Fort Ward Park and Museum Area Management Plan

SECTION II

9. LANDSCAPE MANAGEMENT OF EARTHWORKS AND OTHER CIVIL WAR RESOURCES

The City of Alexandria, Virginia

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Landscape Management of Earthworks and Other Civil War Resources

Introduction


Model of Fort Ward located in the museum

Fort Ward Museum & Historic Site offers visitors a unique opportunity to experience the best preserved example of the Union fort and battery system built to protect Washington, D.C., during the American Civil War (1861-1865). Fort Ward Park features **Fort Ward Museum**, a carefully assembled collection of historic maps, photographs, and artifacts that explain the military importance of the fort, and other aspects of the site's history, as well as **authentic military fortifications—**physical, tangible evidence of the Civil War that has survived for more than 150 years. A portion of the historic fortifications—the **Northwest Bastion**—has been faithfully reconstructed by the city of Alexandria to exhibit several ephemeral features—headlog revetments, artillery emplacements, powder magazines, and bombproofs—that have not survived elsewhere. The fort itself affords a unique opportunity for visitors to understand Civil War-era military engineering, particularly as part of a larger system encircling the Union capital.

While the fort is accessible to visitors whenever the park is open to engage in self-guided tours, park staff also regularly arrange for educational and interpretive programs, tours, lecture and video series, bus tours, and living history activities that include visits to the fort. Through these programs, visitors experience first-hand the everyday life of Civil War soldiers and Alexandria citizens, the city's role as a vital Union Army crossroads, life within the defenses of Washington, and the strategic importance of the fort.


View of the interior of Fort Ward and the reconstructed gate

The various features that comprise Fort Ward and are the focus of resource management and

interpretation include the original surviving elements of Fort Ward, the reconstructed Northwest Bastion, a rifle trench, covered way, and forward battery. Irreplaceable resources with a direct connection to America's Civil War, the original fort features are composed of fragile mounds of soil called parapets and excavated troughs referred to as ditches. Civil War earthen fortifications are extremely fragile due to their susceptibility to erosion. To protect against the erosion, which can be caused by a number of factors such as rain, wind, and animal burrowing, earthworks must be carefully and comprehensively protected under a land cover material, such as grass, mulch, or leaf litter. Protection against erosion is also an important consideration for archeological resources and artifacts associated with the earthworks.

Interior of Fort Ward and the bombproof

The Fort Ward Park Resource Management Plan addresses the protection of a wide range of resource types within the park, including earthworks. This appendix provides additional detailed information relating to earthworks management. This information is based on specific objectives, including 1) their preservation, and 2) protection against damage and erosion, 3) the sustainable management of the land cover designed to protect the soil from erosion, 4) interpretation that conveys the need for stewardship, and 5) the establishment of a program of regular evaluation and monitoring that can be used to make adaptive management decisions.

Ultimately, the resource management strategies implemented for the Fort Ward earthworks should address:

- aboveground and belowground evidence of Civil War activities, taking into consideration resource protection, best management and maintenance practices, control of visitor access, and interpretation;
- the relationship between the earthworks and the Fort community, and related issues of resource management and interpretation;
- the provision of an engaging and informative visitor experience that also instills a sense of stewardship for the resources;

- the relationship between the earthworks and the park's natural resources, and maintenance and management approaches that respect this relationship;
- management and maintenance within the context of overall park operations;
- current and potential future partnerships and linkages with related sites.

Earthworks management strategies should also meet the vision, goals, and objectives for earthworks and Civil War resources at Fort Ward as discussed below.

Management Vision

The vision of the Park in managing earthworks and Civil War resources is as follows:

- Fort Ward Park will continue to protect and preserve, for the edification and enjoyment of future generations, the original, authentic Civil War earthworks, as well as the reconstructed Northwest Bastion;
- Park and city personnel will strive to establish and implement maintenance and management protocols for earthworks protection and preservation that are consistent with federal historic preservation standards and an ethic of stewardship, while also taking into consideration both financial and environmental sustainability;
- Visitors will be afforded a rich and engaging interpretive program that enhances appreciation for and understanding of the earthworks and their role in the military events of the Civil War and the protection of Washington, D.C. from Confederate attack between 1861 and 1865, without contributing to resource deterioration.

Management Goals

The goals of the Park in managing earthworks and Civil War resources include:

- Appropriate maintenance and repair of the impacts of visitation and natural degradation on the historic earthworks resources;
- Enhancement of the visitor experience by increasing the interpretive opportunities associated with the earthworks;
- A clear distinction made between the original and reconstructed earthworks for visitors; and

- Establishment of management and maintenance protocols that support environmental and financial sustainability.

Two of these goals suggest an inherent conflict that requires special consideration. These include the goals of making the earthworks more understandable to the public, while protecting the resources from the visitor. At Fort Ward, the Resource Management Plan affords guidance in how to strike a balance between resource protection and enhancing the visitor experience. For the plan to succeed, it will be important for the park to restrict visitor access to the most fragile portions of the resources, while also minimizing all other access, including that related to maintenance and repair. To compensate for a lack of access, the Park should provide enhanced interpretive opportunities and address the natural inclination for visitors to climb atop the parapet to achieve the view by offering alternative view options. Specialized maintenance practices are recommended to limit Park personnel access to the earthworks.

