____

Interviews: _____

_____

_____

_____

_____

Photographs: _____

_____

_____

_____

_____

_____

_____

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and color slide (35mm) photographs. Specific conditions were photographed as were the larger resources on which they were found. Overall views to illustrate the general settings of the resources were also made. Field data were reviewed, summarized, and organized into problem types in the preliminary report.

During the fieldwork, it became apparent that there were similarities in many of the sites' problems. Obvious similarities, such as destructive vegetation weakening structural conditions, were grouped into four categories. They are:

1) Sites with structural damage:

2) Sites with maintenance demands:

3) Sites with beneficial and threatening vegetation; and

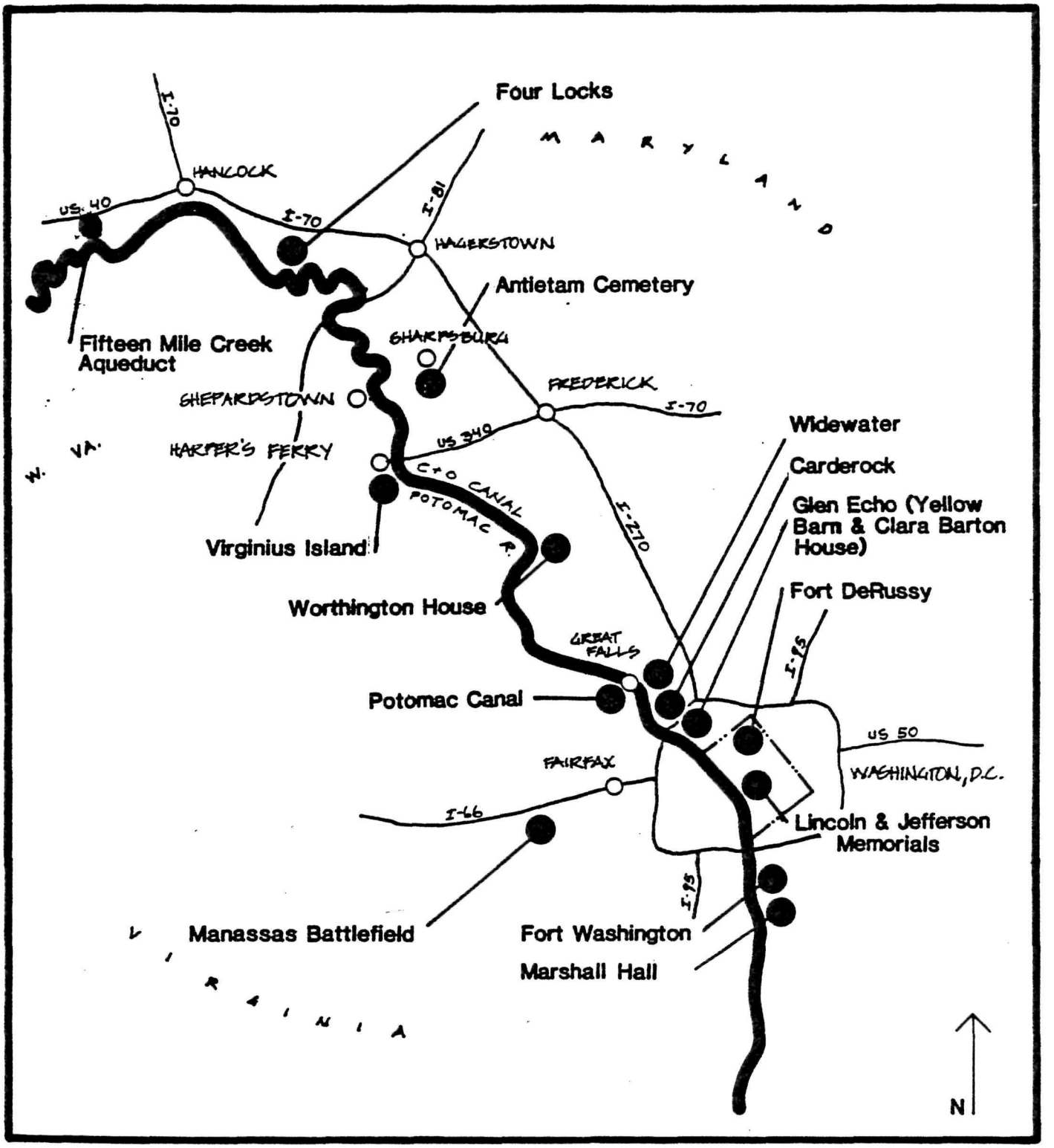
4) Sites with interpretive opportunities.

Following are fifteen case studies which include a discussion of the problems and recommendations for each of the sites.

Plants have been identified by their common name and Latin binomial. In a few cases only the genus name has been indicated where thorough identification of the species was not possible. Predominant vegetative species have been named at wooded sites rather than an exhaustive list of all plant species.

1.1. Site Location Map

National Capital Park Region National Park Service



2.1 Sites with Structural Damage

The most common problem encountered in visiting the sites was structural damage. Structural damage has occurred in two distinct ways: it has been caused by vegetation or has occurred prior to the appearance of vegetation. Vegetation, then, can be the cause or the symptom of structural damage.

Plant-caused damage may result from expanding tree roots in a restricted space, falling tree limbs, or the accumulation of leaves and other plant debris on a structure. Cracking foundations, shifting walls, clogged gutters, and damaged roofs may result. The sycamore tree at the Yellow Barn is an example of a plant causing major disruptions to a building, as is poison ivy at Worthington House.

In many cases, structural damage existed prior to the appearance of invasive vegetation. Examples of structural damage would include mortar and masonry disruption due to a differing coefficient of expansion (Fifteen-Mile Creek Aqueduct and the Batteries at Ft. Washington), bowing walls resulting form change in external pressure (the draining of the C&O Canal at Four Locks), and walls weakened by flooding (Carderock). Such physical weaknesses make a structure vulnerable to invasive vegetation. At six or seven sites within this group (with the exception of Yellow Barn and, to some extent, Worthington House), inherently weakened structures serve as hosts to a variety of vegetation which aggravate and accelerate deterioration.

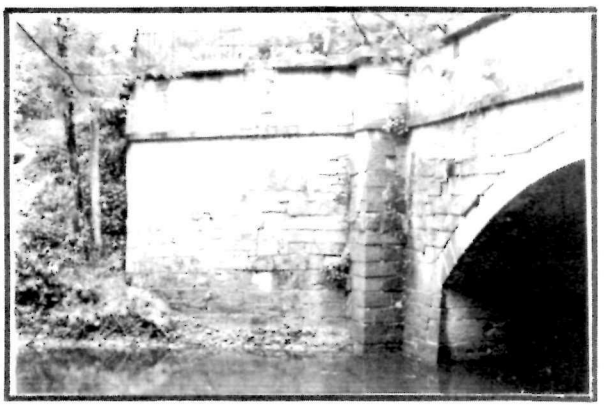
With Worthington House, vegetation is both the cause and symptom of structural damage. The roof, through neglect, has become host to sapling trees and other invasive vegetation while the walls, in sound condition, were literally attacked by poison ivy.

With frequent interaction of one problem with another, it is difficult to prescribe one method of treatment. In nearly every case, however, it should be noted that the problem has reached a point at which vegetation management alone will not solve the problem of structural damage. Where extensive damage has occurred, it is important to correct the structural defect as well as remove the continuing threat of vegetative damage. With structural repairs such as repointing, and roof replacement the opportunity for vegetative encroachment is eliminated.

2.1.1. Fifteen Mile Creek Aqueduct

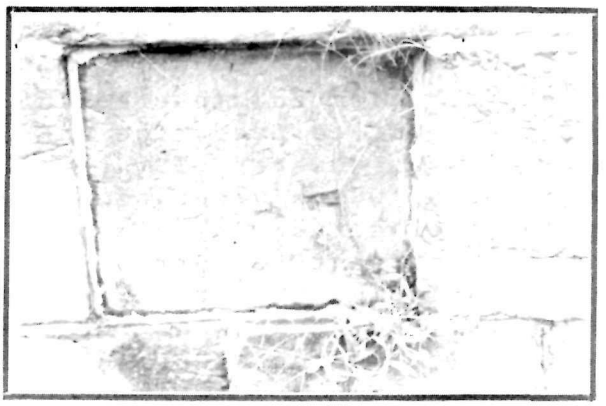
Site with Structural Damage

1 View of aqueduct



2 View of aqueduct wall
Herbaceous volunteer plants are growing on the aqueduct walls

3 View of aqueduct wall
Herbaceous volunteer plants are growing on the ledges



4 Detail of wall
Masonry disruption has occurred, followed by invasive plant growth

2.1.1 Fifteen-Mile Creek Aqueduct

The aqueduct is situated near the juncture of Fifteen-Mile Creek and the Potomac River and is surrounded by densely overgrown banks. It is secluded along the canal and well concealed from view by overhanging branches. It is a cut-stone aqueduct with a dirt foot path between the two outer walls.

At first glance, vegetative growth appears minor and fairly recently developed. To the casual eye, there appears to be few plants growing on it and nothing threatening or damaging. Volunteer plants are mostly non-woody and include ferns (*Asplenium sp.*, *Polystichum* sp.), grasses (Graminaceae fam.), lichens, common weeds such as plantain (*Plantago major*), lambs ear (*Stachys byzantina*), ragwort (*Senecio aureus*) and Golden Aster (*Chrysopsis* sp.). Their size varies: some lichens cover an area of a few inches, some grases are 5-10" tall or hang down two feet, one aster is a foot tall. The plants growing on the aqueduct have positioned themselves in the mortar joints, on the ledges, in the bolt holes, at the top of the wall and in some porous stone of the bulwark walls. Most of the plants are growing on the outside of the walls and are inaccessible from above or below the walls. The presence of constant moisture from the canal and the shaded conditions of the bank are conducive to fern and lichen growth on the aqueduct. The very crowded banks around the aqueduct walls provide host plants and are predominantly populated by silver maples (*Acer saccharinum*), poison ivy (*Rhus radicans*), raspberries (*Rubus* sp.), and waist-high grasses.

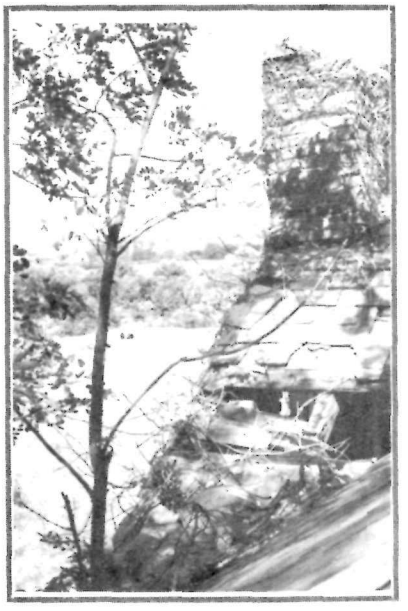
On closer inspection the stones of the aqueduct have experienced mortar-masonry disruption and the back wall of the aqueduct has bowed out significantly with the shifting stones. In some places mortar is loose, deteriorated, or non-existant. Stones have shifted up to 2", providing ledges, crevices and openings for a natural cycle from dust and dirt deposit to deposit of seeds by birds and winds to resultant plant growth.

Vegetative growth on the aqueduct is somewhat obstructive and historically inappropriate. Most importantly, it is not the cause of structural weakening or damage but is symptomatic of a structural shift. A threat for further weakening is the entrapment of water in the joints, expanding and contracting during winter temperatures and the growth of woody plant materials such as raspberries and silver maples in the joints succeeding the non-woody volunteer plants.

The rapidly growing trees along the canal banks are historically inaccurate and threaten the continuity of the towpath. These should be cleared restoring visual integrity. The canal requires a major cleaning effort with removal of all woody and herbaceous plants from the canal bed and the towpath. Plants growing on the aqueduct should be removed by cutting at the base to insure against further mortar disturbance. The masonry should be repointed, but a more immediate need is to replace the stone capping missing from one section of the upper wall. This structural damage will continue to weaken the aqueduct walls and provide a host environment for destructive vegetation should this condition be neglected. The aqueduct walls at this point bow considerably and will require structural reinforcement or reconstruction. This problem, however, is not directly related to vegetative threats. Once cleared, woody and herbacious plants should be cut to the ground on a regular schedule of once or twice a year with spring and fall or summer and fall being the preferred times for maintenance.

