



**National Park Service
U.S. Department of the Interior**

COLONIAL NATIONAL HISTORICAL PARK VIRGINIA

FIRE AND FUELS MANAGEMENT PLANS

Environmental Assessment /Assessment of Effect

August 2005



**Environmental Assessment
Assessment of Effect
for
FIRE MANAGEMENT PLAN

Colonial National Historical Park
Virginia

2005**

Public Comment

Note to Reviewers and Respondents:

If you wish to comment on this environmental assessment, you may mail comments to the name and address below. This environmental assessment will be on public review for 30 days. Please note that names and addresses of people who comment become part of the public record. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations, businesses, and individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

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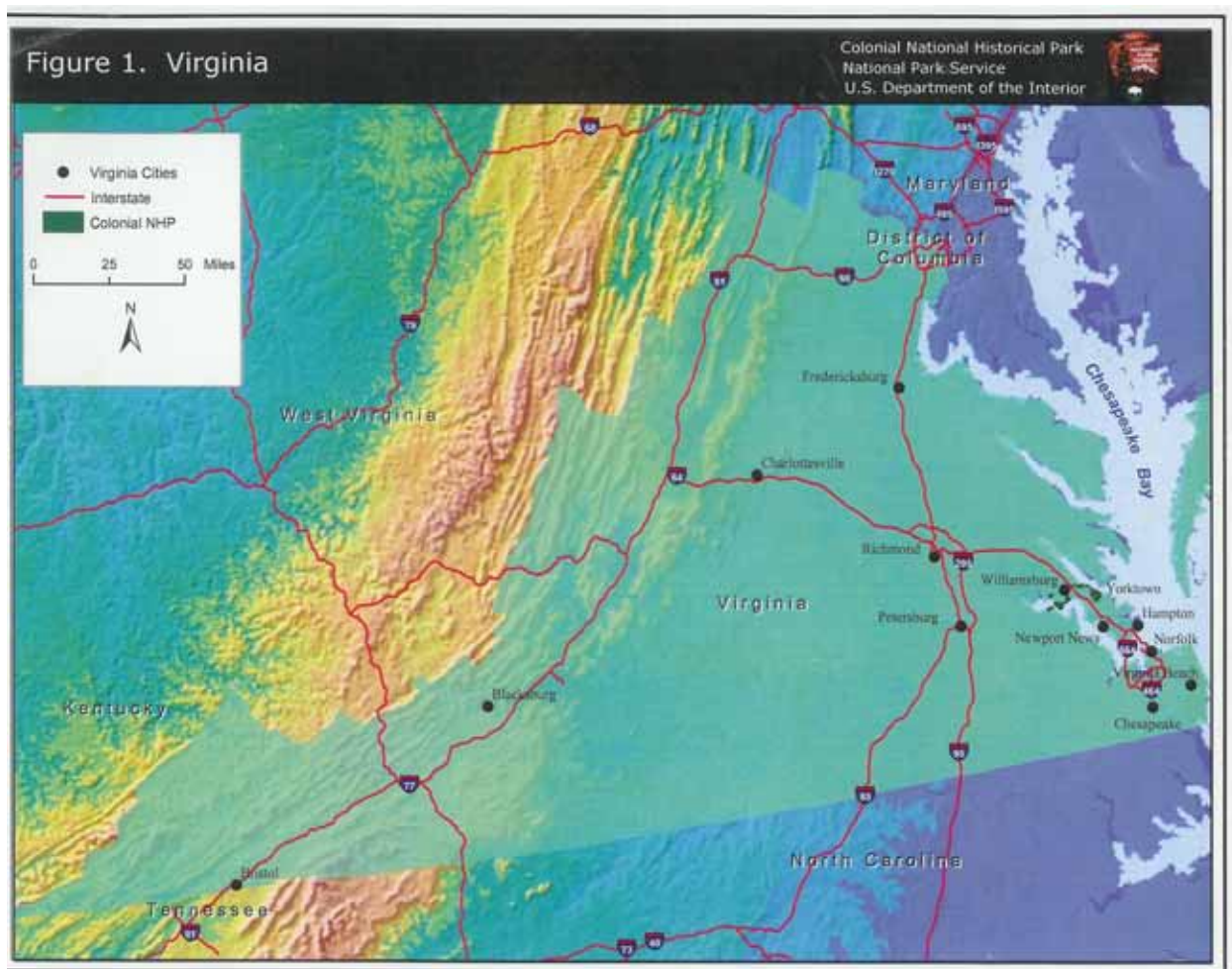
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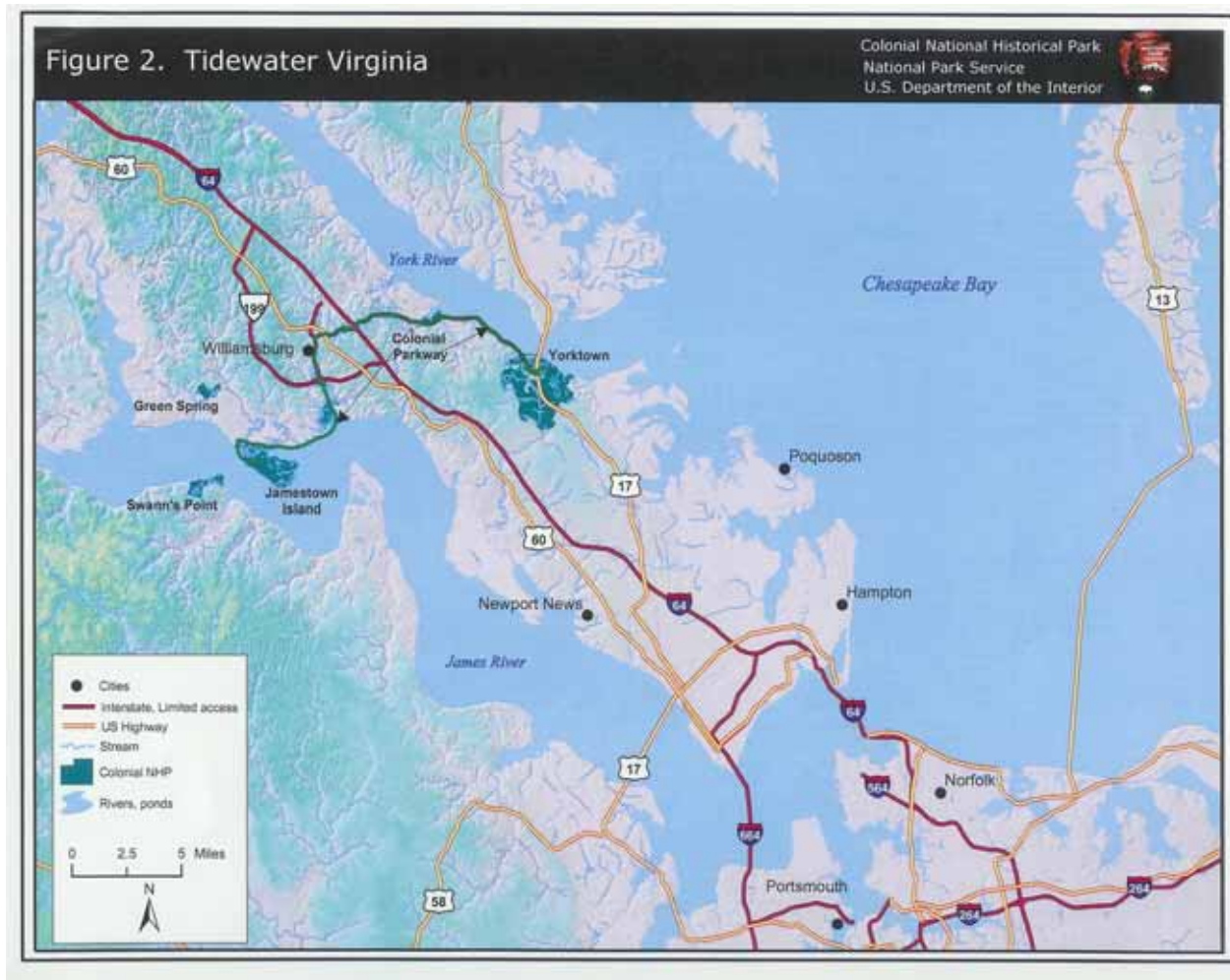
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INTRODUCTION

Colonial National Historical Park (COLO) is located approximately sixty miles from Richmond Virginia and is within a three hour drive of major metropolitan areas such as Washington D.C. and Baltimore, Maryland (Figure 1). The park is situated in the southern tidewater region of Virginia (Figure 2), positioned between the York and James rivers. Much of the surface relief is flat, but steep topography can be found along the edges of ravines and sandstone bluffs lining tidal rivers and creeks. Various types of land-use surround the park, including two large naval bases, a Coast Guard facility, residential subdivisions, the cities of Newport News and Williamsburg, and the village of Yorktown.





The 10, 221 acre Colonial National Historical Park encompasses most of Jamestown Island (1,561 acres), site of the first permanent English settlement in North America established in 1607, and Yorktown (4,302 acres), scene of the culminating battle of the American Revolution in 1781. The 23-mile Colonial Parkway (3,596 acres), which connects these and other colonial sites (including Colonial Williamsburg), provides an aesthetic drive through natural environments with few intrusions imposed by modern development. Colonial National Historical Park integrates the histories of Jamestown, Colonial Williamsburg, and Yorktown, providing a medium through which visitors may understand the British Colonial experience in North America.

In addition to the three major areas noted above, the park also contains several detached areas: the 312-acre Green Spring plantation site, where early colonial governor William Berkeley made his home; Cape Henry memorial, the .23 acre site memorializing the arrival of the first Jamestown colonists; Swann's Point, a 414-acre site across the James River from Jamestown Island; and Tindall's point, a site which contains various Civil War fortifications (Figure 3a).

resources, are integral to the purposes for which Colonial National Historical Park was created.

Management Objectives

The following management objectives, as stated in the current General Management Plan (1993) for Colonial National Historical Park, constitute the interpretation of the parks authorizing legislation. They state, in part, that the purpose of Colonial National Historical Park is to:

- *Interpret for visitors the significance and relationships of the sites and events at Jamestown, Yorktown, and Colonial Williamsburg.*
- *Preserve colonial-period resources and make them accessible in a manner that is safe and enjoyable for visitors.*
- *Protect, enhance, and interpret natural resources in a manner consistent with applicable policies and regulations while supporting cultural resource objectives.*
- *Actively promote conservation of the landscapes adjacent to Colonial National Historical Park to enhance historic and scenic views and to protect park resources and values.*

In addition to the park-wide objectives stated above, a number of corollary management objectives have been developed for each of the park units. Those with a potential relationship to the fire management program are stated below.

Jamestown

- *Interpret the 17th century history of Jamestown, with emphasis on the first settlement, the beginnings of representative government, the people who played various roles in the development of Jamestown, and the historical and archeological resources that remain.*
- *Keep human habitation sites clear of vegetation to the extent necessary for visitors to see cultural resources.*
- *In areas without evidence of habitation, maintain the natural environment in ways that suggest the conditions of the 1607 forest environments.*
- *Promote a sense of the primitive isolation Europeans experienced in 1607.*

Yorktown

- *Preserve, restore, and research historic structures and archeological sites of the colonial and revolutionary periods, the Yorktown National Cemetery, the Victory Monument.*
- *Manage National Park Service (NPS) properties to suggest the character and flavor of colonial times within the limits of safety and practicality.*

Yorktown Battlefield

- *Establish conditions on the battlefield and the York River that reflect the visual scene of 1781.*
- *Promote a sense of the surrounding rural agricultural setting.*

Colonial Parkway

- *Maintain the Colonial Parkway for safety while retaining the integrity of its design as a scenic roadway. Protect the historic sites, the landscapes, and the undeveloped vistas of the James and York Rivers along the Parkway.*

Purpose and Need

The purpose of this Environmental Assessment is to ensure that Colonial National Historical Park fulfills the requirements of the National Environmental Policy Act of 1969 in the course of implementing the actions described in the National Park Service's Management Policy (2001), and National Park Service (NPS) Director's Order #18 (DO-18) – Wildland Fire Management. DO-18 requires that each NPS unit capable of sustaining fire develops a Fire Management Plan (FMP) describing the long-range actions required to prevent destructive wildfires. The park currently has no existing FMP. Colonial National Historical Park needs to have a comprehensive FMP in order to protect natural and cultural resources, the public and employees, and park facilities. Within this Environmental Assessment, all reasonable alternatives or options for the development of an FMP are explored and the potential impacts of each are described. Analysis of the alternatives outlined in this document will provide a basis for decision-making at the park and regional level and will provide an opportunity for public involvement in the planning process.

Wildland fires occur today through both human-induced and natural causes. This proposed fire management plan must define the levels of preparedness and procedural actions for wildland fires that would provide for human safety and the protection of park resources, both natural and cultural.

Fire is an ecological factor that has forever been present in many North American ecosystems. The lands encompassed by Colonial National Historical Park are no exception. The presence of wildland fire in current ecosystems is not as readily apparent as it was during the time encompassing pre-European settlement. A variety of factors may be responsible for this marked change. Among these, the absence of both natural and human-caused fires, and the shift from a landscape reflecting an agriculturally-based society to one reflecting significant suburban and urban growth and development, is perhaps the most important. As a result of these changes, the landscape at Colonial National Historical Park has shifted from one dominated by open fields composed of grasses and brush, towards a scene dominated by pine and oak-pine forests as well as diminishing open fields and meadows. These present-day

conditions are not representative of the landscape found during the historical period. In addition, as old trees have died and time has passed, fuels have accumulated on the forest floor. The ignition of these fuels in an uncontrolled situation, such as by human occurrence or by lightning could be devastating to the sensitive resources of the park as well as to adjacent lands. In addition, this type of fire poses a real threat to human life.

A variety of fire management activities may be utilized to achieve the protection of park resources. The proposed suitability and implementation of these methods, singularly or in combination, is analyzed in this document. These techniques include: suppression (aggressive and/ or appropriate management response), the use of prescribed fire and non –fire (mechanical, manual, and chemical) applications to reduce hazardous fuels, and the use of prescribed fire and non-fire procedures as a means of restoring and enhancing native vegetation as well as promoting forest and overall ecosystem health.

The objective for the writing of a Fire Management Plan is to address park issues related to fire management as discussed in the previous paragraph. As previously described, the park must also comply with the requirements of DO-18 and the National Environmental Policy Act in meeting these objectives.

This Environmental Assessment has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended; the regulations of the Council on Environmental Quality (CEQ) (40 CFR 1508.9); the NPS *Director's Order 12* and accompanying Handbook, and the National Historic Preservation Act (NHPA) of 1966, as amended (36 CFR 800).

Objectives

Colonial National Historical Park is mandated by the National Park Service agency mission to maintain long term protection and preservation for all resources found within its boundaries. The park has also been tasked to prepare and implement a fire management program that supports this legislative mandate. The objectives of the fire management program that relate directly to the core mission of the park are:

1. Identify, evaluate, protect and preserve park cultural resources, including earthworks, historic structures, monuments, grave sites, cemeteries, archeological sites, ethnographic resources and artifacts important to the understanding of the areas in and around Jamestown, Colonial Williamsburg, and Yorktown (General Management Plan, 1993).
2. Manage natural resources in a manner that complements and protects the cultural resources and historic scenes (Resource Management Plan, 1999).
3. Conduct a safe and vigorous wildland fire management program with the highest professional and technical standards. (RM-18).
4. Efficiently accomplish resource management objectives through the application and management of prescribed and wildland fires. (RM-18)

Corollary objectives specific to fire management as mandated through the National Fire Plan (2000) and RM-18 are:

6. Suppress all unscheduled ignitions.
7. Ensure smoke production does not violate state and federal standards; and minimize smoke impacts to park neighbors.
8. Assess and reduce hazardous fuels that pose potential threats to resources to be protected (values at risk).
9. Cooperate with partners and other interested parties on fire management issues.

Scoping Issues and Impact Topics

Issues and concerns affecting this plan were identified by NPS specialists and from the input of cooperating and interested parties. Internal scoping was conducted in December 2003, as well as in subsequent discussions. The assembled group of interdisciplinary experts evaluated a variety of different strategies with which to effectively implement a fire management plan for the park. Discussions relating to the development of a fire management plan for the park were centered upon core management objectives that are identified in a variety of park management documents that were discussed in the previous objectives section.

The park has never had an approved fire management plan nor has it had access to fire management expertise for the purpose of planning fire management activities. As a result, a wide variety of issues relating to park management and fire were discussed at great length by the participants. ***The results of internal scoping and impact topic development are summarized below.***

Impact Topics Selected for Consideration

- Provide for safety as the paramount objective during all fire management activities including safety for firefighters, park visitors, and the adjacent public. This emphasis on safety is mandated by DO-18 and is the highest single priority in any activity involving wildland fire management.
- Comply with state and federal air quality regulations in all fire related actions. Air quality was adopted as an impact topic.
- The protection and preservation of cultural resources and properties is critical to the park mission. As a result, cultural resource protection was adopted as an

impact topic and includes earthworks, historic structures, archeological sites, cultural landscapes, and museum collections.

- Improve the overall ecological functioning and health of oak, pine, and mixed pine–oak forests, as well as open fields and marsh areas found within the park. The potential exists for impacts, both positive and negative, upon vegetative species in each of these ecosystems. As a result, vegetation was adopted as an impact topic.
- Because the use of prescribed fire and non-fire hazardous fuel reduction to achieve management objectives are new management tools being considered for use in the park, it is important to assess the effect the implementation of these management tools may have on visitors, local landowners and adjacent communities. Consequently, the effects of these management practices on local landowners and adjacent communities have been considered as an impact topic.
- The park serves as home to a variety of species of wildlife. Their protection and well-being are important management objectives of the park, thus, the inclusion of wildlife as an impact topic.
- The potential impact of fire management plan alternatives on soils is of concern to park managers and was selected as an impact topic.
- Colonial National Historical Park contains a significant percentage of aquatic wetlands and floodplain resources. These areas serve as important habitat for birds, wildlife, and vegetative species as well as representing an important part of the parks cultural scene. They also serve to protect park resources; cultural, natural and infrastructure, from shoreline erosion. For these reasons, aquatic wetlands and floodplains were selected as impact topics to be included in this assessment.
- Because Colonial National Historical Park presently contains species designated as threatened and endangered at both the federal and state levels, as well as those that are currently candidate species for those same designations, discussions regarding these species were selected as an impact topic.

Impact Topics Dismissed from Further Consideration

The rationale for dismissing specific topics from further consideration is given below.

Prime and Unique Farmlands

In August, 1980, the Council on Environmental Quality (CEQ) directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. According to the NRCS, 36% of the lands contained within Colonial National Historical Park in both York and James City Counties are designated as prime and unique farmlands. However, none of the management activities proposed by this fire management plan in any way are in derogation of the Farmland Protection and Policy Act which states that "...projects are subject to FPPA requirements if they irreversibly convert farmland (directly or indirectly) to non-agricultural use..." Therefore the topic of prime and unique farmlands was dismissed as an impact topic in this document.

Socioeconomic Environment

The proposed action would neither change local and regional land use nor impact local businesses or other agencies in the long-term. Implementation of the proposed action, particularly prescribed burning, may require temporary closures of project areas which may, in turn, inconvenience some park visitors. Such closures, however, are likely to be small in size and of very short duration. The impacts to park visitors are regarded as negligible. Therefore, the socioeconomic environment will not be addressed as an impact topic in this document.

Environmental Justice

Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The proposed action would not have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Environmental Justice Guidance (1998). Therefore, environmental justice was dismissed as an impact topic in this document.

Overview of Predominant Fire Management Strategies.

The primary goals of fire management are the preservation and protection of human life, property, and resources. In developing a reasonable range of alternatives for implementing a fire management plan, it is important to understand the types of fire strategies that are available to land managers. A discussion of each of the predominant fire management strategies is provided below. Because there are a limited number of strategies available, each alternative may be composed of a combination of strategies as defined in this section.

Wildland fire suppression (aggressive) – This strategy utilizes a variety of tactics in order to achieve control of a wildland fire in the most expeditious manner possible. Primary emphasis is upon limiting the fire to the smallest possible perimeter size. This may entail the use of mechanized equipment (dozers, tractor plows, engines, hand crews, and aerial resources that utilize retardants).

Wildland fire suppression (appropriate management response) – This strategy employs tactics where fire suppression resources utilize opportunities to allow fires to burn into areas where fuels are non-existent or reduced. These areas are typically represented by pre-existing natural and man-made features on the landscape (i.e. streams, trails, roads, rockslides, riparian areas, or any area with light fuels). This strategy may result in more acreage burned. However, it reduces or precludes the necessity of placing suppression resources in areas where park values at risk may be damaged by their presence, thus preventing a situation where more damage may be caused by suppression efforts than by the effects of the fire itself.

Non-fire treatments – The use of mechanical and chemical treatments, either singularly or in combination, as a means to achieve fire management program objectives, in those areas where the use of prescribed fire is contraindicated due to the presence of environmental constraints.

Prescribed fire – Fire intentionally ignited by fire management professionals under specific pre-determined conditions (a *prescription*) in order to meet specific objectives related to hazardous fuels reduction or habitat improvement. A written, approved prescribed fire plan or burn plan is prepared for each separate prescribed fire project application. This burn plan provides the information needed to implement an individual prescribed burn project, and includes measurable criteria, or prescriptions, that define the conditions under which a prescribed fire may be ignited, guides selection of appropriate management responses, and indicates other required actions. Criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations, each of which is specific to the project being implemented.

A key component of the use of prescribed fire is the requirement of the preparation of a Fire Effects Monitoring Plan. This plan would describe quantifiable fire effects and methods for monitoring vegetation to determine if the desired outcomes were being

achieved. If, in the course of implementation of a Fire Management Plan (FMP), Fire Effects Monitoring yields data that reflects negative impacts to the resources of the park, a new plan would be written to reduce or cease the use of prescribed fire within the park (the adaptive management technique).

Prescription – A pre-defined range of environmental variables that must be present in order for a prescribed fire to be implemented. (For example; ambient air temperature, relative humidity, fuel moisture, mixing heights, transport speeds, wind direction, fuel loading).

Hazardous fuel reduction – Hazardous fuels accumulations accrue through a variety of environmental processes. The most common is the natural accumulation of fuels over a long period of time, usually exacerbated by the total suppression of wildland fire. These accumulations can also be created through the cumulative action of such events as wind, insect damage, and ice and snow. Heavy fuel loadings create a significant wildland fire hazard since any fires occurring in these areas burn with intensities and spread rates that often are beyond the capabilities of suppression resources to effectively manage. In addition, fires of this type are much more prone to damage vegetation, soils, and forest resources through the intense heat they generate and the longer residence times they produce during the life of the fire. Fuel loading can be quantitatively measured and then reduced to safe levels through the use of a variety of techniques. Depending upon location and amount of excess fuel, manual hazard fuel reduction methods or prescribed fire may be utilized effectively, either individually or in combination. In addition, herbicide application may also be a part of the treatment regime. This process is referred to as *integrated fuels management*. For example, an extremely effective tool in the maintenance of some vegetation communities is the manual hazard fuel reduction and removal of excess fuel through hand-cutting, accompanied by application of low intensity prescribed fire. Hazardous fuel accumulations may also be manually cut, piled, and then burned when environmental conditions are favorable for their removal.

Integrated Fuels Management – See above (hazardous fuel reduction).

Chemical treatments – The use of herbicides to kill unwanted vegetation, such as invasive species, is an effective treatment. Herbicide use is often carried out under the guidance of an Integrated Pest Management (IPM) plan; however, there can be a beneficial overlap between IPM and fire management. Chemical treatments are often used as a follow-up to an application of prescribed fire or mechanical cutting in order to eliminate stump and root sprouting that may occur after treatment. For example, the use of prescribed fire to place stress on black locust saplings followed by a treatment of individual stumps with an indicated herbicide is very effective in reducing the proliferation of this species in those areas where the management objective is to maintain open vistas for historic scene preservation. In any case, appropriate re-vegetation plans and monitoring, accompanied by spot-treatments where necessary, are important components of any use of herbicide.

Herbicides may also be effectively used in broadcast application in order to eliminate selected invasive species. Re-seeding with a desired species is then undertaken, followed by an application of prescribed fire in order to aid and maintain the proliferation of native species. This technique is most commonly used in the restoration of native warm season grass communities that occur in areas where the restoration of historic grass communities is a priority. Herbicide use will be consistent with the guidelines established in the National Park Service Natural Resource Management Guideline, NPS-77 and the Exotic Plant Team Operations Manual.

Wildland Fire Use – Natural ignitions (lightning) are allowed to burn under prescribed environmental conditions in order to meet park management objectives.

In each of the alternatives that follow, predominant fire management strategies are discussed as they relate to operational implementation of each alternative. Each of the alternatives discussed will address the park's need for fire management preparedness as governed by DO-18.

ALTERNATIVES CONSIDERED

Alternative I - No-Action (Aggressive fire suppression only)

Colonial National Historical Park currently has no fire management plan (FMP). Since the park is mandated by DO-18 to prepare an FMP by December 2004, a fire management plan would be prepared in order to incorporate preparedness actions, program requirements, and formats as outlined in DO-18. The sole fire management strategy under this alternative would be to continue to suppress all wildland fire ignitions using the most expeditious means necessary (aggressive fire suppression). Under the no action alternative, the fire management plan would not address any actions for the reduction of the accumulation of hazardous fuels, nor would it permit prescribed fire for resource management purposes. Under the guidance of an already approved plan for management of invasive vegetation, chemical treatments may be used to meet management objectives.

Alternative II – Appropriate Management Response and Integrated Fuels Management (Preferred Alternative)

This alternative would allow for the preparation of a fire management plan that includes wildland fire management preparedness actions as well as detailed procedural actions during wildland fire events. In this alternative, the suppression of all wildland fire ignitions would utilize an appropriate management response. It would also provide a detailed action plan for preparedness and suppression of wildland fires including the mitigation of impacts, safety, and resource protection. The use of prescribed fire, either individually or as a part of an integrated management approach, would be utilized to accomplish the full range of natural and cultural resource management and hazardous fuel reduction goals. All prescribed fires would be planned and approved consistent with the method and format required by RM-18. Wildland fire use would not be permitted.

This alternative would include the use of prescribed fire for the purpose of hazardous fuel reduction. The use of prescribed fire would reduce hazardous fuel loads that have accumulated in the absence of naturally occurring fires and decrease the likelihood of a catastrophic wildland fire that presents a potential danger to human life as well as park/private resources. In those years when drought is present, the likelihood of a human – caused wildland fire is increased significantly. In those areas where fuel loads are outside the normal range of conditions (14 – 25 tons/acre for deciduous and mixed deciduous forest fuels), but manageable through the use of prescribed fire, a return interval of 5 -10 years is recommended for the treatment interval. Prescribed fire will be implemented in such a manner that only ground fuels will be consumed, with little or no ignition occurring in the crown structure of the forest.