Management Objectives

The Park has already identified several management objectives for addressing protection of the Civil War earthen fortifications as outlined below. These are consistent with the approach recommended as part of this study:

- Ensuring that strategies are consistent with the guidance afforded in the Secretary of the Interior's Standards for the Treatment of Historic Properties;
- Balancing the management of natural, cultural, and recreational resources, and defining the actions required to mitigate any adverse effects;
- Identifying best management and sustainable practice strategies that will coordinate site use, site protection, and changes at the site over time;
- Providing a framework for monitoring, preserving, protecting, and maintaining resources at the Park, including earthworks, archeological resources, interments, natural features, and the landscape as a whole;
- Identifying coordinated park enhancement opportunities, including possible upgrades related to historical education and interpretation, the recognition and demarcation of graves/cemeteries, Park facilities, museum additions and improvements, recreation infrastructure, public accessibility, and plantings;
- Identifying what areas are important to preserve, maintain, and enhance;

- Establishing park management activities that avoid impacts to known and unknown resources;
- Establishing park management policies in relation to:
    - tree and shrub planting
    - construction or reconstruction of pathways and trails, and bridges
    - stormwater management
    - meadow management
    - picnic area pads or modified surfaces to accommodate group activities
    - installation of elements with posts and footings such as signs and kiosks
- Enhancing recognition of the park and its importance;
- Enhancing maintenance to improve the appearance of the park;
- Considering re-establishing an arboretum approach to vegetation management, replacing missing specimens, and taking better care of those that survive;
- Establishing Fort Ward as the primary location for telling the broader story of the Circle Fort system;
- Continuing to offer living history programs.

Management Process

Although individual approaches to earthworks management vary depending on site-specific conditions and management capabilities, there are four fundamental components of any earthworks management program:

1. Understanding historic landscape conditions through research, documentation, and archeological investigation;

2. Understanding contemporary landscape conditions through inventory, mapping, documentation, and assessment;

3. Establishing a management strategy that sets forth goals, issues, concerns, and a desired outcome, as well as a prioritized process for achieving the vision; and

4. Evaluating the success of the resource management process implemented through review, monitoring, and revision as needed based on the evaluation.[1]

Although many of these efforts have already been addressed to some degree, for example, documentation of the historic origin, location, and use of the earthworks has already been completed, park mapping and documentation will need to be updated as elements of the Resource Management Plan are implemented, such as when new trails are added or erosion is repaired, and to record monitoring information.

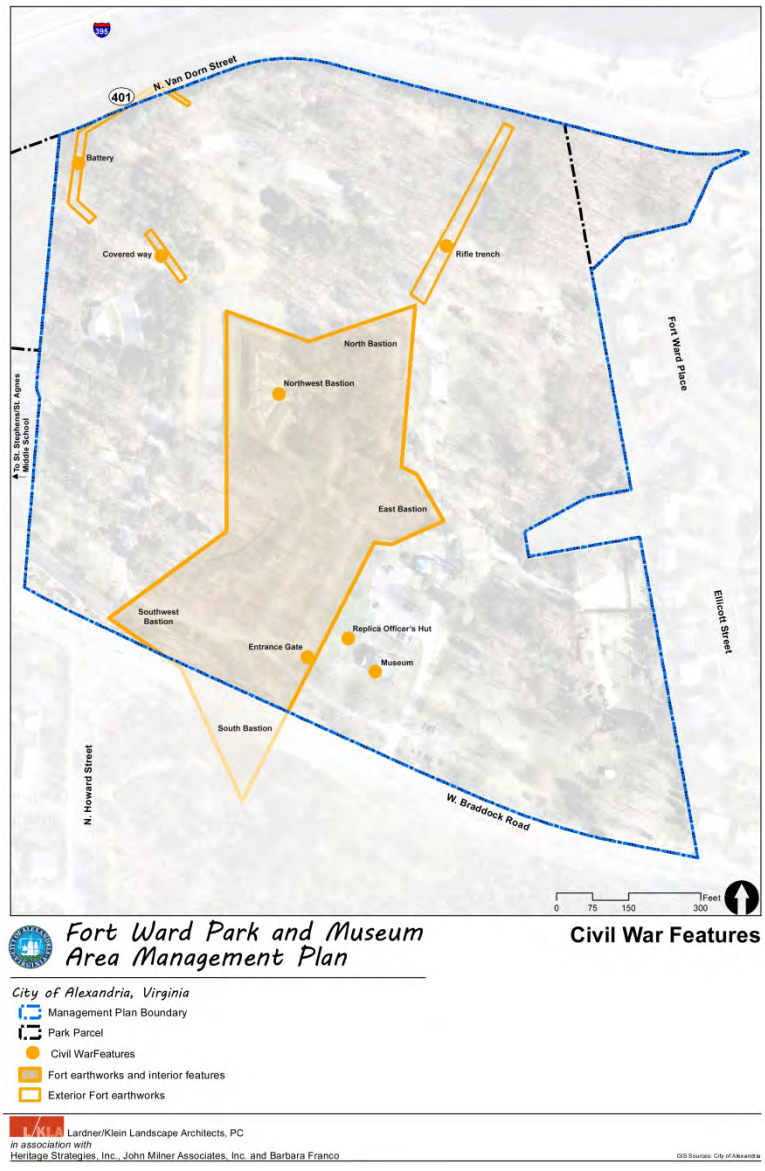


Diagram of Civil War earthworks and resources at Fort Ward Park.

[1] National Park Service, "Implementation + Management; Techniques for Sustainable Earthworks Management" in *05 Currents; Sustainable Earthworks Management,* online at http://www.nps.gov/hps/hli/currents/earthworks/imp_manage.htm (accessed February 1, 2010).