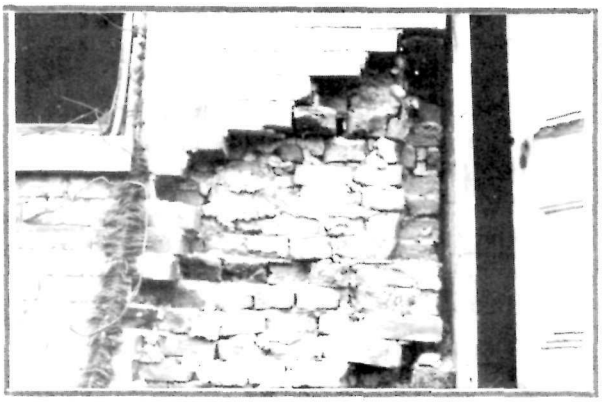
2.1.2. Worthington House

Site with Structural Damage



1 View of roof
A volunteer sapling is growing from the deteriorated cornice while vines are covering the chimney

2 View of house
Poison ivy has grown up the walls and into the windows and wall openings



3 Detail view of wall
A thick poison ivy stem is visible adjacent to the vandalized wall

2.1.2 Worthington House

The Worthington House is located within the Monacacy National Battlefield Park, a few miles south of Frederick, Maryland. The National Park Service has been acquiring land at this site only in recent years and, as yet, the park is not open for visitors. The Worthington House is a two-story single pile brick building with a three bay, symmetrical facade and a rear ell. It stood at the site at the time of the Civil War battle of July 9, 1864. It remains today in its rural, agricultural setting. Of the sites included in this investigation, the Worthington House is among the most dramatic examples of structural deterioration.

The house has suffered from several years of abandonment and neglect with resultant vandalism and vegetative growth. The roof has been severely damaged and now leaks throughout the house; volunteer saplings are growing from the deteriorated cornice. The brick walls have been attacked by poison ivy (*Rhus radicans*). The poison ivy has grown up the walls to the height of the roofline, its fastening rootlets invading the mortar and the bricks. The stems of the plant have reached, in some places, a diameter of six to eight inches. Many of the bricks crumble at the touch of a hand, their integrity and strength vanquished by the invasive vine. Poison ivy tendrils drape the insides of the window frames and snake across the interior walls, their foliage and roots retaining destructive moisture and providing a host environment for insects. This damage has been partially arrested by recent cutting of the vines at their base but many of the vines have not yet been pulled away from the house and the threat remains a strong one: the ground around the house is carpeted by poison ivy which also grows around the trunks of nearby trees.

Other vegetative threats include the trees and weeds growing from the roof. The gable roof with its slate shingles is in badly deteriorated condition. Water runs freely into the interior of the house as a result of leaks in the roof. The corbelled brick cornice is in equally poor repair with bricks ready to topple to the ground. From the junction of the roof of the main block and the rear ell, grow seedlings of black locust (*Robinia pseudo-acacia*), 1-2' in height catalpa (*Catalpa speciosa*), 1-2' in height vines of poison ivy (*Rhus radicans*), and Virginia creeper (*Parthenocissus quinquefolia*). A large tree is growing close to the rear corner of the house, whose roots could possibly damage the foundation.

The house in its present condition is essentially a vertical garden, host to a variety of vegetation which threatens the survival of the building. It should be noted that the poor condition of the house at the time it was acquired by the National Park Service, and the relative lack of maintenance afforded it, made way for the vegetative threats. These threats then came into their own and have done at least as much direct damage as vandalism or neglect. While it is not uncommon for a roof of such a building to require almost complete replacement, the disintegrated condition of the brick walls is a more serious condition. The poison ivy rootlets penetrated not only the mortar but the bricks themselves, passing into the interior walls and causing large patches of original plaster to fall to the floor. Some interior stems are of three inches in diameter.

The preservation of the Worthington House is of some priority, given its association with the historical landscape of the 1864 battle. The house, while not of outstanding or unique architectural quality, is nonetheless an interesting one. The house has a traditional plan with its two single pile rectangular sections. The main block has a central stair passage with a room to either side, and the rear service ell has a secondary stair and one principal room. The mortice and tenon common rafters are typical of construction techniques in Frederick and Washington Counties. Interior trim is characteristic of the Greek Revival style as expressed in its late phase in rural areas. An unusual feature exists in the decorated plasterwork of the center passage: the plaster retains its original polychromed designs of panels and a stylized floral rosette on the ceiling. The remaining members of the balustrade retain their light graining. The most stylish feature of the exterior, the porch which extends the length of the facade, is composed of square wood posts with chamfered edges and a bracketed cornice. The porch is in poor condition, having fallen against the house.

Despite the poor condition of much of the fabric of the house, there is little left for conjecture as to its original appearance. Modifications over the years have been almost negligible and are clearly distinguishable from the historic fabric. These modifications are primarily limited to the partitioning of rooms which occured in the 1960's. The primary concern is the structural integrity of the brick walls. Vandals have removed sections of brick from the first floor of the building, but the greater problem is the damage caused by the poison ivy growth. The elevation consisting of the gable end of the main block and the side of the rear ell has been subject to the most damage. It is at this wall that the ivy has fully penetrated the bricks into the interior of the house. The result is that the brick is so weakened as to be unstable: left exposed it will continue to draw moisture into the interior and ultimately collapse. The entire house would require not only repainting but extensive replacement of brick.

The Worthington House requires immediate and extensive maintenance even to prevent the existing conditions from rapidly worsening. Here vegetation, in combination with concurrent structural defects, threatens to reduce the house to ruins in a matter of a few years. The poison ivy which climbs the walls of the house and has formed a ground cover within the fenced area of the yard should be treated with the systematic application of herbicide. The tree growing close to the house should be removed or have its branches cut back. This would eliminate the build-up of organic debris in the roof gutters (particularly important in an isolated site such as this), and remove at least part of the threat of falling branches damaging the roof. Immediate needs for the house include the removal of all seedlings and volunteer plants from the roof and cornice. The roof should then be replaced in combination with repairs to the brick walls. The walls have been so damaged by the ivy and vandalism as to require not only repointing but the replacement of large sections of brickwork. Areas of particular concern are the corbelled cornice and the areas of the first floor walls where vandals have removed brick exposing the interior to external climatic conditions. Given the great expense in matching brick and mortar that would be required in a traditional restoration effort, one alternative would be to consider painting the exterior walls after repairs. This method is used on brick buildings which have suffered from sandblasting. While the house appears never to have been painted, the historical precedent for such a treatment could be argued as well as the fact that such a treatment might result in the retention of more of the original fabric.

While the work specified is essential to the preservation of the building, finding a use for the building is equally important. Isolated from the park maintenance staff located at Antietam Battlefield, the house cannot receive the attention it deserves. To perform extensive repairs to the house and then abandon without a plan for its use or a schedule for its maintenance would result in a new cycle of deterioration. It was this inactivity around the building which contributed to its present state. Certainly all of the problems which plague the house could have been noticed and corrected with minimal effort had the house been utilized or visited on a regular basis. The reasons for the acquisition of the farms that comprise the Monacacy battlefields are equally applicable to the Worthington House. With limited man-power and financial resources to maintain this property, the Worthington House suggests alternatives to traditional restoration and interpretation plans. In a case such as this where a regularly scheduled maintenance plan is not easily implemented due to the burden of existing maintenance responsibilities, finding some means of utilizing the building is essential to its preservation.

2.1.3. Carderock

Site with Structural Damage

1 View of towpath
Sycamore trees are growing at the top of the wall adjacent to the towpath

2 View of retaining wall
Honeysuckle is growing densely in the joints of this dry laid retaining wall

2.1.3 Carderock

The stone retaining wall supporting the towpath at Carderock is obscured by vegetative overgrowth. The top of the wall is at towpath level; the foot of the wall lies 20-30' below the towpath and is accessible down a steep footpath. The path winds along the base of the wall; it is highly unlikely that many people notice this wall or explore the base of it.

At present, large sycamore trees (*Platamus occidentalis*), over 2' diameter, redbuds (*Cercis canadensis*) and slippery elm (*Ulmus rubra*) grow at the top of the wall. At the base of the wall, American beech (*Fagus grandifolia*), green ash (Fraxinus *pennsylvanica*), redbud, pawpaw (*Asimina triloba*), pumpkin ash (*Fraxinus tomentosa*) and basswood (*Tilia americana*) crowd together. Asters (*Crypsopsis sp.*), grasses (*Graminaceae* fam.), and other herbaceous weeds, and two woody vines, Virginia creeper (*Parthenocissus quinquefolia*) and common honeysuckle (*Lonicera japonica*) grow between the dry laid stone. The honeysuckle and Virginia creeper present a cascading growth of 10-12 feet down the wall, with their roots tightly wedged in narrow openings.

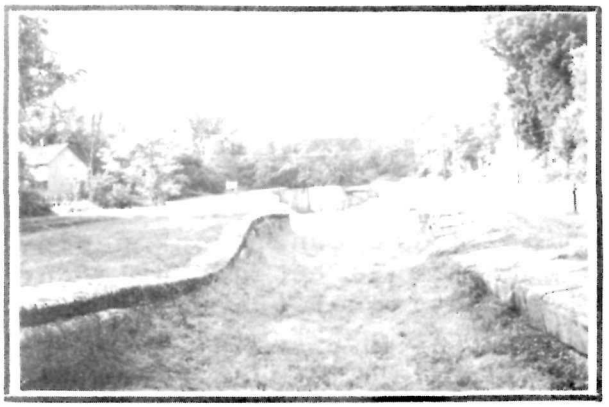
Each of these groups of plants poses a potential threat of damage. While the honeysuckle is not a visible threat or an historically inappropriate plant on the wall, the plant is a tenacious, fast-growing vine whose strong woody roots and stems could dislodge stones. Another potential threat is the root growth under or into the base of the wall from the major shade trees growing at the base. The most severe threat of damage is caused by the growth of sturdy well-rooted elm and sycamore trees at the edge of the towpath next to the wall; a major storm, uprooting those trees, could cause damage to whole sections of the wall.

While no apparent physical damage has been caused by the vegetative growth, the threats from vegetation are multiple and serious. Further honeysuckle growth must be discouraged; and potentially damaging trees need to be reviewed for removal or pruning.

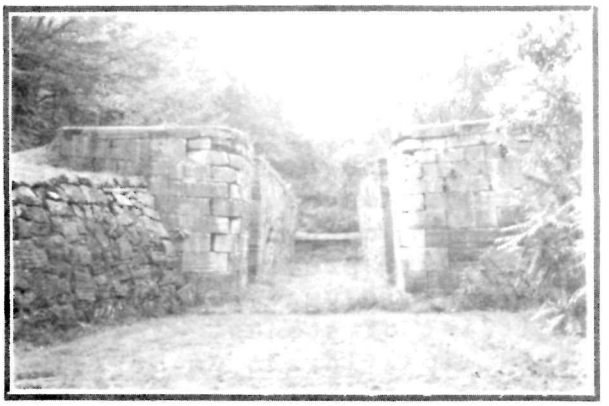
As an immediate measure, small trees and seedlings growing at the top of the wall should be cut to the ground. Larger, more well established trees should be retained, as cutting them to the ground would result in their roots drawing excessive moisture behind the wall and eventual decay. While the pressure of the current root systems against the wall is great and it is imperative that the trees ultimately be removed, this should be delayed until the resources are available for repairs to the wall. The same is true of the large tree growing at the base of the wall; although its roots probably do not pose as great a threat of pressure against the wall. The honeysuckle should be removed for aesthetic and practical reasons. This is best done by cutting it back; as the vine does not respond to pruning with vigorous growth, an annual treatment should suffice.

2.1.4. Four Locks

Site with Structural Damage

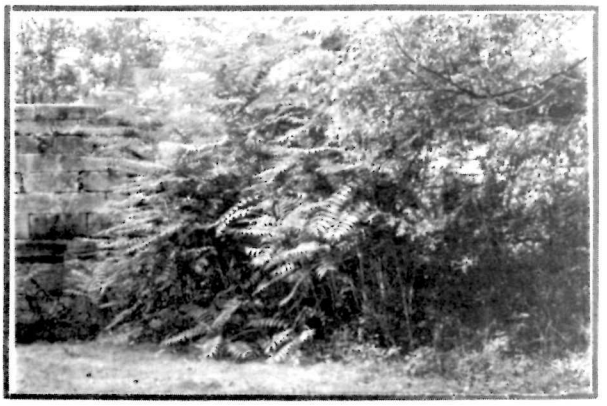


1 Overall view of locks
The mown area of the canal bed is well maintained



2 View of canal bed and locks
Absence of canal water has resulted in bowing walls

3 View of wall disruption
The canal wall has been damaged subsequent to the draining of the canal



4 Untended area of canal bed
A variety of invasive plants are growing on the banks across from the towpath

2.1.4 Four Locks

At Four Locks, located at Big Spring, Maryland, the site of four closely spaced canal locks along the C & O Canal, vegetation is obstructive, structurally damaging, and historically inappropriate. The site appears fairly well maintained, with mown grass carpeting the banks of the canal and some of the bottom of the canal, and is mostly open, affording views of the Potomac River. It appears to be primarily used as a through way for fishermen and other water sportsmen who use an underground tunnel as access to the River.