In those areas where fuel loading is heavier (26+ tons/acre), particularly near structures, manual reduction methods will be utilized to reduce fuel loading. Where access is available, fuels will be removed and disposed of by removing them from the site. In those areas where access is limited, piles of cut debris will be constructed for burning at an opportune time. Generally this occurs during the winter months when the ground is snow covered or wet from winter precipitation, temperatures are low, and winds are minimal.

The use of prescribed fire to achieve resource benefits and cultural scene restoration and preservation will be confined to the restoration and maintenance of native warm-season grasses and select areas in park forests. It may also be used to reduce invasive species in those areas where treatment is indicated.

The presence of warm season native grasses is an important component of the cultural scene and also serves as nesting habitat for birds and insects. Treatments with prescribed fire in the early spring on a 1-3 year rotation have been shown to be effective to propagating these species and increasing the density of existing populations.

Forests comprise an important part of the cultural scene of the park. For this reason they are an important historical and natural resource component of the park. Promoting the rehabilitation and reproductive success of these remnant oak-hickory forests as well as maintaining productive Loblolly pine forests is a goal identified in the park resource management plan. In addition, the promotion of oak-hickory forest/woodland and healthy Loblolly forest would achieve the broad National Park Service goal of natural resource protection and preservation by providing improved wildlife habitat through the propagation of native vegetation species and promotion of natural ecological processes. The use of prescribed fire would help achieve these goals in a cost-effective, expeditious, and safe manner.

A description of proposed prescribed burn/ non-fire hazard fuel reduction units proposed under this alternative (5-year plan) is located in Appendix B of this document.

.In accordance with Chapter 12 of RM-18, a monitoring plan will be developed and implemented to monitor the vegetation associated with each treatment area, regardless

of the treatment method used. This monitoring will allow managers to determine if project objectives have been met and, if not, how the treatment can be altered to meet stated objectives.

Alternative III – Appropriate Management Response and Non-Fire Fuels Management

The fire management program under this alternative would, as in Alternative II, suppress all wildland fire ignitions using the appropriate management response. It also allows for the use of non-fire fuel reduction such as mechanical methods and the use of chemical herbicides, either individually or in combination, to achieve park cultural landscape, natural resource, and fuels management objectives. Prescribed fire would not be used in this alternative.

Alternative IV – Wildland Fire Use

Under this alternative, a full range of available fire management strategies including appropriate management response, wildland fire use (the use of naturally occurring wildland fire ignitions to meet resource management objectives) and prescribed burning would be used. This alternative also allows for the use of mechanical treatments and chemical herbicides.

Alternative V – No Management

Under this alternative, all unscheduled wildland fire ignitions (lightning) would be allowed to burn unimpeded by management actions until objectives were met. Prescribed fire and non-fire hazardous fuel reduction would not be utilized in this alternative.

Alternatives Considered and Rejected

Alternative IV – Wildland Fire Use

This alternative has been considered and rejected because it is not feasible to safely manage a wildland fire to achieve resource benefit with the limited size and staff of COLO.

Alternative V – No Management

This alternative has been considered and rejected because it could threaten the integrity of COLO cultural resources and cultural landscapes, and does not ensure the safety of park visitors, employees or surrounding landowners.

Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the Council on Environmental Quality (CEQ). The CEQ provides direction that “the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA’s Section 101” (*Forty Most Asked Questions Concerning Council on Environmental Quality’s National Environmental Policy Act Regulations*, 1981.)

Section 101 of the National Environmental Policy Act states that “...it is the continuing responsibility of the Federal Government to ... (1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradations, risk to health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment which supports diversity and variety of individual choice; (5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life’s amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.” The environmentally preferable alternative for this project is based on these national environmental policy goals.

Alternative I - This alternative would aggressively suppress all wildland fires. It would allow for an increased potential of ground disturbing activities during wildland fire suppression operations due to the effects of the use of heavy equipment (bulldozers and tractor plows) used in aggressive suppression activities. Hand line construction by suppression crews also may lead to increased ground disturbance in this alternative. Therefore, this alternative would not result in the same level of protection for natural and cultural resources and the public over the long-term as would occur with the preferred alternative. Consequently, this alternative does not satisfy Provision 4 of NEPA’s Section 101.

Alternative II - Appropriate Management Response and Integrated Fuels Management would provide for continued suppression of all unscheduled wildland fire ignitions using the most appropriate management response. This would allow managers to choose a suppression alternative that would minimize ground and vegetation disturbance activities. This alternative would also provide for use of prescribed fire, mechanical fuel reduction, and chemical herbicides, used individually or in combination, to achieve natural resource, cultural landscape and fuels management objectives. The wildland fire suppression operations as utilized in this alternative would ultimately provide for better protection of natural and cultural resources, health and safety of visitors, park neighbors and employees because of their ability to reduce hazardous fuel loadings in a proactive manner *before* a catastrophic wildfire event occurs. In addition, the natural and cultural

resource values of the park may be enhanced through the use of prescribed fire as a tool to propagate native warm season grass populations, improve select marsh and wetland habitats, reduce or remove invasive species, and improve pine, hardwood, and mixed oak – pine forests in the park. This alternative would best satisfy each of the provisions of the national environmental policy goals.

Alternative III – Appropriate Management Response and Non-Fire Fuels Management would provide the same elements as Alternative II, however this alternative would not allow the use of prescribed fire to achieve natural resource, cultural landscape and fuels management objectives. This alternative excludes one of the potential methods of cultural and natural resource protection that has proven to be successful and at the same time exert a low impact on park resources. Consequently, this alternative does not satisfy provisions 3, 4 and 6 of NEPA's Section 101.

The environmentally preferable alternative is Alternative II; Appropriate Management Response and Integrated Fuels Management because it surpasses Alternative I and Alternative III in realizing the full range of national environmental policy goals as stated in §101 of the National Environmental Policy Act. The use of prescribed fire to enhance native warm season grass populations, improve wetland habitat, reduce and remove invasive plants, enhance forest habitat, and reduce heavy fuel accumulations provides a clear advantage over the other alternatives that do not utilize techniques that closely replicate natural processes. A rejection of the preferred alternative may result in further degradation of natural resources and add to the accumulation of hazardous fuels. Admittedly, manual methods of hazardous fuel reduction can be effective, but, in and of themselves, they do not offer as many of the advantages that can be attributed to prescribed fire. Careful application of prescribed fire is considerably more cost effective than manual hazardous fuel reduction, and can be applied in a manner that enhances the safety of the crews doing the work. The negative impacts of smoke from prescribed burns cannot be totally eliminated, but it can be minimized through the use of a variety of implementation techniques that relate to time of ignition, ignition pattern used, fuel moisture at the time of the burn, and adherence to the environmental parameters of prescriptions that relate to the height of convection column rise and dispersion of pollutants.

ENVIRONMENTAL CONSEQUENCES

Park managers have reviewed critical cultural and natural resources that may be impacted through the implementation of a fire management plan. Impact topics have been selected on the basis of the significant resources of the park and the potential for beneficial or adverse effects on them by each alternative. Internal Scoping meetings held in the park determined the identified impact topics as having particular relevance for Colonial National Historical Park.

Cumulative Impacts

Impacts to cultural and natural resources may be direct, indirect, or cumulative. Direct effects are caused by an action and occur at the same time and place as the action.

Indirect effects are caused by the action and occur later in time or farther removed from the place, but are still reasonably foreseeable.

The Council on Environmental Quality (CEQ), which implements the National Environmental Policy Act, requires assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts were determined by combining the effects of each of the alternatives with other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). As a result, it was necessary to identify other ongoing or reasonable foreseeable future projects within the Colonial National Historical Park area and, if applicable, the surrounding region. Cumulative impacts are considered for all of alternatives.

Impairment of Park Resources or Values

In addition to determining the environmental consequences of the preferred and other alternatives, National Park Service policy (Management Policies, 2001) requires analysis of potential effects to determine whether or not actions would impair park resources.

The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow limited impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park. This applies as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute impairment. An impact would be more likely to constitute impairment to the extent that it has a moderate or severe adverse effect upon a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

Determinations as to impairment are included for each of the following impact topics under each alternative.

IMPACT SUMMARY

The impacts of implementation of the proposed Alternative for the Fire Management Plan are described and analyzed in this section.

Table 1. Summary Comparison of Impacts

Objective	Alternative I (Beneficial)	Alternative II (Beneficial)	Alternative III (Beneficial)
Provide for firefighter and public safety	Short-term safety would not be affected by the adoption of this alternative.	Firefighter safety in the long term is enhanced through use of mechanical treatments to reduce hazardous fuels, thus reducing the threat of large wildland fires driven by heavy accumulations of those fuels. Benefits are enhanced to the maximum extent possible through use of prescribed fire, mechanical treatments, and chemical use to reduce hazardous fuels. The ability to employ an appropriate management response provides the greatest protection of firefighter and public safety in suppression actions. Wildland fire prevention activities provide for long-term safety.	Firefighter safety in the long term is enhanced, though not to the same extent as in alternative II. In addition, the ability to employ an appropriate management response provides the greatest protection of firefighter and public safety in all suppression actions.
	(Adverse) Aggressive fire suppression poses greater risks to personnel than an appropriate management response by placing personnel in situations where fire control actions allow little flexibility for options in the decision-making process. Hazardous fuels may actually increase in the long term creating a greater hazard through the perpetuation of aggressive fire suppression.	(Adverse) Personnel will be exposed to short term impacts of working with power equipment, heavy lifting, and exposure to prescribed fire operations.	(Adverse) Inability to utilize prescribed fire reduces ability to accomplish fuel reduction throughout the park to the maximum extent. As a result, fuel loads may increase, with an increased potential for wildfires. Moderate impacts to risk in the long term for suppression resources.

Air Quality(avoid violation of air quality standards)	Alternative I (Beneficial)	Alternative II (Beneficial)	Alternative III (Beneficial)
	Aggressive suppression may limit the size of wildland fires reducing the amount of smoke produced to low levels in the short term. Because there is no prescribed fire in this alternative, there will be no smoke impacts from that activity.	Because fuels are removed through the combined effects of an integrated program of fuels management, impacts would be short-term and minor to moderate in those areas that have been treated. Generally, more fuels can be treated with this alternative.	Similar to Alternative II, except that not as much fuel is removed due to the lack of the availability of prescribed fire as a management tool. As in alternative I, there will be no smoke impacts from prescribed fire.
	(Adverse)	(Adverse)	(Adverse)
	Aggressive suppression of fires allows for the gradual build-up of fuels, thus creating the production of longer lasting and higher volume smoke impacts when wildland fires do occur. This may occur at times when environmental conditions favor stagnation and lack of dispersion.	Short term, minor impacts from smoke produced as a result of prescribed fires will result. Smoke on roadways and in the air could impact normal traffic patterns and disrupt transportation for short time periods. Persons already at risk from smoke and pollution (i.e. asthmatics) could be placed at further risk due to the presence of smoke in the atmosphere.	Impacts will still occur, though their effects will be moderate, both in terms of intensity and exposure. Because prescribed fire is not utilized as a management tool to reduce hazard fuels in this alternative, there would be no additional impacts due to smoke from prescribed fires; however, this benefit may be offset by the fact that not as much fuel is removed, thus increasing the potential for smoke intensity and duration when wildland fire does occur.
Protect and Preserve Cultural Resources (historic structures, earthworks, archeological resources, cultural landscapes, collections)	Alternative I (Beneficial))	Alternative II (Beneficial)	Alternative III (Beneficial)
	Historic Structures: Aggressive suppression of wildland fires may protect historic structures from immediate effects of a wildland fire in the short term. This would be accomplished chiefly through the construction of protective fireline and would constitute a moderate beneficial impact. Earthworks: No beneficial impacts are provided. Archeological Resources: Aggressive suppression could lead to short term protection and would be achieved largely through reduced potential for a wildland fire impacting the resource area. Minor beneficial impact in the short term. Cultural Landscapes: Fireline construction would be used to protect these resources. Minor short-term beneficial impact.	Historic Structures: Moderate long-term beneficial impacts to historic structures from mechanical and prescribed fire treatments would occur. These activities can be carefully planned and executed at appropriate times and locations. The use of appropriate management response in unplanned ignitions reduces the possibility of adverse impacts caused by aggressive suppression activities. This alternative should result in the lowest level of potential adverse impact upon historic structures. Earthworks: This alternative allows fire suppression resources the opportunity to <i>avoid</i> sensitive earthworks, thus negating damage caused from fire suppression operations. Prescribed fire is an effective tool in enhancing the growth of native grasses and forbs found on earthworks, thus reducing the amount and intensity of manual clearing necessary to either mow grasses and/or reduce woody vegetation that encroaches upon the earthworks.	Historic Structures: This alternative would provide minor beneficial impacts to historic structures resulting from mechanical treatments. The potential exists for incrementally greater impacts from foot traffic and mechanical devices due to the exclusion of prescribed fire. Use of appropriate suppression response in unplanned ignitions reduces possibility of adverse impacts due to suppression activities. Earthworks: Similar to Alternative II except that the positive effects of prescribed fire are not realized. More emphasis upon the use of mechanical fuel reduction (mowing and cutting) and herbicide use is necessary. Archeological Resources: The alternative would have moderate beneficial impacts upon archeological resources by allowing suppression resources the flexibility to manage wildland fires in a manner that minimizes exposure to heavy equipment and ground disturbing techniques. Hazardous fuel reduction achieved by mechanical treatment

	Collections: Because many collections are stored in structures, the impacts would be the same as in the historic structures section. Other collections, such as the artillery on exhibit in the fields at Yorktown would be subject to the same impacts.	Archeological Resources: This alternative would have moderate to major beneficial impacts upon archeological resources by allowing suppression resources the flexibility to manage wildland fires in a manner that minimizes exposure to heavy equipment and ground disturbing techniques. Hazardous fuel reduction achieved through a combination of both mechanical treatment and prescribed fire could be tailored to the site specific resource, thus maximizing protection. Cultural Landscapes: By utilizing suppression activities that take advantage of natural fuel breaks, more invasive ground disturbance suppression activities are avoided. Prescribed fire is particularly effective in restoration of the historic vegetative character of these landscapes (both field and forest) and helps preserve the open character of the fields as well as enhancing the oak hickory forest types found in the witness woodlots. This alternative provides moderate to major beneficial impacts on cultural landscapes. Collections: Because most collections are stored in structures, the impacts would be the same as in the historic structures section. . Other collections, such as the artillery on exhibit in the fields at Yorktown would be subject to the same impacts.	could be tailored to the site specific resource, thus allowing for effective protection. Cultural Landscapes: By utilizing suppression activities that take advantage of natural fuel breaks, more invasive ground disturbing activities are avoided. Hazard fuel reduction and manual manipulation of forest systems can enhance the cultural scene found in oak hickory forest systems in the short term. This alternative provides minor beneficial impacts on cultural landscapes. Collections: Because the majority of the collections are stored in structures, the impacts would be the same as in the historic structures section. The remainder of the collections, such as the artillery on exhibit in the fields at Yorktown would be subject to the same impacts.
	(Adverse)	(Adverse)	(Adverse)
	Historic Structures: This alternative allows the potential for major adverse impacts resulting from aggressive suppression activities. Heavy accumulations of fuel may expose historic structures to the potential for significant long term major impacts as a result of increased fire potential and severity. Earthworks: The potential For ground-disturbing fireline construction and the impacts wrought by	Historic Structures: Even when appropriate management response strategies are utilized in fire suppression, there is still potential for minor impacts to historic structures in the short term. The use of appropriate management response in unplanned ignitions reduces possibility of adverse impacts caused by aggressive suppression activities. Although negligible, the potential for adverse impacts to historic structures from mechanical and prescribed fire treatments exist. Since these activities can be	Historic Structures: In this alternative, there is potential for negligible short-term adverse impacts to historic structures from mechanical treatments, though a potential exists for incrementally greater impacts from foot traffic and mechanical devices with the exclusion of prescribed fire. Use of appropriate suppression response in unplanned ignitions reduces possibility of adverse impacts due to suppression activities. Earthworks: The implementation of this alternative would produce

	those activities is high in this alternative, and represents the greatest single threat to earthwork preservation. Archeological Resources: Because these types of resources can be damaged seriously from ground-level suppression activities such as fireline construction, moderate long-term impacts could occur. Cultural Landscapes: Under this alternative, no pro-active activities would take place to protect these resources in the long-term. Impacts would increase over time due to the build-up of hazardous fuels, thus setting the stage for more destructive wildfires. Impacts would be long-term and moderate to severe. Collections: Because most collections are stored in structures, the impacts would be the same as in the historic structures section. Other collections, such as the artillery on exhibit in the fields at Yorktown would be subject to the same impacts.	carefully planned and executed at appropriate times and locations, the potential for adverse impacts is greatly reduced. This alternative should result in the lowest level of potential adverse impact upon historic structures. Earthworks: The implementation of this alternative would produce impacts on earthworks identical to those described for historic structures. Archeological Resources: Mechanical and prescribed fire operations have the potential to expose these types of resources to the negative effects of weather as well as exposing them to potential predation by relic hunters and artifact seekers. Impacts can be classified as minor and short-term. Cultural Landscapes: Short term adverse minor visual impacts could result from the use of this alternative. Generally speaking, areas such as native grass fields would recover and green-up in two weeks or less, while forest areas might take considerably longer to recover from the visual effects of a prescribed burn. This would include the presence of dead trees (snags) and blackened scorch marks on tree trunks. Collections: Because most collections are stored in structures, the impacts would be the same as in the historic structures section. . Other collections, such as the artillery on exhibit in the fields at Yorktown would be subject to the same impacts.	impacts on earthworks identical to those described for historic structures. Archeological Resources: Mechanical hazard fuel reduction methods have the potential to disturb archeological resources through the cumulative effects of increased foot traffic and mechanized equipment use. Costs for the manual reduction of hazardous fuels are often prohibitive, often resulting in long periods of non-treatment and inactivity. Minor to moderate short to long-term adverse impacts can occur. Cultural Landscapes: Greater reliance on invasive mechanical measures (such as mowing) to modify and/ or enhance cultural landscapes increases the potential for damage to resources through impactation of soil. The inability to deliver ecological benefit through processes that enhance understory components of the oak hickory forest system, such as prescribed fire, may cause a reduction in the reproductive capabilities of these important cultural landscapes. Moderate long term adverse impacts may result. Collections: Because most collections are stored in structures, the impacts would be the same as in the historic structures section. . Other collections, such as the artillery on exhibit in the fields at Yorktown would be subject to the same impacts.
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Vegetation	Alternative I (Beneficial)	Alternative II (Beneficial)	Alternative III (Beneficial)
	Short-term impacts on vegetation would not be effected by the adoption of this alternative.	This alternative would be beneficial in maintaining viability in the oak hickory forest and forest understory vegetation. The use of low-intensity prescribed fire, combined with selective cutting of undesired species, and their subsequent treatment with herbicides, is expected to favor oak and hickory reproduction, a component of the park ecosystem that is in general decline. In addition, this forest type provides important food sources for wildlife and cover for nesting and breeding activities for many species. Open areas in the park would be enhanced through the restoration of native arm season grasses and from changes in patterns of plant succession. Encroaching invasive species would be reduced. Impacts from prescribed fire and mechanical treatments should be short-term and negligible to minor. Use of appropriate management response should reduce potential suppression-related impacts.	Impacts from mechanical treatments should be short-term and negligible to minor. Selective cutting of undesired species will favor oak and hickory reproduction, though not to the extent as in Alternative II.
	(Adverse)	(Adverse)	(Adverse)
	Aggressive suppression activities have the potential to cause local and minor adverse impacts. Oak hickory forests would become decadent with attendant loss of ecological diversity and structure. Long term control of wildland fires would become more difficult due to additional fuel loading. Open areas in the park could become smaller due to processes of vegetative succession. Ecosystem diversity would not be optimized.	The potential for the short-term introduction and proliferation of invasive species is present in this alternative. There is a reduced benefit to those species that are not fire-tolerant. Impacts from the use of herbicides could have impacts upon wildlife, either directly as a result of application, or indirectly through removal of food supply and nesting or cover sources. Wetlands and water quality could also be affected by herbicide use.	The potential is greater for adverse impacts due to increased foot and/or machine traffic, if more invasive forms of mechanical reduction are utilized. Use of appropriate management response should reduce potential suppression-related impacts. Oak hickory forests and open areas will not benefit from the use of the restorative benefits of prescribed fire. In addition, some sprouting of unfavorable species will occur.

Adjacent Communities and Landowners	Alternative I (Beneficial)	Alternative II (Beneficial)	Alternative III (Beneficial)
	The implementation of this alternative would have little or no short term affect on park neighbors and adjacent communities since this alternative would be one of continuation of current operations. In the long term, the increased potential for wildland fire, accompanied by public development along the park boundary, could lead to moderate long term benefit through the development of cooperative fire suppression and training in order to meet the increased wildfire risk potential.	Local communities and landowners would accrue moderate long term benefit from the utilization of prescribed fire and hazard reduction in areas along the park boundary. Increased public participation in the protection and perpetuation of park natural and cultural resources as a means to ensure the same benefits for their own lands would result. Positive results of this cooperative protection effort would be directly proportional to the effort expended in program development and implementation at the park level.	The implementation of this alternative offers many of the benefits of both alternatives I and II, without the potential negative effects that can result from prescribed fires that escape control or exceed intensity. This alternative offers minor long term beneficial impacts.
	(Adverse)	(Adverse)	(Adverse)
	The implementation of this alternative would eventually result in the degradation of park resources to the extent that the potential for a catastrophic wildland fire and subsequent loss of valuable natural and cultural resources could occur, both in and outside of the park. This could directly impact private landowners and the public outside of the park as well as park visitors and constitutes a moderate to major adverse impact.	The potential for a prescribed fire escape and/ or the impacts of an improperly executed prescribed burn could lead the public to question the wisdom of implementing this alternative. As a result, this alternative might not be implemented which would result in an increased risk to developments both in and outside of the park, particularly along the boundary where public development is expected to take place in the future. These impacts could be major and long term, but could be mitigated by an effective proactive education effort.	Although, at first glance, this alternative might seem attractive to the general public, a closer examination reveals that its implementation could have long term moderate to major impacts upon park and local community resources. Oak hickory forests would continue to reach a decadent state, and open fields would be reduced in size and vegetative composition. These changes would be accompanied by a general reduction in species composition and diversity of all types. Since these types of changes, over time, occur spatially across landscapes, impacts would most likely have an effect on local communities as well as the park.

Wildlife	Alternative I (Beneficial)	Alternative II (Beneficial)	Alternative III (Beneficial)
	Lack of prescribed fire and aggressive suppression of wildland fire generally favors fire intolerant species, particularly those that thrive in non-disturbance ecosystems. For example, some species such as the grey squirrel and the opossum flourish in areas where disturbance events are minimized. Long term minor impacts result.	Increased diversity and abundance of species will occur through an improvement of habitat. This applies to both forest as well as open field systems. An elevation in reproductive rates will result from an increase in nutrient availability and habitat improvement. Long term moderate beneficial impacts result.	Long term minor habitat improvements can be expected, though these may be limited dependent upon funding for hazardous fuel reduction projects. Fire intolerant species will benefit in the short term.
	(Adverse)	(Adverse)	(Adverse)
	Fuel loading levels will increase exponentially with time. Long term major impacts on wildlife, driven by the accumulation of hazardous fuel loadings, cause wildland fires to exhibit fire behavior and spread rates that are difficult to suppress. As a result, wildland fires will burn with greater intensity and for longer periods of time. Loss of vegetation and the wildlife that utilize it, both as food and for cover, can be expected when this occurs. Wildlife diversity and abundance will remain low in the park.	Some mortality of individuals may occur during prescribed fire operations. These are generally negligible and short term in their impact and isolated in scope.	The major adverse long term impact regarding this alternative is the inability to utilize those management tools, such as prescribed fire, that replicate natural processes and, as a result, produce an increase in wildlife habitat and species diversity. Impacts will not be as dramatic as those in alternative I, but species diversity and abundance will remain at low levels.
Soils	Alternative I (Beneficial)	Alternative II (Beneficial)	Alternative III (Beneficial)
	There will be no soil disturbance in the short term occurring unless and until wildland fires occur. Negligible short term impact.	The use of appropriate management response suppression techniques and rehabilitation during wildland fire suppression minimizes impacts to soils through alternative strategies and tactics that minimize such soil disturbance activities such as the use of mechanized equipment and handline construction. In addition, in areas where soils are more prone to damage, this alternative allows for the ability to avoid the area altogether, engaging in fire suppression activities on more favorable	The same as alternative II except that the inability to utilize prescribed fire limits the potential benefits that would otherwise accrue through the implementation of those strategies and tactics. Minor to moderate impacts in the long term.

		ground. Prescribed fire removes hazard fuels and greatly reduces the potential for intense wildland fires that might otherwise have adverse impacts upon soils. The use of prescribed fire enhances native warm season grasses thus protecting soils from erosion and potential deleterious effects of some invasives. The use of prescribed fire also reduces the reliance upon mechanical and manual methods of hazard fuel reduction, thus reducing foot and mechanized equipment impacts on soils. Moderate impacts in the long term.	
	(Adverse)	(Adverse)	(Adverse)
	The use of aggressive suppression strategies and tactics may cause more disturbances of soils than in the other alternatives. This effect is potentially exacerbated by the suppression-only policy of this alternative that allows fuels to buildup on the soil surface, creating potential for wildland fires that burn with more intensity and for longer periods of time, thus impacting soils in a negative manner. Dependent upon environmental conditions and fireline intensity, moderate to major impacts on soils may occur.	Soil stability may be disturbed in the short term. The removal of some vegetation through the use of prescribed burning can increase the susceptibility of soil to erosion. These effects can be mitigated through seeding and other erosion prevention strategies. Minor impacts overall with the implementation of this alternative.	Due to increased reliance upon hazard fuel removal techniques that require the use of personnel and mechanized equipment, the potential for soil disturbance is increased. Because these techniques may not be able to be implemented in some areas due to limited access, lack of resources needed to accomplish the work, inadequate funding, etc, fuel accumulations may continue to increase over time creating potential for wildland fires that burn with more intensity and for longer periods of time, thus impacting soils in a negative manner. Moderate impacts overall with the implementation of this alternative.
Floodplains, Wetlands And Water Quality	Alternative I (Beneficial)	Alternative II (Beneficial)	Alternative III (Beneficial)
	There might not be disturbance of wetlands and wetland systems in the short term due to the lack of wildland fires. Depending upon fire intensity, location, and time of year, invasive plant populations might not be encouraged to proliferate, since inappropriately placed and timed wildland fires encourage the proliferation of some invasives through site disturbance.	The ability to utilize appropriate management response strategies and tactics in wildland fire suppression largely avoids the unnecessary impacts associated with aggressive fire suppression tactics and strategies. Hazardous fuels may be removed incrementally and at the appropriate time and place for overall ecosystem benefit. In addition, invasive species could be dealt with in the same beneficial manner. Ecosystems may accrue enhanced minor to moderate	Same as Alternative II, except that long term ecological benefits are reduced through the inability to utilize prescribed fire as an ecosystem enhancement tool. As a result, only minor short term benefits are likely to accrue.

		benefit in the long term.	
	(Adverse)	(Adverse)	(Adverse)
	The use of aggressive wildland fire suppression strategies and tactics can have short to long term minor to moderate negative impacts upon wetlands, floodplain areas and water quality. This is achieved largely through disturbance caused by fireline construction, both by personnel and mechanized equipment, and through the use of chemical fire retardants and fire suppressants.	The ability to utilize an integrated approach to fire management, allows managers the ability to minimize the negative impacts of suppression activities, prescribed burns, and various non-fire treatments. The use of prescribed fire at the wrong place and/ or the wrong time could result in short term negative impacts on wetlands, flood plains, and water quality. These would generally be minor in nature and would be "repaired" in relatively short time by a healthy ecosystem.	Non-fire fuel and vegetation manipulation techniques, while effective, are difficult to implement across broad ecosystem landscapes, their cost is high, drawdown on personnel resources needed for implementation is high, and effectiveness is often short term and limited unless timely follow-up processes are adhered to. This may not always be possible due to management constraints imposed by budget reductions, lack of personnel, and the lack of appropriate environmental conditions.
Threatened and Endangered Species	Alternative I (Beneficial)	Alternative II (Beneficial)	Alternative III (Beneficial)
	In the short term, lack of wildland fires would have little or no appreciable impact upon species of concern.	Through the implementation of this alternative, long term ecosystem processes would be enhanced. The bald eagle would probably benefit from the implementation of this alternative largely through the enhancement of forest ecosystems that provide nesting and hunting perches. Benefits would be moderate and would likely occur in the long term.	Long term ecosystem enhancement, upon which the bald eagle and other species on concern ultimately depend, may be restored on a select basis, though not to the extent as in alternative II.