Fort Ward Resource Management Plan

The Earthworks Management Plan is comprised of four parts. The first outlines protocols for earthworks management and integrally-related issues involving visitor access and interpretation. The second discusses several considerations associated with managing earthworks: erosion control and vegetation management and maintenance. The third part is comprised of specific recommendations for action to be conducted by the park, while keeping the protocols and considerations in mind. The fourth and final part features best practices to be used when implementing the recommendations.

Earthworks Management. Protocols for earthworks management include:

- First and foremost, do no harm. Minimize any action that results in the exposure of the earthwork soil to erosion. Plan to minimize or mitigate any impacts of proposed change, and be prepared to address unintended results.
- Implement proposed changes on a trial basis, and monitor the results before undertaking a new strategy over a large area.
- Avoid making substantive changes or instituting new management programs that cannot be completed or are not sustainable in the long term.
- Ensure that a comprehensive grass, grass and forb, or leaf litter exists over the entirety of the earthworks to protect against erosion. The cover type may vary over the extent of the earthworks depending on several factors, such as existing vegetation, and maintenance capabilities.
- Identify the desirable cover type for each area of the earthworks on a map.
- Establish or maintain healthy grass stands in the environs of earthworks to be managed under herbaceous cover. Consider replacing non-native species with native species over time.
- Remove invasive plants and hazard trees, and woody growth from the earthworks within areas managed under grass cover.
- Establish or maintain healthy native woodland cover around the earthworks managed under trees, and use the allow leaf litter produced to protect the earthworks from erosion.
- Immediately repair eroded areas.

- Protect the resources from the destructive actions of animals.
- Address any drainage problems associated with the ditch system of the earthworks, such as ponding water that might result in the decline of the grass cover.
- Limit human access to the earthen parapet and ditch by park visitors as well as maintenance personnel.
- Relocate or consider carefully the design of any trail sections that cross the earthwork parapet or ditch systems to limit potential damage to the earthen resource.
- Relocate signs and structures to support visitor access and interpretation that have been set into the parapet or ditch. These structures can cause damage to the earthworks.
- Establish a monitoring program for the earthworks that will facilitate the identification of problems requiring immediate attention on the park of the park to correct, such as evidence of dead or dying vegetation, animal burrowing, visitor access, unwanted woody or invasive plant growth, and fallen trees.

Visitor Access. Protocols for visitor access associated with the earthworks trails are to:

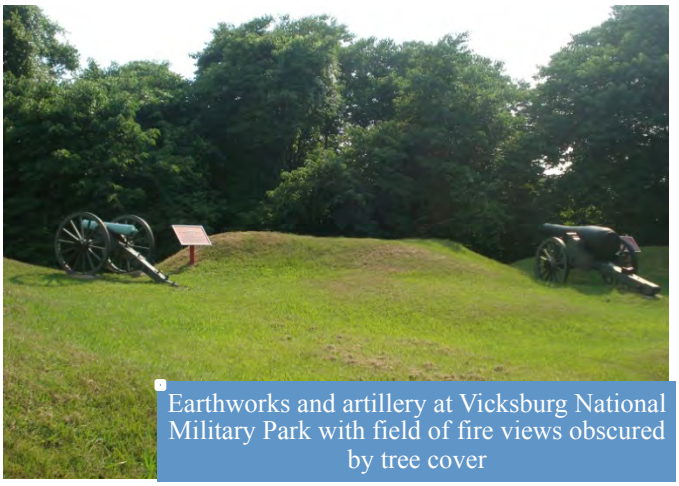
- Provide a designated pedestrian path system that allows visitors to experience and understand the earthworks without damaging the resources.
- Limit human access to the earthen parapet and ditch, including visitors as well as park maintenance personnel.
- Post signs along trails that come into close contact with the earthworks urging visitors to be good stewards of the fragile resources and refrain from climbing or walking on them.
- Establish physical barriers at the margins of parapet and ditch features where visitors are found to be walking and climbing on the earthworks.
- Remove potentially hazardous trees that could potentially injure visitors.

Interpretation. Protocols for interpretation associated with the earthworks trails are to:

- Provide a rich and engaging interpretive experience that explains the role of the earthworks in the events of the Civil War as part of the system known as the Defenses of Washington, D.C., the

military engineering and design principles associated with the earthworks, and their history as an occupied fortification, and partial reconstruction and incorporation into a park by the city of Alexandria.

- Connect visitors with the site and engage their sense of stewardship of the earthworks. Link the design of the system to the terrain and features of the landscape. Interpret the interconnectedness between the site's historical and natural resources, their geographic and historic context, the role of historic preservation in protecting the earthworks from loss, the role of archeology in understanding the site's history, including development of the Fort community.
- Apply a uniform approach to interpretation throughout the park that establishes a recognizable brand or identity for the site. Consider using a range of interpretive media, including exhibits, waysides, directed viewsheds, and technologically-creative programming.



Earthworks and artillery at Vicksburg National Military Park with field of fire views obscured by tree cover

- Remove specific stands of woody vegetation that limit viewsheds that are important to interpreting key relationships in the landscape, such as the intended field of fire for fort artillery.

Resource Management Considerations

Erosion Control

Protecting the earthworks from erosion while interpreting them for visitors requires a delicate balance between affording visual access and restricting physical access. Earthworks are highly susceptible to erosion unless carefully protected against stormwater, visitor access, the installation of signs and structures, and damage by tree fall and animal burrowing. Erosion occurs when

Visitors have damaged the fortifications at Yorktown Battlefield, as shown, by climbing and walking on the parapets

the soil that comprises the parapet structure is exposed to wind, precipitation, and the overland flow of stormwater. Any current evidence of erosion needs to be quickly corrected, and associated causes mitigated to limit future erosion using a combination of monitoring and rapid response. Visitor access to the fragile earthworks leads decline of turf grass and the potential for erosion. Evidence of visitor access must be addressed through the use of inc*r*eased signage, additional barriers, or personal advisement and policing of the earthworks by park personnel and volunteers.