The vegetative management problems can be limited to three areas and pose three different types of problems and threats. The first vegetative problem is primarily cosmetic and illustrative of a natural structural weakening of the canal lock walls. The inward pressure of the earthen embankments behind the stone walls has caused a masonry disruption, bowing of the walls and shifting of stones. Volunteer plants - grass (Graminaceae fam.), dandelion (*Taraxacum officinale*), lambs ears (*Stachys byzantina*), golden-rod (*Solidago* sp.), ferns (*Asplenium* sp., *Polystichum* sp.), plantains (*Plantago major*) are growing to a moderate extent on the tops and on the sides of the lock walls in the joints. The growth is of herbaceous kind and can easily be managed with increased maintenance. However, a recent growth of tree-of-heaven (*Ailanthus altissima*) has developed, and this fast growing woody plant could quickly become a major threat. Its close presence in other areas of the site only increases the threat. As a woody plant, it has the characteristic woody root and stem growth which has the potential to expand and force stones apart as its stems enlarge.

The second vegetative threat is more persistant and threatening. Fast growing plants, smooth sumac (*Rhus glabra*), tree-of-heaven (*Ailanthus altissima*), asters (*Chrysopsis* sp.), are growing thickly and up to 3' tall in the bottoms of some locks. This is mainly a seasonal growth but is inconsistent with the historical use and image of the canal. The growth habit of the tree-of-heaven (quickly growing, to 15' per year, and rapidly multiplying) makes it one of the most threatening and invasive of vegetative problems.

The worst growth is confined to the steep banks of the canal and lock walls across the towpath. A dense woody growth of tree-of-heaven, sumac, grasses, and other volunteers obscures broken stone walls. It is difficult to determine the extent which the invasiveness of the plants and historic neglect of these areas caused the walls to collapse: the lack of water in the canal is certainly a factor given the unchecked pressure exerted by the earthen embankments defining the canal. The tree-of-heaven is growing 12-15' tall in some places. Evidence of cutting back, pruning and mowing to the edge of this overgrown area is clear. Confining or removing this type of growth is the primary issue.

Fragments of stone walls on the towpath side of the canal are camouflaged by weeds and lawn. It is important to determine whether their visibility would increase the historic value of the locks and how achievement of that visibility would affect maintenance.

In summary, initial impressions of the site, with its mixture of moderate and severe vegetation problems, must be considered with the potential threats of much of the vegetation. Blocked views of both sides of the canal, severe vegetative overgrowth and historical inappropriateness of the vegetative growth are major problems at Four Locks.

Recommendations for Four Locks would include careful evaluation of the area that should be kept cleared. The forest's edge and the mowed lawn are at many places indistinct and this appears to be based solely on relative ease of maintenance. In the canal bed, tree-of-heaven has been allowed to grow where cutting with power mowers is difficult. While a manicured lawn is not the goal, the pockets of threatening vegetation within the canal require greater attention. Two to three times a year between spring and fall, plants in the difficult to reach corners at the locks should be checked. Tree-of-heaven presents a special problem in that it is a suckering plant which can respond to pruning by exponential growth. Known as "the tree that grows in Brooklyn," it grows unhindered by confinement. Removal is the preferred option. If removal is not possible in the near future, it is better to allow the existing plants to remain, as they are less likely to sucker. Hand weeding is required at the spillway above Lock 48; hand weeding would allow a better assessment of the deteriorated condition of the spillway.

2.1.5. Glen Echo - Yellow Barn

Site with Structural Damage

1 Historic main entry to park
The sycamore is visible immediately to the right of the tower

2 View of tree and barn
The sycamore appears to be growing out of the corner of the stone foundation of the barn

3 Detail of tree trunk
The sycamore is growing against the barn and pushing it toward the northwest

2.1.5 Yellow Barn at Glen Echo

The Yellow Barn is a large frame building sited at the entrance to the former Glen Echo Amusement Park. The building is among the largest in the park and housed a variety of functions. Consisting of a telescoping series of frame sections united by a facing of rustic stone, the building features a tower and other picturesque elements. The northernmost and smallest section of the building is threatened by a large sycamore tree (*Plantanus occidentalis*). The double-trunked tree -each trunk averaging three to four feet in diameter- grows so close to the stone faced facade as to make the distinction between the plant and the building very difficult.

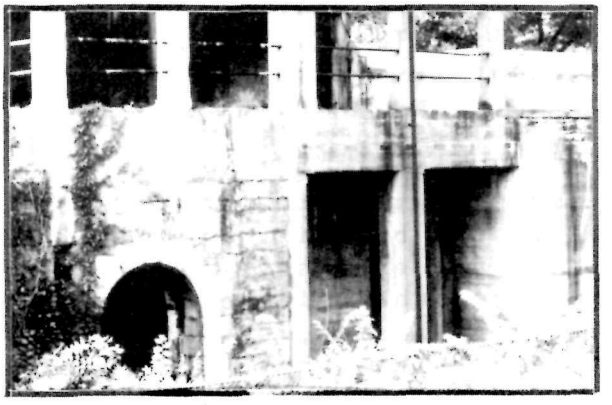
While little direct damage to the stone wall is visible, the entire section of the building lists and leans away from the tree, a result of the extensive and damaging root system which is visible on the other side of the building, forcing through a concrete ramp. Inside, the effects of the tree are seen in the moisture problems where the building has shifted.

The tree is appropriate to the period of the building; its location, however, is not. The building itself is of light construction and, as with other buildings at the amusement park, appears not to have been built with longevity in mind. This impermanent manner of construction coupled with the force of the tree has damaged the building to the point where it will require major repair and replacement of materials.

Clearly, where there is a desire to preserve a building or structure, a tree in such a detrimental location should be removed. In this case, however, the damage to the building is so advanced that the tree need not be removed unless in conjunction with a repair plan. At present, the building is sub-divided and rented to artists for a modest fee. A current tenant of the damaged section of the building has agreed to enter into a long-term lease and provide for the repairs needed for continued use of the space. Any work of this type should be done in connection with careful tree removal. The root system of the tree is such that it will continue to damage the thin concrete pad foundation and the large limbs of the tree are another threat in storms. Removal should consist of cutting the tree at its base at the time the building repairs are initiated. Subsequent root decay will have to be checked to determine if it is causing foundation settling.

2.1.6. Fort Washington - Batteries

Site with Structural Damage



1 View of battery
The bunkers are in severely deteriorated condition and have become overgrown with invasive vegetation

2.1.6 Fort Washington: Batteries

Fort Washington, is situated on the Potomac River, opposite Mount Vernon, in Prince George's County, Maryland. Associated with the early nineteenth century fort is a series of gun and mortar batteries dating from 1897 to 1905. The batteries are set throughout the 341 acre park whose function is primarily recreational (80% of visitors). Annual visitation in 1981 was 300,000-400,000 with about 20% of that figure visiting the fort.

The batteries are an example of inherent structural problems opening the way for further vegetative problems. The eight batteries are in varying condition from good to very badly deteriorated. The oldest of these (1897) is in the worst condition as a result of a unique structural problem: the reinforced concrete used in its walls is of two types (refer to 1975 structural conditions survey, James Madison Cutts) causing differential settling, shrinkage, and expansion. This condition has caused severe damage to the integrity of the structure and is aggravated by weathering and vegetative growth. As openings occur as a result of this differential settling, they invite exposure of the metal reinforcement rods to the elements. These crevices rapidly expand and provide ideal locations for the natural depositing of wind-carried dust, soils, and seeds.

The oldest battery is now fenced off to prevent public access because of the safety hazard of its present condition with large gaps in the walls and crumbling steps and foundations. The unsightly appearance of some of the batteries is heightened by uncontrolled weedy trees, shrubs, and vines. Vegetation includes Virginia creeper (*Parthenocissus quinquefolia*), honeysuckle (*Lonicera japonica*), poison ivy (*Rhus radicans*), Plantain (*Plantago major*), dandelion (*Taraxacum officinale*), ragwort (*Senecio aureus*), golden aster (*Chrypsopsis* sp.), and lamb's ear (*Stachys byzantina*). Trees include tree-of-heaven (*Ailanthus altissima*), a mixture of maples and oaks (*Acer* sp., *Querus* sp.), mulberries (*Morus* sp.), and catalpa (*Catalpa speciosa*).

Saving the 1897 bunker would be a major undertaking for the National Park Service, which could be compared with the preservation efforts at Frank Lloyd Wright's Unity Temple. The deteriorated bunker would require considerably more effort for its restoration than was required for its construction. So damaged is the building that removal of the vegetative threats would not contribute significantly to its preservation or longevity. Without plans for the preservation and repair of the structure, removal of vegetation would serve only to add to its interpretive value as the structure rapidly becomes a ruin. Given the other maintenance and management needs of Fort Washington and the presence of similar bunkers, major treatment of the vegetative problem is not recommended. Annual cutting of trees and shrubs would be the best method of improving visibility without drawing away from the other demands of the park.

2.1.7. Potomac Canal

Site with Structural Damage

1 View of holding basin
Invasive trees and other encroaching plants are damaging basin walls and perception of the canal and basin

2 Matildaville ruins
Lack of distinct edges and severe overgrowth contribute to the neglected appearance of these ruins

3 View of canal lock
Vines and other invasive plants are growing on the masonry walls

2.1.7 Potomac Canal

Potomac Canal is an example of a site at which several factors aiding deterioration are evident. Structural damage, abandonment, and threatening vegetation have damaged the ruins of George Washington's canal. Vegetation currently poses a physical threat and a threat to a visitor's understanding and appreciation of the site.

The short segment of the canal at Great Falls on the Virginia side of the Potomac featured locks that allowed barges and canal boats to bypass the dangerous falls. A small community developed during the early nineteenth century. Ruins of these stone and brick buildings including a mill, several houses, and an inn are visible. Today, only the mill ruins and a short segment of the filled canal near the visitors center is kept free of threatening vegetation. The ruins of the canal keeper's house are overgrown as are the canal basin and locks.

Trees around the retaining basin and cluster of buildings include American basswood (*Tilia americana*), sassafras (*Sassafras albidum*), mulberries (*Morus* sp.), swamp oak (*Quercus bicolor*), sycamore (*Platanus occidentalis*), and green ash (*Fraxinus pennsylvanica*). Sizes range fraom saplings to trees two to three feet in diameter. Some are causing foundation disruption by growing too close to, or on top of, walls. All deciduous vegetation presents a problem in the deposition of leaves and other organic material in the canal basin, locks, and bed.

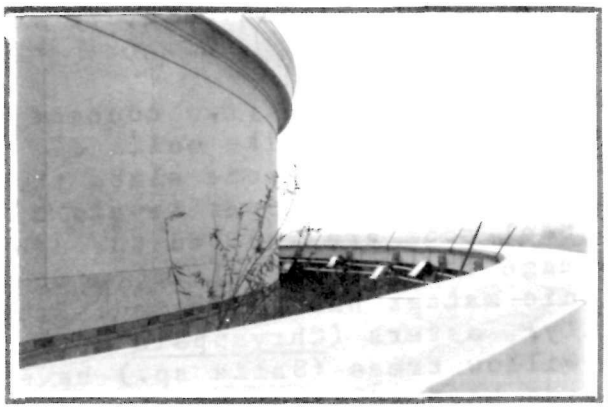
Wild hydrangea (*Hydrangea aboresaens*) is plentiful, as are honeysuckle (*Lonicera japonica*) and poison ivy (*Rhus radicans*). Both woody vines have fastened themselves into mortar and masonry openings in the canal and ruins; their threat of damage lies in the expansion of their root systems and shifting of masonry.