	(Adverse)	(Adverse)	(Adverse)
	In the long term, minor to moderate negative impacts could result for many species as a result of the potential damage inflicted by aggressive wildland fire suppression strategies and tactics, spread and proliferation of invasive species, and lack of ecosystem restorative process in both wetland and forest habitats which would indirectly affect species like the bald eagle.	Short term negligible impacts could accrue due to the implementation of some prescribed fire and non-fire treatments; primarily resulting from smoke and the presence of personnel in and around nests. These activities can be mitigated depending upon timing of treatments.	Lack of the ability to use prescribed fire limits the potential for the breadth and scope of ecosystem restoration. The long term loss of wetland and forest habitat may have minor short to long term impacts upon bald eagle nesting, hunting, and feeding.

Impact Analysis/ Environmental Consequences

1. Provide for Firefighter and Public Safety

Affected Environment.

Colonial National Historical Park does not currently have a Fire Management Plan. However, all National Park Service areas capable of sustaining wildfire are required to have a fire management plan in place as soon as practicable. The overriding goal of this fire management plan will be for the protection of park resources and also to provide a safe environment for visitors, park personnel, and adjacent property owners. Perhaps the most important goal of any fire management planning effort, and COLO is no exception, is the provision for the protection of park resources, visitors, personnel, and adjacent land owners. Safety is always number one!

Methodology.

All available information on wildland fire operations and safety was compiled. Intensity of effects is defined below.

Negligible – Impact barely detectable and not measurable; if detected, would have slight effects.

Minor – Impact measurable but short-term and localized. No mitigation measures would be necessary.

Moderate – Changes in safety would be measurable and would have consequences to personnel and resources. Mitigation measures necessary and likely effective.

Major – Changes in safety would be measurable and would have substantial consequences to resources. Mitigation measures necessary and success of measures not assured.

Cumulative – Impacts, though negligible, add up though time becoming minor to major and may be hazardous and irreversible.

Regulations and Policies.

Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions: Park natural and cultural resources, including visitors, personnel, and adjoining landowners would be protected from unsafe practices emanating from within park boundaries.

Source – NPS DO-18 (2003).

Impacts of Alternative I - No-Action

Impact Analysis

Under the no-action alternative, a fire management plan would be developed that would address safety issues involved with preparedness for wildfires and firefighter training. No hazardous fuel reduction or wildfire prevention would be adopted. Under this alternative the safety of firefighters would be enhanced in the short term due to less exposure to fire. However, there would be a moderate to major long term risk to both the general public and firefighters as a result of the accumulation of fuels that may increase the seriousness of wildfires that occur. While the risk of wildfires is relatively low, should one occur, the present and future accumulations of fuels in some areas is sufficient to seriously jeopardize human life, property, and resources. Firefighters would be forced to aggressively suppress ignitions that might be beyond their effective capability to safely suppress, thus significantly increasing the threat to firefighter and public safety. Overall, this would be a moderate to major adverse impact.

Cumulative Effects

The accumulation of forest fuels over time presents a greater risk to firefighters with this alternative, since firefighters are working under a suppression strategy that dictates aggressive suppression such as line construction and the extinguishing of residual fires, regardless of the intensity and size of the fire. Since many fire suppression agencies outside of the park employ this type of response, the use of this alternative could lead to a continued accumulation of hazardous fuels across the general landscape and, hence greater potential for large fires and increased risk to suppression personnel.

Conclusion

The no-action alternative would have temporary moderate to major impacts on the safety of resources both in the park and outside. The implementation of this alternative would place the safety of some critical park resources, i.e. firefighters, at increased risk; thus making the implementation of this alternative less desirable than any of the other alternatives.

Mitigation

Firefighters engaged in suppression activities will be required to be trained in firefighter safety as dictated through RM-18. Because wildland fires may be burning at high intensity levels, firefighters may have to “back off” from some intense fires and suspend operations until environmental conditions are again favorable for suppression efforts.

Impacts of Alternative II – Preferred Alternative

Impact Analysis

The most beneficial result of the implementation of this alternative is the decreased potential for both the ignition and propagation of wildland fires. Both of these phenomenon's are directly related to the amount of fuel that is available to burn in a wildland fire situation. By utilizing a variety of reduction methods, managers will be able to reduce hazardous fuel accumulations over a broad spectrum of environmental conditions. The effectiveness of these reduction activities are enhanced in this alternative by the ability to utilize increasingly low impact reduction methods, such as prescribed fire and herbicides. Effective treatment utilizing this integrated management approach will assist in maintaining fuels in a safe state for an extended period of time (generally 5-10 years per treatment). Although safety is of paramount importance in prescribed fire operations, some risk of injury is possible. Adequate training, planning, and supervision minimize the likelihood of problem occurrences.

Cumulative Effects

The ability of the park to utilize integrated management activities in reducing excess fuel loading, combined with the coordinated efforts of adjacent local agencies such as the Virginia Department of Forestry and the United States Military, would assist in creating an environment where the potential for wildland fires is decreased through cooperative effort.

Conclusion

This alternative provides the best opportunity for safety of both park resources and the public of the alternatives considered. Its implementation provides the opportunity for long term protection through joint cooperative fire prevention and suppression that presents only minor risks to park and public resources. Properly implemented programs

of hazard fuel reduction, especially those of the interagency variety, greatly decrease the risk to personnel as well as to cultural and natural resources.

Mitigation

Firefighters engaged in suppression activities will be required to be trained in firefighter safety as dictated through RM-18. Since they will also be engaged in hazardous fuel reduction activities, personnel will have to be trained in the use of chainsaws, chippers, brush cutting, and related safety equipment. Prescribed fires can be utilized during those time periods when environmental conditions are favorable to the safety of firefighters and the public and in accordance with the approved prescribed burn plan. For example, prescribed fires would only be used during time periods when exposure to smoke is minimized through the combination of environmental parameters conducive to smoke dispersion. Herbicides would only be applied by trained and qualified practitioners as outlined in NPS policy (NPS-77).

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

This alternative provides some of the benefits associated with non-fire reduction of hazardous fuels, but falls short of providing the long-term protection of the preferred alternative. The exclusion of prescribed fire as a tool in this alternative eliminates the ability to reduce fuels in those areas where access is limited, and prevents the follow-up low maintenance benefits of fuel reduction that the preferred alternative provides. As a result, impacts on safety are confined to minor risks, but are extended over a longer period of time than in the preferred alternative.

Cumulative Effects

Similar to the preferred alternative, but the cumulative accumulation of fuels in some areas where manual reduction methods are unable to be used, such as in those areas where access is limited, may lead to moderate impacts on safety through increased fuel loadings and potentially higher intensity wildfire events.

Conclusion

This alternative provides some of the advantages of the preferred alternative in the short term, but fails to capitalize on the long term benefits of an integrated fuels management treatment program involving the use of prescribed fire. The risk associated with non-fire hazard fuel reduction methods (chainsaws, brush cutters, axes, herbicides), is proportional to the level of experience and training that the personnel involved in these types of activities possess.

Mitigation

Same as alternative II but without prescribed fire.

2. AIR QUALITY

Affected Environment.

Colonial National Historical Park is classified as a Class II Air Quality area. A Class II designation indicates the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter, as specified in the 1963 Clean Air Act (42 U.S.C. 7401 *et seq.*). Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts.

At the present time, the Virginia Department of Air Quality's Division of Air Pollution Control classifies the counties where the park (James City, York and Surry) is located as being attainment areas for both ozone and carbon monoxide. Despite this fact, air pollution is a potential problem in the park. Of major concern is the fact that regional pollution sources from nearby Richmond industrial plants, Hopewell chemical industries, and Providence Forge and West Point wood and pulp production plants, are exerting potential negative impacts on park air quality. In the Hampton Roads area sources of potential pollution include construction, ship building, power generation, industrial production, and considerable automobile and air traffic. Rapid urban growth in the area is expected to continue, along with attendant increases in commercial development, highways, traffic, and congestion. Minor pollution originating inside the park generally takes the form of auto emissions, wind-blown dust, soil, and smoke from infrequent wildland fires.

Methodology.

All available information on air quality was compiled. Intensity of effects are defined below.

Negligible – Impact barely detectable and not measurable; if detected, would have slight effects.

Minor – Impact measurable but short-term and localized. No mitigation measures would be necessary.

Moderate – Changes in air quality would be measurable and would have consequences to sensitive receptors, but effects are localized. Mitigation measures necessary and likely effective.

Major – Changes in air quality would be measurable and would have substantial consequences to sensitive as well as to non-sensitive receptors. Mitigation measures necessary and success of measures not assured.

Cumulative – Impacts, though negligible, add up though time becoming minor to major and may be irreversible

Regulations and Policies.

Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions - Air quality related values would be protected from pollution sources emanating from within and outside park boundaries. Park management activities do not violate Federal and State air quality and conformity standards.

Source – Clean Air Act; NPS Organic Act; NPS *Management Policies* (2001).

Impacts of Alternative I - No-Action

Impact Analysis

Under the no-action alternative, wildland fires would be aggressively suppressed with the primary goal of keeping wildland fires to the smallest acreage possible. Direct adverse impacts to air quality from wildland fire under this alternative would include the release of particulates and smoke into the airshed. Since these fires would most likely be the result of heavier than normal accumulations of dead and downed fuel, fire intensity and duration could provide considerable resistance to control for suppression resources. This condition is somewhat mitigated by the fact that, even though areas of excessive hazardous fuel are located in the park, they are generally not continuous, but rather are composed of isolated cells of heavy fuel that are not always interconnected with one another. This fact may give suppression resources the opportunity to isolate heavy fuel accumulations and suppress fires in a more expeditious manner. This would reduce smoke and particulate emissions. Generally, durations of smoke particulates would range from minor to moderate (1-5 days). In most cases, especially those in which drought is not a factor, fires will produce a short term impact. The generally high humidity found in the area lends itself to the production of increased smoke, since fuels readily absorb the moisture in the atmosphere and require large quantities of heat in order to accomplish complete combustion. The fire suppression tactics used in this alternative would focus on extinguishing fires as quickly as possible. This would normally minimize smoke production because the total number of acres burned would be kept to a minimum.

Cumulative Effects

Due to the short-term nature of most wildland fires, the cumulative effects on air quality would be localized and minor. This alternative would not contribute to cumulative effects on air quality in the long term. Air quality in the park would continue to be impacted from

daily vehicle emissions on park roads and other management activities that utilize power-driven machinery. Outside of the park, backyard trash burning, a common practice in rural and suburban communities, would continue and present a consistent impact on air quality over time. Development along the boundary is expected to accelerate in the future with increased demand for housing and commercial land. At the present time, very little use of prescribed fire occurs in the area, though that is expected to change during the next ten years as the Virginia Department of Forestry and various military reservations such as the USNWS Yorktown now anticipates using this management practice as a tool to manage forest resources in areas found on their lands in the vicinity of the park.

Conclusion

The no-action alternative would have temporary short term (1-4 days) minor to long term (7+ days) moderate impacts on air quality due to the effects of wildland fire. Wildland fire smoke impacts would be minimized in the case of smaller fires that result from the implementation of aggressive suppression tactics. It should be noted that there may be cases where fires, particularly those driven by excess hazardous fuel loadings, may exceed the capabilities of suppression resources to effectively and safely suppress, thus allowing fires to burn with increased intensity and resultant increased smoke production. Despite the potential for adverse impacts in the short term, the adoption of this alternative does not constitute impairment.

Mitigation

During aggressive fire suppression activities, the rapid suppression of fires and the extinguishment of residual smoke during the mop-up phase generally help reduce smoke impacts, particularly during the smoldering phase of combustion often seen during these waning periods of a wildland fire's life cycle.

Impacts of Alternative II – Preferred Alternative

Impact Analysis

Wildland fire suppression, non-fire hazard fuel reduction and prescribed fire would result in minor to moderately adverse, but short term (1-4 days) impacts to air quality. Depending on the tactics of wildland fire suppression used, air quality impacts could be prolonged because tactics would be employed to minimize potential resource damage. As a result, wildland fires could burn longer and consume more total acres. This would lead to minor to moderate smoke impacts of longer duration (5-6 days). Indirect adverse impacts resulting from these emissions could be responsible for reduced visibility along park and public roads, reductions in visitor use due to the presence of smoke, and odors, and potential health effects to sensitive receptors, including local park residents and the visiting public. These adverse impacts would be short to long term (7+days), localized, and minor. Smoke from prescribed fires is only present during the time period when a prescribed burn is being implemented. This includes those time periods when mop-up activities will be in process and residual smokes will be suppressed and

eliminated. Since most prescribed burns at the park are projected to be small in acreage, a typical burn would last approximately 4-12 hours. Smoke from prescribed fire can be minimized by altering ignition patterns and burning during times of the day when smoke dispersal would be maximized. In spite of these measures, minor to moderate short term impacts could occur.

Cumulative Effects

Because of the relatively short duration of these non-fire fuel reduction and prescribed fire management activities, this alternative would not contribute to the cumulative impacts of air quality over the long-term. Air quality in the park would continue to be impacted in the short term with minor impacts from such uses as daily vehicle emissions and other similar management and/ or public activities such as trash or backyard burning. In the long term, adverse impacts would be lessened as accumulations of hazardous fuels were reduced through fuel reduction strategies (manual, mechanical, prescribed fire) both in and outside the park through cooperative efforts with neighbors and sister agencies.

Conclusion

This alternative would have a temporary minor to moderate adverse impact on air quality in those areas where hazardous fuels are being removed, either by non-fire fuel reduction or through prescribed fire. Wildland fire smoke impacts may be increased in the short term through the use of the appropriate management response to fire suppression tactics. In the long term, this same approach allows more fuels to be consumed and may actually reduce the potential for both smoke production and duration. Smoke impacts from prescribed burns are short term, usually from between 4-12 hours, and may be planned for periods of the day when environmental conditions are maximized for smoke dispersion and direction, a major change from most wildland fires resulting from human causes. These types of fires typically result from human activities such as refuse burning, unintentional ignitions resulting from improper use of fire, and even arson, that typically occur during periods of the day/ night when environmental conditions are such that smoke production is increased (higher relative humidity/ greater fuel moistures) and dispersion is reduced (stable atmospheric conditions). The adoption of this alternative does not constitute impairment.

Mitigation

Extinguishment of residual smoke from burning fuels during wildland fire incidents.
Coordination with adjacent regulatory agencies before prescribed fire operations.
During prescribed fire operations, a variety of techniques may be utilized to reduce the production of smoke emissions and/ or plan for their dispersion:

- Ignitions only implemented when relative humidity is optimized for fuel consumption (less smoke production in a “clean” burn.
- Fuel moistures are relatively low

- Ignition patterns utilized that minimize smoke production (backing fires).
- Mixing heights at least 500 meters or more
- Transport winds greater than 12 mph
- Wind direction away from critical identified targets
- Prescribed burn projects compartmentalized into smaller units, resulting in smaller sections burned with less smoke production.
- Burning during periods of atmospheric instability (daylight hours)
- Press releases and public contacts will be made prior to implementation of a prescribed burn or as soon as possible during a suppression effort, particularly in regard to those areas designated as being sensitive receptors.

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

Wildland fire suppression (appropriate management response) and non-fire hazard fuel reduction would cause minor to moderate adverse, but short term impacts to air quality. Depending upon the wildland fire suppression tactics utilized, air quality impacts could be prolonged because tactics would be employed to minimize potential resource damage. As a result, wildland fires could burn longer and consume more total acres, leading to minor to moderate smoke impacts over longer periods of time. This alternative would eliminate smoke from prescribed fires and would rely upon non-fire (manual, mechanical, chemical) methods to reduce hazardous fuel accumulations.

Cumulative Effects

There would be no short term smoke produced from prescribed fires in this alternative. Because of the short duration of most hazard fuel reduction activities, this alternative would not contribute to the cumulative impacts of air quality over the long-term in the strict sense of the activity. But, because prescribed fire is not available as a fuel reduction tool in this alternative, potential for increased fuel loading to occur over time may lead to increased wildland fire activity and smoke production in the future. Air quality in the park would always be impacted in the short term from daily vehicle emissions and other management activities, both in and outside of the park, such as trash or backyard burning.

Conclusion

The implementation of this alternative could have a short term minor to moderate adverse impact on air quality in those areas of the park where non-fire reduction of hazardous fuels is undertaken. Although these methods are an effective means of removing hazardous fuels, they are at the same time a costly, labor intensive treatment that depends upon significant funding for implementation. Funding for these projects

may or may not be available. As a consequence, significant amounts of fuel may continue to exist which increases the potential for smoke impacts, both in terms of intensity and duration, when wildland fires do occur in untreated areas. The adoption of this alternative does not constitute impairment.

Mitigation

Extinguishment of residual smoke from burning and smoldering fuels during wildland fire incidents would occur.

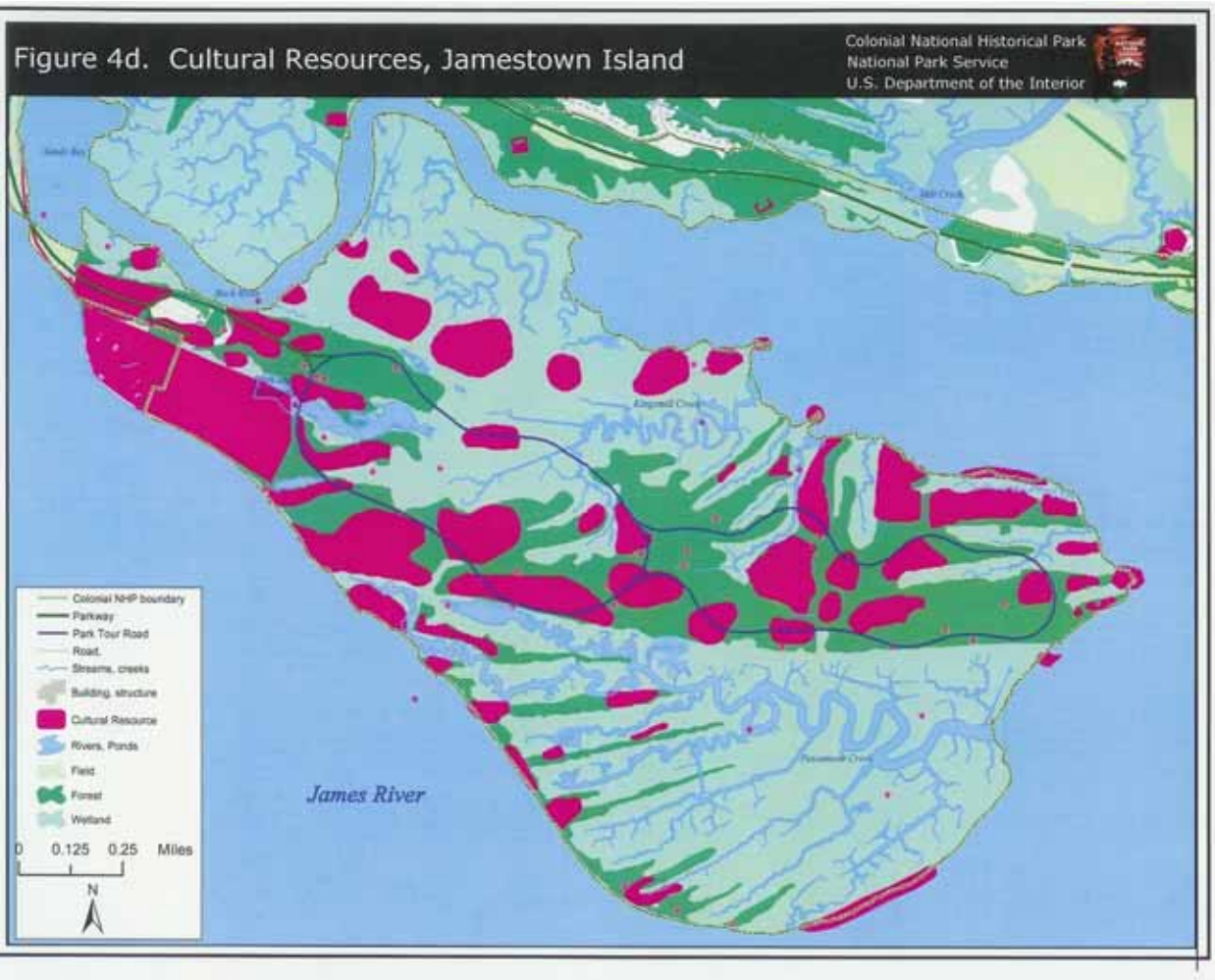
Press releases and public contacts would be made as soon as possible during a suppression effort, particularly in regard to those areas designated as being sensitive receptors.

3. Protect and Preserve Cultural Resources.

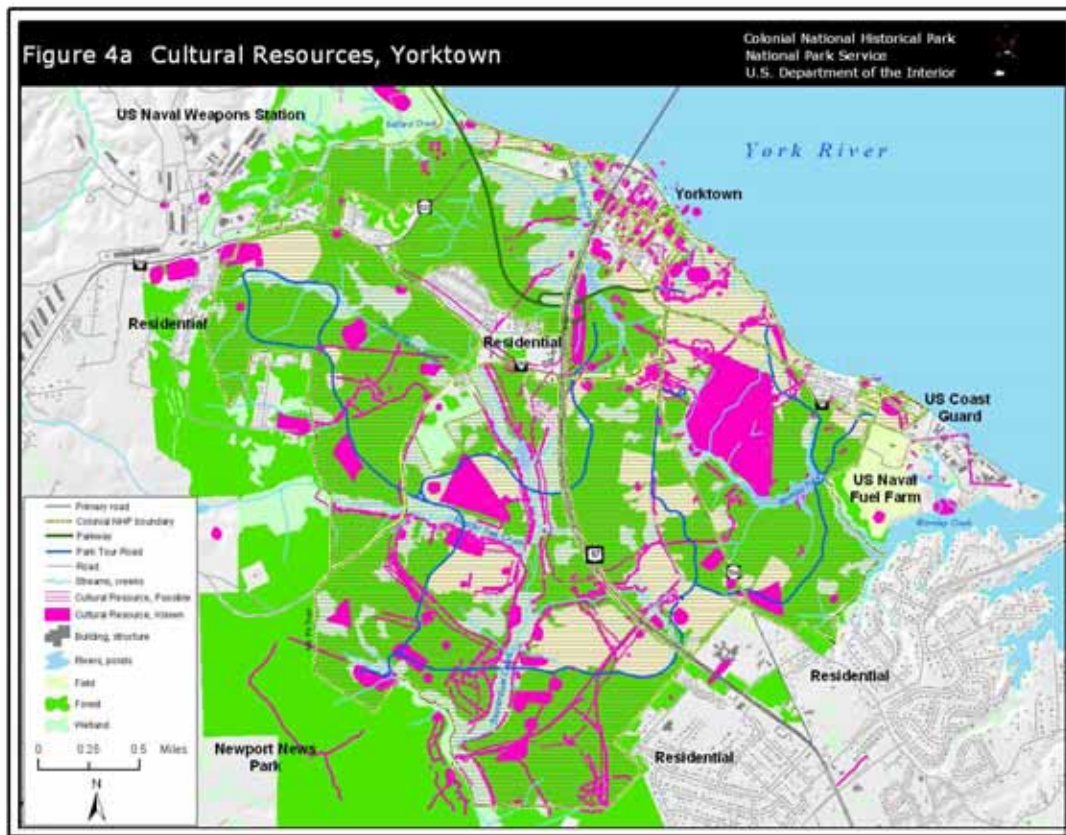
Affected Environment.

Colonial National Historical Park contains a variety of prehistoric and historic resources; both aboveground and below grade. Artifacts vary from those of the prehistoric variety that are thousands of years old to historic 17th, 18th, 19th, and 20th century materials. Most of the historic resources relate to the British colonial period in some way, but Spanish and northern European sites may also exist in the park.

Jamestown is the site of the first permanent English settlement in North America, which was established in 1607. Resources in this area are primarily archeological sites of the 17th and 18th centuries. However, there are also structures such as the Ambler House ruins, the 1907 Monument and Civil War earthworks, as well as historic roads, berms, and ditches scattered throughout the island (Figure 4d).