Vegetation Management and Maintenance

The Fort Ward earthworks are protected by combinations of **woodland** and **grass** cover, and plantings of thorny **barberry hedges**. Each of these conditions requires its own maintenance and management strategy to ensure protection of the earthworks.

Woodland trees generally offer the best protection of earthworks from erosion by dropping a layer of leaf litter or duff that creates a barrier to erosive activity. Grass is also a successful barrier, but requires regular mowing and other periodic maintenance. Soil erodes more quickly under grass cover than it does under forest cover. Maintenance of grass through mowing also has the potential to damage the earthworks. Methods of mowing that protect the earthworks from damage should be identified and used regularly by well-trained personnel.

Earthworks at Kennesaw Mountain National Battlefield Park protected under woodland duff

Woodlands, however, also require maintenance in the form of monitoring, removal of dead limbs and trunks, hazards, and likely hazards. On an individual basis, the trees that compose a woodland and provide leaf litter that can protect the earthworks from the destructive power of stormwater are also living entities that will eventually succumb to age, disease, or insect infestation, and their demise has the potential to damage the earthen structures by falling on or across them, or by dislodging historic fabric through root upheaval. Falling trees also present a danger to the visitor and to interpretative features and site amenities. Managing the woodland in the vicinity of the earthworks thus involves protection of historic resources and minimization of risks to the visitor.

Taking an ecological approach to vegetation management, with earthworks preservation as the goal, will afford the highest degree of protection with the smallest input of financial and personnel resources.

Vegetation management strategies must also take aesthetics into consideration. Vegetation has the potential to enhance or detract from interpretation, and to affect the visitor's impression of the park. The maintenance and management of vegetation has the potential to enhance or block views, and to elicit a sense of mystery, surprise, awe, and beauty. These qualities may be encouraged through simple maintenance practices such as the removal of downed dead trees visible near the trail, selective limbing up of trees for directed views, and thinning of shrubs. While it may be desirable to remove vegetation in specific locations where interpretation is a focus, the park should avoid establishing an overly manicured or controlled appearance, which may send the wrong message to visitors about the accessibility of the earthworks.

Hazard Trees

The large deciduous trees that are growing on and around the earthworks pose a threat of windthrow, branch drop, and other structural failure that can cause damage to the earthworks. Regardless of their condition, all trees have the potential to fail as a result of the many unpredictable variables such as weather, climate, and pests. Unsafe, hazardous, and other undesirable trees need to be carefully removed from the site without causing harm to the earthworks.

Careful tree maintenance directed by an arborist is an important part of managing earthworks under woodland cover

Hazard trees pose a risk of damage to historic resources and other park property and injury to visitors through the potential for all or portions of a tree to fall or fail. Although any tree or portion of a tree may present some degree of risk or hazard to people or property at any time, hazard trees are those that are determined to possess a significant flaw or structural defect that greatly increases the potential for failure.[2] Conditions that contribute to a hazard tree designation include decay, cavities, dead limbs or overhangs, splits and shakes, weak crotches, heavy horizontal limbs, basal or crown rot, root decay, termite and carpenter ant infestations, wind and vehicle damage, construction damage, leaning or heaving trees, soil slippage areas, tree declines due to insect or disease, and decline due to soil compaction, root damage, or filling.[3] Of particular concern are those trees that are located within falling distance of visitor use areas or historic resources. These trees require regular inspection by qualified professionals. It is possible for a

[2] National Park Service, *NPS-77: Natural Resource Management Guideline* (Washington, D.C.: U.S. Department of the Interior, 1991), 349.
[3] Ibid., 356.

certified arborist to quantify and rate hazard potential, and prescribe and prioritize mitigation techniques and procedures. The form and frequency of inspection should be determined as part of the monitoring plan recommended herein.

Assessment of the windthrow hazard of individual trees relates to the inherent root structure of the species in combination with the soil conditions where they are growing. Larger roots contribute to tree stability. Trees subject to windthrow are those with shallow roots in rocky or wet soils, leaning trees, or trees in areas of grade change that lead to poor drainage. The position of a tree on the earthwork itself will affect the windthrow potential due to the ability of the roots to grow in various directions and anchor the tree. Seventy-five percent of tree failures are root related. Poor soil growing conditions inhibit root growth. Older trees are more susceptible to windthrow because of their height to crown relationship. Trees most likely to be susceptible to windthrow or become hazards are trees growing on the edge of the woods that are exposed to wind and storms, lone trees that are subject to lightning strikes, and trees located in high traffic areas that may suffer from the effects of soil compaction and wounding that leads to decay. Dead limbs, branch structure, an unbalanced crown, co-dominant leaders, and trunk wounds and cracks can all lead to a higher percentage of failure of part(s) of the tree, or its susceptibility to windthrow.