It is difficult to maintain a sense of historical association at this site. The vegetation is historically inappropriate and blocks the dramatic vistas to the Potomac and makes the canal indistinguishable from surrounding forest at a number of places. Recommendations would include an intensive clean-up program which would result in clearing the canal bed, basin, and locks of large and obstructive or destructive vegetation. Clearing back about twenty to thirty feet on either side of the canal would not allow for the build-up of organic material. An optimum measure would be to dig out by two feet the filled canal bed and basin so that it might again be visible. Beyond the lock closest the visitors' center, the trail becomes very narrow and confusing as the vegetation becomes denser and closer to the locks. This area needs a similar redefinement. As for immediate measures, the ruins near the first lock have been covered with black plastic sheets and weighted down with the repositioned stones. Given the short-term effect of this method, it would not be an advisible method for application elsewhere in the park. The plastic, despite the best attempts, remains unsightly and ultimately tears, allowing larger vegetation to grow

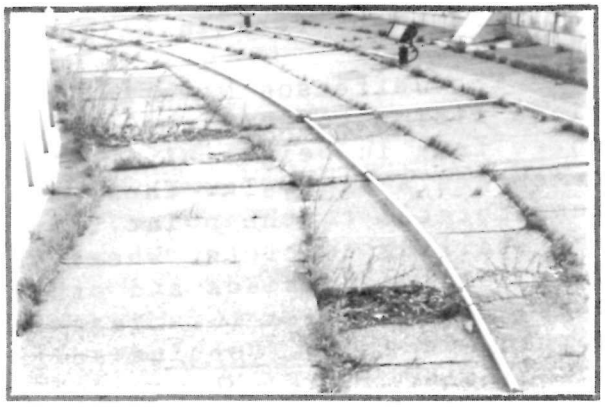
through and on top of it. The major clean-up effort is recommended not for immediate physical needs but for interpretive needs which are great here. One helpful element in the park's design are the numerous and attractive markers which present the best indication of what the area may have looked like before being overwhelmed by vegetation.

2.1.8. Lincoln and Jefferson Memorials

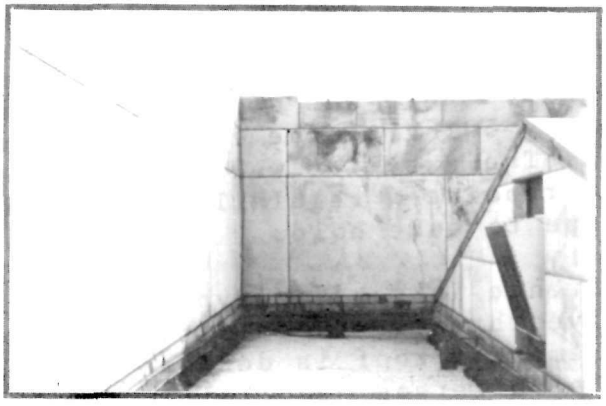
Site with Structural Damage



1 View of Jefferson Memorial roof
Cottonwood and willow saplings are growing up to 8′ tall on the roof



2 Detail view of roof
Pockets of dirt and volunteer plant growth have developed where the roof is damaged



3 View of Lincoln Memorial roof
There is an absence of plant growth on this roof due to its frequent cleaning and different construction from the Jefferson Memorial

Jefferson and Lincoln Memorials

Essential elements in the Federal presence of Washington, D.C., the Jefferson and Lincoln Memorials have annual visitation figures in the millions and are afforded perhaps the highest leval of maintenance of any of the sites visited. The stark marble walls and manicured lawns would not suggest presence of vegetation which might be threatening to their structural condition. Examination of the roofs of the two buildings, however, revealed, in one case, sapling trees of eight feet in height.

The Jefferson Memorial has a roof consisting of two concentric rings rising to the familiar marble dome. Parapet like walls of three feet in height hide a roof of reinforced concrete slabs that resembles a sidewalk. These slabs at the main and upper levels have deteriorated to the point that the steel rods are exposed through the spalling concrete. Where this damage is most prevalent, airborne dust, soil, and seeds and other organic matter has collected. From this base, grasses (Graminaceae family), asters (*Chrysopsis* sp.), cottonwood trees (*Populus* sp.), and willow trees (*Salix* sp.) have taken hold. While the grasses and weeds have attained heights of several inches to two feet, the trees have sent up shoots of three to eight feet. Because of their weak and spindly character, they are visible only in the summer months from ground level, and the threat is best seen from the roof itself. These plants will not reach maturity because of the confinement of their root systems and are aggravating an existing structural problem rather than creating one. Soil deposits of six to eight inches will, however, continue to harbor vegetation at an increasing rate until the structural problem is corrected.

Inspection at the Lincoln Memorial revealed a different roof type which harbors no vegetation and appears to have little potential for doing so. The roof is of tar and gravel and is maintained on a regular five year basis. There was no indication of any mosses or fungi which is probably owing to the full exposure to the sun and free air circulation. The exterior walls of the memorial are steam cleaned annually and repointed regularly, allowing little room for vegetation of any type to take hold.

It is the difference in roofing type that accounts for the presence of vegetative threats at one site and their absence at another. The Lincoln Memorial roof is designed for optimum and swift drainage, whereas the Jefferson Memorial roof has outlived its functional life and harbors accumulations of organic material and moisture conducive to plant growth.

Recommendations would consist of structural repairs rather than vegetative management. Plant removal would be merely an aesthetic gesture of limited purpose and of no benefit to the actual problem. The plants are symptomatic of a roof which needs immediate attention.

2.2 Sites with Maintenance Demands

Vegetative threats at three of the sites examined could be corrected by the implementation of a plan for regularly scheduled maintenance. Antietam Cemetery, the Clara Barton House, and the fort at Fort Washington could all benefit from an adjusted schedule of maintenance. Each of these sites has a simple problem, of less urgency and more easily corrected than at the other categories of sites.

Vegetative threats, as they now exist at these sites, should be considered on a long-term basis. At Antietam Cemetery, the vegetative threats have largely been corrected, and what remains is a need for periodic inspection of tree stump conditions and checks against future threats. At Fort Washington, the vegetative problems should be attacked by means of a long-term plan for the physical improvement of the site. The need here is for a better definition of the interpretive area (involving clearing and ground cover planting) and scheduled maintenance (repointing and repair) of the masonry walls. The Clara Barton House requires only a periodic check against vegetative threats, with the real challenge in the implementation of an historic garden plan for the small yard.

2.2.1. Antietam Cemetery

Site with Maintenance Demands

1 View of tombstone
Scars from previously used metal lawn mower blades are apparent on this tombstone

2 View of ongoing maintenance
Use of the remaining stock of herbicdes is permitted in some parks

3 View of invasive tree
The tree trunk and roots of this tree have overgrown these tombstones, pushing them out of their original location

2.2.1 Antietam Cemetery

Antietam Cemetery in Maryland is a beautifully sited Civil War cemetery of circular pattern. The eleven acre site contains 5000 markers organized in concentric rings along the contours of a gentle mound rising to a central, heroically scaled statue of a soldier. Large shade trees grow throughout the walled enclosure with dramatic vistas of the Antietam battlefields. The cemetery is one of the two single most popular stops within the heavily visited park. Tourists frequently remark on the beauty of the site and its well maintained appearance.

In visiting Antietam Cemetery, a program of vegetative management was seen in progress. The large trees that had engulfed the marble grave markers had been freshly cut and a new method of grass cutting had been adopted in order to afford greater protection against damage to the markers caused by mower blades.

Vegetative and maintenance problems at the site are overgrowth of shade trees, damaged grave markers, and an intensive level of maintenance effort required to keep up its appearance. Roots of Norway maples (*Acer platanoides*) and sugar maples (*Acer saccharum*) and other major shade trees have grown over and through some of the markers. Markers, particularly those at the ends of rows, have been badly scarred, the result of cutting the grass with metal-blade lawn mowers. Mowing is a two-day task every week in spring and summer with two people required. While maintenance remains labor intensive, some of the other problems have been solved.

The trees which were damaging or potentially damaging to the grave markers have been carefully cut off at their bases. These have been replaced by a row of maples in a circular pattern set in from the first ring of stones at a distance that park maintenance staff feel will not be detrimental to the stones in the future (the old trees had been placed between the stones). The rotary lawn mowers used for trimming around stones have been replaced by "weed eater" type equipment with nylon cord used for cutting; this does not appear to scar the marble. In some places, existing stocks of herbicides such as 2,4D are used to accelerate weed removal and trimming tasks.

Recommendations for Antietam Cemetery are simply to continue the level of maintenance. There would appear to be no way of reducing the time required for mowing and trimming. The use of trimmers with nylon filament has been effective in eliminating damage to the markers and the discoloration of the scars from the metal blades will eventually lessen. The tree removal program appears to have been equally effective, with the only suggestion being to watch for shifting markers as the stumps decay. The cemetery is among the best maintained sites visited in this survey and recent efforts for improved maintenance serve as a model for other sites.

2.2.2. Clara Barton House

Site with Maintenance Demands

1 View of side wall of house
Wisteria is growing on the back porch, posing a potential threat of damaging the porch

2 View of side wall of house
Vines are growing on the clapboard wall and pose a potential threat of moisture damage

3 View of front porch
The yew shrubs have grown out of scale and partially block the front porch

2.2.2 Clara Barton House

The Clara Barton House is a late nineteenth century frame house of considerable size exhibiting eccentric formal and stylistic qualities. The associated yard is very small due to the encroachment of the George Washington Memorial Parkway and the Glen Echo Amusement Park parking lot. The house appears to be in good structural condition on the exterior. The vegetative problem is largely confined to the northwest elevation that provides the first view of the house from the parking area.

At the Clara Barton House, historically appropriate foundation plantings are the vegetative threat. Virginia creeper (*Partheno-cissus quinquefolia*), ivy (*Hedera helix*), rhododendron (*Rhododendron* sp.) and wisteria (*Wisteria sinensis*)are the principal plantings. These plants have, in cases, become overgrown and are obstructive and potentially destructive plants. Ivy and creeper are now climbing the clapboard walls; while primarily obstructive at present, the potential for damage by vines to a frame building is much greater than that to a masonry building and should be carefully watched and maintained. The rhododendron is overgrown and spindly, posessing few of the qualities for which it was chosen for the site. The wisteria, a plant with a potential for tremendous damage, seems to have been recently cut back. Still, a season's growth will see it fastening to the stairs and wall. At the facade, overgrown yews (*Taxus* sp.) are obstructive to an appreciation of the architectural detailing of the porch.

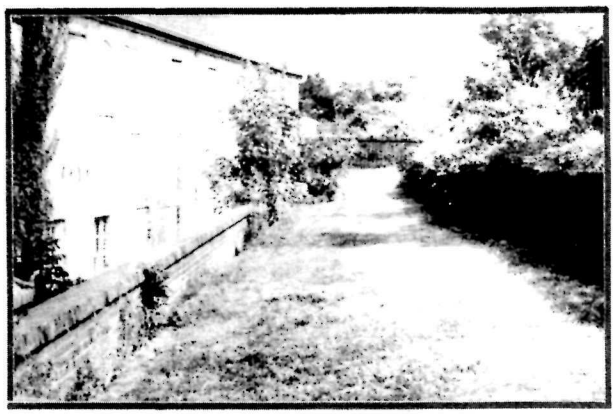
The primary recommendation for the Barton House is to establish a garden maintenance plan that would include plants appropr the period of the house and to maintain them at appropriate levels. The small site offers a fine opportunity for developing a garden plan and implementing a regularly scheduled maintenance plan. Rather than remove the wisteria, ivy, and creeper, they might be retained and trained onto supports or trellises appropriate to the period. Mrs. Schuyler Van Rennselaer advocated the use of a number of vines in combination for growing on the walls of a house in 1893 and describes in detail appropriate foundation plantings for the time.[1] Numerous references to foundation plantings exist in the publications of the late nineteenth and early twentieth centuries and could provide an excellent source for documenting plants in the garden plan. As for immediate threats, recent efforts to cut-back and prune seem to have abated the potential for threat . Once or twice a year this potential should be checked by the same method if funding is not sufficient for developing a planting and maintenance plan.

[1] Mrs. Schuyler [Marianna B.] Van Rennselaer, *Art Out of Doors*. New York: Charles Scribner's Sons, 1893, Chapter IV.