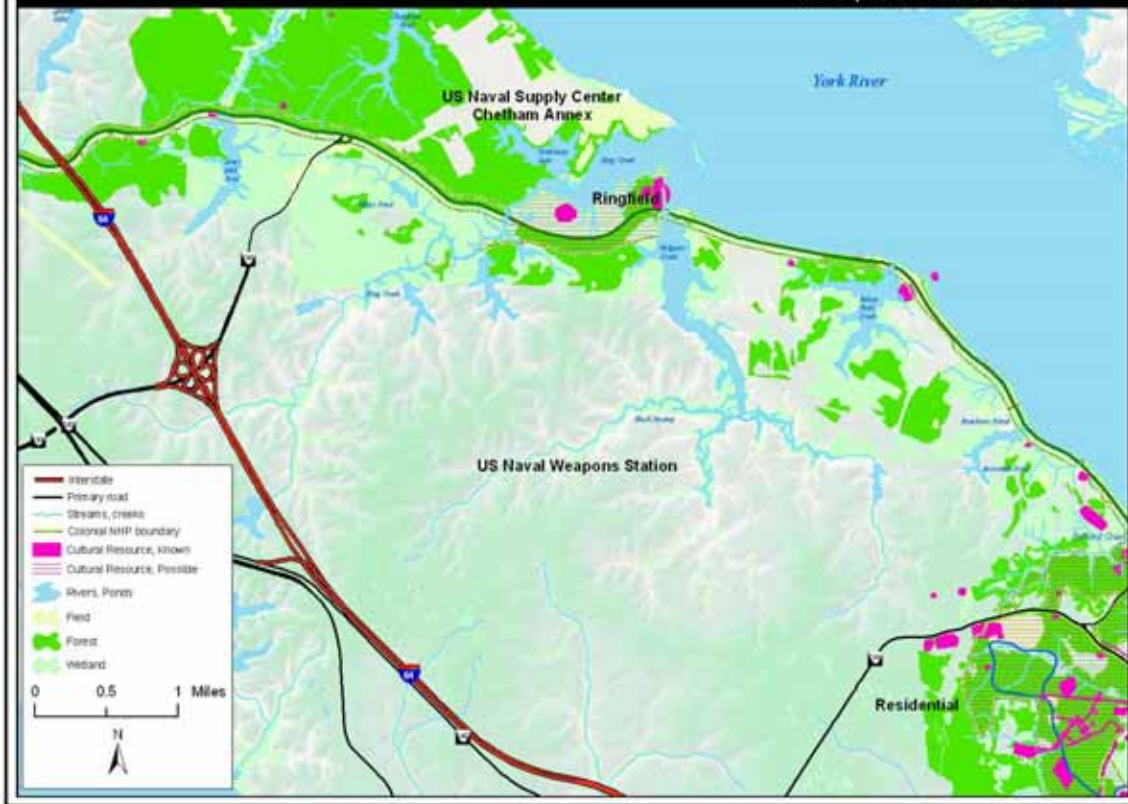
Yorktown battlefield is the site of the last land conflict of the Revolutionary War. Battlefield resources consist of archeological sites, buildings, and monuments (Figure 4a) relating to the siege that took place between September 28 and October 18, 1781. Various other cultural resources also exist on the battlefield site, including earthworks from the Revolutionary War, the Civil War (some of which used original 1781 structures as a base for their construction) and the Civilian Conservation Corps (CCC) period.

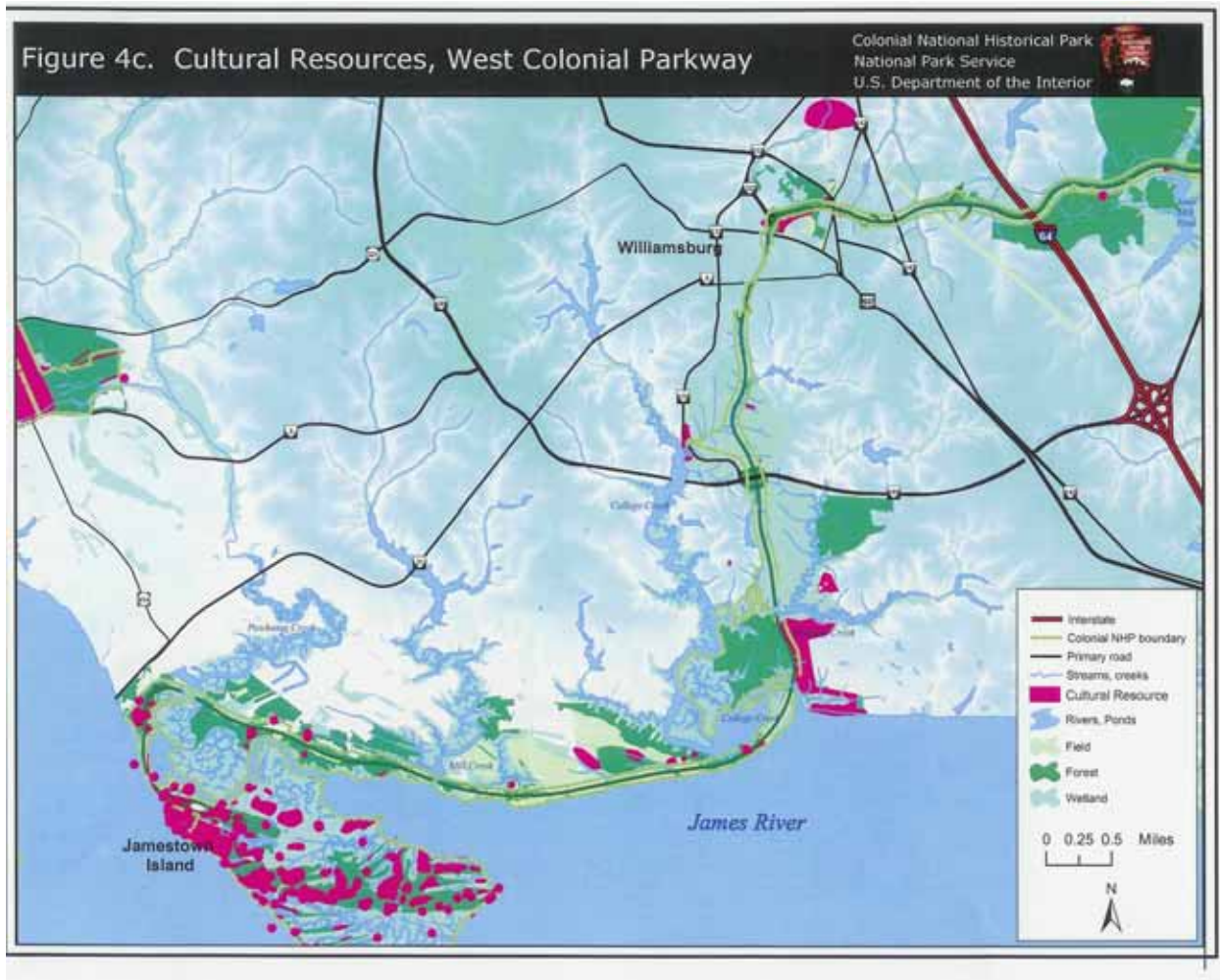


The Colonial Parkway was built between 1931 and 1957 in order to establish a connection between Yorktown, Williamsburg, and Jamestown. The road was developed in order to maintain a link that projected a “country road” flavor between the entities mentioned in the previous paragraph. In addition, it was also designed to preserve the rural nature of the landscape between important sites of British colonial history. Included along the parkway are archeological sites, structures, and monuments that relate to events which took place between the 17th and 20th centuries. In addition, there are Civil War earthworks found at various locations within the Parkway boundary, as well as a number of significant bridges, culverts, a tunnel, walls (at the Marine Barracks), and even the road bed of the Parkway itself (Figures 4b and 4c).

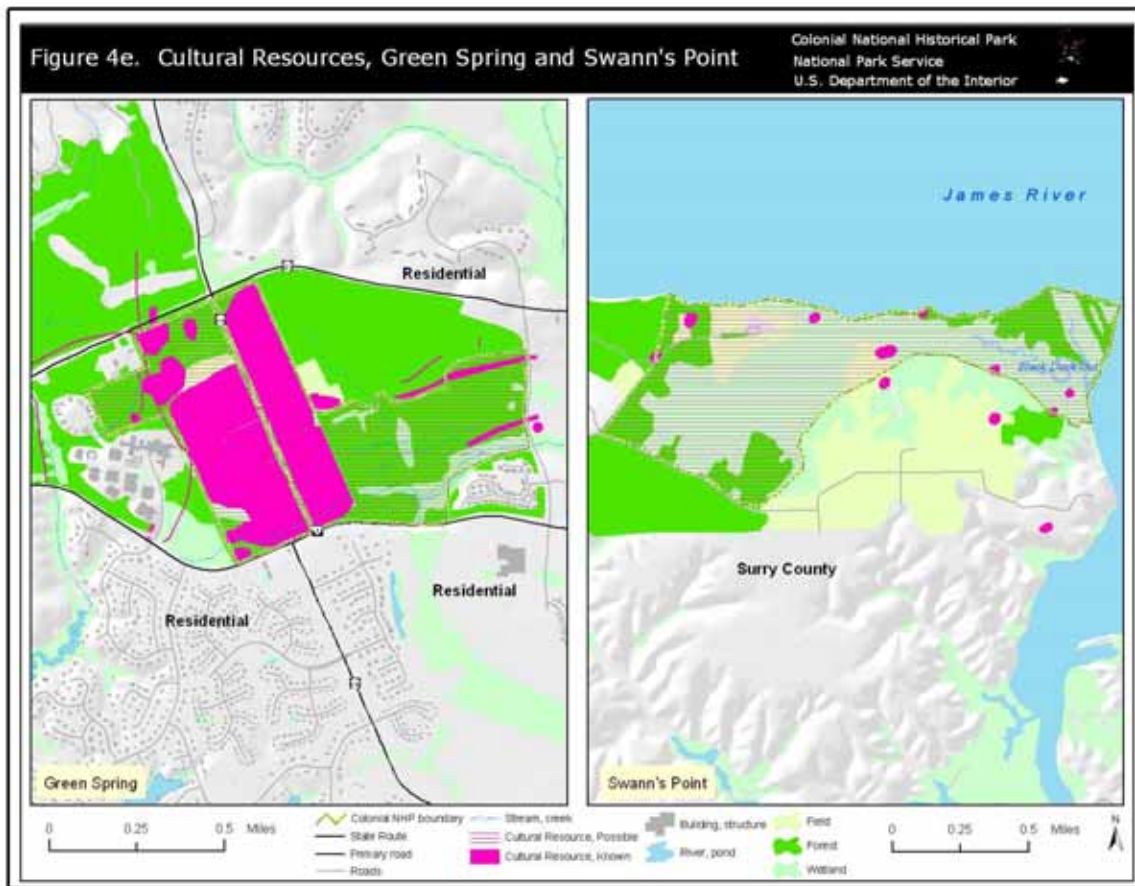
Figure 4b. Cultural Resources, East Colonial Parkway

Colonial National Historical Park
National Park Service
U.S. Department of the Interior





Other areas of the park contain a variety of cultural resources that provide important links to park history and purpose, and contain a variety of pre-historic and historic resources. Included are Green Spring, Swann's Point (Figure 4e), Cape Henry, the Mill Dam site, Tindall's Point, Archer's Hope Landing, Neck of Land, Glebe Land Site, Bellfield Plantation Site (belongs to the U.S. Navy with the NPS Special Use Permit), and the Ringfield Plantation Site.



Historic Structures:

Colonial National Historical Park has a total of 152 structures delineated on the List of Classified Structures, the official National Park Service inventory and database of important historic structures. Among the most important are the Nelson, Smith, Ballard, Somerwell, Dudley Digges, Cole Digges, and Archer houses that have been restored or rehabilitated in Yorktown. The Swan Tavern Complex, comprised of five buildings in Yorktown, was reconstructed in 1933 and represents some of the earliest attempts by the National Park Service to reconstruct historic buildings. The Medical Shop and a number of outbuildings were also reconstructed.

The Colonial Parkway, Green Spring, Jamestown Island, Jamestown National Historic Site (APVA), and Glasshouse Point are all listed and documented on the National Register of Historic Places. Yorktown Battlefield, including Gloucester Point, is listed but not documented, although a draft has been completed. Cape Henry, Tindalls Point, and Ringfield are listed but without documentation. Cultural Landscape Reports have been completed for Colonial Parkway, Green Spring, Jamestown Island and Glasshouse Point. Cultural Landscape Inventories have been drafted for the Village of Yorktown, Moore House, and segments of Yorktown Battlefield. Because of the evolutionary

nature of the park's cultural resource base, the List of Classified Structures, the cultural landscape and cultural sites inventories, and other appropriate inventories will have to be consulted regularly before any management activities are initiated in order to ensure appropriate protection of resources.

Earthworks:

Colonial National Historical Park also is the home for an extensive collection of earthworks unique in the National Park System. They include those of the Revolutionary and Civil Wars. Some of the Civil War earthworks were built on top of the remnants of Revolutionary War earthworks, and some were built as new construction. There are documented British earthworks and an earthwork of French origin. An extensive line of earthworks surrounding the town of Yorktown represents a Confederate/ Union defense line superimposed over the British defense line of 1781. Miles of Confederate earthworks built in 1861-1862 related to a defensive line running across the Virginia Peninsula anchored at Yorktown. Union earthworks associated with the plan to reduce Yorktown in 1862 can also be found throughout the park. Limited earthworks associated with the fighting during the battle of Williamsburg in 1862 are also in evidence. These works are primarily located along the Colonial Parkway. There are also several forts and water batteries on Jamestown Island or on the nearby mainland built with the intent to prevent the passage of the Union Navy up the James River.

Archeological:

A multitude of archeological excavations in the park have been conducted for over 100 years. The park represents an unparalleled storehouse for a vast array of archeological resources ranging from such entities as the Ambler foundations located on Jamestown Island to road traces and American Indian sites located at various locations throughout the park. Grounds owned by the APVA on Jamestown Island were the first portions of the island to be investigated. From its acquisition of the rest of the island in 1934 until the present, the National Park Service has conducted a wide range of archeological exploratory excavations, on both APVA and NPS lands. In 1994, the APVA initiated its own program of archeology which continues at Jamestown until the present day.

Cultural Landscapes:

The designation of *cultural landscapes* is crucial to an understanding of the significance of many park resources, particularly when seen in the context of management activity.

The following four cultural landscapes have been identified and earmarked for protection. They have also been identified in park planning documents for further analysis in order to determine historic vegetation patterns and help determine which areas, if any, could have vegetation management activities undertaken as a part of a comprehensive fuels reduction and cultural scene restoration plan.

- Yorktown Battlefield (includes Village of Yorktown)

The entire area is significant given its early colonial settlement, the site of a major Revolutionary War battle, the presence of fortifications constructed during the Civil War, the area designation as one of the first historical parks, development in regards to early historic preservation during the Civilian Conservation Corps era, and the access and visitation developments carried out in the Mission 66 era of the National Park Service in the 1960's.

In 1781 the landscape in and around Yorktown was transformed and altered for military use. Although many structures that composed the historic vernacular landscape were still in evidence, the general landscape could best be characterized as one consisting of an open landscape of earthworks, devoid of trees and covering vegetation. A series of defensive earthworks were constructed by the British and a roughly parallel series of earthworks were constructed by American and French opponents. During the Civil War some of the original earthworks were built-up and reinforced by the Confederate army. A number of these earthworks were later re-constructed in the 1930's by the National Park Service. Views for the Surrender Field and the area between the first and second siege lines will receive close attention as the result of archeological and historical investigations. Today the viewshed is affected by the presence of the Visitor Center, Route 238, parking lots, and circulation routes near and around redoubts 9 and 10. The vegetation in these areas has been allowed to reach a climax stage, blocking views both in the direction of the York River and of the Village of Yorktown.

- Colonial Parkway

The Colonial Parkway is a meticulously crafted landscape that integrates the region's natural and cultural resources into a memorial roadway of the American colonial experience. It represents the first National Park Service effort at utilizing a designed parkway whose purpose was to unify dispersed sites, in this case the historical sites of Yorktown, Colonial Williamsburg, and Jamestown. The Parkway traverses a diverse environment, presenting the visiting public with dramatic open vistas of rivers and tidal estuaries as well as shady passageways through pine and hardwood forests. A primary management goal is to preserve and protect vistas and viewsheds along the Parkway in order to maintain the "country road" character of the road, as well as to screen it from the intrusions of modern day development along the boundary.

- Jamestown

Three distinct landscapes can be clearly observed as a result of the field and document research conducted on Jamestown Island. They are directly linked to

natural systems and major human development activities on and surrounding Jamestown Island.

The landscape that most accurately reflects the 17th century historic scene is embodied by the existing natural environment on the island and its defining bodies of water. Marshes, rivers, and woodlands sustained the indigenous peoples that existed on the island dating back almost 10,000 years. They also greeted the members of the Virginia Company when they landed in the area in 1607 and formed the first permanent English colony on the North American continent. Important components of the landscape also include the 1608 Glasshouse, Travis family cemetery, historic boundary ditches, and a series of roadways that may be found scattered across the island.

The second landscape is largely defined by the APVA property, and reflects the period of memorialization of Jamestown Island between the end of the 19th century and the first half of the 20th century. The location of remaining landscape features and overall design of the site still reflect the original intention for the site to be a park-like commemorative landscape.

The third landscape is the mid 20th century modern interpretive landscape constructed by the National Park Service and includes Glasshouse Point, the Colonial Parkway, New Towne, and the Island Loop Drive. These features represent a large-scale designed landscape that was initiated in the 1940's and completed in 1957 as a part of the Mission 66 park development period.

In addition, there may also be found on the island landscape features and historic structures that date from the 18th to mid 19th centuries. While they are contributing features in understanding the history of the island, they do not emerge as key elements that define a larger landscape. These include Civil War earthworks, orchard remnants, and architectural ruins like the Ambler House.

- Green Spring

The cultural landscape at Green Spring (195.74 acres) is comprised of a rich and extensive collection of archeological resources and some surviving above-ground landscape features. When combined, these provide important evidence of stylistic and horticultural trends from the early colonial period through the early republic, and of Tidewater agriculture as it evolved from the early days of crop experimentation to the destructive years of intensive tobacco cultivation and poor agricultural practices. Green Spring is likely one of the few plantations of the 17th century that has any surviving features. The complex of partial historic ruins, archeological sites, and landscape features, are all that remain of the plantation home of Royal Governor Sir William Berkeley, one of the most renowned and controversial royal governors in British colonial history.

Objects (museum collection):

There are a total of 1, 509,781 total objects and specimens contained in the museum collection of Colonial National Historical Park. This collection includes specimens and documents from archeology and history that relate to the human history of the park beginning as far back as 10,000 years up through and including the Mission 66 period of National Park Service development.

Objects from the museum collection are exhibited at the Jamestown Visitor Center, Yorktown Visitor Center, the Moore House and the Nelson House.

At present, storage areas are fragmented and need better protection from the potential effects of fire, flood, and theft. The Jamestown Collection was impacted by Hurricane Isabel on September 18, 2003 and is undergoing stabilization and conservation treatment at an offsite facility. A new collection storage building is under construction on Jamestown Island to house the collection after conservation treatment is completed. The Yorktown collection is stored in five locations with varying storage conditions. A new collection storage building will be constructed in 2005 to house the majority, but not all of the collection.

As required by the Automated Checklist Program in the ANCS+ cataloging system and in accordance with the NPS Museum Handbook, facilities exhibiting and storing museum objects have completed fire protection surveys (scheduled for updating at COLO), fire suppression and detection systems (with the exception of Swann Tavern Kitchen and the Yorktown Visitor Center, although the latter is scheduled for a system), and orientation to the fire fighting organizations responsible for the suppression of fire (last completed in 2001) .

Properties on the National Register:

The Colonial Parkway, Green Spring and Jamestown Island, Jamestown National Historic Site (APVA), and Glasshouse Point are all listed and documented on the National Register of Historic Places. Yorktown Battlefield including Gloucester Point is listed but not documented, although a draft has been completed. Cape Henry, Tindalls Point and Ringfield are listed but not documented.

Methodology.

In accordance with the Advisory Council on Historic Preservation's regulations on implementing Section 106 of the National Historic Preservation Act (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources and cultural landscapes will be identified by (1) determining the area(s) of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources which are unevaluated, listed in, or eligible to be

listed in the National Register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

The Council on Environmental Quality (CEQ) regulations and the National Park Service's (NPS) *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order #12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of the impact from one that falls into the major category to one that is moderate or minor. However, any resultant reduction in intensity of impact resulting from mitigation is an estimate of the effectiveness of the mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse.

Under the Advisory Council's regulations, a determination of either *adverse effect* or *no adverse effect* must be made for affected National Register and National Register eligible cultural resources. An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register. Examples of this include; diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by an alternative that would occur at some point later in time, be farther removed in distance, or be cumulative (36 CFR Part 800.5, *Assessment of Adverse Effects*.) As noted earlier, adverse effects under Section 106 may be mitigated, but the effects remain adverse. A determination of *no adverse effect* means that there is an effect, but it would not diminish in any way the characteristic of the cultural resource that qualifies it for inclusion on the National Register.

A separate Section 106 analysis for all the alternatives immediately follows the impact analysis section. The Section 106 analysis and summary is intended to meet the requirements of Section 106 and is an assessment of the effect of the implementation of the selected alternative on cultural resources. The summary is based upon the criteria of effects found in the Advisory Council's regulations.

All available information from the General Management Plan (1993), National Register documentation, List of Classified Structures, Cultural Landscapes Inventories and Reports, Archeological Sites inventory and other internal park documents were compiled and used to assess impacts of the projects on cultural resources. The following definitions were used in analyzing effects on cultural resources.

Negligible – Impacts to archeological resources or historic properties, either beneficial or adverse, which are at the lowest levels of detection, barely perceptible, and not measurable. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor – The impact affects an archeological site or feature with little data potential. The historic context of the affected site(s) would be local. The impact would not affect the contributing elements of a listed structure eligible for the National Registry of Historic Places. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate – The impact is measurable and perceptible, but does not diminish the integrity of the affected resource. The impact affects the archeological or historic site with modest data potential. The historic context of the affected site(s) would be at the State level. For a National Register eligible site, the adverse impact would have to affect some of the contributing elements of the site, but not diminish the integrity of the resource or jeopardize its National Register eligibility. For purposes of Section 106, the determination of effect would be *adverse effect* or *no adverse effect*.

Major – The impact affects an archeological or historic site with high data potential. The historic context of the affected site(s) would be at the national level. For a National Register eligible or listed site, the impact would affect the contributing elements of the site by diminishing the integrity to the extent that it is no longer eligible for listing on the National Register. For purposes of Section 106, the determination of effect would be an *adverse effect*.

Cumulative – Impacts, though negligible, add up though time becoming minor to major and may be irreversible.

Short-term – Refers to a transitory effect, one that largely disappears over a period of days or months.

Long-term – The duration of long-term effects are essentially permanent.

Regulations and Policies.

Current laws and policies require that the following conditions be achieved in the park:

Desired Condition: Inventory, protection, preservation and enhancement of cultural resources based upon documented data from appropriate investigation and research. In terms of prescribed fire and non-fire hazard fuel reduction, this especially applies to historic structures including agricultural fields, forests, cemeteries, monuments, and traces of historical conveyance patterns. *In the event of a wildfire requiring suppression, all of the alternatives would call for the protection of cultural resources through an immediate tactical suppression response.*

Source – National Historic Preservation Act; Executive Order 11593; Archeological and Historic Preservation Act; Archeological Resources Protection Act; the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; Programmatic Memorandum of Agreement Among the NPS, Advisory Council on

Historic Preservation, and the National Council of State Historic Preservation Officers (1995); NPS Organic Act; NPS Management Policies.

Impacts of Alternative I – No Action

Impact Analysis

Historic Structures

Under the no-action alternative, protection issues relating to historic structures would only occur when a wildland fire was underway. Protection through a proactive hazardous fuels reduction program would not occur, thus potentially creating a minor to moderate adverse impact through the accumulation of hazardous fuels adjacent to historic structures. In the event of a wildland fire, fire lines would be constructed in order to protect structures resulting in a moderate beneficial impact in the short term.

Earthworks

As was noted in the historic structures discussion, pro-active protection from wildland fire would not occur, thus allowing for the creation and development of hazardous fuels and the growth of woody vegetation on earthworks. Impacts from the root systems of woody vegetation can have detrimental impacts upon earthworks, and their presence during wildland fires provides fuel that further exacerbates the negative impacts of wildland fire. Since the implementation of this alternative requires immediate and aggressive fire suppression, the potential for permanent long-term damage to earthworks by such ground disturbance activities such as fireline construction and woody fuel removal is greatly increased.

Archeological Resources

The effects of wildland fire on archeological resources are influenced by fuel loading, soil texture and moisture, types (e.g., head fire v. backing fire) and rates of fire spread, and residence time (Ryan 2002). Fire effects, accordingly, may vary from negligible to moderate and adverse to beneficial.

Severe fires – those that burn in heavy fuel loads and exhibit long-residence time and a substantial downward heat pulse – may damage buried organic and inorganic materials. In heavy continuous fuels, temperatures at the soil surface may be sufficient to damage stone or ceramic resources by scorching, fracturing, charring, and spalling. Organic matter may be distilled or destroyed at temperatures of 200-300° Centigrade. Temperatures of 500-600° C will begin to affect stone materials. Temperatures diminish rapidly with soil depth; when surface temperatures are 500° C, the temperatures at a depth of 5 cm would be only about 200°C. With fires of light to moderate severity, residence time is usually short and the downward heat pulse is low. Ryan (2002) notes that soil heating is commonly shallow even when surface fires are intense. Surface fuel loading and duff accumulations in many of vegetation communities at COLO are light to

moderate, resulting in wildland fires that would tend to have minor to moderate severity. Ryan (2002) noted that fires of moderate severity may consume surface fuel layers and cause charring of the top centimeter of the mineral soil.

In addition, some effects of fires on archeological sites may be beneficial. When vegetation is removed, sites may become evident and accurate inventory and mapping can be completed.

The implementation of this alternative would provide no proactive protection for those areas where archeological resources are found or suspected to be. Protection would only occur when a wildland fire was taking place. The use of aggressive wildland fire suppression tactics could have potentially moderate to major adverse impacts upon archeological resources and cause more damage than the impacts from the fire itself. This fact could be exacerbated by the lack of definitive knowledge of the location and extent of many archeological resources in the park. It is entirely possible that these resources could be subjected to major impacts through inadvertent aggressive techniques of fire suppression.