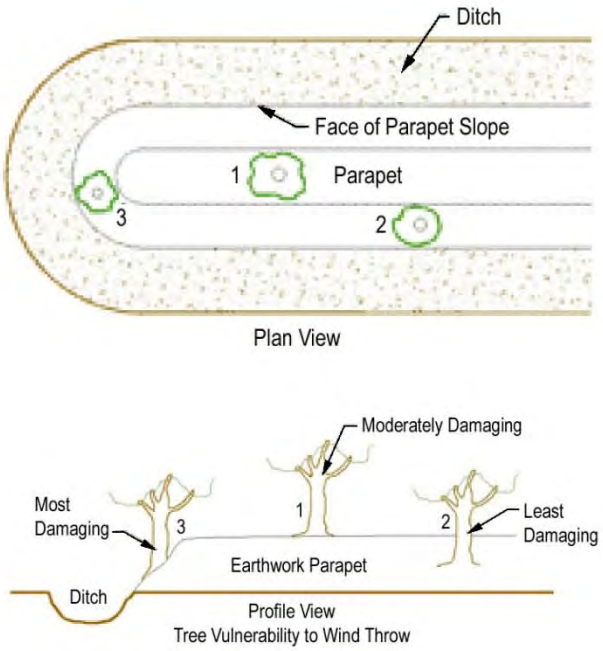


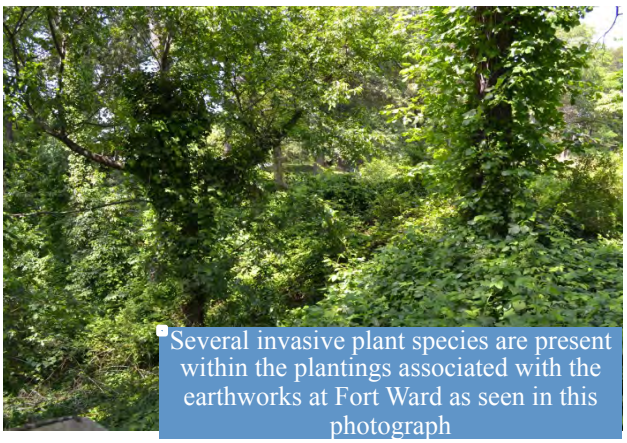
Diagram indicating the potential for trees growing on earthworks to become windthrow hazards. (Prepared by the National Park Service)

The removal of hazard trees to protect the earthworks and visitors must be carefully mitigated to avoid unanticipated consequences. Ecologists have determined that woodlands have two distinct zones—the forest interior and the forest edge—and that each supports a different association of plant species. The forest interior is denser and allows less light to reach the forest floor. Typically, the understory layer includes saplings of the overstory tree species. The understory is relatively sparse, allowing for views through the trees. These saplings act as replacement reserves that will perpetuate the forest when the current overstory trees die. Along the forest edge, and in gaps in the forest where higher light levels

penetrate to the forest floor, a completely different composition of plant species will arise. The character of this vegetation is typically shrubby, dense, and leafy. This type of growth obscures views, and will limit or interfere with the visual accessibility of earthworks. Thus, planned tree removal must be carefully considered to anticipate the resulting dense growth of shrubs and vegetation that will follow. If properly anticipated, important views of earthworks can be maintained.

Invasive Plants

Invasive plants have the potential to impact native vegetation communities. The health of the native woodland and grass cover that offer protection against erosion could potentially be threatened by invasive plant species.



Several invasive plant species are present within the plantings associated with the earthworks at Fort Ward as seen in this photograph

Invasive plants are an issue of special concern to the earthworks management because of their potential to threaten native vegetation and a healthy balanced ecosystem. Non-native or exotic vegetation falls into one of two categories: innocuous or disruptive. Innocuous species are those that do not invade native ecosystems without human-caused disturbance, whose populations tend not to expand, or which generally do not displace native species to any significant extent.[4] Maintenance and management activities should not be focused on innocuous species, but rather concentrate on the disruptive species that have the potential to significantly alter natural processes. The effects of disruptive species, which are herein referred to as invasive plants, include alteration of successional patterns, reduction of native species populations, hybridization with native species, and deterioration of historic resources through rampant growth.

The primary control mechanism for invasive species is to prevent their establishment. Invasive plant species are generally easier to eradicate when they first appear. Monitoring programs can be used to foster early detection and removal of invasive species. It should be noted, however, that one of the primary vehicles for invasive plant establishment is site disturbance through construction or grading, or the alteration of natural vegetation patterns such as woodland clearing. Because these activities may occur through necessary activities such as hazard tree removal, regular monitoring of sites undergoing disturbance to identify the presence of disruptive species is highly recommended.

[4] Ibid., 288.

Prior to any site disturbance, a list of predicted invader species should also be developed so that personnel involved in monitoring can be on the lookout for these species and implement measures to prevent their invasion. Each predicted species may require a unique monitoring and control strategy. Long-term or even permanent management commitments and consistent follow-up are essential to successful invasive plant control programs. The persistent seed banks and long-lived seeds of invasive plants often require control efforts over many years to eradicate. Initial control of invasive species, particularly woody species, may accelerate recruitment of the seed bank or additional growth. Thus missed treatment cycles can actually result in population levels greater than pre-control levels.

Herbicides are frequently included in invasive plant control programs because of the ineffectiveness or unavailability of biological control agents and the inapplicability of mechanical and cultural control methods in natural systems. Biological control agents such as beneficial insects are available for only a few invasive plant species, and the research required to locate and test potential biological control agents is beyond the individual capabilities of many parks. However, research of available literature is invaluable in developing control methods and strategies, including cultural, mechanical, biological, and pesticide control methods. Without the application of herbicides, most woody invasive plant species can re-sprout from the cut stump, root crown, or roots when cut or disturbed. As natural weedy invaders, invasive plant species will usually re-colonize sites where undesirable plants have been removed. Native plants may need to be planted or encouraged to flourish in areas where invasive species have been removed.[5]

Park maintenance personnel will also need to be familiar with the types of plant pathogens and insects likely to adversely affect the existing desirable vegetation and with mechanisms for their control and/or eradication. In addition, park personnel should be mindful of the fact that plant pathogens and insect infestations can be transmitted to local native plant populations through the introduction of new plantings. Prior to bringing them into the park, all plants intended to be planted on site need to be inspected for diseases, pests, and parasites.