2.2.3. Fort Washington - Fort

Site with Maintenance Demands

1 View of entry to fort
Ferns and other plants are growing on the fort walls and may be evidence of moisture damage in the walls



2 View of parapet
Plant overgrowth on the wall at the left and on the ramparts to the right has occurred

2.2.3 Fort Washington: The Fort

The historic fort at Fort Washington Park dates to the first decades of the nineteenth century. Along with a series of c.1900 concrete batteries, the fort is situated on the Potomac River in Prince George's County, Maryland on a park of 341 acres. The park had an annual visitation last year of 300,000-400,000 with 80% of that figure visiting the site for recreational purposes and 20% visiting the site in order to see the fort itself

The fort is of stone and brick construction with some of the rear walls utilizing earthen ramparts. There are three major problem areas. On the outer walls of the fort (particularly the southern and eastern elevations), vines have grown extensively. These vines include: Virginia creeper (*Parthenocissus quinquefolia*), honeysuckle (*Lonicera japonica*), and possibly Boston ivy (*Parthenocissus tricuspidata*--it is difficult to identify as it is not readily accessible). These woody vines are a potential threat to the masonry walls, capable of fastening to the walls, creating moisture problems, and causing a dislodging and enlarging of masonry apertures. A greater problem exists in the earthen embankments on the eastern side of the fort. Here the steep slopes are overgrown with shrubby vine growth. It may have some benefit in guarding against further slope failure, a problem in the recent past, but is historically inappropriate in that it severely blocks the vistas integral to the fort's function. A dense entanglement of cedar (*Juniperus virginiana*), and maple and oak saplings (*Acer* sp., *Quercus* sp.) are growing three- to four feet in height. Raspberry (*Rubus* sp.), honeysuckle (*Lonicera japonica*), and poison ivy (*Rhus radicans*) also cover the slope. The third problem exists in the neglected areas within the fort: certain buildings on which creepers are growing, ramparts where weeds are sprouting between bricks, fern growth on the walls. While most of this growth is of an herbaceous volunteer nature and includes grasses (Graminaceae family), plantains (*Plantago major*), dandelions (*Taraxacum officinale*), lamb's ear (*Stachys byzantina*), ferns (*Asplenium* sp., *Polygonum* sp.), these plants are encroaching in highly visible places such as the ramparts. By inserting themselves in narrow apertures they are widening these apertures, building up moisture and are the first sign of successive woody development. The potential threat is that these plants may be replaced by woody plants, more costly and time-consuming to remove.

A major clean-up effort is recommended for the overgrown earthen embankments followed by more regular maintenance. Once clear, the embankment should be planted with a quick growing, dense, thorny shrub such as Japanese barberry (*Berberis thunbergii*) or Scarlet firethorn (*Pyracantha coccinea*) in combination with a ground cover such as crown vetch (*Coronilla* sp.), shore juniper (*Juniperus confera*) or Chinese juniper (Juniperus chinensis). This would prevent visitors from climbing dangerous areas and would act as an erosion preventive planting requiring a very low level of maintenance. The thorny shrub would require pruning and should be planted at the top and bottom of the embankment. An annual check of vegetation on the fort's masonry walls should be made to assess the need for removal of vines and woody plants.

2.3 Sites with Threatening and Beneficial Vegetation

In some cases, vegetation which is historically inappropriate to a setting and which may be threatening to an historic resource also serves to protect or support the resource. The decision, in such a case, as to whether to remove the vegetation must consider both the positive and negative values of the plants. In these situations, vegetation can be posing problems and damage yet exerting some measure of support and protection to the structure. Frequently examples of this type of vegetative threat are erosion preventive.

Three sites fall into this category of historic resources which are host to vegetation at once threatening and beneficial: Widewater, Virginius Island, and Fort DeRussy. These resources are united by a common threat, the threat of erosion. Whether by flood, as at Wildwater and Virginius Island, or by the effects of exposure to weathering and visitor traffic as at Fort DeRussy, serious erosion threatens the very existence of the resource. The problem is not so clear cut as it may seem in that the vegetation is both supportive of and destructive to the resource. Before advocating the removal of the vegetative threat, consideration must be given as to how to restore the element of protection that the same vegetation afforded the resource. Conversely, the long term detrimental effects of leaving the resource "as is" must be considered.

2.3.1. Widewater

Site with Beneficial and Threatening Vegetation

1 View looking northwest
The sycamore tree growing on top of the stone retaining wall interrupts the continuity of the towpath

2 View looking southeast
Trees are growing on top of the stone retaining walls and on the earthen embankments

3 Overall view of Widewater

2.3.1 Widewater

Widewater refers to a section of the C & O Canal which widens into a natural body of water. It is located a few miles northwest of the District of Columbia in Montgomery County, Maryland. At Widewater, two sections of the canal bank, one earthen and one stone, are suffering from the encroachment of historically inappropriate vegetation. At the time of the canal's operation, the area between the towpath and the canal was kept clear of vegetation so as not to interfere with barge activities.

Today, several trees and entangling vines are growing at the tops of these embankments. The trees are black locust (*Robinia pseudoacacia*), sycamore (*Plantanus occidentalis*), red maple (*Acer rubrum*), basswood (*Tilia americana*), pumpkin ash (*Fraxinus tomentosa*), and Virginia cedar (*Juniperus viginiana*). They range in size from seedlings to eight- to ten inch caliper trees. One large sycamore is approximately two feet in diameter. Staghorn sumac (*Rhus typhina*) also grows atop the bank. A dense mat of honeysuckle (*Lonicera japonica*) fox grape (*Vitis labrusea*), and trumpet creeper (*Campsis radicans*) covers the ground and grows entangled in certain trees; honeysuckle also grows between the stones of the wall. The trees are potentially damaging to the wall in that the pressure of the roots may be pushing the stones outward toward the canal, disrupting the masonry. At the same time, they are of some benefit to the canal banks in that they help retain them against the seasonal floods.

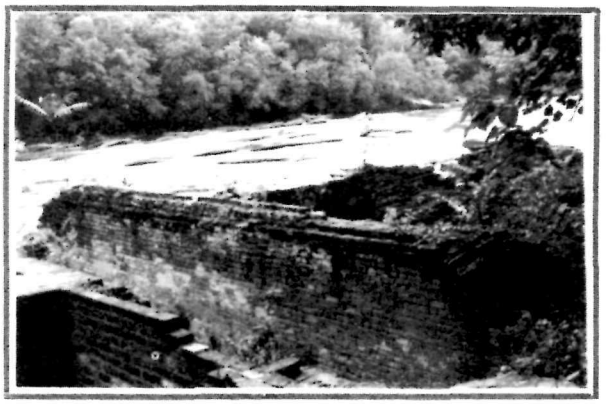
The trees are not only physically damaging to the canal banks, but they obstruct the visual continuity of the towpath and its vistas of the canal. Their removal is in order, however their beneficial qualities of retention should be considered before such action is taken. As with Fort DeRussy, the question as to which trees should be removed is a delicate one. The best solution would be to remove all saplings and trees of less than twelve inches in trunk diameter as soon as possible, leaving the larger trees in place. The larger trees are also the larger threat and should ultimately be removed in conjunction with repairs to the canal walls. Vegetation of a smaller character such as shrubs and vines should be kept in place on the earthen walls and may require pruning at one or two year intervals. The vegetation should reflect the use of the towpath, and should not reach more than two to three feet in height. Where vines and shrubs appear on masonry walls of the canal, they should be cut off at the base once a year.

2.3.2. Virginius Island

Site with Beneficial and Threatening Vegetation

1 View within ruin foundations
The ruins are extensively overgrown due to successive reforestation

2 View of arched wall
Major trees are growing adjacent to and on ruin walls



3 View within ruin walls
Plant overgrowth is apparent on top of ruin walls

2.3.2. Virginius Island

Site with Beneficial and Threatening Vegetation

4 View of islet
Ruins of stone walls are being retained by vegetative growth

5 View of mill structure
The walls are deteriorating and are becoming overgrown with small plant material

2.3.2 Virginius Island

Virginius Island, part of the Harper's Ferry National Historical Park, is located in the Shenandoah River near its junction with the Potomac River. The island, in a flood plain valley surrounded on both sides by dramatic mountains, is at the foot of historic Harper's Ferry, West Virginia. The industrial archaeological remains of nineteenth century canals, railroads, a cotton goods mill, and a pulp mill are visible today along the Virginius Island Trail.

It was flooding that destroyed the industrial buildings and structures on the island. Flooding in 1889, 1924, 1936, and 1942 was of disastrous proportion; in 1936 the water rose 36½ feet destroying most of the lower town of Harper's Ferry and Virginius Island. With six major floods occuring in the nineteenth century alone, the builders of the water-powered industries were apparently willing to assume the risk of flood damage in hopes of high profits in drier times. The ruins of these industrial structures are a memorial to the effects of natural disaster, suggesting nature's ability to reclaim the works of man, quickly and without notice.

The ruins of the cotton goods mill and its associated structures, the pulp mill, and the transportation routes is of interest to industrial archaeologists; but for many visitors, their associative value is of primary interest. Kevin Lynch discusses the fascination for ruins in his book, What Time Is This Place?:

> There is a poignancy in evanescance, in something old about to disappear. Old toys, made for brief use, seemingly so fragile, associated with a passing and vulnerable phase of life, are much more emotive than permanent, serious memorials.
>
> Ruined structures, in the process of going back to the earth, are enjoyed everywhere for the emotional sensations they convey. This pleasurable melancholy may be coupled with the observer's satisfaction at having survived or be tinged with righteous triumph, esthetic delight, or intellectual enjoyment. But at base the emotional pleasure is heightened by a sense of the flow of time.[1]

[1]Kevin Lynch, What Time Is This Place?, Cambridge, Mass.: MIT Press, 1976, p. 44.

It is this sense of a flow of time that is so immediate and perceptible at Virginius Island. It is a fascinating contrast with the restored and maintained buildings in Harper's Ferry which present a slice of time rather than a continuum of time. Despite the many appealing qualities of ruins, their transitory nature is on occasion best prolonged. At Virginius Island, vegetation poses a threat to the continued enjoyment of the ruins. While the constant threat of flooding and erosion are somewhat independent of the threats posed by vegetation, it is the vegetative threat that is most easily managed and associated with visitors' appreciation of the site.

At Virginius Island, site management requires sensitivity and imagination and must consider a discussion of the complex issues involved in preservation and maintenance of the site. Should a plant that is encroaching upon an historic structure but has an erosion preventive value be removed? Should structures that are so seriously damaged, physically threatened by vegetation, and susceptable to repeated storm damage be the subjects of extensive restoration efforts?

The ruins are difficult to see in many places as a result of the extensive vegetative growth and their poor condition. Some foundation walls exist to the extent that the plan of a building may be discerned. In most cases, however, these walls are no higher than ten feet, most are three- to five feet tall. They are all of stone and brick construction. Fragments of buildings-- sections of walls, a corner here, an arch there-- are most common. Vegetative growth is in a very advanced state. Sycamores (Platanus occidentalis) with trunks over three- and four feet in diameter, are growing over walls, their roots squeezing around large stones, lifting them out of place, or growing under foundations, lifting whole sections of walls. Large silver maples (Acer saccharinum) are the predominant species along the water side of the ruins, their roots pushing against the walls but also creating an erosion preventive net along the sandy shoreline. Weeds and seedlings of many types are growing luxuriantly on top of walls, on walls, and inside enclosures. The most invasive and threatening of these are the Empress tree seedlings (Paulownia tomentosa), honeysuckle (Lonicera japonica), mulberries (Morus sp.), ash (Fraxinus sp.), basswood (Tilia americana), tree-of-heaven (Ailanthus altissima), sumacs (Rhus sp.). Grasses and non-woody growth include asters (Chrypsopsis sp.) (Graminaceae family), plantains (Plantago major), white snakeroot (Eupatorium rugosum), Joe-Pye-weed (Eupatorium maculatum), clearweed (Pilea pumila), false nettle bag hemp (Boehermia cylindrica). Woody plants common to the area include box elder (Acer negundo), River birch (Betula nigra), Spicebush (Lindera benzoin).