Cultural Landscapes

Under this alternative, no proactive fire management activities would take place to protect cultural landscapes. In the event of a wildland fire, fire lines would be constructed in order to protect resources. In the short term, this would protect resources in question, but, over the long term, impacts could actually be increased through the additional accumulation of hazardous fuel. As a result, park forests could be subjected to fire intensities that exceed the normal range, thus potentially damaging stand integrity. Areas that are currently open meadows would be sustained by continued use of programs such as the agricultural lease program and/or such techniques as mowing and hand trimming. Wetland habitats could degrade from the unwanted presence of invasives such as common reed (*Phragmites australis*) that are not a part of the cultural scene. Moderate long term adverse impacts could result if this alternative were implemented.

Objects

Because most collections are stored or exhibited in structures, the impact of wildland fire would be the same as in the Historic Structures section, with the caveat that most of the Jamestown and Yorktown collections will be stored in non-historic structures. Also, some objects, such as the artillery pieces exhibited along the tour roads in the park, may be susceptible to the short-term exposure to flames produced by wildland fire. Since these pieces are generally found in areas of sparse fuels, impacts from even direct flame exposure would be short-lived and minor, resulting in some discoloration and perhaps charring.

Cumulative Effects

Under this alternative a build-up of hazardous fuels would continue. As a result long term minor to major impacts would accrue over time. The long term potential for development along the park boundary could provide additional ignition sources for wildland fires and, when combined with the increased fuel load within the park, could significantly increase the potential for wildland fires, both in terms of number of fires and in intensity. The resultant increase in the number and size of fires would likely lead to increased suppression and potential damage to cultural resources.

Conclusion

The no-action alternative could result in moderate to major impacts to the integrity of the park's cultural landscapes. Current forests and meadows would continue to change due to natural succession and the potential effects of insects and storm damage, though the impacts of these changes would be retarded by the application of such management practices as mowing and manual vegetation management. In time, this would lead to a potential degradation of some cultural viewsheds particularly those involving battlefield scenes, historic road traces, views from scenic overlooks, and from earthworks. Wildland fire suppression actions could lead to long-term moderate to major adverse effects. Earthworks, in particular, would potentially be subjected to the potentially major impacts caused by aggressive fire suppression. Excess accumulations of fuels, particularly those of woody species on earthworks, would lead to increased fire intensity and longer residence time (period of time for materials to burn). Because there would be no pro-active reduction of excess fuel from earthworks before a wildland fire event, this condition would be exacerbated over time. The adoption of this alternative could reasonably be expected to lead to degradation and potential damage to some cultural resources found in the park.

Mitigation

Many impacts that result from suppression operations can be minimized through the use of MIST (minimum impact suppression tactics). See Appendix E for specific procedures and techniques.

For those historic sites and cultural landscapes which would be vulnerable to impacts from wildland, such as historic structures, a wide range of options are available to either eliminate or mitigate potential impacts. These include: black-lining (creating a fuel-free space with the use of a controlled use of fire) around structures or features near wildland fires; treatment with fire retardant foam prior to or concurrent with fire activity; wrapping with heat reflective materials; and the establishment of sprinkler systems on and around structures concurrent with ongoing wildland fire suppression activities. Other standard cultural resource mitigation measures include the following: prior to the implementation of any fuel reduction project an inventory of previously un-surveyed areas would be conducted by a cultural resource professional who meets the Secretary of the Interior's standards; monitor fire management activities and suspend operations if

previously unknown resources are located within a project area; protect and record newly discovered resources; conduct educational briefings regarding cultural resources for all work crews engaged in suppression and/ or project work; avoid ground disturbance in areas that contain known cultural resources;

Impacts of Alternative II – Preferred Alternative

Impact Analysis

Historic Structures

Under this alternative project activities would occur that could have minor to moderate long term beneficial impacts to historic structures. The use of appropriate management response fire suppression strategies and tactics would be designed to minimize impacts by avoiding suppression techniques and locations that might damage historic structures. Alternatively, this alternative allows the flexibility to use aggressive suppression in the case of an unplanned ignition that directly threatens an historic structure. Non-fire hazard fuel removal treatments would be designed to reduce hazardous fuel loadings in the vicinity of structures. Prescribed fire would not likely be utilized as a hazardous fuel removal tool in close proximity to some historic structures because of the risk, albeit slight, of potential damage caused by an escape or by fire behavior that exceeds planned parameters. In these cases non-fire methods would be the management tools of choice.

Earthworks

The implementation of this alternative allows management the opportunity to protect earthworks *before* they are subjected to impacts from wildland fires. The use of both prescribed fire and non-fire methods (manual fuel reduction), utilized either individually or in combination, allows opportunities for the reduction of excess fuel accumulations on earthworks. It also provides a vehicle through which the restoration and proliferation of a variety of species, in particular native grasses and forbs that stabilize and protect earthworks and that also contribute to the cultural scene, can be undertaken. The use of prescribed fire to reduce and discourage woody vegetation from earthworks has been well documented and is a valuable tool included in the implementation of this alternative. Also, by implementing this alternative, management has the option to avoid direct impacts to earthworks by suppression forces during wildland fire suppression operations by steering clear of them altogether. This is an important tactical and strategic tool, since it ensures that damage to earthworks is either minimized or eliminated as the result of the suppression of wildland fire. In most cases, the construction of fireline would be more detrimental than the impacts caused by the fire.

Archeological Resources

The implementation of this alternative could have moderate to major beneficial impacts on archeological resources. This alternative allows suppression resources the flexibility

to manage wildland fires in a way that allows aggressive fire suppression techniques, such as heavy mechanized equipment or hand line construction, to be excluded from areas where archeological resources are located. Appropriate management response techniques of wildland fire suppression such as using existing roads, trails, streams, and sparse fuel areas as fire breaks instead of traditional hand line construction; assist in the protection of resources while at the same time extinguishing the fire. An additional benefit of this method of suppression is that potential hazardous fuels are consumed and thus eliminated. This fact benefits the protection of resources in the long term. Other techniques such as the use of foam and water provide suppression alternatives to traditional ground disturbance type activities and further protect resources from damage. Prescribed fire operations have the potential to impact archeological resources by exposing them to the elements as well as through construction of hand lines. For this reason, the use of existing roads, trails, watercourses, and natural terrain breaks will be indicated when preparing prescribed burns. Each prescribed burn will have an individual plan prepared, including the identification and mitigation of negative impacts through a compliance section specific to that plan. Non-fire and prescribed fire operations have the potential to expose these types of resources to the negative effects of weather as well as exposing them to potential predation by relic hunters and artifact seekers. Negative impacts can be classified as minor and relatively short term.

Cultural Landscapes

As with archeological resources, cultural landscapes are afforded the protection of suppression activities that take advantage of natural breaks in fuel, rather than relying on more invasive ground disturbance suppression activities. Open fields that comprise an important component of the cultural landscape, are enhanced through the application of prescribed fire. The capabilities of prescribed fire to enhance and propagate native warm season grasses are well documented. The use of prescribed fire discourages the introduction of pioneer woody species that, over time, eliminate open fields and attendant vistas. Prescribed fire also may enhance both hardwood and pine forests found in the park and, in the long term, reduces wildland fire risk by promoting a more fire resistant hardwood forest and reducing hazardous fuels. Some wetland and marsh habitats are also improved by prescribed fire and integrated management approaches to vegetation management. Moderate to major beneficial impacts may accrue as a result of the implementation of this alternative. Short term minor adverse impacts could result from the use of this alternative. These adverse impacts generally manifest themselves with a visual presence. Generally speaking, areas such as native grass fields recover from the implementation of a prescribed fire within a few weeks or less. Forested areas take considerably longer to recover from the visual impacts of a prescribed burn. These include the presence of dead trees (snags) and blackened scorch marks on the trunks of standing trees.

Objects

Because most collections are stored or exhibited in structures, the impact of wildland fire would be the same as in the Historic Structures section, with the caveat that most of

the Jamestown and Yorktown collections will be stored in non-historic structures. Also, some objects, such as the artillery pieces exhibited along the tour roads in the park, may be susceptible to the short-term exposure to flames produced by wildland fire. Since these pieces are generally found in areas of sparse fuels, impacts from even direct flame exposure would be short-lived and minor, resulting in minor cosmetic effect. Since these items are highly mobile, they can be moved relatively easily in the event of a wildland fire event.

Cumulative Effects

The impacts on the cultural landscape from proposed projects would afford better long-term protection for cultural resources due to restoration of a lower fire intensity ecosystem in the hardwood and mixed hardwood-pine forest, and reduction of hazardous fuels. At the present time, the potential for development and change in land-use patterns outside of the park boundary, from a primarily agricultural landscape, to one that is representative of an urban land use, makes the preservation of cultural landscapes within the park an even more important priority for park management. The potential for wildland fire ignitions is increased through development occurring along the park boundary. Since very little, if any, protective activities relating to pro-active fire suppression are being undertaken in these areas, the potential for risk to cultural resources is significantly increased over time.

Conclusion

This alternative provides the advantage of negligible negative impacts on cultural resources. Wildland fire suppression techniques would be designed to minimize cultural and natural resource impacts. Prescribed fire and non-fire treatments would aid in the restoration and maintenance of cultural resources and landscapes for which the park was established. These resources are key components to the natural integrity of the park. In addition, prescribed fires have been documented (Jones et al) as being useful tools in removing heavy vegetation layers from existing archeological and historic sites, thus making their presence known to investigators. This can also have a potentially negative impact through unauthorized public access and looting of sites if not properly managed after discovery. The adoption of this alternative does not constitute impairment.

Mitigation

Many impacts that result from suppression operations can be minimized through the use of MIST (minimum impact suppression tactics). See Appendix E for specific procedures and techniques.

For those historic sites and cultural landscapes which would be vulnerable to impacts from either wildland or prescribed fire, such as historic structures, a wide range of options are available to either eliminate or mitigate potential impacts. These include: avoidance of prescribed fire in the vicinity of structures, black-lining (creating a fuel-free space with the use of prescribed fire) around structures or features near wildland fires or

proposed prescribed fires; treatment with fire retardant foam prior to or concurrent with fire activity; wrapping with heat reflective materials; and the establishment of sprinkler systems on and around structures prior to the implementation of prescribed fires or concurrent with ongoing wildland fire suppression activities. Other standard cultural resource mitigation measures include the following: prior to the implementation of any fuel reduction project an inventory of previously un-surveyed areas would be conducted by a cultural resource professional who meets the Secretary of the Interior's standards; monitor fire management activities and suspend operations if previously unknown resources are located within a project area; protect and record newly discovered resources; conduct educational briefings regarding cultural resources for all work crews engaged in project work; dispose of slash and vegetative debris in areas free of cultural sites; avoid ground disturbance in areas that contain known cultural resources; prior to the commencement of any project, protect the character-defining elements of a site's cultural landscape. For prescribed burns, mitigations must be included in the project specific prescribed burn plan that is prepared for each project. As a matter of procedure, the Virginia SHPO will be consulted as a part of each project's prescribed burn plan.

As this alternative is implemented, consultation and communication with cooperating agencies; state (Virginia Department of Forestry, SHPO), federal (adjacent military reservation USCG), USFWS), and local (APVA and CWF), will be maintained throughout the life of the project(s). Communication and coordination with park neighbors and local jurisdictions should also be a part of the process so as to ensure maximum protection for park resources.

Cultural resource professionals in archeology, historical architecture and historical landscapes will be assigned to the planning and implementation phase of each prescribed burn and /or manual reduction effort to minimize negative impacts to cultural resources. As with natural resource specialists, the level of expertise of cultural resources specialists differs greatly.

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

Historic Structures

Same as Alternative II except that there is no use of prescribed fire.

Earthworks

Same as Alternative II except that there is no use of prescribed fire. As a result, the reduction of woody species and hazardous fuels on earthworks will have to be accomplished solely through non-fire manual fuel-reduction methods such as mowing, cutting, and herbicide use (either singly or in combination). Impacts are likely to result, primarily from compaction, as the result of foot traffic and equipment use by crews.

Archeological Resources

Because prescribed fire will not be utilized as a management tool in this alternative, there will be a greater reliance on non-fire hazardous fuel reduction. This may lead to an increased threat to archeological resources through the attendant increase in hazardous fuel loading and through increased ground impactation from non-fire manual and mechanical fuel reduction activities. In addition, sites may continue to be covered under layers of vegetation and their presence hidden from the scrutiny of cultural resource professionals. Higher costs may also result from the implementation of this alternative. Impacts from the utilization of appropriate management response suppression techniques will be same as those described in Alternative II.

Cultural Landscapes

The inability to utilize prescribed fire as a restorative and maintenance tool in order to propagate and enhance warm season grasses may lead to heavier reliance on more invasive measures such as mowing by machinery with an increase in potential for resource damage. Continuation of programs such as those implemented through agricultural leases or scheduled maintenance mowing could provide a similar result, though ecosystem diversity is not enhanced with the implementation of these types of programs. Hardwood forests and pine forest alike would likely continue to decline over time without the benefits of prescribed fire. Even though excessive hazardous fuel loadings could be removed through non-fire methodologies, overall, the understory components of park forests would not be allowed to benefit from prescribed fire treatments. As a result, natural reproductive capabilities may be reduced and ecosystem viability reduced, an attendant loss of some elements of the cultural landscape could be expected.

Objects

Because most collections are stored or exhibited in structures, the impact of wildland fire would be the same as in the Historic Structures section, with the caveat that most of the Jamestown and Yorktown collections will be stored in non-historic structures. Also, some objects, such as the artillery pieces exhibited along the tour roads in the park, may be susceptible to the short-term exposure to flames produced by wildland fire. Since these pieces are generally found in areas of sparse fuels, impacts from even direct flame exposure would be short-lived and minor, resulting in some discoloration and perhaps charring.

Cumulative Effects

The implementation of this alternative would moderately contribute to the protection of cultural resources, though not to the extent allowed by Alternative II. In the long term, hazardous fuel loading removal and the potential for damage through these more invasive techniques, even when implemented with great care, could lead to minor impacts as the result of increased foot traffic and equipment. Because these types of projects are expensive, and often require large numbers of personnel for

implementation, there is a high probability that implementation may be delayed or foregone altogether due to the realities of increased budget shortfalls and funding constraints. As a result, cultural resources may be placed at minor increased risk over time. The potential for wildland fire ignitions is increased through development occurring along the park boundary. Since very little, if any, proactive activities relating to fire suppression are being undertaken in these areas, the potential for risk to cultural resources is increased.

Conclusion

The removal of encroaching vegetation from the areas surrounding historic structures and archeological resources would have a beneficial long-term impact and would minimize wildland fire intensity. The use of appropriate management response during wildland fires would provide protection of most cultural landscapes, historic structures and archeological sites from the effects of those types of incidents. The lack of ability to use prescribed fire could lead to increased impacts from non-fire reduction of hazardous fuels caused by increased foot traffic, use of mechanized equipment, and the removal of excess fuels both next to structures and on earthworks. This could also result in greater project costs. As a result, restoration of some cultural landscapes would not occur, with long term minor to moderate adverse effects occurring in these areas from a lack of treatment. The adoption of this alternative does not constitute impairment.

Mitigation

Many impacts that result from suppression operations can be minimized through the use of MIST (minimum impact suppression tactics). See Appendix E for specific procedures and techniques.

For those historic sites and cultural landscapes which would be vulnerable to impacts from wildland fire, such as historic structures, a wide range of options are available to either eliminate or mitigate potential impacts. These include: black-lining (creating a fuel-free space with the use of wildland fire techniques) around structures or features near wildland fires; treatment with fire retardant foam prior to or concurrent with fire activity; wrapping with heat reflective materials; and the establishment of sprinkler systems on and around structures concurrent with ongoing wildland fire suppression activities. Other standard cultural resource mitigation measures include the following: prior to the implementation of any fuel reduction project an inventory of previously unsurveyed areas would be conducted by a cultural resource professional who meets the Secretary of the Interior's standards; monitor fire management activities and suspend operations if previously unknown resources are located within a project area; protect and record newly discovered resources; conduct educational briefings regarding cultural resources for all work crews engaged in project work; dispose of slash and vegetative debris in areas free of cultural sites; avoid ground disturbance in areas that contain known cultural resources; prior to the commencement of any project, protect the character-defining elements of a site's cultural landscape.

Hazard fuel reduction around historic structures is implemented with hand tools and other methods that are less invasive than methods using mechanical techniques. Through the implementation of appropriate management response fire suppression techniques, low intensity wildland fires would be allowed to burn over the surface of archeological sites where little, if any, damage occurs from the low heat developed in these relatively fast moving surface fires.

As this alternative is implemented, consultation and communication with cooperating agencies; state (Virginia Department of Forestry, SHPO), federal (military reservations, USFWS), and local (APVA, York, James City, Gloucester and Surry Counties, City of Newport News) will be maintained throughout the life of the project(s).

Cultural resource professionals in archeology, historical architecture and historical landscapes will be assigned to the planning and implementation phase of each non-fire manual reduction effort to help minimize negative impacts to cultural resources. As with natural resource specialists, the level of expertise of cultural resources specialists differs greatly.

Cultural Resources and Section 106 National Historic Preservation Act Colonial National Historical Park

In this Environmental Assessment (EA), impacts to cultural resources are described in terms of type, context, duration, and intensity, as described above, which is consistent with the regulations of the CEQ that implement NEPA. These impact analyses are intended, however, to comply with the requirements of both NEPA and Section 106 of the National Historic Preservation Act (NHPA). In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), impacts to archeological resources, cultural landscapes, and historic structures were identified and evaluated by 1) determining the area of potential effects; 2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; 3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and 4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must also be made for affected National Register eligible cultural resources. An adverse effect occurs whenever an impact alters, either directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National register, e.g. diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects can also include reasonable foreseeable effects caused by the implementation of the preferred alternative that would occur later in time, be farther removed in distance, or be cumulative (6 CFR 800.5, Assessment of Adverse Effects). A determination of no adverse effect means that there is an effect, but the effect would not diminish in any

way the characteristics of the cultural resources that qualify it for inclusion in the National Register.

CEQ regulations and the NPS DO-12 also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g. reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse.

A Section 106 Summary is included in the impact analysis section for historic structures, earthworks, archeological resources, cultural landscapes, and museum collections and objects.

Historic Structures

Affected Environment

Historic buildings at Colonial National Historical Park exist in two basic conditions: 1) intact buildings at least fifty years of age, or 2) ruins or building sites that are either known or that may require archeological investigation to locate. For the purposes of managing historic structures, categories for classification used in the National Park Service List of Classified Structures will be utilized:

Category A: Structures that must be preserved and maintained. The structure's preservation may be specifically mandated by legislation, or the structure is directly or indirectly related to the area's legislatively defined significance through association with persons, events, historic scene, or monumentation. The structure may be nationally significant as defined by the National Historic Landmark criteria or contributing to a nationally significant theme or purpose in the park.

Category B: Structures that should be preserved and maintained. These historic structures meet National Register criteria individually or as a part of a network, district, or multiple resources; are compatible with a primary park theme; and have a continuing or potential use for the park or as a leased operation.

Category C: Structures that may be preserved and maintained. The structure either meets National Register criteria, but because of condition, location, or other factor does not qualify, or the structure is of less than National Register significance, but one whose preservation is desirable to meet management needs.

Category D: Structures that should be or have been disposed of, demolished or altered for some other management purpose because the structure is an irreparable hazard to public health and safety, has lost all significance or integrity, is a physical intrusion on a prime park value, or has been disposed of by a planned action.

Colonial National Historical Park has a total of 152 structures delineated on the List of Classified Structures, the official National Park Service inventory and database of important historic structures. Among the most important are the Nelson, Smith, Ballard, Somerwell, Dudley Digges, Cole Digges, and Archer houses that have been restored or rehabilitated in Yorktown. The Swan Tavern Complex, comprised of five buildings in Yorktown, was reconstructed in 1933 and represents some of the earliest attempts by the National Park Service to reconstruct historic buildings. The Medical Shop and a number of outbuildings were also reconstructed.

Environmental Consequences

Methodology

In order for a structure or building to be listed in the National Register of Historic Places, it must be associated with an important historic context, i.e. possess significance – the meaning or value ascribed to the structure or building, and have integrity of those features necessary in order to convey its significance, i.e. location, design, setting, workmanship materials, feeling, and association. For purposes of analyzing potential impacts to historic structures and buildings, the threshold of change for the intensity of an impact is defined as follows:

Negligible: Impact(s) are at the lowest levels of detection – barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Adverse impact – Impact(s) would not affect the character defining features of a National Register of Historic Places eligible or listed structure or building. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial impact – Stabilization/ preservation of character defining features in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Adverse impact – Impact would alter a character defining feature(s) of the structure or building but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial impact – Rehabilitation of a structure or building in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: Adverse impact – Impact would alter a character defining feature(s) of the structure or building, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial impact – Restoration of a structure or building in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Effects of Alternative I

There would be no change in current management. Under the no-action alternative, protection issues relating to historic structures would only occur when a wildland fire was underway. Protection through a proactive hazardous fuels reduction program would not occur, thus potentially creating a minor to moderate adverse impact through the accumulation of hazardous fuels adjacent to historic structures. In the event of a wildland fire, fire lines would be constructed in order to protect structures resulting in a moderate beneficial impact in the short term.

Cumulative Effects

Under this alternative a build-up of hazardous fuels would continue to accrue. Fuel accumulations would be in close physical proximity to, and in some cases, immediately adjacent to historic structures. As a result, long term minor to moderate impacts could accrue over time. The long term potential for development along the park boundary would provide additional ignition sources for wildland fires and, when combined with the increased fuel load, both within and outside of the park, would significantly increase the potential for wildland fires. This increase would be manifested by an increased number of fires as well as an increase in their intensity. Predicted increases in the number and intensity of fires would likely lead to an increased reliance on aggressive wildland fire suppression, with an attendant augmented potential for damage to cultural resources.

Conclusion

The no-action alternative would result in minor to moderate long-term impacts to the integrity of the park's historic structures. The majority of these impacts would result from aggressive wildland fire suppression actions that could disturb historic structures. Perhaps even more threatening would be the potential for damage to a structure resulting from the presence of a wildland fire near-by. Excess accumulations of fuels, particularly those of woody species found near to historic structures, would lead to increased potential fire intensity and longer residence time (period of time for materials to burn). Because there would be no pro-active reduction of excess fuel from areas

surrounding historic structures *before* a wildland fire event, this condition would be exacerbated over time. The adoption of this alternative could reasonably be expected to lead to degradation and potential damage to some historic structures in the park.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to historic structures.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative I would result in a determination of *no adverse effect* to historic resources.

Effects of Alternative II

Under this alternative project activities would occur that could have minor to moderate long term beneficial impacts to historic structures. The use of appropriate management response fire suppression strategies and tactics would be designed to minimize impacts by avoiding suppression techniques and locations that might damage historic structures. Alternatively, this alternative allows the flexibility to use aggressive suppression in the case of an unplanned ignition that directly threatens an historic structure. Non-fire hazard fuel removal treatments would be designed to reduce hazardous fuel loadings in the vicinity of structures. Prescribed fire would not likely be utilized as a hazardous fuel removal tool in close proximity to some historic structures because of the risk, albeit slight, of potential damage caused by an escape or by fire behavior that exceeds planned parameters. In these cases non-fire methods would be the management tools of choice.

Cumulative Effects

Under this alternative the build-up of hazardous fuels adjacent to historic structures would take place. Fuel accumulations in close physical proximity to, and in some cases, immediately adjacent to historic structures, would receive priority treatment. As a result, long term minor to moderate beneficial impacts would accrue over time. Because the increased potential for development along the park boundary would provide additional ignition sources for wildland fires that might ultimately threaten historic structures within the park, the pro-active fuel reduction programs implemented as the result of this alternative would significantly decrease the potential for wildland fires. In those cases where wildland fires would occur, the use of the wide range of appropriate management response fire suppression techniques available in this alternative would allow for

maximum protection of historic structures from the suppression actions themselves. The end result would be a decreased potential for damage to cultural resources.

Conclusion

The preferred alternative would result in minor to moderate beneficial long-term impacts to the integrity of the park's historic structures. The use of appropriate management response fire suppression strategies and tactics would be designed to minimize impacts by avoiding suppression techniques and locations that might damage historic structures. Alternatively, this alternative allows the flexibility to use aggressive suppression in the case of an unplanned ignition that directly threatens an historic structure. Non-fire hazard fuel removal treatments would be designed to reduce hazardous fuel loadings in the vicinity of structures. Prescribed fire would not likely be utilized as a hazardous fuel removal tool in close proximity to some historic structures because of the risk, albeit slight, of potential damage caused by an escape or by fire behavior that exceeds planned parameters. In these cases non-fire methods would be the management tools of choice.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to historic structures.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative II would result in a determination of *no adverse effect* to historic resources.

Effects of Alternative III

Same as Alternative II except that there is no use of prescribed fire

Cumulative Effects

Under this alternative the build-up of hazardous fuels adjacent to historic structures would be reduced through a pro-active program of non-fire hazardous fuel reduction. However, the inability to use prescribed fire would place a heavier reliance on non-fire mechanical methods of fuel reduction. As a result, impacts from the use of mechanized equipment such as chainsaws, brush cutters, and chippers, as well as increased foot traffic from personnel, would reduce the potential for overall effectiveness of fuel reduction and increase impacts from compaction and erosion. Though still effective, this

alternative would not be as valuable in terms of scope and efficiency as the preferred alternative. Fuel accumulations in close physical proximity to, and in some cases, immediately adjacent to historic structures, would receive priority treatment. As a result, long term minor to moderate beneficial impacts would accrue over time. Because the increased potential for development along the park boundary would provide additional ignition sources for wildland fires that might ultimately threaten historic structures within the park, the pro-active non-fire fuel reduction programs implemented as the result of this alternative would decrease the over-all potential for wildland fires. In those cases where wildland fires would occur, the use of the wide range of appropriate management response fire suppression techniques available in this alternative would allow for maximum protection of historic structures from the suppression actions themselves. The end result would be a decreased potential for damage to cultural resources, though not to the same extent as with the preferred alternative.

Conclusion

The removal of encroaching vegetation from areas adjacent to and in close proximity to historic structures would provide a beneficial long-term impact and would minimize wildland fire intensity, should such an event occur. The use of appropriate management response strategies and tactics during wildland fires would provide protection of most historic structures from the effects of wildland fire. The lack of ability to use prescribed fire could lead to increased impacts from non-fire reduction of hazardous fuels caused by increased foot traffic, use of mechanized equipment, and the removal of excess fuels next to and adjacent to historic structures. This could also result in greater project costs. As a result, some fuel reduction projects would not occur, with long term minor to moderate adverse effects occurring in these areas from a lack of treatment.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to historic structures.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative III would result in a determination of *no adverse effect* to historic resources.