Resource Management Recommendations

General Recommendations

- Update the park's National Register documentation to consider the significance of the park and reconstructed Northwest Bastion, as well as other historical associations, such as the Fort community.

[5] Ibid., 297–298.

- Complete an administrative history of Fort Ward Park.
- Identify a responsible party to oversee management, maintenance, and monitoring of the earthworks that report to museum personnel.
- Enhance interpretation of the military engineering and earthworks construction process, the relationship between military terrain and the overall design of the defense system at the fort, and the physical relationship between the earthworks and the Fort community. Integrate interpretation of all aboveground evidence of fort features within the park into a designated walking tour that is outlined at an orientation station located near the museum.
- Consider opportunities to expand interpretation to a broader audience, such as incorporating earthworks references in the design of the playground.
- Acquire an easement for the portion of the earthwork that lies south of West Braddock Road.
- Develop an overarching plan for future archeological investigations that prioritizes proposed actions, supports a broad knowledge and documentation base, and establishes the key research questions to be addressed.
- Ensure that all management procedures are conducted in conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. For Fort Ward, the overarching treatment approach for the site is **rehabilitation**. The Standards for Rehabilitation are:

    1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.
    2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
    3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.
    4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.

10. New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.[6]

Earthworks Management Recommendations

- Assess the existing land cover associated with the fort, rifle trench, covered way, and forward battery for its ability to protect the earthworks from erosion. Identify any areas that are not currently protected by either grass cover or leaf litter derived from woodland cover. Determine an appropriate plan of action for immediately addressing exposed areas (see also below).

- At **Fort Ward**, the land cover includes areas maintained under grass cover as well as areas maintained under woodland cover. In both cases, the park should manage for a healthy plant community composition that is free of invasive species. For grass cover, consider replacing non-native species with natives that might include Virginia wild rye or native warm-season grasses. Native warm-season grasses offer the advantage of requiring less frequent mowing. Taller grasses

[6] http://www.nps.gov/hps/tps/standguide/rehab/rehab_standards.htm

will help deter visitors from climbing on the resource. Consider carefully the placement of paths to avoid damaging the earthwork. Encourage visitor stewardship of the earthworks through a park-wide culture of protection that includes posting signs in key locations, including the orientation station, noting the fragility of the resource and requiring that visitors refrain from leaving designated trails.

The placement of signs, such as the one shown at Kennesaw Mountain National Battlefield Park, to guide visitors away from the earthworks is recommended

- At the **covered way and outer battery**, consider establishing a short spur trail that is part of a comprehensive interpreted self-guided tour of the park's earthworks. Consider options for enhancing grass cover where light levels are sufficient; otherwise ensure a comprehensive protective layer of leaf litter or mulch atop the earthworks structures. Consider native species for the grass cover that might include Virginia wild rye or native warm-season grasses. This approach is consistent with the park's native meadow program.

- At the **rifle trench**, relocate visitor access routes away from the top of the earthen structure to a new designated trail that is part of a comprehensive interpreted self-guided tour of the park's earthworks. Apply a comprehensive layer of matted leaf litter and/or mulch to the rifle trench structure.


The rifle trench at Fort Ward. This original Civil War feature is being negatively affected by people walking over its surface.

- Engage a forester or certified arborist to regularly inspect and evaluate existing vegetation for its potential to damage Civil War era-resources, particularly trees growing on the parapet and ditch that constitute hazards. Identify and prioritize necessary hazardous and large tree and limb removals. Determine a phased removal strategy based on the inspection and evaluation. Flag trees to be removed.

- Retain and maintain existing native tree cover around the **earthworks**, with the exception of hazard trees. Retain and maintain healthy longer-lived hardwood saplings in the earthworks environs as future replacements for current woodland species. In areas where trees have been removed, retain longer-lived hardwood saplings, and remove short-lived volunteer species and species with shallow root systems that may constitute future hazard trees. Consider planting saplings of locally native canopy tree species suited to the soil and moisture conditions of the site around the margins of the earthworks to perpetuate woodland conditions. Always remove invasive species.

- Remove hazard trees and likely windthrow hazards that have the potential to damage the earthworks, recognizing that special techniques must be employed in the removal of vegetation in this area to avoid threats to the resource. Avoid disturbing the soil in the environs of the earthworks. While conducting necessary removals, retain healthy trees that are less likely to be windthrown in order to maintain light levels and duff production. Over time, consider removing all of the trees growing directly on the parapet and in the ditch, but only after a stand of healthy trees exists along the perimeter of the earthworks capable of providing the necessary sheltering qualities and leaf litter.