At Virginius Island, recommendations for vegetative management are closely associated with the goal of improving the site's interpretive value. While preservation at other areas of Harper's Ferry is of a very high quality, Virginius Island is severely neglected. In addition, Virginius Island seems physically and philosophically isolated. A large parking lot separates the restored areas from the industrial ruins with signage and trails inadequate to draw visitors toward the Virginius Island Trail. The dense growth of forest at the end of an indistinct path, coupled with sparse signs that are confusing in their direction of visitors to the site, leave Virginius Island for only the most dedicated or informed visitor. Even the official trail guide, which must be purchased from the bookstore, suggests that there are cutoffs for those who may tire from the trail or must hurry.[2]

In short, it appears that there is no concerned effort to take advantage of the interpretive possibilities of the site. This may in part be due to the difficulty in interpreting ruinous structures which are so densely overgrown. Recommendation for total clearing and repair of the ruined structures is neither feasible nor desirable. Instead, what is needed is a phased program of selective clearing and maintenance which would allow for greater interpretation and preservation of the ruins. Trees which appear to be holding together walls and other structural features as well as the larger trees located between the river and the ruins should be retained. Trees, shrubs, and vines growing within or on the walls of ruinous structures should be removed in all cases except where they may serve to support walls. This treatment should be applied to all of the ruins on the island and will result in greater visibility and improved preservation. It is recommended that this treatment be phased and begin with the extensive cotton goods mill ruins near the start of the trail. The area between the trail and the ruins should also be subject to extensive clean-up efforts. Ideally, all trees, shrubs, vines, and other obstructive vegetation should be removed from this area. This would in effect confine the forest's edge to the land side of the trail with a largely cleared area towards the river which would encompass all of the ruins except those of the paper mill (currently these are very well maintained and have effective interpretive signs and trails). Moving away from the parking lot entrance to the trail, the ruins decline in visual interest, so this phased approach would not only enhance the entrance but would afford immediate treatment to the most interesting and intact ruins. Depending on the availability of maintenance staff for the major clean-up, this task would best be accomplished over a period of several years with routine scheduled maintenance needed two to three times from spring to fall. The routine maintenance would consist of checking the cleared areas for vegetative growth atop walls and within the "rooms" of the structures. All obstructive and destructive vegetation could be removed (by hand on top of walls, and by machinery at ground level).

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[2]Eastern National Park and Monument Association, Virginius Island Trail. E.N.P.M.A. and National Park Service, 1962, p.1.

As advocated at all related sites, trees should be cut at ground level with special care taken to grub out suckering plants. Should clearing the area between the path and the ruins not be possible, an area of thirty feet around each structure or feature should be kept cleared to prevent the encroachment of damaging vegetation. Improvement of signs along the trail could enhance visitors' appreciation of the ruins, as better signs at the parking area could direct more visitors to the island. Signs such as those at Potomac Canal might be considered.

2.3.3. Fort DeRussy

Site with Beneficial and Threatening Vegetation

1 Top of embankment
Overgrowth has obscured the form of the earthen embankments

2 Top of embankment

3 View of fortification walls
Indistinct edges between the fortifications and surrounding area are caused by uninterrupted successive reforestation

2.3.3 Fort DeRussy

Fort DeRussy is one of the Circle Forts of Washington, D.C., a group of fortifications that encircled the Federal City during the Civil War. Located within Rock Creek Park in Northwest Washington, D.C., it is situated near Oregon Avenue and Military Road. The fort is comprised of earthworks that are among the best preserved in the area. While posing a threat to their survival, vegetation also serves in some measure to protect the delicate resource.

The earthworks are densely overgrown with trees and saplings. These include black cherry (*Prunus serotina*), flowering dogwood (*Cornus florida*), sasafras (*Sassafras albidum*), oaks (*Quercus* sp.), tulip poplars (*Lirodendron tulipifera*), American holly (*Ilex opaca*), maples (*Acer* sp.), and sorrel tree (*Oxydendrum arbreum*). In addition, raspberries (*Rubus* sp.), and devil's walking stick (*Aralia spinosa*) are developing a low shrubby growth with greenbriar (*Smilax rotundiflora*), poison ivy (*Rhus radicans*), and honeysuckle (*Lonicera japonica*) beginning to carpet some slopes and climb trees.

It is difficult to gain an impression of the configuration of the fortification with the extensive vegetation. Examining Civil War period photographs reveals that the entire area was cleared land and that the forested character is historically inappropriate to its function. Seeing more than a small section of the earthen embankments at one time is difficult and frustrating in attempting to imagine the configuration.

The earthworks have suffered from weathering, visitor traffic (a trail runs the entire circumferenec of the fort on top of the embankment), and from the effects of trees. Trees, while serving to prevent erosion, are primarily threatening. All trees of less than twelve inch calliper should be felled and the larger trees retained In the center of the earthworks, all trees should be felled as they should for thirty feet beyond the earthen banks. The large trees growing on the embankments should not be felled as their large root systems could be damaging to the delicate ramparts if invaded by moisture and decay. A native ground cover or sod is recommended for the cleared area. Once cleared, a program of regularly scheduled maintenance is necessary; this would depend on the nature of the ground cover.

Sites with Interpretive Opportunities

In the course of the fieldwork investigations, two sites stood out as having needs that were primarily interpretive. Marshall Hall and Manassas Battlefield do not exhibit the immediate sorts of vegetative threats as seen at Virginius Island or the Worthington House, their vegetation is not a physical threat, nor is regularly scheduled maintenance the answer in itself.

This "miscellaneous" category contains two of the most interesting problems examined in the course of the study. While both have clear needs, they are in the form of long term goals for vegetative management rather than immediate solutions to threatening vegetation. Marshall Hall requires extensive structural attention to stabilize the ruins of a recent fire. Its threatening vegetation, at this point, is not of a serious extent, rather it is symptomatic of conditions that will develop if the house remains in its present state. At Manassas Battlefield, a similar condition exists. Here, the threat is to an historic landscape rather than to a building. The problem is that the historic vegetative patterns of the Civil War period of significance have changed in some places. While this is a threat to a visitor's ability to visualize the scenes of battle, it is not a physical threat. The need is for an imaginative solution to long term management and maintenance needs at both sites.

2.4.1. Manassas Battlefield

Site with Interpretive Opportunities

1 View from Henry Hill
Historically inappropriate revegetaion has occurred to the left

2 View of Henry Hill
Largely accurate vegetative patterns are visible here

3 View of Stonewall Jackson statue

2.4.1 Manassas Battlefield

The Manassas (Bull Run) National Battlefield Park is located in Prince William County, Virginia, 26 miles southwest of Washington, D.C. Comprising approximately 3000 acres, the park is a memorial to two Civil War battles of major consequence. Acquisition of park land began in 1938 with the conveyance of the Henry Farm to the United States Government, although 128 acres had been purchased in 1922 by the Manassas Battlefield Confederate Park, Inc. and the Sons of the Confederate Veterans.

The Battle of First Manassas (July 21, 1861) was the opening engagement of the Civil War while the Battle of Second Mansassas (August 29-30, 1862) paved the way for Lee's first invasion of the North. In each case, the Confederate Army won over the Federal forces and seriously threatened the City of Washington. In total, 28,814 soldiers died on the site in the three days of conflict.[1] These three days in 1861 and 1862 provide the basis for the area's historical significance and preservation mandate. The goal of the National Park Service is to re-establish the field and forest pattern of portions of the park as they existed 120 years ago.

A draft General Management Plan for the park is now in print. Among the objectives contained in the plan is the reforestation of about 200 acres and the deforestation of 350-450 acres. The goal is to recreate the historical vistas as they can be seen from the present visitor trails. The park contains approximately fifteen buildings and structures, the majority of which are of an historic character. In some cases, the plan calls for the removal of buildings inappropriate to the historical landscape. Over the past forty to eighty years, areas within the 3000 acre park have been subject to ecological succession. The result is that some areas which were forested at the time of the war are now cleared, and other areas which were cultivated land are now forested. In some cases, cannon point toward these recently forested lands which were the sites of battles. The resultant visual dilemma is the focus for vegetation management priorities: the plan attempts to select that portion of the park which is most historically significant and accessible to visitors and to recreate within that area a sense of place particular to the time of the two battles.

[1]Francis F. Wilshin, Manassas (Bull Run) National Battlefield Park, Virginia, Washington, D.C.: National Park Service, 1953, reprinted 1961, pp. 17, 38.

Most of the cleared land is planted in grass and hay, with about 250 acres in crop production. Because of the expense inherent in maintaining the cleared land, 900 acres are leased to private individuals. This is thought to be the most efficient way in which to prevent ecological succession from occuring. There is no attempt to recreate the agricultural practices of the 1860's as those processes are too destructive to the land. Inasmuch as it is feasible, however, fields which were planted in a particular crop at the time of the battles are today planted in that same crop. The problem here is how to allow for crop rotation so as not to deplete the soils. To date, a relatively insignificant amount of landscape restoration has been accomplished with the primary area of interest around Henry Hill. The staff is about two years away from beginning work on the restoration as outlined in the forthcoming General Management Plan.[2]

The park is traversed by two major roads, Interstate Highway 29/211 and State Highway 234. Bull Run, which extends into the Potomac River, begins at the northern boundary of the Park. Two major buildings remain which stood at the time of the battles, the Stone House and the Dogan House. The Robinson and Henry houses, destroyed in the war, were rebuilt shortly thereafter. These replacement structures remain today as major interpretive features within the central portion of the park. The Stone Bridge at Bull Run has been reconstructed several times, but incorporates the Civil War period abutments. Other buildings and structures relating to the battles include the Sudley Church, a section of unfinished railroad, the Chinn House (ruins) and the 1865 Union Monument. A modern Visitor Center is centrally located on a rise of Henry Hill. Nearby is an equestrian statue of "Stonewall" Jackson (1940). The park contains a succession of historical markers dating from several periods within this century. The most recent of these are presently in poor condition so as to have lost much of their interpretive value. In addition, their large scale and white painted posts make them highly obstructive features within the landscape.

The specific goal of this investigation is to suggest a means by which the areas may be revegetated as appropriate to the landscape and can be used as a deterent to human wear on monuments without sacrificing visual integrity.

The central portion of the park, which encompasses the concentrated areas of battle, is largely cleared land as it was at the time of the war. Historical photographs establish precedent for the hedge rows and clusters of shade trees and evergreens.

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[2]Rolland Swain (NPS): personal communication, 1982.

In this case, the species is appropriate, but it is the location of the vegetation that is sometimes inaccurate. This vegetation, then, is obstructive rather than destructive in nature. Obstructive vegetation consists of mature woodland plant types; chief among them are oaks (Quereus sp.), pines (Pinus sp.), Virginia Cedar (Juniperus virginiana), and maples (Acer sp.). These plants are of a regenerative woodland character with a continuing potential for growth and obstruction.

A unique problem exists with the equestrian statue of Thomas J. "Stonewall" Jackson: because of its prominent location near the Visitors' Center, it is attractive to young visitors who enjoy climbing the base of polished black granite to the bronze figure, an activity potentially detrimental to its preservation. The statue is situated on a rise of Henry Hill, about 125 yards from the Visitors' Center and parking lot, with mowed grass extending out from the base in all directions. At this base, a paving of flagstones facilitates lawn maintenance and protects the statue from damage caused by mowers. The statue is the only one within the park and as such is a very prominent feature.

In considering recommendations for the park, the possibility of using plantings selected and placed so as to discourage access to the statue was examined. The dense thorny shrubs suggested for the fort at Fort Washington Park were considered but are not recommended as they are inconsistent with the goal of recreating the landscape to the period of the Civil War. In addition, the black granite base of the statue is an important element in its design and should not be obstructed. A low iron fence as seen at the Henry family burial plot is perhaps more in keeping with the design tradition and goals of the park. Of light design and painted black, the fence would be less obstructive and would pose a visual rather than a physical barrier. Should the problem of visitor access persist, the fence might be utilized in the peak visitation months and removed in the off-season.[3]

[3]See Rudy J. and Joy Putman Favretti, Landscapes and Gardens for Historic Buildings, Nashville: American Association for State and Local History, 1978, pp. 185-187, 189 for a related discussion on Visitor Circulation and Wear.

2.4.2. Marshall Hall

Site with Interpretive Opportunities

1 View of house
The house shows extensive damage from a recent fire

2 View of rafters
A first years growth of pokeweed is growing on the rafters

2.4.2 Marshall Hall

Marshall Hall is located in Prince George's County, Maryland on the Potomac River opposite Mount Vernon. Part of the National Capital Parks- East system, the early eighteenth century house was largely destroyed by fire in 1981. What remains are the exterior brick walls and some of the interior bearing walls. The charred remains of an evolution of decorative brickwork are at places visible within the house. The roof was completely destroyed, leaving the interior of the house exposed to the elements. A high chain-link fence surrounds the house as a precaution against further vandalism. Associated with the house is the Marshall family cemetery and a small brick outbuilding of early construction. As the property served until recently as an amusement park, much of the area is, or was until recently, paved with asphalt. Since the fire, no work has been done to the house and the debris from the fire remains in situ. The objective at this site is to recommend a means by which the house might be stabilized for maintenance and eventual interpretation as a ruin, and to consider ways in which vegetation might be included in these plans.