Earthworks

Affected Environment

Colonial National Historical Park also is the home for an extensive collection of earthworks unique in the National Park System. They include those of the Revolutionary and Civil Wars. Some of the Civil War earthworks were built on top of the remnants of Revolutionary War earthworks, and some were built as new construction. There are documented British earthworks and an earthwork of French origin. An extensive line of earthworks surrounding the town of Yorktown represents a Confederate/ Union defense line superimposed over the British defense line of 1781. Miles of Confederate earthworks built in 1861-1862 related to a defensive line running across the Virginia Peninsula anchored at Yorktown. Union earthworks associated with the plan to reduce Yorktown in 1862 can also be found throughout the park. Limited earthworks associated with the fighting during the battle of Williamsburg in 1862 are also in evidence. These works are primarily located along the Colonial Parkway. There are also several forts and water batteries on Jamestown Island or on the nearby mainland built with the intent to prevent the passage of the Union Navy up the James River.

As was noted in the historic structures discussion, pro-active protection from wildland fire would not occur, thus allowing for the creation and development of hazardous fuels and the growth of woody vegetation on earthworks. Impacts from the root systems of woody vegetation can have detrimental impacts upon earthworks, and their presence during wildland fires provides fuel that further exacerbates the negative impacts of wildland fire. Since the implementation of this alternative requires immediate and aggressive fire suppression, the potential for permanent long-term damage to earthworks by such ground disturbance activities such as fireline construction and woody fuel removal is greatly increased.

Environmental Consequences

Methodology

In order for an earthwork to be listed in the National Register of Historic Places, it must be associated with an important historic context, i.e. possess significance – the meaning or value ascribed to the fortification, and have integrity of those features necessary in order to convey its significance, i.e. location, design, setting, workmanship materials, feeling, and association. For purposes of analyzing potential impacts to earthworks, the threshold of change for the intensity of an impact is defined as follows:

Negligible: Impact(s) are at the lowest levels of detection – barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be *no adverse effect*.

- Minor: Adverse impact – Impact(s) would not affect the character defining features of a National Register of Historic Places eligible or listed section of earthwork. For purposes of Section 106, the determination of effect would be *no adverse effect*.
- Beneficial impact – Stabilization/ preservation of character defining features in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties. For the purposes of Section 106, the determination of effect would be *no adverse effect*.
- Moderate: Adverse impact – Impact would alter a character defining feature(s) of the earthwork but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. For the purposes of Section 106, the determination of effect would be *no adverse effect*.
- Beneficial impact – Rehabilitation of an earthwork in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties. For purposes of Section 106, the determination of effect would be *no adverse effect*.
- Major: Adverse impact – Impact would alter a character defining feature(s) of the earthwork, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.
- Beneficial impact – Restoration of an earthwork in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Effects of Alternative I

There would be no change in current management. Under the no-action alternative, protection issues relating to earthworks would only occur when a wildland fire was underway. Protection through a proactive hazardous fuels reduction program would not occur, thus potentially creating a minor to moderate adverse impact through the accumulation of hazardous fuels located on and adjacent to historic earthworks. In the event of a wildland fire, fires could be allowed to burn unimpeded over existing earthworks or fireline could be constructed in order to keep the fire from spreading to adjacent values at risk (e.g. buildings, monuments, etc). Depending upon which of these techniques was applied, negative impacts could be negligible to moderate in the short term or have a moderate beneficial impact in the short term.

Cumulative Effects

Under this alternative a build-up of hazardous fuels would continue to accrue. Fuel accumulations would be in close physical proximity to, and in some cases, immediately adjacent to historic earthworks. As a result, long term minor to moderate impacts could accrue over time. The long term potential for development along the park boundary would provide additional ignition sources for wildland fires and, when combined with the increased fuel load, both within and outside of the park, would significantly increase the potential for wildland fires. This increase would be manifested by an increased number of fires as well as an increase in their intensity. The predicted increase in the number and size of fires would likely lead to an increased reliance on aggressive wildland fire suppression. The end result would be an increased potential for damage to earthworks.

Conclusion

The no-action alternative would result in minor to moderate long-term impacts to the integrity of the park's earthworks. The majority of these impacts would result largely from aggressive wildland fire suppression actions that could disturb historic earthworks. Excess accumulations of fuels, particularly those of woody species found on and near to historic earthworks, would lead to increased potential fire intensity and longer residence time (period of time for materials to burn). Because there would be no pro-active reduction of excess fuel from areas on and surrounding historic earthworks *before* a wildland fire event, this condition would be exacerbated over time. The adoption of this alternative could reasonably be expected to lead to degradation and potential damage to some historic earthworks in the park.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to historic earthworks.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative I would result in a determination of *no adverse effect* to historic earthworks.

Effects of Alternative II

Under this alternative project activities would occur that could have minor to moderate long term beneficial impacts to historic earthworks. The use of appropriate management

response fire suppression strategies and tactics would be designed to minimize impacts by avoiding suppression techniques and locations that might damage historic earthworks. This alternative allows the flexibility to use aggressive suppression in the case of an unplanned ignition that directly threatens historic earthworks. Non-fire hazard fuel removal treatments would be designed to reduce hazardous fuel loadings on earthworks. Prescribed fire would be utilized as a hazardous fuel removal tool on earthworks since its application, when properly applied, causes little impact upon these types of resources. Post-fire erosion of soils on earthworks could result from this type of treatment, so appropriate mitigation actions regarding erosion prevention should be undertaken as a routine portion of the use of prescribed fire. In those areas where earthworks are located adjacent to other values at risk, non-fire methods of hazardous fuel reduction would be the management tools of choice.

Cumulative Effects

Under this alternative the build-up of hazardous fuels on historic earthworks would take place. Fuel accumulations located on or in close physical proximity to historic earthworks, would receive priority treatment. As a result, long term minor to moderate beneficial impacts would accrue over time. Because the increased potential for development along the park boundary would provide additional ignition sources for wildland fires that might ultimately threaten historic earthworks within the park, the proactive fuel reduction programs implemented as the result of this alternative would significantly decrease the potential for wildland fires. In those cases where wildland fires would occur, the use of the wide range of appropriate management response fire suppression techniques available in this alternative would allow for maximum protection of historic earthworks from the suppression actions themselves. The end result would be a decreased potential for damage to earthworks.

Conclusion

The preferred alternative would result in minor to moderate beneficial long-term impacts to the integrity of the park's historic earthworks. The use of appropriate management response fire suppression strategies and tactics would be designed to minimize impacts by avoiding suppression techniques and locations that might damage historic earthworks. This alternative does allow the flexibility to use aggressive suppression in the case of an unplanned ignition that directly threatens an historic earthwork. Non-fire hazard fuel removal treatments would be designed to reduce hazardous fuel loadings in the vicinity of structures or other values at risk. This technique could also be used where the potential for erosion caused by the application of prescribed fire is a potential risk. Prescribed fire would be utilized as a hazardous fuel removal tool on many earthworks, though this technique would be contraindicated where earthworks lay in close proximity to historic structures because of the risk, albeit slight, of potential damage caused by an escape or by fire behavior that exceeds planned parameters. In these cases non-fire methods would be the management tools of choice.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing

legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to historic earthworks.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative II would result in a determination of *no adverse effect* to historic earthworks.

Effects of Alternative III

Same as Alternative II except that there is no use of prescribed fire

Cumulative Effects

Under this alternative the build-up of hazardous fuels adjacent to historic earthworks would be reduced through a pro-active program of non-fire hazardous fuel reduction. However, the inability to use prescribed fire would place a heavier reliance on non-fire mechanical methods of fuel reduction. As a result, impacts from the use of mechanized equipment such as chainsaws, brush cutters, and chippers, as well as increased foot traffic from personnel, would reduce the potential for overall effectiveness of fuel reduction and increase impacts from compaction and erosion. Though still effective, this alternative would not be as valuable in terms of scope and efficiency as the preferred alternative. Fuel accumulations located on or in close physical proximity to, and in some cases, immediately adjacent to historic structures, would receive priority treatment. As a result, long term minor to moderate beneficial impacts would accrue over time. Because the increased potential for development along the park boundary would provide additional ignition sources for wildland fires that might ultimately threaten historic earthworks within the park, the pro-active non-fire fuel reduction programs implemented as the result of this alternative would decrease the over-all potential for wildland fires. In those cases where wildland fires would occur, the use of the wide range of appropriate management response fire suppression techniques available in this alternative would allow for maximum protection of historic earthworks from the negative aspects of the suppression actions themselves. The end result would be a decreased potential for damage to cultural resources, including earthworks, though not to the same extent as with the preferred alternative.

Conclusion

The removal of encroaching vegetation from areas located on and adjacent to and in close proximity to historic earthworks would provide a beneficial long-term impact and would minimize wildland fire intensity, should such an event occur. The use of

appropriate management response strategies and tactics during wildland fires would provide protection of most historic earthworks from the effects of wildland fire. The lack of ability to use prescribed fire could lead to increased impacts from non-fire reduction of hazardous fuels caused by increased foot traffic, use of mechanized equipment, and the removal of excess fuels located on, next to, and adjacent to historic earthworks. This could also result in greater project costs. As a result, some fuel reduction projects would not occur, with long term minor to moderate adverse effects occurring in these areas from a lack of treatment.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to historic earthworks.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative III would result in a determination of *no adverse effect* to historic earthworks.

Archeological Resources

Affected Environment

A multitude of archeological excavations in the park have been conducted for over 100 years. The park represents an unparalleled storehouse for a vast array of archeological resources ranging from such entities as the Ambler foundations located on Jamestown Island to road traces and American Indian sites located at various locations throughout the park. Grounds owned by the APVA on Jamestown Island were the first portions of the island to be investigated. From its acquisition of the rest of the island in 1934 until the present, the National Park Service has conducted a wide range of archeological exploratory excavations, on both APVA and NPS lands. In 1994, the APVA initiated its own program of archeology which continues at Jamestown until the present day.

Environmental Consequences

Methodology

Important questions about human history can only be answered by the actual physical material present in cultural resources. Archeological resources have the potential to answer, either in whole or in part, such research questions. An archeological site(s) can be eligible to be listed in the National Register of Historic Places if the site(s) has yielded, or may be likely to yield, information important in prehistory or history. An

archeological site can be nominated to the National Register in one of three historic contexts or levels of significance: local, state, or national. For purposes of analyzing impacts to archeological resources, thresholds of change for the intensity of an impact are based upon the potential of the site(s) to yield information important in prehistory or history, as well as the probable historic context of the affected site(s):

Negligible: Impact is at the lowest levels of detection – barely measurable with no perceptible consequences, either adverse or beneficial, to archeological resources. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Adverse impact – Disturbance of a site(s) results in little, if any, loss of significance or integrity and the National Register eligibility of the site(s) is unaffected. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial impact – Maintenance and preservation of a site(s). For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Adverse impact – Disturbance of a site(s) does not diminish the significance or integrity of the site(s) to the extent that its National Registry eligibility is jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial impact – Stabilization of a site(s). For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: Adverse impact – Disturbance of a site(s) diminishes the significance and integrity of the site(s) to the extent that it is no longer eligible to be listed in the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial impact – Active intervention to preserve a site(s). For purposes of Section 106, the determination of effect would be *no adverse effect*.

Effects of Alternative I

The implementation of this alternative would provide no proactive protection for those areas where archeological resources are found or suspected to be. Protection would only occur when a wildland fire was taking place. The use of aggressive wildland fire suppression tactics could have potentially moderate to major adverse impacts upon archeological resources. This fact could be exacerbated by the lack of definitive knowledge of the location and extent of many archeological resources in the park. It is entirely possible that these resources could be subjected to major impacts through inadvertent aggressive techniques of fire suppression.

Cumulative Effects

Present and reasonably foreseeable future actions that would have an effect on archeological resources within the park include the ignition and suppression of wildland fires. This includes wildland fires that may have their ignition source outside of the park. The increase in development along the park boundary has increased the potential for ignitions caused by human occurrence and the spread of wildland fire across park boundaries into the park. An increase in hazardous fuel accumulations in many of these boundary areas has increased fuel loading to such an extent that, should a wildland fire occur, fire intensity and resultant resistance to control would likely exceed wildland fire suppression forces ability to effectively control. As a result, the potential for long-term moderate negative impacts upon park archeological resources is present.

Conclusion

There would be no change in current management, and wildland fires would still be suppressed with aggressive suppression tactics. Implementing Alternative I would result in long-term moderate negative impacts on archeological resources from the effects of both wildland fires and the impacts of aggressive suppression tactics. This alternative would also contribute to cumulative adverse impacts to archeological sites in the park. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the enabling legislation of Colonial National Historical park; (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents there would be no impairment of the park's resources or values related to archeological resources.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative I would result in a determination of *adverse effect* to archeological resources.

Effects of Alternative II

The implementation of this alternative would have moderate to major beneficial impacts on archeological resources. This alternative allows suppression resources the flexibility to manage wildland fires in a way that allows aggressive fire suppression techniques, such as heavy mechanized equipment or hand line construction, to be excluded from areas where archeological resources are located. Appropriate management response techniques of wildland fire suppression such as using existing roads, trails, streams, and sparse fuel areas as fire breaks instead of traditional hand line construction; assist in the protection of resources while at the same time extinguishing the fire. An additional benefit of this method of suppression is that potential hazardous fuels are consumed and thus eliminated. This fact benefits the protection of resources in the long term.

Other techniques such as the use of foam and water provide suppression alternatives to traditional ground disturbance type activities and further protect resources from damage. Prescribed fire operations have the potential to impact archeological resources by exposing them to the elements as well as through construction of hand lines. For this reason, the use of existing roads, trails, watercourses, and natural terrain breaks will be indicated when preparing prescribed burns. Each prescribed burn will have an individual plan prepared, including the identification and mitigation of negative impacts through a compliance section specific to that plan. Many impacts of prescribed fires are beneficial for archeological resources. For example; when vegetation is removed, sites that were previously hidden may be exposed to view, allowing accurate inventory, mapping, and protection. Non-fire and prescribed fire operations also have the potential to expose archeological resources to the negative effects of weather as well as exposing them to potential predation by relic hunters and artifact seekers. Negative impacts can be classified as minor and relatively short term.

Cumulative Effects

The impacts on archeological resources from this alternative would afford better long-term protection through the restoration of native grass communities and the perpetuation of lower fire intensity ecosystems present in hardwood and mixed hardwood-pine forests as well as through an overall reduction of hazardous fuels. At the present time, the potential for development and change in land-use patterns outside of the park boundary, from a primarily rural landscape, to one that is representative of an urban land use, makes the preservation of archeological resources within the park an even more important priority for park management. The potential for wildland fire ignitions is increased through development occurring along the park boundary. Since very little, if any, protective activities relating to pro-active fire suppression are being undertaken in these areas, the potential for risk to archeological resources is significantly increased over time.

Conclusion

This alternative provides the advantage of negligible negative impacts on archeological resources. Wildland fire suppression techniques would be designed to minimize cultural and natural resource impacts. Prescribed fire and non-fire treatments would aid in the restoration and maintenance of archeological resources for which the park was established. These resources are key components to the natural integrity of the park. In addition, prescribed fires have been documented (Jones et al) as being useful tools in removing heavy vegetation layers from existing archeological and historic sites, thus making their presence known to investigators. This can also have a potentially negative impact through unauthorized public access and looting of sites if not properly managed after discovery. The adoption of this alternative does not constitute impairment.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that

implementation of Alternative II would result in a determination of *no adverse effect* to archeological resources.

Effects of Alternative III

Because prescribed fire will not be utilized as a management tool in this alternative, there will be a greater reliance on non-fire hazardous fuel reduction. This may lead to an increased threat to archeological resources through the attendant increase in hazardous fuel loading and through increased ground impactation from non-fire manual and mechanical fuel reduction activities. In addition, sites may continue to be covered under layers of vegetation and their presence hidden from the scrutiny of cultural resource professionals. Higher costs may also result from the implementation of this alternative. Impacts from the utilization of appropriate management response suppression techniques will be same as those described in Alternative II.

Cumulative Effects

The implementation of this alternative would moderately contribute to the protection of cultural resources, though not to the extent allowed by Alternative II. In the long term, hazardous fuel loading removal and the potential for damage through these more invasive techniques, even when implemented with great care, could lead to minor impacts as the result of increased foot traffic and equipment. Because these types of projects are expensive, and often require large numbers of personnel for implementation, there is a high probability that implementation may be delayed or foregone altogether due to the realities of increased budget shortfalls and funding constraints. As a result, archeological resources may be placed at minor increased risk over time. The potential for wildland fire ignitions is increased through development occurring along the park boundary. Since very little, if any, proactive activities relating to fire suppression are being undertaken in these areas, the potential for risk to archeological resources is increased.

Conclusion

The removal of encroaching vegetation from the areas surrounding archeological resources would have a beneficial long-term impact and would minimize wildland fire intensity, thus assisting in the protection of these types of resource. The use of appropriate management response strategies and tactics during wildland fires would provide protection of most archeological resources from the negative impacts of wildland fire suppression activity. The lack of ability to use prescribed fire could lead to increased impacts from non-fire reduction of hazardous fuels caused by increased foot traffic and use of mechanized equipment. Non-fire hazardous fuel reduction methods require intensive personnel allocation and can be very costly, often resulting in increased project costs. As a result, restoration of some archeological resources would not occur with the implementation of this alternative. Long term minor to moderate adverse effects would occur to archeological resources due to the lack of treatment. The adoption of this alternative does not constitute impairment.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative III would result in a determination of *no adverse effect* to archeological resources.

Cultural Landscapes

Affected Environment

Cultural landscapes are the result of the long interaction between people and the land. The influence of human beliefs and actions over time upon the natural landscape provides a living record of an era's past, like a visual chronicle of history. Cultural landscapes are shaped through time by historical land use and management practices, as well as politics and property laws, technology, and economic conditions. The dynamic nature of modern human life, however, contributes to the continual re-shaping of cultural landscapes; making them a good source of information about specific times and places, but at the same time rendering their long-term preservation a challenge.

The designation of *cultural landscapes* is crucial to an understanding of the significance of many park resources, particularly when seen in the context of management activity.

The following four cultural landscapes have been identified and earmarked for protection. They have also been identified in park planning documents for further analysis in order to determine historic vegetation patterns and help determine which areas, if any, could have vegetation management activities undertaken as a part of a comprehensive fuels reduction and cultural scene restoration plan.

- Yorktown Battlefield (includes Village of Yorktown)

The entire area is significant given its early colonial settlement, the site of a major Revolutionary War battle, the presence of fortifications constructed during the Civil War, the area designation as one of the first historical parks, development in regards to early historic preservation during the Civilian Conservation Corps era, and the access and visitation developments carried out in the Mission 66 era of the National Park Service in the 1960's.

In 1781 the landscape in and around Yorktown was transformed and altered for military use. Although many structures that composed the historic vernacular landscape were still in evidence, the general landscape could best be characterized as one consisting of an open landscape of earthworks, devoid of trees and covering vegetation. A series of defensive earthworks were constructed by the British and a roughly parallel series of earthworks were

constructed by American and French opponents. During the Civil War some of the original earthworks were built-up and reinforced by the Confederate army. A number of these earthworks were later re-constructed in the 1930's by the National Park Service. Views for the Surrender Field and the area between the first and second siege lines will receive close attention as the result of archeological and historical investigations. Today the viewshed is affected by the presence of the Visitor Center, Route 238, parking lots, and circulation routes near and around redoubts 9 and 10. The vegetation in these areas has been allowed to reach a climax stage, blocking views both in the direction of the York River and of the Village of Yorktown.

- Colonial Parkway

The Colonial Parkway is a meticulously crafted landscape that integrates the region's natural and cultural resources into a memorial roadway of the American Colonial experience. It represents the first National Park Service effort at utilizing a designed parkway whose purpose was to unify dispersed sites, in this case the historical sites of Yorktown, Colonial Williamsburg, and Jamestown. The Parkway traverses a diverse environment, presenting the visiting public with dramatic open vistas of rivers and tidal estuaries as well as shady passageways through pine and hardwood forests. A primary management goal is to preserve and protect vistas and viewsheds along the Parkway in order to maintain the "country road" character of the road, as well as to screen it from the intrusions of modern day development along the boundary.

- Jamestown

Three distinct landscapes can be clearly observed as a result of the field and document research conducted on Jamestown Island. They are directly linked to natural systems and major human development activities on and surrounding Jamestown Island.

The landscape that most accurately reflects the 17th century historic scene is embodied by the existing natural environment on the island and its defining bodies of water. Marshes, rivers, and woodlands sustained the indigenous peoples that existed on the island dating back almost 10,000 years. They also greeted the members of the Virginia Company when they landed in the area in 1607 and formed the first permanent English colony on the North American continent. Important components of the landscape also include the 1608 Glasshouse, Travis family cemetery, historic boundary ditches, and a series of roadways that may be found scattered across the island.

The second landscape is largely defined by the APVA property, and reflects the period of memorialization of Jamestown Island between the end of the 19th century and the first half of the 20th century. The location of remaining landscape

features and overall design of the site still reflect the original intention for the site to be a park-like commemorative landscape.

The third landscape is the mid 20th century modern interpretive landscape constructed by the National Park Service and includes Glasshouse Point, the Colonial Parkway, New Towne, and the Island Loop Drive. These features represent a large-scale designed landscape that was initiated in the 1940's and completed in 1957 as a part of the Mission 66 park development period.

In addition, there may also be found on the island landscape features and historic structures that date from the 18th to mid 19th centuries. While they are contributing features in understanding the history of the island, they do not emerge as key elements that define a larger landscape. These include Civil War earthworks, orchard remnants, and architectural ruins like the Ambler House.

- Green Spring

The cultural landscape at Green Spring (195.74 acres) is comprised of a rich and extensive collection of archeological resources and some surviving above-ground landscape features. When combined, these provide important evidence of stylistic and horticultural trends from the early colonial period through the early republic, and of Tidewater agriculture as it evolved from the early days of crop experimentation to the destructive years of intensive tobacco cultivation and poor agricultural practices. Green Spring is likely one of the few plantations of the 17th century that has any surviving features. The complex of partial historic ruins, archeological sites, and landscape features, are all that remain of the plantation home of Royal Governor Sir William Berkeley, one of the most renowned and controversial royal governors in British colonial history.

Environmental Consequences

Methodology

In order for a cultural landscape to be listed in the National Register, it must possess significance (the meaning or value ascribed to the landscape) *and* have integrity of those features – spatial organization and land forms; topography, vegetation; circulation networks; water features; and structures/ buildings, site furnishing or objects – necessary to convey its significance. The character of defining features of a cultural landscape include spatial organization and land patterns; topography; vegetation; circulation patterns; water features; and structures/ buildings, site furnishings and objects. For purposes of analyzing potential impacts to cultural landscapes, the thresholds of change for the intensity of an impact are defined as follows:

- Negligible: Impact is at the lowest levels of detection – barely perceptible and not measurable. For the purposes of Section 106, the determination of effect would be *no adverse effect*.
- Minor: Adverse impact – Impact would not affect the character defining patterns or features of a National Register of Historic Place eligible or listed cultural landscape. For the purposes of Section 106, the determination of effect would be *no adverse effect*.
- Beneficial impact – Preservation of character defining features in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* a site(s). For purposes of Section 106, the determination of effect would be *no adverse effect*.
- Moderate: Adverse impact – Impact would alter a character defining pattern(s) or feature(s) of the cultural landscape but would not diminish the integrity of the landscape to the extent that its National Register eligibility is jeopardized. For the purposes of Section 106, the determination of effect would be *no adverse effect*.
- Beneficial impact – Rehabilitation of a landscape or its patterns and features in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. For the purposes of Section 106, the determination of effect would be *no adverse effect*.
- Major: Adverse impact – Impact would alter a character defining pattern(s) or feature(s) of the cultural landscape, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register. For the purposes of Section 106, the determination of effect would be *adverse effect*.
- Beneficial impact – Restoration of a landscape or its patterns and features in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Effects of Alternative I

Under this alternative, no proactive fire management activities would take place to protect cultural landscapes. In the event of a wildland fire, fire lines would be constructed in order to protect resources. In the short term, this would protect resources in question, but, over the long term, impacts could actually be increased though the additional accumulation of hazardous fuel. As a result, park forests could be subjected

to fire intensities that exceed the normal range, thus potentially damaging stand integrity. Areas that are currently open meadows would be sustained by continued use of programs such as the agricultural lease program and/or such techniques as mowing and hand trimming. Wetland habitats could degrade from the unwanted presence of invasives such as common reed (*Phragmites australis*) that are not a part of the cultural scene. Moderate long term adverse impacts could result if this alternative were implemented.

Cumulative Effects

Under this alternative a build-up of hazardous fuels would continue. As a result long term minor to moderate impacts would accrue over time. The long term potential for development along the park boundary could provide additional ignition sources for wildland fires and, when combined with the increased fuel load within the park, could significantly increase the potential for wildland fires, both in terms of number of fires and in intensity. The resultant increase in the number and size of fires would likely lead to increased suppression and potential damage to cultural landscapes, particularly those representing vegetation communities and forest screens.

Conclusion

The no-action alternative could result in minor to moderate impacts to the integrity of the park's cultural landscapes. Current forests and meadows would continue to change due to natural succession and the potential effects of insects and storm damage, though the impacts of these changes would be retarded by the application of such management practices as mowing and manual vegetation management. In time, this would lead to a potential degradation of some cultural viewsheds particularly those involving battlefield scenes, historic road traces, views from scenic overlooks, and from earthworks. Wildland fire suppression actions could lead to long-term minor to moderate adverse effects. Earthworks, in particular, would potentially be subjected to the potentially major impacts caused by aggressive fire suppression. Excess accumulations of fuels, particularly those of woody species on earthworks, would lead to increased fire intensity and longer residence time (period of time for materials to burn). Because there would be no pro-active reduction of excess fuel from earthworks before a wildland fire event, this condition would be exacerbated over time. The adoption of this alternative could reasonably be expected to lead to degradation and potential damage to some cultural landscapes found in the park.

Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the enabling legislation of Colonial National Historical park; (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents there would be no impairment of the park's resources or values related to archeological resources.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative I would result in a determination of *no adverse effect* to cultural landscapes.