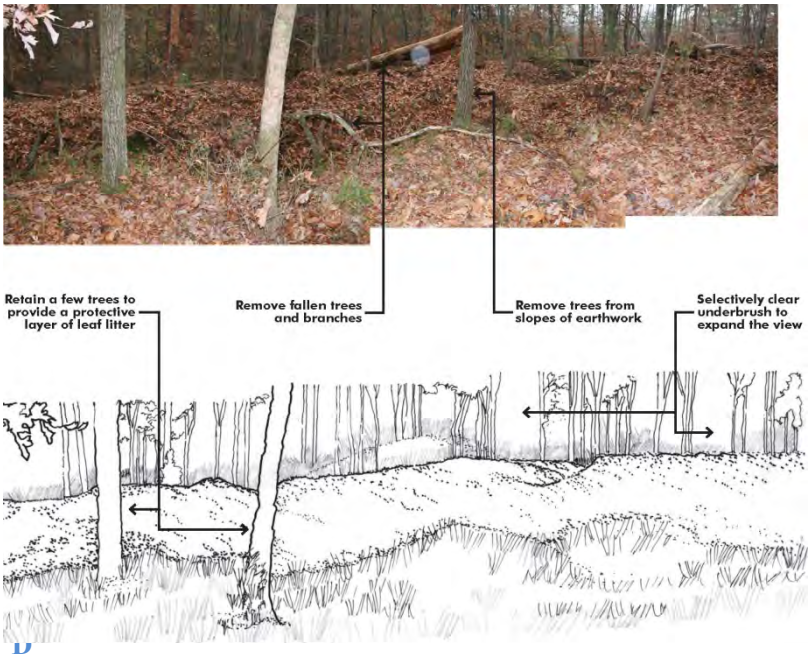
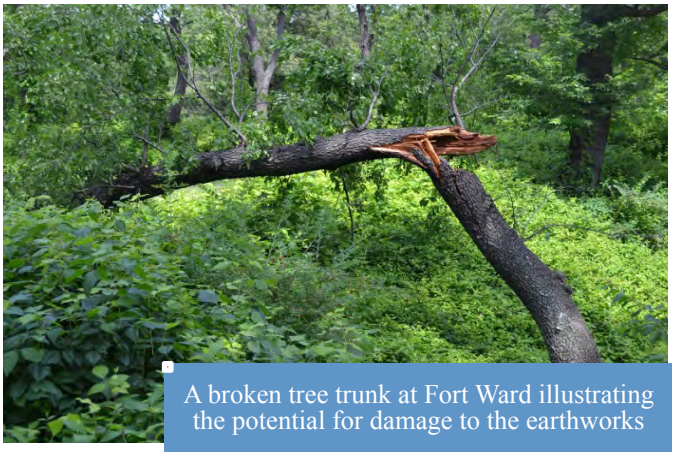


Diagram indicating the approach to woodland management recommended for the earthworks. Shown is Kennesaw Mountain National Battlefield Park.

- Clear all debris, brush, fallen trees and branches, and other plant materials not considered healthy vegetation from the earthworks without causing additional damage. Undertake vegetation removal and erosion mitigation using specialized techniques that avoid damage to the earthen resources (see also below).

- Chip or remove cleared vegetation to an approved landfill or appropriate location within the park for decomposition. Consider using chipped material derived from healthy native trees and shrubs as a mulch to protect areas of earthworks not adequately covered by leaf litter.



A broken tree trunk at Fort Ward illustrating the potential for damage to the earthworks

- Control and eradicate invasive plants from the parapet and ditch system of the earthworks that have the potential to diminish the health of the woodland or grass cover that protects the earthworks, and use invasive species control programs as an opportunity to educate the general public about the harm that invasive species cause, and the importance of preventing their introduction. Ensure that all plant material relating to invasive species is removed from the site.

- Institute a cyclical monitoring program—annually at a minimum—that includes regular inspection of the earthworks for erosion, the presence of invasive plant species, tree falls requiring removal, maintain vertical clear zones, identify evidence of visitors leaving trail corridors, animal burrows, and comprehensive leaf litter cover in areas under woodland cover. The annual inspection of trees by a certified arborist should be considered part of the monitoring program. During inspection, and subsequent monitoring activities, document instances of these problems requiring repair, including their locations on a map. Identify areas requiring rehabilitation, and replacement or establishment of grass cover or leaf litter. Evaluate and monitor the health of the woodland with the intention of planting saplings if the community is found not to be regenerating itself. Record all procedures and techniques conducted as part of the monitoring and management program on forms created for this purpose.

- Repair immediately upon its discovery erosion and structural damage to the earthworks. Establish vegetative or leaf litter cover in all areas currently undergoing soil erosion and that may erode in the future.

- Protect the resources from the destructive actions of animals. Determine the type of animal engaged in creating burrows, and identify the best method of control, considering humane methods such as relocation. Repair burrow sites, and document the repair.

- Locate signage carefully to avoid inviting visitors to access the earthworks. Signage should never be installed by digging a footer within the structure of the parapet or ditch.

Visitor Access

- Prevent visitor access to the earthen parapet and ditch, and limit access by park maintenance personnel. Establish a designated path to be followed by visitors. Use signage and stewardship information placed in key locations around the park to indicate rules and regulations that restrict access to the earthworks. Continue to use signage to direct visitors from walking on the earthworks. Install fencing or bollard and chain barriers along trails if it is determined that visitors are disregarding the signage.

- Relocate any trails, benches, and signage that are founded within the parapet or ditch system of the earthworks.

- Consider the establishment of native warm-season grasses that can be mown less frequently as a deterrent to visitor access to the earthworks.

Interpretation

- Remove and thin shrubs and understory vegetation where visual accessibility is desirable to support interpretation.

- Consider using the barberry hedges as an interpretive aid for recalling ephemeral features of the fortification system, namely the abattis that served as an outer obstacle to approaching Fort Ward.

- Consider replacing the existing barberry hedges, which are tall and narrow, with a lower, wider planting that will allow for views from the Northwest Bastion that better approximate the field of fire of the fortification during the Civil War. Interpret the firing distance of the artillery emplaced in the bastion, and consider options for expressing that distance on the ground, potentially by clearing a view corridor.