At Marshall Hall, a preliminary colonization of pokeweed (*Phytolacca americana*) has begun. This is the first year's growth since the fire. One to two feet high specimens are growing above the rafters of the first floor, and slightly smaller plants are growing on the ash heap near the fireplace in the southernmost room. These non-woody plants are not particularly threatening and could easily be removed. However, their presence suggests that other plant species could well follow, finding the ash pile a fertile spot in which to grow; woody vines, shrubs, or saplings taking root above the rafters could be more damaging as their roots invade an already weakened beam.

Indeed, the comparative lack of vegetative problems at Marshall Hall suggests it requires a different treatment than the other sites examined. The conditions at Marshall Hall are unique within this study in that vegetation is only now becoming established for the first time. This vegetation is symptomatic of a graver situation, that of the structural integrity of the house ruins. The problem of correcting the invasive vegetation is easily accomplished and pales in comparison with the urgency of stabilizing the ruin against further deterioration. For several reasons, ruins stabilization rather than restoration is planned by the National Park Service. The isolated location of the house, the proliferation of other historical sites in closer proximity to more populated areas, the extensive loss of original building fabric, and the costs of maintaining a restored property are factors which suggest an alternative means of site interpretation.

While the preservation of stabilized ruins is not uncommon in other countries, such efforts have experienced little popularity in the United States. Archaeological excavations and prehistoric

resources have occasionally been treated in this manner, but this sort of attention has seldom been afforded above-ground resources. There is now, more than ever in this country's preservation movement, a reluctance to reconstruct. Many preservationists are of a philosophy that there is little need for reconstructing lost or severely deteriorated buildings and, in cases where reconstructions must be based in part on conjecture due to the loss of original fabric, the idea is even less popular.

One project remarkable for its innovative approach to a similar situation as seen at Marshall Hall is that of Franklin Court, Philadelphia. The architectural firm of Venturi, Rauch and Scott Brown considered archaeological and historical evidence in their skeletal recreation of Benjamin Franklin's house for the National Park Service. To interpret this historically significant site, the firm avoided a traditional reconstruction which would, of necessity, have been based on scant evidence. Lacking historical views, the exterior appearance of the house was not known. Further, the archaeological investigations at the site, while producing a wealth of information, were inconclusive in establishing the physical appearance of the house much beyond its basic floor plan. A steel frame was constructed on the foundations of the original house to suggest merely the outline of the building that Franklin inhabited. Stone slabs inscribed with quotations from Franklin and his wife concerning the furnishing and decorating plans are laid around the base of the "building". Archaeological features are visible through hooded covers and a formal garden is suggested by the raised beds of granite filled with earth and planted with low maintenance trees and annual flowering plants. A related row of eighteenth century commercial/residential buildings was reconstructed based on extensive physical and documentary evidence. The interiors of these buildings were treated as vertical arcaheological features, in direct contrast to the meticulously restored exteriors. Interior walls were stripped of later coverings and left exposed with scars suggesting the original placement of cornices, partition walls, chair rail, stairs, etc. In addition to offering an imaginative approach to interpretation, the site requires a much lower level of maintenance than would a reconstruction.[1]

Marshall Hall, in its ruined state, shares a number of qualities with Franklin Court. In this case, portions of the original building remain-- the major exterior features. The in situ remains of the burned elements offer an opportunity for architectural historical inquiry. Rather than attempt a traditional reconstruction, the opportunities for a unique interpretation should be considered. James Marston Fitch illustrates two related examples of ruins preservation in England: the Cathedral of Coventry and Fountains Abbey. He points to the enormous success of both efforts, but cautions that, "despite Ruskin's demands that they not be tampered

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[1]Steven Izenour; Venturi, Rauch and Scott Brown: personel communication, 9 October, 1982.

with, ruins require continuing maintenance if they are not to disappear altogether." At Coventry, the floor of the nave was originally planted with an English lawn, but visitor traffic was so high as to necessitate its replacement with paving stones.[2]

Marshall Hall, significant for its early date of construction and for unusual formal and stylistic features, should clearly be afforded protection against further deterioration. Maintenance and interpretation of the house ruins offer unique opportunites for utilizing vegetative management techniques. Laying sod around the house and within its walls would tie the building to its surroundings and serve to protect any buried archaeological resources. The use of sod would create less disturbance than would paving materials and could be more easily maintained against settling and deterioration. The use of sheep as grazing stock could reduce further the maintenance needs of the site and might serve then as a link with the neighboring National Colonial Farm. The recommendations of Mr. Ray Coppinger of the New England Farm Center for grazing sheep might be applied to this site once sod has been planted.[3] Sheep, if tended and properly fenced, would maintain the appearance of a meadow and add another element of interest to the site.

[2]James Marston Fitch, Historic Preservation: Curatorial Management of the Built World. New York: McGraw-Hill, 1982, pp. 294-295.

[3]See note 1, page 4.

2.5 Comparison Studies

The problem of vegetative threats has been the subject of recent attention at Harvard University and the Smithsonian Institution. The problem, in each case, is with Boston ivy causing extensive damage to the walls of historic buildings. The two sites are also similar in that strong cases may be made on aesthetic and historical grounds for the retention of the damaging plant.

The problems caused by ornamental ivy were evident only in small measure at one of the National Park Service sites examined (Clara Barton House), yet the issue is an important one to a study of vegetative threats. Where an invasive, and poisonous, ivy has severely damaged a building such as the Worthington House, an indisputable argu ment may be made for its removal; but, where the ivy has attained a strong associational value to a particular building, argu ments for its removal may not meet with unanimous approval.

The use of vines on buildings gained popularity in the early and mid-nineteenth century, peaking in the last quarter century. In 1893, Mrs. Schuyler Van Rensselaer proposed the following plan for a typical country house:

> ...plant Japanese ivy against the long recessed wall; let Virginia-creepers drape, more loosely and boldly, the projecting turret; in the angle between the turret and the long wall set a trumpet-creeper whose dark glossy foliage will contrast with the lighter tone of the Japanese Ivy and the medium tone of the turret-vines, let honeysuckles and clematis twine around your piazza-posts, and then you will have draperies which will be beautifully varied in themselves and will accent, not canceal, the architect's intentions, while bringing his features into closer harmony with one another and the ground which bears them.[1]

Mrs. Van Rensselaer, however, did not intend for her dramatic scheme to be lost to negligent maintenance. She decried plantings of a single type of vine which were allowed to grow out of hand citing "the beauty of the architectural work is lost, and, besides, the effect of upper stories apparently based on a superstructure of fluttering leaves is most unfortunate."[2]

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[1] Van Rensselaer, pp. 72-73.

[2] Ibid:, p.77.

2.5.1 The Smithsonian Institution Building (A Comparative Study)

The Smithsonian Institution Building with its massive dimensions (447' x 160'), central location on the Mall, and Norman-turreted silhouette is a prime element of the human landscape of Washington, D.C. Its picturesque form and ivy-covered red sandstone walls set it apart from the surrounding Federal buildings of simpler form and lighter color. The growth of ivy on the walls of "The Castle" has historical precedent, appearing in photographs of the Civil War years. The current growth of Boston Ivy (*Parthenocissus tricuspidata*) and English Ivy (*Hedera helix*) has reached its present extent within the last two decades. The vines climb over vast portions of the exterior walls obscuring much of the richly ornamented masonry, but also establishing a strong presence of their own. The pendent greenery seems to envelop whole sections of the building as if in smoke and selectively reveals a battlement or a round arched window. In places, formal and stylistic elements are entirely concealed; elsewhere, the stylized foliate carvings contrast with natural foliage. The whole is a Romantic scene with the stark and unusual qualities of the building broken by the seemingly random trailings of ivy.

While the ivy contributes to this Romantic imagery, it also contributes to the material damage and decomposition of the building. The damaging effects of *Hedera helix* have long been known, but *Parthenocissus tricuspidata* has not traditionally been considered a threat to masonry structures. In October 1982, water damage in a second floor passage was traced to a large window on the western exterior wall. A dense growth of *Parthenocissus* was removed and it was discovered that a label terminal had deteriorated creating the internal moisture problem. A reproduction label terminal was fashioned and put in the place of the original. In this process, the old stone was removed and 1/8" - 1/4" thick roots of the ivy were found growing at a depth of 7" behind the first layer of stone. The thick, healthy roots extended out of sight, presumably continuing along the weakest point between the two layers of stone.

Whether the ivy caused or merely obscured the damage to the label terminal is not certain. At other locations on the first floor level, ivy has hidden problems as severe as rotted window frames that would otherwise have been immediately apparent. More serious than the disguising nature of the plant is the invasive nature of its roots. The roots have apparently entered the walls through the thin mortar joints, flourishing in the damp interior. This damage is particularly interesting in light of the nature of the material: the red sandstone quarried at Seneca, Maryland has been shown by compression tests to be the most durable locally available variety, far superior to other sandstones in its potential for longevity.[1] The strength of this material is borne out by comparison of The Castle with other local buildings. Houses

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[1]James Goode, personal communication, 22 November, 1982.

constructed of other varieties of sandstone forty or more years after The Castle show advanced signs of material decomposition and evidence of considerable repair. Vegetation, then, should be considered a serious threat to the otherwise remarkably well preserved carved ornament and hand-finished rusticated surfaces. In disturbing the mortar joints and establishing root systems within the walls, the ivy makes room for rapid deterioration of the stone itself (as may have occurred with the label terminal).

The English Ivy (Hedera helix) appears in small and isolated portions of the building. On the north elevation, a well established growth was examined. Here the ivy has attached itself to the wall by means of "stubby root-like anchors." Detaching the live ivy by even the most careful means results in the removal of thin coin-sized flakes of the sandstone surface that adhere to the root-anchors. As Feilden notes, extreme care should be taken in the removal of such a growth so as to minimize masonary disturbance.[2] Both varieties of ivy pose more general threats to the building. Insects and birds are attracted to vines and cause damage of their own. Further, the vines allow for a moisture accumulation which could ultimately damage the masonry.

The extent of known damage to the building is in direct opposition to some popular notions as to the effects of Boston Ivy and the potential for vegetative damage to a masonry building:

> Stone masonry walls consisting of large stone blocks and relatively few mortar joints may endure forever, as long as their foundations are not undermined. Vines have little impact on such walls.[3]

Dan Maciejak further recommends the use of Boston Ivy "for quick cover of masonry, buildings and walls; brilliant fall color, black berries."[4]

Because of the damage discovered on the west wall, plans were made for the removal of all ivy from the building within the next year. Following removal, the extent of damage may be determined and an assessment made as to the conditions under which the ivy might again be used on the walls.

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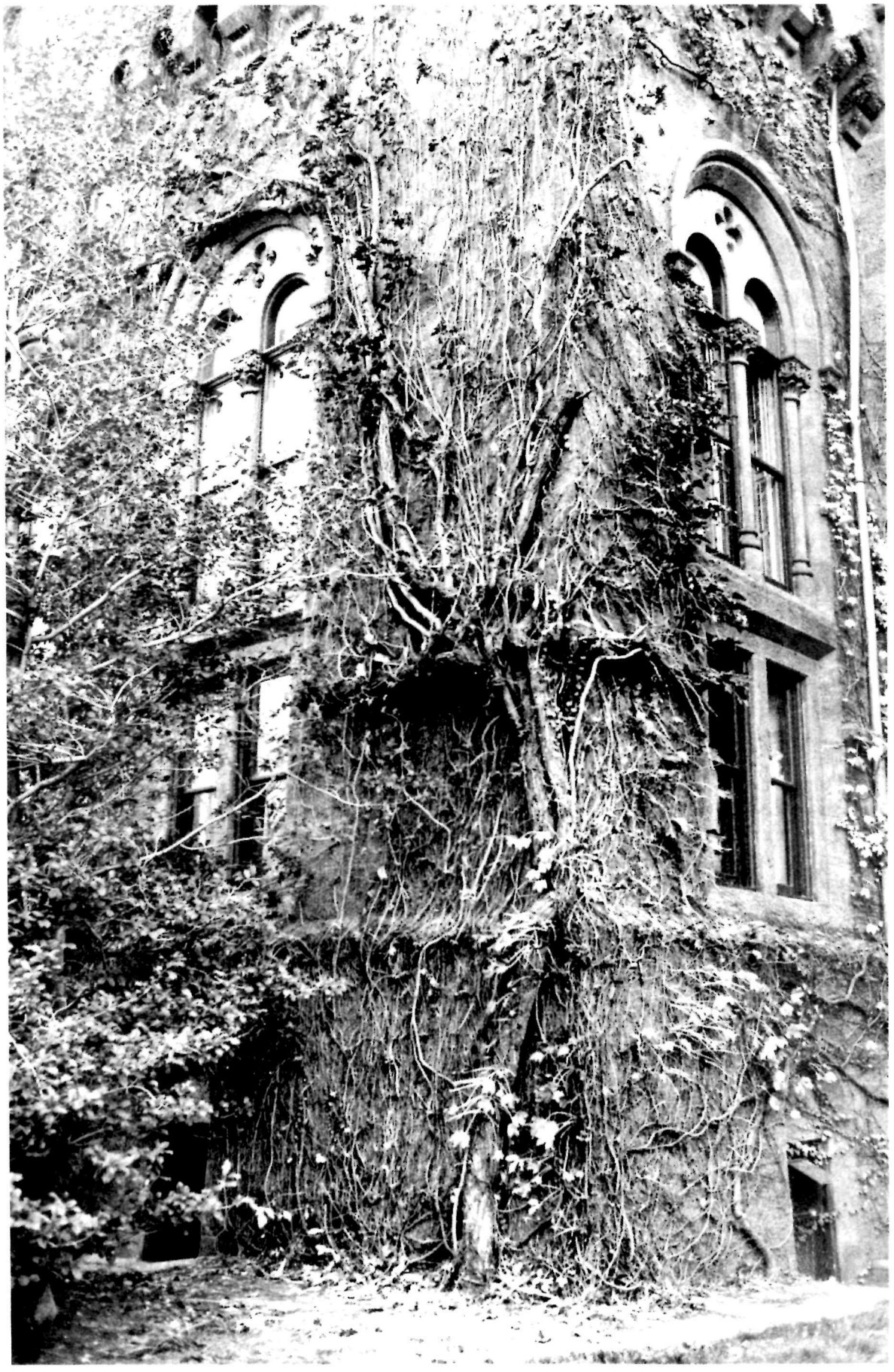
[2] Feilden, Chapter 9.