Effects of Alternative II

As with archeological resources, cultural landscapes are afforded the protection of suppression activities that take advantage of natural breaks in fuel, rather than relying on more invasive ground disturbance suppression activities. Open fields that comprise an important component of the cultural landscape, are enhanced through the application of prescribed fire. The capabilities of prescribed fire to enhance and propagate native warm season grasses are well documented. The use of prescribed fire discourages the introduction of pioneer woody species that, over time, eliminate open fields and attendant vistas. Prescribed fire also may enhance both hardwood and pine forests found in the park and, in the long term, reduces wildland fire risk by promoting a more fire resistant hardwood forest and reducing hazardous fuels. Some wetland and marsh habitats are also improved by prescribed fire and integrated management approaches to vegetation management. Moderate to major beneficial impacts may accrue as a result of the implementation of this alternative. Short term minor adverse impacts could result from the use of this alternative. These adverse impacts generally manifest themselves with a visual presence. Generally speaking, areas such as native grass fields recover from the implementation of a prescribed fire within a few weeks or less. Forested areas take considerably longer to recover from the visual impacts of a prescribed burn. These include the presence of dead trees (snags) and blackened scorch marks on the trunks of standing trees.

Cumulative Effects

The impacts on the cultural landscape from proposed projects would afford better long-term protection for cultural resources due to restoration of a lower fire intensity ecosystem in the hardwood and mixed hardwood-pine forest, and reduction of hazardous fuels. At the present time, the potential for development and change in land-use patterns outside of the park boundary, from a primarily rural landscape, to one that is representative of an urban land use, makes the preservation of cultural landscapes within the park an even more important priority for park management. The potential for wildland fire ignitions is increased through development occurring along the park boundary. Since very little, if any, protective activities relating to pro-active fire suppression are being undertaken in these areas, the potential for risk to cultural resources is significantly increased over time.

Conclusion

This alternative provides the advantage of negligible negative impacts on cultural landscapes. Wildland fire suppression techniques would be designed to minimize cultural and natural resource impacts. Prescribed fire and non-fire treatments would aid in the restoration and maintenance of cultural resources and landscapes for which the park was established. These resources are key components to the natural integrity of the park. In addition, prescribed fires have been documented (Jones et al) as being useful tools in removing heavy vegetation layers from existing archeological and historic sites, thus making their presence known to investigators. This can also have a potentially negative impact through unauthorized public access and looting of sites if not properly managed after discovery. The adoption of this alternative does not constitute impairment.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative II would result in a determination of *no adverse effect* to cultural landscapes.

Effects of Alternative III

The inability to utilize prescribed fire as a restorative and maintenance tool in order to propagate and enhance warm season grasses may lead to heavier reliance on more invasive measures such as mowing by machinery with an increase in potential for resource damage. Continuation of programs such as those implemented through agricultural leases or scheduled maintenance mowing could provide a similar result, though ecosystem diversity is not enhanced with the implementation of these types of programs. Hardwood forests and pine forest alike would likely continue to decline over time without the benefits of prescribed fire. Even though excessive hazardous fuel loadings could be removed through non-fire methodologies, overall, the understory components of park forests would not be allowed to benefit from prescribed fire treatments. As a result, natural reproductive capabilities may be reduced and ecosystem viability reduced, an attendant loss of some elements of the cultural landscape could be expected.

Cumulative Effects

The implementation of this alternative would moderately contribute to the protection of cultural resources, though not to the extent allowed by Alternative II. In the long term, hazardous fuel loading removal and the potential for damage through these more invasive techniques, even when implemented with great care, could lead to minor impacts as the result of increased foot traffic and equipment. Because these types of projects are expensive, and often require large numbers of personnel for implementation, there is a high probability that implementation may be delayed or foregone altogether due to the realities of increased budget shortfalls and funding

constraints. As a result, cultural resources may be placed at minor increased risk over time. The potential for wildland fire ignitions is increased through development occurring along the park boundary. Since very little, if any, proactive activities relating to fire suppression are being undertaken in these areas, the potential for risk to cultural resources is increased.

Conclusion

The removal of encroaching vegetation from the areas surrounding historic structures and archeological resources would have a beneficial long-term impact and would minimize wildland fire intensity. The use of appropriate management response during wildland fires would provide protection of most cultural landscapes, historic structures and archeological sites from the effects of those types of incidents. The lack of ability to use prescribed fire could lead to increased impacts from non-fire reduction of hazardous fuels caused by increased foot traffic, use of mechanized equipment, and the removal of excess fuels both next to structures and on earthworks. This could also result in greater project costs. As a result, restoration of some cultural landscapes would not occur, with long term minor to moderate adverse effects occurring in these areas from a lack of treatment. The adoption of this alternative does not constitute impairment.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative III would result in a determination of *no adverse effect* to cultural landscapes.

Objects

Affected Environment

There are a total of 1, 509,781 total objects and specimens contained in the museum collection of Colonial National Historical Park. This collection includes specimens and documents from archeology and history that relate to the human history of the park beginning as far back as 10,000 years up through and including the Mission 66 period of National Park Service development.

Objects from the museum collection are exhibited at the Jamestown Visitor Center, Yorktown Visitor Center, the Moore House and the Nelson House.

At present, storage areas are fragmented and need better protection from the potential effects of fire, flood, and theft. The Jamestown Collection was impacted by Hurricane Isabel on September 18, 2003 and is undergoing stabilization and conservation treatment at an offsite facility. A new collection storage building is under construction on Jamestown Island to house the collection after conservation treatment is completed. The Yorktown collection is stored in five locations with varying storage conditions. A

new collection storage building will be constructed in 2005 to house the majority, but not all of the collection.

As required by the Automated Checklist Program in the ANCS+ cataloging system and in accordance with the NPS Museum Handbook, facilities exhibiting and storing museum objects have completed fire protection surveys (scheduled for updating at COLO), fire suppression and detection systems (with the exception of Swann Tavern Kitchen and the Yorktown Visitor Center, although the latter is scheduled for a system), and orientation to the fire fighting organizations responsible for the suppression of fire (last completed in 2001) .

Environmental Consequences

Methodology

The National Park Service and Colonial National Historical Park are the custodians in perpetuity of irreplaceable and priceless museum collections that include objects, specimens, and archival and manuscript materials (textual, electronic, audio-visual documents) representing cultural and natural resources in the United States, including, but not limited to the disciplines of archeology, biology, ethnology, geology, history, and paleontology. Museum collections are part of the natural and cultural heritage of the country and are collected, preserved, and interpreted for public benefit. For the purpose of analyzing potential impacts to objects in COLO collections, the thresholds of change for the intensity of an impact are defined as follows:

Negligible: Impact is at the lowest levels of detection – barely perceptible and not measurable. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Adverse impact – Impact would not affect the character defining patterns or features of a National Register of Historic Place eligible or listed cultural landscape. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial impact – Preservation of character defining features in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* a site(s). For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Adverse impact – Impact would alter a character defining pattern(s) or feature(s) of the cultural landscape but would not diminish the integrity of the landscape to the extent that its National Register eligibility is jeopardized. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial impact – Rehabilitation of a landscape or its patterns and features in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: Adverse impact – Impact would alter a character defining pattern(s) or feature(s) of the cultural landscape, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register. For the purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial impact – Restoration of a landscape or its patterns and features in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. For the purposes of Section 106, the determination of effect would be *no adverse effect*.

Effects of Alternative I

There would be no change in current management. Under the no-action alternative, protection issues relating to historic structures and museum objects contained within them would only occur when a wildland fire was underway. Protection through a proactive hazardous fuels reduction program would not occur, thus potentially creating a minor to moderate adverse impact through the accumulation of hazardous fuels adjacent to historic structures. In the event of a wildland fire, fire lines would be constructed in order to protect structures resulting in a moderate beneficial impact in the short term.

Cumulative Effects

Under this alternative a build-up of hazardous fuels would continue to accrue. Fuel accumulations would be in close physical proximity to, and in some cases, immediately adjacent to historic structures. As a result, long term minor to moderate impacts could accrue over time. The long term potential for development along the park boundary would provide additional ignition sources for wildland fires and, when combined with the increased fuel load, both within and outside of the park, would significantly increase the potential for wildland fires. This increase would be manifested by an increased number of fires as well as an increase in their intensity. The predicted increase in the number and size of fires would likely lead to an increased reliance on aggressive wildland fire suppression. The end result would be an increased potential for damage to cultural resources as well as more modern facilities utilized to protect museum collections and objects.

Conclusion

The no-action alternative would result in minor to moderate long-term impacts to the integrity of the park's historic structures. The majority of these impacts would result from aggressive wildland fire suppression actions that could disturb historic structures as well as other non-historic structures used to house museum collections and objects. Perhaps even more threatening would be the potential for damage to a structure resulting from the presence of a wildland fire near-by. Excess accumulations of fuels, particularly those of woody species found near to historic structures, would lead to increased potential fire intensity and longer residence time (period of time for materials to burn). Because there would be no pro-active reduction of excess fuel from areas surrounding both historic and non-historic structures *before* a wildland fire event, this condition would be exacerbated over time. The adoption of this alternative could reasonably be expected to lead to degradation and potential damage to some structures, either historic or non-historic, and the collections and objects contained within them. Also, some objects, such as the artillery pieces exhibited along the tour roads in the park, may be susceptible to the short-term exposure to flames produced by wildland fire. Since these pieces are generally found in areas of sparse fuels, impacts from even direct flame exposure would be short-lived and minor, resulting in some discoloration and perhaps charring.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to museum collections and objects.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative I would result in a determination of *no adverse effect* to historic resources.

Effects of Alternative II

Under this alternative project activities would occur that could have minor to moderate long term beneficial impacts to historic structures and non-historic structures, and the collections and objects contained within them. The use of appropriate management response fire suppression strategies and tactics would be designed to minimize impacts by avoiding suppression techniques and locations that might damage historic structures. Alternatively, this alternative allows the flexibility to use aggressive suppression in the case of an unplanned ignition that directly threatens a historic or non-historic structure. Non-fire hazard fuel removal treatments would be designed to reduce hazardous fuel loadings in the vicinity of structures. Prescribed fire would not likely be utilized as a

hazardous fuel removal tool in close proximity to some historic structures because of the risk, albeit slight, of potential damage caused by an escape or by fire behavior that exceeds planned parameters. In these cases non-fire methods would be the management tools of choice.

Cumulative Effects

Under this alternative the build-up of hazardous fuels adjacent to structures (historic and non-historic) structures would take place. Fuel accumulations in close physical proximity to, and in some cases, immediately adjacent to structures (historic and non-historic), would receive priority treatment. As a result, long term minor to moderate beneficial impacts would accrue over time. Because the increased potential for development along the park boundary would provide additional ignition sources for wildland fires that might ultimately threaten historic structures within the park, the pro-active fuel reduction programs implemented as the result of this alternative would significantly decrease the potential for wildland fires. In those cases where wildland fires would occur, the use of the wide range of appropriate management response fire suppression techniques available in this alternative would allow for maximum protection of historic structures from the suppression actions themselves. The end result would be a decreased potential for damage to structures of all types, as well as the museum collections and objects they provide storage for.

Conclusion

The preferred alternative would result in minor to moderate beneficial long-term impacts to the integrity of the park's historic structures, and the objects and collections stored within them. The use of appropriate management response fire suppression strategies and tactics would be designed to minimize impacts by avoiding suppression techniques and locations that might damage historic structures. Alternatively, this alternative allows the flexibility to use aggressive suppression in the case of an unplanned ignition that directly threatens an historic structure. Non-fire hazardous fuel removal treatments would be designed to reduce hazardous fuel loadings in the vicinity of structures. Prescribed fire would not likely be utilized as a hazardous fuel removal tool in close proximity to some historic structures because of the risk, albeit slight, of potential damage caused by an escape or by fire behavior that exceeds planned parameters. In these cases non-fire methods would be the management tools of choice. Also, some objects, such as the artillery pieces exhibited along the tour roads in the park, may be susceptible to the short-term exposure to flames produced by wildland fire. Since these pieces are generally found in areas of sparse fuels, impacts from even direct flame exposure would be short-lived and minor, resulting in some discoloration and perhaps charring. These resources can easily be protected during prescribed fire implementation through removal in place, or through protective measures identified in the project specific prescribed burn plan.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity

of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to museum collections and objects.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative II would result in a determination of *no adverse effect* to museum collections and objects.

Effects of Alternative III

Same as Alternative II except that there is no use of prescribed fire

Cumulative Effects

Under this alternative the build-up of hazardous fuels adjacent to structures (historic and non-historic) structures would be reduced through a pro-active program of non-fire hazardous fuel reduction. However, the inability to use prescribed fire would place a heavier reliance on non-fire mechanical methods of fuel reduction. As a result, impacts from the use of mechanized equipment such as chainsaws, brush cutters, and chippers, as well as increased foot traffic from personnel, would reduce the potential for overall effectiveness of fuel reduction and increase impacts from compaction and erosion. Though still effective, this alternative would not be as valuable in terms of scope and efficiency as the preferred alternative. Fuel accumulations in close physical proximity to, and in some cases, immediately adjacent to historic and non-historic structures would receive priority treatment. As a result, long term minor to moderate beneficial impacts would accrue over time. Because the increased potential for development along the park boundary would provide additional ignition sources for wildland fires that might ultimately threaten structures within the park, the pro-active non-fire fuel reduction programs implemented as the result of this alternative would decrease the over-all potential for wildland fires. In those cases where wildland fires would occur, the use of the wide range of appropriate management response fire suppression techniques available in this alternative would allow for maximum protection of structures from the suppression actions themselves. The end result would be a decreased potential for damage to cultural resources, including museum collections and objects stored in buildings, though not to the same extent as with the preferred alternative.

Conclusion

The removal of encroaching vegetation from areas adjacent to and in close proximity to both historic (and non-historic) structures would provide a beneficial long-term impact and would minimize wildland fire intensity, should such an event occur. The use of appropriate management response strategies and tactics during wildland fires would

provide protection of most park structures from the effects of wildland fire. The lack of ability to use prescribed fire could lead to increased impacts from non-fire reduction of hazardous fuels caused by increased foot traffic, use of mechanized equipment, and the removal of excess fuels next to and adjacent to historic and non-historic structures. This could also result in greater project costs. As a result, some fuel reduction projects would not occur, with long term minor to moderate adverse effects occurring in these areas from a lack of treatment. Also, some objects, such as the artillery pieces exhibited along the tour roads in the park, may be susceptible to the short-term exposure to flames produced by wildland fire. Since these pieces are generally found in areas of sparse fuels, impacts from even direct flame exposure would be short-lived and minor, resulting in some discoloration and perhaps charring.

Because there would be no *major* adverse impacts to a resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the establishing legislation for Colonial National Historical Park; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant National Park Service planning document, there would be *no impairment* of the park's resources or values related to museum collections and objects.

Section 106 Summary

In accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800.5., Assessment of Adverse Effects), the National Park Service proposes that implementation of Alternative III would result in a determination of *no adverse effect* to museum collections and objects.

4. VEGETATION

Affected Environment.

Colonial National Historical Park is composed of a variety of habitat types including: upland coastal plain, coastal pine and hardwood forest, wetlands and marshes, swamps, and open and agricultural fields. According to National Park Service records, COLO supports 1014 vascular plant species representing 98 families and 352 genera. At the present time, park vegetation is approximately 50% forest, including forested wetlands (swamps). The remainder of the park is composed of wetlands, open fields and lawns; and developed and landscaped areas including roads, gardens, buildings, parking lots and overlooks.

There are currently 177 "patches" (areas) of fields and lawns that cover 935.9 acres of land. These open areas vary in size from very small fragments that cover less than .1 of 1 acre to larger patches that are more than 74 acres in size. The majority of these open areas are less than 5 acres in size. Many of the smaller patches are located along roadways and have a linear shape. Historically the proportion of open areas and fields to forest was exactly the opposite of what is found today. This fact is integral to the

historic understanding of the events that took place in the area before the park was established. It also has significant management implications regarding the restoration and maintenance of cultural scenes in the park has been discussed in a previous section bearing that title.

Although there is a history of recorded fire in the park, both natural and anthropogenic, the emphasis on fire suppression since the time of the park's establishment has most likely contributed to the density of vegetation and the conversion of open areas to forest. There is extensive evidence that intentionally set fires were used to clear underbrush and trees in the area prior to European settlement. "When the Indians of coastal Virginia go hunting, they leave their habitations, and reduce themselves into companies, as the Tartars do, and go to the most desert (uninhabited) places with their families, where they spend their time in hunting and fowling.....having found the deer they environ them with many fires, and betwixt the fires they place themselves". (Captain John Smith early 1600's). The following statement of Wood (1634) further supports the fact that fire was in evidence everywhere prior to the settlement. "There is no underwood saving in the swamps and low grounds that are wet...for it being the custome of the Indians to burne the wood in November, when the grass is withered, and the leaves dried, it consumes all the underwood, and rubbish, which otherwise would grow over the Country, making it unpassable.... There is also extensive evidence that European settlers used fire to keep areas clear of overstory vegetation and dense underbrush. Hammond (1880) states that "the early settlers in this region were stock raisers and kept up the Indian practice of burning off the woods during the winter". Byrd (1728) tells us that "the woods are not burnt every year, as they generally are amongst the inhabitants, but the dead leaves and trash of many years are heaped up together , which are at length kindled by the Indians that happen to pass that way, furnishing fuel for a conflagration that carries all before it". The use of fire started to decrease in the mid to late 1800's. Fire survey results from Hough (1882) show that in Pennsylvania and Virginia during this time period, from 2 to 14% of the land area was burned annually, and average fire rotation of eleven years.

In general, park forests are healthy, though they have been subjected to a variety of impacts including severe storm damage, lack of the presence of natural occurrence of wildland fire, and insect infestations. The natural ecological succession of park forests is from sub-climax pine to oak-hickory or other shade tolerant hardwoods. Typical hardwood species found in the more xeric sites of the park include tulip poplar, white oak, willow oak, black cherry, red oak, and hickory (spp.) Predominate hardwood species in areas where wet soils or in poorly drained areas are sweet gum, white ash, red maple, black walnut, black gum, cypress, and sycamore. Historically, damage from the southern pine bark beetle (*Dendroctonus frontalis*) has been minimal. The frequency and severity of these types of insect infestations has varied historically, and predicting future impacts upon park resources is problematical. As pine forests senesce, the potential for outbreaks of SPB are intensified (USFS 2001).

Few areas of the park have been spared the effects of periodic disturbance. Forests, open fields, wetlands, marsh, and swamps have all been subjected to disturbances of

one type or another, whether natural and of human occurrence. These disturbance events have provided opportunities for the invasion of a multitude of invasive plant species. An inventory of invasive species conducted in 1999 identified 39 invasive species found in forested areas; 39 species along roadsides, and 38 species in open fields. Indeed, invasives may occupy as much as 30% of the park. Species causing the greatest impact, based upon the park acreage that they cover, are: Microstegium (*Microstegium viminium*), Japanese honeysuckle (*Lonicera japonica*), Bermuda grass (*Cynodon dactylon*), tall fescue (*Festuca elatior*), Chinese privet (*Ligustrum sinense*), orchard grass (*Dactylis glomerata*), and Chinese lespedeza (*Lespedeza cuneata*). A significant number of highly invasive species with a relatively low coverage throughout the park are present. As a result, these species have been placed in a high priority for eradication. These include; autumn olive (*Elaeagnus umbellata*), Common reed (*Phragmites australis*), Oriental bittersweet (*Celastrus orbiculatus*), kudzu, (*Pueraria lobata*), tree-of heaven (*Ailanthus altissima*) and wineberry (*Rubus phoenicolasius*). The COLO Natural Resource Management Plan and the Strategic Plan for Managing Alien Invasive Vegetation at Colonial National Historical Park have been developed in order to actively manage invasive species and will be partially implemented using elements of the park fire management plan as a tool in managing vegetation within the park. For reasons chiefly related to funding and personnel limitations; kudzu, phragmites, and tree-of-heaven have received primary emphasis from the parks management program.

Periodically, extreme weather conditions have caused severe damage to park vegetation and associated cultural resources. High winds associated with hurricanes, as well as winter weather and ice storms, often accompanied by intense periods of ground-soaking moisture, have uprooted many trees and broken the tops out of many more, severely damaging earthworks and archeological sites. For example, Hurricane Isabel in September of 2003 uprooted thousands of mature trees, subjecting earthworks and associated cultural and archeological resources to deleterious and often irreversible impacts caused by tree root-ball uprooting and associated soil disturbance. In addition, the dead and downed trees provide an increased fuel loading that can be expected to lead to intensified danger from wildland fire, both in terms of ignition, fire intensity and overall size should environmental conditions be present that favor the start and propagation of wildland fire (for example a drought).

Eleven designated Natural Heritage Areas have been identified and earmarked for special study and management protection as the result of the recommendations of the Conservation Planning for Natural Areas of Colonial National Historical Park, Virginia, prepared by the Virginia Division of Natural Heritage. These areas contain a variety of unique species and habitats, many of which are federal or state threatened, endangered or watchlisted. These areas are discussed in greater detail in the section on threatened and endangered species.

Jamestown

Jamestown Island is composed primarily of pine-oak forests and associated marshes. In addition, there are some forested wetlands. Loblolly pine is the predominant forest

species. These forests are made up of second and third generation disturbed forest that has experienced frequent fires of low to moderate intensity (prior to park establishment), and semi-natural vegetation that has developed following primarily anthropogenic disturbance (largely agricultural uses). In the absence of fire, the substantial component of these forests, loblolly pine (*Pinus taeda*) is being lost as a predominately single aged cohort senesces and conditions persist that preclude successful regeneration. In general, understory vegetation is thick, often accompanied by transitional vegetation such as vines. The pitch and tar swamp near the Jamestown visitor center contains considerable unique vegetation. This 22-acre swamp is classified as a palustrine wetland system. The upstream portion, where pioneer species such as red maple (*Quercus rubus*) and black gum (*Nyssa sylvatica*) are replacing common marsh species like cattail (*Typha Sp.*), arrow arum, saltbrush and switchgrass, is characterized as emergent. Downstream the swamp becomes increasingly saline as it feeds into Kingsmill Creek. The vegetation in that portion of the swamp is characterized by the presence of big cordgrass (*Spartina cynosuroides*).

The Colonial Parkway

The Colonial Parkway corridor is predominantly composed of pine-hardwood forests and associated wetlands (marsh and swamps). Evidence of Hurricane Isabel is readily visible in many areas and is manifested in the large numbers of dead and down trees found in forested areas. Forests in these areas provide an important buffer against the visual and physical intrusions of development along the park boundary. Wetlands provide an important refuge for park vegetation and wildlife, aesthetics for the visiting public, shoreline protection, and important cultural viewsheds.

Yorktown

The vegetation in and around Yorktown is predominantly pine-oak forest with loblolly pine and various oak species predominating. The forested areas are approximately 75 years old and dominant species include Tulip poplar (*Liriodendron tulipifera*), Sweet gum (*Liquidambar styraciflua*), White oak (*Quercus alba*), Black gum (*Nyssa sylvatica*) and Loblolly pine (*Pinus taeda*). Open fields provide important cultural viewsheds as well as being home to meadow-loving plants and wildlife. At the present time, these areas are predominantly composed of cool season grasses with a native warm season grass component. Since this unit of the park serves as the main visitor interpretation area, the predominance of open grassy expanses are encouraged and maintained through an active mowing program. Earthworks and earthen remnants of the Yorktown siege of 1781 and the Civil War are maintained in such a manner so as to allow visitors the opportunity to enjoy the benefit of an open vista; making it easier to interpret the battlefield as it would have existed in 1781. Forested areas range from almost pure pine stands to mixed pine and hardwood.

Several coastal seasonal pond complexes are found on the Yorktown Battlefield. These are a part of the larger Grafton Pond Seasonal Complex found on the adjacent Newport News Park and Watershed lands.

Green Spring Plantation

The vegetation in area of the park is predominately pine-hardwood forest and open fields. Loblolly pine is the primary overstory species. Lowland areas have extensive forested wetlands.

The Green Spring Unit of the park is home to a Globally Rare Forest. A Riverine Saturated Forest association is currently only known in Virginia, though it may range into Maryland. Very little information is known about this association, but it is uncommon and most of the remaining examples are of low quality with the most common threats being hydrologic alteration, timber extraction, and exotic species influence. The occurrence at Green Spring was disturbed by a logging event approximately 40-50 years ago, and most of the area is in regeneration of sweetgum, but there are a few islands of more mature hydric oaks scattered throughout the stand (willow oak, swamp oak, swamp white oak, cherrybark oak), representing the historic condition of the forest. *Microstegium viminium* is a clear and present threat to the integrity of the community, growing on the hummocks, but it is not yet present in the wettest areas.

Swann's Point

This area of the park is dominated by forested wetland, primarily mixed hardwood species, with cypress and marsh vegetation along the shoreline. Upland terrestrial areas are characterized by the presence of mixed hardwoods and pine.

Methodology

All available information on vegetation was compiled from the General Management Plan (1993), Resource Management Plan (2000), Strategic Plan for Managing Invasive Vegetation (2000), Final report: Inventory of Invasive Exotic Plants of Colonial National Historical Park, Management of Park Fields to Enhance the Natural Resource Value and Biodiversity of Colonial National Historical Park, Plants and Animals Recorded from the Jamestown Island 400th Project Area, COLO 2002, Inventory of Rare, Threatened and Endangered Plant and Animal Species at Colonial National Historical Park, Yorktown Creek Drainage 1995, Conservation Planning for Natural Areas of Colonial National Historical Park, Virginia (1998) and other available literature. Predictions about short- and long-term site impacts were based on this information. Intensity of effects is defined below.

Negligible – An action that may cause changes to the vegetation structure, but the change will be so small that it will not be of any measurable or perceptible consequence to the population.

Minor – An action that may cause changes to the vegetation structure, but the change will be small and that if it is measurable, it will be a small and of localized consequence to the population.

Moderate – An action that will cause changes to the vegetation structure, and the change will be measurable and will have a sufficient consequence to the population, but is more localized.

Major – An action that will cause a noticeable amount of change to the vegetation structure, and the change will be measurable and will have a substantial and possible permanent consequence to the population.

Cumulative – Impacts, though negligible, add up though time becoming minor to major and may be irreversible

Source – NPS Organic Act, NPS *Management Policies* (2001), National Environmental Policy Act, Executing Order 13112 Invasive Species

Impacts of Alternative I - No-Action

Impact Analysis

Under the no-action alternative, wildland fires could not be managed to produce desired changes in vegetation; and aggressive suppression activities would be used that may have short term minor adverse impacts on vegetation. Since emphasis in this alternative is on keeping fires to the smallest possible size, suppression methods may be utilized that place those types of activities in areas of sensitive vegetation, such as those where invasives are located. In addition, the use of mechanized equipment and fireline construction techniques that utilize extensive line construction may have obvious negative adverse short term impacts upon vegetation. The timing and intensity of wild land fires also tends to favor the further development of some invasive species. Unwanted wildland fires, particularly those driven by excess fuel accumulations during the spring months, can cause extensive mortality in many native species. This allows invasives on the periphery of the fire to colonize with their characteristically hardy and abundant seed sources. Spring is also the time of the year when many types of vegetation are undergoing phenologic changes as a result of their efforts to achieve robust spring growth. When they are in this condition, they are susceptible to the killing effects of even moderate heat generated by a wildland fire. In addition, fires driven by excess fuels can remove significant amounts of the duff layer, thus laying bare large areas of mineral soil which make the area ripe for the introduction of invasive species. Short to long term moderate adverse impacts may occur as a result of these processes.