Example of a cleared viewshed to indicate an important historic military relationship. Shown is Fort Mill Ridge

- Prune and thin shrubs growing on the earthworks where visual accessibility is deemed desirable. Maintain a vertical clear zone between the interpretive trail and the earthworks to enhance visual accessibility in specific locations where it is intended to support interpretive objectives such as at waysides. The vertical clear zone should be established through removal of dead and dying vegetation, removal of fallen limbs and branches, and thinning and pruning shrubs taller than 2 feet, and removing the lower branches of the trees below 16 feet measured from the ground plane to open specific, desirable views to the earthworks from the trail.

Best Practices Relating to the Recommendations

Best practices involving establishing and maintaining grass cover, woodland management issues including tree removal, invasive plant control, and sustainability are addressed below.

Best Practices for Woodland Management and Tree Removal

- Prioritize tree removals by first identifying those trees that pose the greatest threat of windthrow or loss during a storm. Remove the trees identified as posing the highest risk, along with invasive plants, short-lived old-field invader species, species with shallow root systems, and all debris, brush, and other material not considered healthy vegetation, from the earthworks. Assess the resulting light levels and leaf litter coverage. Over time all trees, including saplings, should be removed from the earthen parapet and ditch. Healthy, existing, longer-lived hardwood saplings that do not possess shallow root systems should be removed last once the desired forest management conditions for areas providing leaf litter are met. Healthy longer-lived hardwood trees located around the earthworks should be retained and maintained, and augmented with new plantings, to protect the soil of the earthworks from erosion. In areas where trees have been

removed, allow saplings of the longer-lived hardwoods to become established around the earthworks, but continue to remove trees from the earthworks themselves.

- Avoid disturbing the soil during tree removal activities. Special care must therefore be taken in the removal process not to cause erosion. Trees should be sectioned and the cut sections lowered to the ground, taking care not to disturb existing soil and grades.

- Cut stumps flush with the surrounding grades and apply a systemic herbicide to the cut end of deciduous hardwoods to discourage resprouting. Stump grinding of trees removed from the earthworks is not recommended due to the disturbance this would cause to potential archeological resources and the stability of the earthen structures.

- Remove invasive plants such as tree-of-heaven and Japanese honeysuckle identified during monitoring programs by cutting stems flush with the ground and applying a systemic herbicide. Avoid hand-pulling or other techniques that may cause soil disturbance.

- Monitor earthworks to ensure that the earthworks remain entirely covered with leaf litter as an erosion control measure.

Best Management Practices for New Grass Cover Establishment

- Retain and maintain existing grades, except where drainage or soil erosion problems have been identified. In particular, avoid modifying existing topography that may reflect evidence of military activities. Also avoid removing soil in the environs of the earthworks.

- Establish criteria for the desired character and composition of new grass cover. Consider the following:

    - Species must be able to be maintained at a height of between three and fifteen feet above the ground.

    - Species must be suited to local soil types, the planting zone, and rainfall conditions (soil testing should precede species selection).

    - Species should be drought tolerant.

  - Species must provide above ground cover and/or a root system that protects against soil erosion characteristics particular to the local soil.
  - If the species provides long-term soil erosion protection but no short-term protection, there must be a viable annual or interim landcover option for the establishment period.
  - The long-term cover species must be perennial or self-perpetuating, although temporary cover species may be annual.
  - Preference will be given to a species that is relatively easy to establish.
  - Preference will be given to species that promote diversity and offer benefits to wildlife.
  - Preference will be given to a species that has less onerous maintenance requirements than fescue, specifically as regards mowing frequency.
  - Preference will be given to native species over non-native species.
  - Invasive species will not be used.

- Re-vegetate all disturbed soil in a manner that optimizes plant establishment for that specific site, unless ongoing disturbance at the site will prevent establishment of invasive species. Re-vegetation may include plug planting, seeding or hydroseeding, fertilization, and mulching.
- Monitor and evaluate the success of revegetation.
- When re-vegetating areas that were previously dominated by invasive plants, try to achieve at least 90 percent control of the invasive before attempting restoration.
- Monitor earthworks to ensure that grass entirely covers the earthworks as an erosion control measure.

Best Practices for Invasive Plant Species Control

- Before starting any ground-disturbing activities, inventory invasive plant infestations both on-site and in the adjacent area.
- Begin activities in uninfested areas before operating in infested areas.

- Use uninfested areas for staging, parking, and cleaning equipment. Avoid or minimize all types of travel through infested areas, or restrict to those periods when spread of seed or propagules are least likely.

- When possible, to suppress growth of invasive plants and prevent their establishment, retain relatively closed canopies.

- Minimize soil disturbance and retain desirable vegetation in and around the area to the maximum extent possible.

- Schedule disturbance activity when seeds and propagules are least likely to be viable and to be spread.

- Monitor infested areas for at least three growing seasons following completion of activities. Provide for follow-up treatments based on inspection results.

- Quarantine soil from infested areas to prevent off-site spread.

- Invasive plants can be introduced and spread by moving infested equipment and material. Inspect material sources at site of origin to ensure that they are free of invasive plant material before use and transport.

Best Practices for Sustainability

- Consider sustainability practices in all aspects of earthworks management, limiting the need for irrigation to periods of extreme drought and during plant establishment, and reducing the need for fertilizers, other soil amendments, and water by selecting plant species that are native and naturally adapted to existing site conditions.

- Limit herbicide and pesticide use as much as possible.

- Take advantage of natural ecological processes to manage resources efficiently.