[3] Dan Maciejak, "Twining Vines" in The Old House Journal, Vol.X, No. 10, p.227.

[4] Ibid., p.228.



The Smithsonian Institution Building showing Boston ivy

2.5.2 Harvard University (A Comparitive Study)

Harvard University has undertaken a program to alleviate the problem of Boston ivy growing on the walls of its historic buildings. The program has gained publicity and some criticism for its plans to remove or reduce the amount of ivy on the campus. The associational value of ivy-covered walls is particularly strong at Harvard and has assumed a place in the history of the university. Despite the fact that the campus was without ivy-covered buildings for many decades after its inception, the vine growth has become a symbol of the school's Ivy League association.

The University's Construction Management Department, under Project Manager Roger J. Cayer, Jr., has initiated a plan for problem and the plan is abstracted below:

> Harvard University spends more than $50,000 on an annual basis in a valiant, though futile, effort at keeping Boston ivy (Parthenocissus tricuspidata) from window and door openings. Frankly, it has been a losing battle and the vine is now held largely responsible for the need of a multimillion dollar program to prevent the buildings from further damage.
>
> Boston ivy (though not a true ivy) is a hardy plant capable of surviving temperatures to negative 20 degrees fahrenheit; thus, the reason for its presence in much of the United States. The plant is also tolerant of urban pollution and, if allowed to grow unchecked, will grow at an alarming rate of six to ten feet in a single year. It can grow to a full height of some sixty to seventy feet and will scale even the smoothest of surfaces. The ivy's tendril tips are cemented to the surfaces, over which it crawls, by a secreted solution, rich in dextrin which hardens within two to three days. Years after the ivy has been removed from a building's surface, its signature is evident by the presence of the tendrils' tips which will remain unless removed after a thorough soaking with ether.
>
> As its vines cover the walls, the vegetation becomes a source for moisture for a building's exterior envelope. The vine also retains this moisture against the building and, once tendrils have found their way into a cracked surface will become the source of moisture within the building, causing serious damage to walls, floors and ceilings. The situation becomes aggrevated when one considers the late revelations concerning the acidity of rain water here in the northeast.

Additionally, tremendous amounts of physical damage are incurred by: windowsand window frames; doors and door jambs; to gutters and downspouts which are pulled away from a building's surfaces by the heavy weight of the ivy; and, by the foundation walls whose settling cracks are penetrated, and thus aggravated, by the thick ivy roots. On the somewhat lighter side, the ivy's vines become the home of the birds, rodents and squirrels.

The argument is also made that the ivy is an insulator and therefore, the buildings, will remain cool on hot summer days. This is a true statement; the interiors will remain cool, and damp, throughout much of the year in climates such as ours.

In closing, I would like to mention that though a strong case for physical damage can be made against Boston ivy, it must be recognized that, at least here at Harvard, a strong political case can be made for its retention. Therefore, where there is latitude for negotiation, a mutual agreement should be possible. For example, such an agreement might stipulate that a thin layer of ivy be allowed to grow, away from building openings, roofs, and protrusions. A maintenance plan, which would include the systematic removal of certain growth sections for building repairs, could then be prepared to keep the ivy's growth in close check. Allowing the ivy's re-growth is expensive but, as you have indicated yourself there is a problem of "conflicting views" and, it is not restricted to the Park Service and the Smithsonian Institute.[1]

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[1]We are indebted to Roger J. Cayer, Jr., Project Manager, Construction Management Department, Harvard University for sharing this information and permitting its inclusion in this report. Roger J. Cayer, Jr., Harvard University, Letter Re: "Building Damage Caused by Boston Ivy" (to R. Warnock, Soil Systems, Inc.), 4 January, 1983, 2pp.

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The Deterioration and Conservation of Porous Building Materials in Monuments; A Literature Review (International Centre for the Study of the Preservation and Restoration of Cultural Property)

Stewart, John J.
"A short note on foundation planting and the problem of over-growth." APT Bulletin, Vol. VIII #3, 1976, p. 74-79, letters re: foundation plantings along the facade of Frederick W. Vanderbilt Mansion, scale of plantings now make them incompatible with original design of renaissance style structure - blocking sizeable part of structure from view, reply discusses concept of foundation planting in late 19th and early 20th centuries.

U.S. Dept. of the Interior
Heritage Conservation and Recreation Service.
Lehigh Canal: An HCRS Project Report. HCRS Public #36. Proj. Supervisor: Dr. T. Allan Comp; Project Supervisors: Donna Ware, Jane Vaseff, AIA; NAER Chief: Robert Kapsch. pp. 78-79: "Vegetation can severly damage masonry structure. Weeds, grasses, and trees, once started in a stone wall, send-their roots deep into joints and disrupt and crack rocks, opening the way for water. Root spreading combined with freezing and thawing will turn the finest stone wall (or lock chamber) into a pile of rubble. Even moss crumbles stone through chemical action and provides a place for moisture to collect and plants to grow. Thus, the first and most important step in stabilization is to clear away all vegetation. "Plants should be uprooted by hand. Workers have to be careful not to pull out large chunk of masonry with particular deep-rooted specimens. Trees should be felled and their stumps trimmed close to the wall. Roots of shade trees growing near, but not in, lock masonry, can be trimmed w/a planting bar or sharpened ditching spade to prevent further damage". "Herbicides, to hinder reintroduction of plants, should not be used in canal structures because of the risk of downstream contamination. Once masonry is thoroughly grubbed out, subsequent clearing at 3 or 4 year intervals will be far less difficult".

U.S. Department of the Interior
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Management Policies. 1978

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Albright, Stanley T. NPS: "Memorandum: Call for Certain Fy 1983 Pesticide Use Proposals". 21 October 1982.

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7/14/81 #2336, replaces 6/19/81 #2331.

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Dickerson, Russell E., Director
NPS. Memorandum: "Update and clarification of NPS Policy on the Use of Chemical Pesticides on Lands Administered by NPS". Feb. 06, 1981. To Regional Directors.

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Albright, Stanley T., Associate Director
Memorandum: Draft and Interim Guidelines for Pesticide Use in NPS Areas to Regional Directors. 2 September, 1982. NPS, Wash., D.C., Attachments - USDI Pesticide Use Proposal Pesticide Use Log.

VanRensselaer, Mrs. Schuyler
Art Out of Doors. 1893. New York: Charles Scribner's Sons Chap. XIV, "A Word for the Axe". 291/292 "the popular feeling that a tree, as such, is a sacred object, and that to cut one down which might be preserved is to commit a crime. But a tree is a tree in the same sense only that a book is a book. Even a beautiful tree ought sometimes to be felled in the interests of beauty, just as an essentially moral book ought sometimes to be taken out of the hands of good children." 292 "A fine tree which does not seriously interfere with the worth of more important things ought, of course, to be preserved even at a considerable sacrifice of money or convenience." 292/293 "Our attitude toward trees today is not rationally artistic; it is purely sentimental. Not once in twenty times does an owner (of a tree) "...recognize the fact when his pleasure grounds need to be relieved of a tree; and when he does recognize it, not once in twenty times is he courageous enough to sharpen and swing his axe." Chapter IV: Close to the House - describes appropriate foundation plantings/describes vines & creepers, their use and growth habits. Chapter X: Out-Door Monuments - advocates careful use of ivy at pedestals of equestrian monuments.

Weaver, Martin E.
Course Notes - The Conservation of Word in Historic Buildings; II Preliminary Draft for Review. September 1978, includes section on fungal decay and stains with illustrations.

Weaver, Martin E.
"A Masonry Deterioration Case Study: Holy Trinity Anglican Church, Hawksburg, Ontario". APT Bulletin Vol. X #1, 1978, p. 11-19, rising damp resulting in deterioration of internal plasterwork caused partially by marked accumulation of earth and vegetation along base of wall - prevented drainage away from wall.; recommended removal of flower beds from base of wall.

White, Peter T.
"The Temples of Angkor: Ancient Glory in Stone"
National Geographic. Vol. 161, No. 5. May 1982
pp. 552-589. 9th-13th C. p. 579 - vegetation results from neglected maintenance-trees damage structures but retain stones so long as trees/roots live-fall into piles afterwards; p. 572 - 2 photos of a building at Preah, Khan, 1968, 1981; p. 572-573 - 1 showing similar building partially restored (veg. selectively removed) to show "We created a false, romantic view of nature".

Wilshin, Francis F.
Manassas (Bull Run) National Battlefield Park, Virginia
Wash., D.C. National Park Service Historical Handbook Series No. 15, 1953, Reprint ed. 1961. 48 pp.; hist. maps.

Winkler, E.M. "Decay of Stone in IIC New York Conference on Stone and Wooden Objects," 1970, Vol. 1, 1-14, p. 6. "Stone surfaces are attacked...K. and F. describe the weathering process by plant-root action...".

Worthington, George, III
Historic American Buildings Survey Inventory Form
Barboursville, (&ruins) Orange Co., VA.
June, 1957. 1 p. with 4 2" x 2" prints.

4. Appendices

4.1 Project Personnel

A project team from Soil Systems and EDAW was selected to conduct the investigation. Because of the multidisciplinary nature of the study, personnel from both firms were involved at all phases of the project.

Soil Systems was responsible for meeting the contractural obligations of scheduling and quality control. Issues of historic preservation were examined by Soil Systems personnel in the field investigations and in technical preservation research. Robert A. Warnock served as Architectural Historian and Principal Investigator for the study. Mr. Warnock visited all of the sites, designed the research phase, had, a joint role with EDAW in the development of recommendations. Barbara E. Hightower conducted much of the technical preservation research and interviewed many of the individuals cited in the report. Terry Denise Tatum served as Consulting Botanist reviewing the field notes and providing general recommendations for vegetation management. Elizabeth W. Anderson and Charles H. LeeDecker served in advisory roles reviewing the progress of the study.

EDAW's role was primarily in the indentification and analysis of vegetative problems and in the identification of plant materials. Lila Fendrick served as Project Manager for the EDAW team. Ms. Fendrick examined all of the sites, conducted technical research on vegetation control, interviewed landscape architects and other professionals, and provided recommendations in association with Soil Systems. Key plant identification was provided by Ms. Fendrick and Joseph Fisher. Robert W. Good and Elliot Rhodeside served in advisory roles.

4.2 Additional Project Materials

The following materials were transmitted to the Office of Professional Services, National Capital Region, National Park Service:

- black-and-white negatives (35mm), including but not limited to those which were printed for this report;
- additional black-and-white prints;
- color slides (35mm) of all sites, and copies of selected historical photographs for seminar presentations;
- field notes from National Park Service sites;
- copies of correspondance and notes on conversations pertinent to this study;
- additional notes.