Because the reduction of hazardous fuels would not be undertaken, the potential for large or unusually intense fires would be increased with the potential results described in the preceding paragraph.

Due to the aggressive suppression of wildland fires, fields in the park would be reduced in size due to the effects of natural succession. At the present time, many fields are kept open through mechanical mowing and agricultural leases. While these methods are effective in maintaining current open fields, they are costly, both in terms of time and personnel, and accomplish little to improve native plant propagation (warm season grasses for example) or the promotion of ecosystem diversity. Under this alternative, these areas may be maintained by mowing and agricultural use with no change or improvement in species diversity resulting. Long term adverse impacts would be minor to moderate in nature.

Cumulative Effects

The no-action alternative would contribute to long-term changes in the structure of the vegetation. Barring some management practices, such as mowing in open fields, succession in both forested and open areas would continue, unimpeded by disturbance, and the cultural scene would be modified from that described in the desired futures discussion. Wildland fire suppression techniques could cause immediate adverse impacts that would accumulate over time with moderate to long term adverse impacts

upon some vegetative communities. As land use patterns change outside the park with increases in development and the disturbance they engender, the potential for the introduction of invasive species is increased with the attendant decline in native species encouraged through the implementation of this alternative.

Conclusion

This alternative would produce minor to moderate adverse vegetation impacts in the short term, and would have long term moderate to major adverse impacts on some vegetation types, particularly those represented by the oak, pine, mixed pine –oak forests and open grasslands.

Mitigation

Current management practices, such as mowing or other agricultural uses, would temporarily set-back the effects of succession of open fields, but would do little to enhance species and habitat diversity.

Impacts of Alternative II – Preferred Alternative

Impact Analysis

Evidence exists that strongly suggests the existence of frequent (2.8 -14 year fire return interval) fires that occurred in the area of the park during the pre-European settlement period. The predominately hardwood upland oak forest type typically experienced low intensity under story fires. The frequency and extent of Native American burning decreased substantially after European contact. As a result, forest canopies closed over previously open grasslands, savannas, and woodlands (Buckner 1983; Deneven 1992; Dobyns 1983; MacCleery 1993, 1995; Pyne 1997). European settlers increased the frequency and extent of burning in the oak hickory forest and mixed pine forest types and shortened fire return intervals to 2-10 years; many sites were burned annually (Cutter and Guyette 1994, Guyette and Dey 1997, Holmes 1911, Sutherland and Others 1997 and 1995). Others, (Van Lear 1989 and Abrams 1992), have made a strong case for the re-introduction of fire to what were once the oak dominated forests and woodlands of this geographic area.

As shade tolerant species invade present day oak forests, the oak trees and other less shade-intolerant companion species cannot thrive and become reproductively unsuccessful. The recent predominance of red maple in oak forests has been shown to prohibit reproduction of oaks (Apfelbaum and Haney 1989). This condition is evident within many of the oak forests in the park. A program of prescribed fire would provide the potential for the creation of open forest gaps, increased ground forage, and nutrient release to the soil. These are all conditions that are needed in order to support increased woodland/ forest diversity by providing resources needed for a variety of flora and fauna and by creating viable seedbeds necessary for oak reproduction. An increase in populations of oak reproduction and herbs in the understory could reasonably be

expected to create an attendant increase in the presence of some species, such as white-tailed deer. In areas where over-populations of these species exist, the potential exists for a decrease in vegetative species diversity due to the removal of new plants by foraging wildlife.

The beneficial impacts of fire to oak and companion species (hickory, for example) that are relatively fire tolerant would be immediate following a prescribed fire as would also some short term adverse impacts (mortality and/ or weakening) to fire intolerant species. Estimating the duration of these impacts is difficult to quantify because there are a number of factors that are involved, most of which are highly variable. Factors to be considered are the survivability of some mature species that are fire intolerant in their seedling stage, but exhibit resistance to fire in their more mature stages of development; the presence of a viable seed-bank in the soil, the environmental conditions following the fire, and the time interval between prescribed fire treatments. Post-burn activities such as invasive species removal and native species planting programs, will also determine the duration of the impacts to vegetation.

The time interval between prescribed fire applications will also exert a significant influence upon the intensity and duration of impacts to vegetation. The generally accepted return interval for oak forests is between 5 –10 years. Weakening and mortality of some fire-tolerant trees can be expected with the return intervals suggested. It can also be expected that most of the desired species will re-sprout following prescribed fire. This is the primary method utilized by many oak species in order to regenerate. Hickory, redbud, and dogwood species in the park also react in this manner as long as they are not top-killed by fire (<http://www.fs.fed.us/database/feis>). A prescribed fire that utilizes low intensity ground fire would not significantly affect larger trees of these and other species. Long term moderate to major beneficial impacts are expected to occur over time (2-15 years), foreshadowing any minor short term adverse impacts that may occur immediately post burn.

Recently, guidelines have been developed for using prescribed fire in order to thin dense natural stands of loblolly pine (*Pinus taeda*) (Van Lear). Since the park has significant amounts of this species present, the potential use for prescribed fire as a tool to effectively manage this resource is evident.

The effect of prescribed fire on populations of native warm season grasses in the park such as (*Andropogon virginicus*, *Sorghastrum cirvenaceum*, *Panicum virgatum*, *Andropogon gerardii*, and *Schizachurium scoparium*) and others are well known (Wright, 1982 and internet database located at (<http://www.fs.fed.us/database/feis>)). The applications of prescribed fire to representative populations of these species within the park, particularly during the very early spring when grasses are still in the dormant stage, have proven to be most effective in propagating these species. While mechanical processes such as mowing have been used to keep grasses short, primarily as a means of maintaining the historic scene in the park, these methods do little to enhance current populations of native warm season grasses and may actually contribute to their decline in the long run. On the opposite side, prescribed burns in the spring have been shown to be very effective in killing cool season grasses, particularly those classified as

non-natives such as *Poa pratensis* and *Elymus virginicus* (Hensel 1923, Ehrenreich, 1959, Old 1989). The strategy of applying prescribed fire to selected open field areas on a rotational schedule of between 1-3 years has been proven to be most effective in enhancing native warm season grass populations and in reducing some selected non-natives. In addition, the acreage selected for treatment of this type in the park is relatively small. Attention to monitoring will provide important information as it relates to the effectiveness of the prescribed burn program in meeting management objectives. Immediate beneficial impacts on these species will be realized and the long term prognosis for moderate to major benefit is a realistic expectation regarding these species.

Severe disturbance events, such as those manifested in an unwanted wildland fire, can have profound impacts upon natural resources, interrupting the natural succession process. As a result, other resources, both natural and cultural, may be placed at increased risk. This is exacerbated due to the fact that coniferous species are generally higher in flammability and are more susceptible to the negative effects of ice storms, insects, and wind damage. These elements often combine to create the potential for increase in fire activity through the accumulation of dead and downed forest fuels above normal levels.

In those areas where access is available, non-fire reduction of dead and down fuels is the treatment of choice in these forest types. Forest stands in this transitional phase present the most risk regarding wildland fire. This is largely due to the presence of large amounts of fuel, chiefly in the form of snags (standing dead trees) and downed trees and branches. Where relatively pure pine stands are beginning to make the transition to a more mature stand with attendant over story, residual hardwoods in the under story can begin to develop. These areas are the most susceptible to damage from environmental elements. Care will have to be taken not to damage hardwood seedlings and reproduction in the under story when manual hazardous fuel reduction activities are undertaken. Minor, short term adverse impacts can be expected, but these will be quickly overshadowed by the long term major beneficial changes in forest structure and attendant lower fuel loading. Caution must also be taken to preserve those gap openings in the forest canopy that will allow for shade intolerant hardwoods in the under story the opportunity to respond to the sunlight provided by the gap openings in the forest canopy. This also encourages the growth of grasses and forbs in the under story and increases overall site diversity.

Cumulative Effects

This alternative would contribute to desired major long-term beneficial changes in the structure of the vegetation within the park. The establishment and maintenance of native grass and forbs, as well as the restoration and maintenance of the oak-hickory and loblolly forests would help reduce impacts on vegetation from unplanned ignitions and help restore the natural and historical landscape. The cumulative effect of this process would manifest itself in the preservation of species diversity and viewsheds in the park. This is of particular importance because of gradual development projected to

occur along the park boundary within the next several decades and the potential for increased ignition of unwanted wild land fires. Also, the introduction of structures in areas where they were previously not found (e.g. along the park boundary) add to the list of values at risk should a wildland fire ignite in the area.

Conclusion

The use in this alternative of prescribed fire, non-fire hazardous fuel reduction, and appropriate management response in wild land fire suppression situations, provides a range of alternatives that maximize the ability of park managers to manage vegetation in order to promote public safety and enhance resource value. The establishment and maintenance of native grasses and the restoration and maintenance of the oak and pine forests are instrumental to the restoration of the park historical landscape and to species diversity. Major long term beneficial impacts are expected to result from the implementation of this alternative.

Mitigation

The USFWS, Virginia Division of Natural Heritage and COLO natural resource management experts will be consulted during planning and development of each of these projects to identify the location of state or federally protected species and define how they will be protected and managed

Non-fire hazard reduction methods (chainsaws/ brush blades, etc) will be used in lieu of other mechanized equipment, particularly in those areas where hardwood seedlings are already present in the forest under story.

Spot treatments of herbicide may be used to eliminate invasive species present in the under story. Their application will be done in accordance with the procedures outlined in the Strategic Plan for Managing Invasive vegetation (2000).

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

Under this alternative, impacts would be similar to those outlined in alternative II. Because prescribed fire activities would not be allowed under this alternative, there is potential for increased short term minor to moderate adverse impacts to vegetation and soils resulting from hazardous fuel reduction. This typically manifests itself in the form of increased foot and machine traffic of the personnel and / or equipment involved. Non-fire treatments without prescribed fire are less effective in favoring or discouraging selected species and are could cost more in the long term. Native warm season grasses would not benefit from the restorative efforts of prescribed fire, thus populations would slowly decrease or likely be replaced by non-native grass species.

Cumulative Effects

Because growth adjacent to and along the park boundary is projected to occur during the next several decades, the restoration and maintenance of species diversity and historical view sheds is a major importance to the park. Under this alternative, there is potential for minor to moderate loss of native grasses, and minor to moderate long term loss of forested historical view sheds with the implementation of this alternative.

Conclusion

This use of non-fire hazardous fuel reduction activities in this alternative would have minor to moderate adverse impacts on vegetation. Some areas would not receive treatment due to lack of access for personnel and equipment. The use of appropriate management response techniques during wild land fire suppression incidents would afford an increased level of protection and /or benefit for vegetation since fire managers would be able to prioritize suppression responses in selected areas. Non-fire hazardous fuel reduction treatments would cause minor localized changes to the forest canopy cover as well as to vegetation in the forest under story. The enhancement of existing vegetative communities would not occur to the extent as demonstrated in alternative II; in particular native warm season grasses and other associated flora and fauna. The adoption of this alternative does not constitute impairment.

Mitigation

The USFWS, Virginia Division of Natural Heritage and COLO natural resource management experts will be consulted during the planning and development of each of these projects to identify the location of state or federally protected species and define how they will be protected and managed

Non-fire hazard reduction methods (chainsaws/ brush blades, etc) will be used in lieu of other mechanized equipment, particularly in those areas where hardwood seedlings are already present in the forest under story.

Spot treatments of herbicide may be used to eliminate invasive species present in the under story. Their application will be done in accordance with the procedures outlined in the Strategic Plan for Managing Invasive vegetation.

5. Adjacent Communities and Landowners

Affected Environment.

In the sixty –nine years that Colonial National Historical Park has been under the stewardship of the National Park Service, there have been no formal finalized comprehensive fire management plans developed with the intent to guide direction of fire management activities. During the time period 1932 - 2004, 190 fires were reported

as having been suppressed on park lands, burning a total of 1,524 acres. The largest fire recorded since 1934 was 300 acres; the smallest .1 of an acre. Average mean fire size is 8.02 acres. Perhaps of equal concern, is the growing impact that residential and industrial development is having upon park resources. Rapid residential growth along the previously agriculturally based boundary of the park, has placed a large number of structures in direct contact with areas of the park that have experienced increased fuel loads resulting from the effects of storms, ice damage, insects, and many years of fire suppression. This raises the concern of a potentially severe fire starting either within the park or just outside of the boundary, and spreading rapidly onto either park or residential, commercial, or military land (Appendix D). The City of Newport News experienced just such a wildfire in 1987, burning to within just a few miles of the park boundary. Historically, a considerable number of mutual aid calls have taken place in which fire suppression personnel and equipment from Colonial National Historical Park have been requested to respond to wildfires on adjacent private land as well as land held in ownership by other federal and state agencies. As the result of these types of mutual aid requests and the physical configuration of the park, namely one that produces an extensive boundary interface with many private, state, and federal landowners, park managers have identified the need to confer with adjacent fire protection organizations, particularly local fire departments, adjacent military reservations and the Virginia Department of Forestry, in order to address basic fire protection mutual aid concerns. As a result of new federal fire policy implemented in 2002, the park is mandated to prepare a comprehensive fire management plan to govern those activities in the park. In compliance with NEPA regulation, this Environmental Assessment is being completed as a part of that process, and will be included as an Appendix to the Colonial National Historical Park Fire Management Plan.

A variety of park management documents have identified natural and cultural resources in the park that require continuing protection. The fire management plan will address the full spectrum of activities that will be used to protect these identified resources. These activities include; the suppression of unwanted wildland fires, the use of prescribed fire and non-fire methodologies to reduce/ remove hazardous fuels, enhance native warm season grasses, protect wetlands and marshes, enhance forest succession, and remove and/ or reduce invasive species.

Because many of these activities will be “new” to park neighbors and the public, it is critical that the rationale for each of the actions discussed in the environmental assessment be clearly defined and presented in such a manner that a clear sense of what is to be accomplished is presented. The goal of this interactive process is to enhance protection efforts for park resources and eliminate potential conflicts that might be based upon a lack of knowledge of management goals, objectives, and procedures. Local fire departments, both military and civilian, adjacent landowners, and local communities will be invited to participate, to the extent of their training and background, in the planning and implementation of the park fire management plan. This will not only provide “buy in” from these resources, but it will also enhance overall protection efforts for resources both in an outside of the park. In addition, resource availability and

potential project funding may be increased by widening the funding base available across agency lines.

Methodology. All available information on resources needing to be afforded protection, as well as park planning documents such as the General Management Plan, Resource Management Plan, Cultural Landscape Reports, and other park documents relating to resources and their protection have been used as resource material for development of this action item. In addition, the use of public comment to assist in gathering information regarding public perception of proposed management actions may be carried out in a variety of ways, including newspaper notices, visitor contacts in the park visitor center, local service clubs and organizations, employee contacts with peers in the local community, and through public notices and meetings. Each park has a different relationship with its constituents, so there is no specific set of actions that must be undertaken. Emphasis should be placed upon effective communication of park goals and objectives, and, to the extent practicable, an explanation of the techniques utilized to meet those objectives and the expected results. The development of cooperative efforts in both planning and implementation of non-fire hazardous fuel reduction, prescribed fire, and fire suppression operations, is undertaken.

Negligible – Impacts barely perceptible or below detection levels.

Minor – Changes in public and interagency support are minor and short-term. Little, if any, mitigation in the form of public meetings or further contacts beyond normal communication would be necessary.

Moderate – Changes in the ability of the park and local resources to protect values at risk are possibly long-term, but localized. Mitigation to offset adverse effects could be necessary, and would likely be successful. This may involve the use of public meetings, forums, and enlistment of other agency representatives in order to clarify programs and treatment methods and ensure joint operations are undertaken to the advantage of both the park and adjacent communities and landowners.

Major – Impacts on park resources may be considerable or require significant effort on the part of park staff, adjacent landowners and other cooperating agencies to mitigate. A portion of the fire management program may have to be set aside for special coordination and education efforts or even suspended pending additional planning and cooperative implementation efforts. Mitigation to offset adverse effects would be necessary as discussed above, but success would not be assured.

Cumulative – Impacts, though negligible in the short term, could add up though time becoming minor to major and may be irreversible.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions: Provide maximum protection to cultural and natural resources, both in the park and out, in perpetuity, by employing a wide range of fire management strategies, including developing working relationships with local fire departments, adjacent landowners, the public, and other fire management organizations, in order to maximize protection of resources. Opportunities for cooperative efforts relating to a wide range of fire management issues including, prescribed fire planning and implementation, hazardous fuel reduction, and educational opportunities, are explored so as to garner public and visitor support of these programs and ensure program implementation achieves the desired protection efforts.

Source – NPS Organic Act, NPS *Management Policies* (2001), National Fire Plan, (2000).

Impacts of Alternative I - No Action

Impact Analysis

Under this alternative the only fire management actions taken would be the development of a fire management plan with emphasis upon the use of aggressive fire suppression as a tool to suppress all unwanted wildland fires. In the short term, the public would have little or no difficulty with this alternative, as they would simply see the continuation of the status quo. However, as time passes and public awareness of the deteriorating condition of park resources, both natural and cultural, and the risk to those resources increases, minor to moderate pressure would be brought to bear on park management to correct deficiencies. Park management would be exposed to increased pressure from park neighbors and local communities to provide protective measures to both private and park land and property from the effects of wild land fire caused, in part, through the deterioration of forest fuels (hazard fuel accumulations). Local fire departments would have a difficult time responding to wildland fires that are driven by heavy fuel accumulations that are currently accruing. When a wildland fire response was required, the potential for damage to park resources would be increased. This may be due to the lack of suppression resource availability and/ or potential strain placed upon local fire departments to respond rapidly to fires in the park when activity in their own jurisdictions needs attention. Threats to public and private property along the boundary of the park would be placed at increased risk as accumulations of wildland fuels increase within the park. Because cultural landscapes could be altered, park visitors and neighbors would question the validity of this management response. It is likely that some type of wildland fire event would eventually occur resulting in loss to either park resources or private property or both. A failure to maintain the fire road and trail system in the park will have a negative impact on park fire protection and resource management activities including inventory and monitoring for disease vectors such as WNV, southern pine bark beetle, gypsy moth, etc. As a result, it would impact the enjoyment of the park for both neighbors and visitors.

Cumulative Effects

The no-action alternative could contribute to long-term negative cumulative effects on park resources manifested by the inability to handle a catastrophic wildland fire and a lack of public support for a fire management program that otherwise should prove instrumental in providing a leadership role in preserving and protecting both park and community resources. Adjacent agencies with fire protection responsibilities would not benefit from fuel reduction activities within the park, placing an increased risk for wildland fire on their jurisdictions located along the park boundary. Because of the increase in development along the park boundary, the attendant loss of species would be compounded by the lack of restorative efforts in the park that favor overall species preservation, enhancement, and diversity.

Conclusion

This alternative could have negligible to minor impacts on park resources in the short term. Over the course of time, impacts could be expected to increase in a minor to moderate fashion, but, this process could be significantly accelerated to the status of a major impact by the presence of precipitating event such as a wildland fire along the boundary or adjacent to a historic structure. The combination of accumulation of hazardous fuels and increase in ignition potential as the result of development along the boundary of the park, are a significant cause for concern. Fire potential may exceed the ability of local fire departments to effectively suppress wildland fire ignitions, primarily due to a lack of cooperative training, planning, and pro-active hazardous fuel reduction activities. Species composition and ecosystem diversity would be reduced, with the potential for the loss of some key ecosystem components. Invasives, particularly those who inhabit wetland areas, would continue to spread unabated from non-park land onto the park.

Mitigation

The best that could be hoped for with the implementation of this alternative would be for cooperative planning and training between the Colonial National Historical Park and adjacent communities and agencies regarding mutual response to wildland fire suppression incidents in an attempt to minimize damage to natural and cultural resources.

Impacts of Alternative II – Preferred Alternative

Impact Analysis

This alternative could be expected to generate considerable interest and public concern in the short term among neighbors, adjacent communities and the public. Most of the concern can be attributed to the proposed implementation of prescribed fire. For the last 60 years the public has been effectively informed by “Smokey Bear” that all fire is bad. Not until the last few years has it come to light that the total exclusion of all wild land fires has actually had a negative impact on our environment. This is most easily seen

through the unnatural accumulation of dead and down forest fuels that, if left alone, create a situation where the stage is set for a potentially catastrophic wildfire fueled by that abundance of fuel. The positive implementation of this alternative would be expected to quickly dispel much of the public concern about the techniques utilized. By enlisting active participation, during the planning and implementation phases of both prescribed burns and non-fire hazardous fuel reduction activities, local fire departments, adjacent military bases that now are using prescribed burning, and the Virginia Department of Forestry would become partners in a successful fire management program. This would greatly assist in developing positive results that would be seen first-hand by the participants and contribute significantly to the beneficial impacts of this alternative. Cooperative planning and program implementation would benefit local landowners and communities since resources would be shared for all of the involved parties. Realistically, there is always the potential for inappropriate use of mechanized equipment or personnel in the hazardous fuel reduction process. In addition, the use of prescribed fire, even with all of the safety checks built in to the implementation process, presents the potential for an escape outside control lines. Results of unsuccessful prescribed burns in the western U.S., though they comprise a very small percentage of the total number of prescribed burns implemented nationwide, have been publicized in the general media. It is reasonable to assume that the public will have concerns about the efforts to use prescribed fire in the park as the result of negative media attention. A cooperative effort in planning and implementing this phase of the alternative would be instrumental in providing for operations that cover all contingencies, both in the park and out, that may arise during the course of prescribed burning operations or non-fire hazardous fuel reduction projects. These specific operational concerns are covered in great detail during the preparation of the individual prescribed burn plan that is prepared and approved before *each and every* prescribed burn. Potential for minor to moderate short term adverse impacts exist.

Cumulative Effects

This alternative would not contribute to any long-term negative cumulative effects on adjacent communities and landowners, provided there are no prescribed fire escapes, since cooperative efforts in fire prevention, fire suppression, and resource enhancement would be undertaken in partnerships developed as a result of the implementation of this alternative. The potential does exist for long term positive cumulative effects that will accrue to the benefit of the park and its neighbors.

Conclusion

This alternative could have moderate long term beneficial impacts on the manner in which adjacent communities and landowners cooperate with one another in order to ensure the protection of both park and private resources. It is likely that, based upon experiences gleaned from other areas where similar programs have been implemented, the long term benefits accrued will enhance all park operations as well as those outside of the park. Cooperative efforts with local fire departments, other agencies, and the public, regarding training, operations, and planning should benefit all fire management

operations and lead to increased protection for resources both in the park and out. Proper utilization of this alternative would be likely to offset the negative aspects, no matter how slight the probability, of a prescribed fire that escapes control or that exceeds predicted intensity levels.

Mitigation

The key to the implementation of this alternative is the development of good working relationships with local fire departments, other fire protection agencies, neighbors, and the public. The development and presentation of quality, proactive education programs about goals and techniques utilized in implementing this alternative is also important to its success. Proactive efforts at public education may be achieved through a variety of techniques including, site bulletins, school and group meetings, visitor center handouts, interpretive talks, cross-training, etc

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

Under this alternative short term impacts created through implementation strategies could be expected to be about the same as those in alternative I. In the long term the inability to enhance some resources, both in the park and out, (forest, invasives, native grasses) through the use of prescribed fire could generate questions from cooperators and the public as to the validity of using this alternative. Because maximum ecological benefit would not be maximized through the implementation of this alternative, some systems, park mixed oak-pine forests for example, would not make an effective transition to a more fire resistant oak hickory forest type. A reliance on non-fire hazardous fuel reduction activity could not be expected to achieve the scope and breadth of results as those described in alternative II.

Cumulative Effects

This alternative would have approximately the same impacts as those in alternative II, except that the potential for long term positive benefit is somewhat reduced since park natural and cultural resources will not be afforded the opportunity to be enhanced through the positive effects of prescribed fire. Depending upon the participation of local fire departments and other agencies, the implementation of this alternative could bring into question the validity of using it as an effective means of preserving park resources. Local communities and landowners would be less likely to be afforded the opportunity to utilize common resource protection strategies with the implementation of this alternative. Species composition, both in and out of the park, could suffer a long-term loss in diversity and critical cultural resources could be placed at increased risk.

Conclusion

The implementation of this alternative appears to offer many of the benefits of both alternatives I and II, without the potential for loss, no matter how slight, that can result from a prescribed fire that escapes control or that exceeds intensity. This alternative could have negligible to minor impacts on the manner in which adjacent communities and landowners work with the park to achieve common fire management goals in the short time. It is more likely that, as a result of the implementation of this alternative, the long term benefits accrued will enhance all park operations in a minor fashion, though not to the extent as outlined in alternative II. Unfortunately, under the auspices of this alternative, species composition and diversity would probably decline, both in and outside of the park. Important cultural resources would also be placed at increased risk due to an inability to utilize a variety of protection strategies in their defense. This would likely comprise a long term moderate adverse impact.

Mitigation

Same as alternative II.

6. Wildlife

Affected Environment.

Colonial National Historical Park is home to a variety of animal species. Colonial National Historical Park files list the presence of 40 mammals, 225 bird species, and 81 reptiles. Some of the more common animals are squirrels, rabbits, white-tailed deer, turkey, opossum, raccoon, red and silver fox, beaver, and a variety of hawks, owls and geese. Bald eagles have been sighted in several areas, and great blue heron rookeries are in and near the park. Most of the rare species found in the park can be found in wetlands and their associated habitats. Wildlife habitat at COLO is still relatively pristine when compared with most of the surrounding region, where rapid urban growth has reduced habitat for many species.

Overall, Colonial was found to contain highly diverse wildlife habitats, especially along the marsh wetlands and estuarine creeks. The mix of open fields and forest habitat also potentially allows for diversification of wildlife species, though the continued reduction in amount of available open areas has had some deleterious effect on wildlife populations that favor those types of habitat.

Methodology. Information based upon COLO Resource Management Plan and other species inventories found in assorted park documents. Predictions about short- and long-term site impacts were based on this information. Intensity of effects is defined below.

Negligible – An action that may cause changes to wildlife, but the change will be so small that it will not be of any measurable or perceptible consequence to the population.

Minor – An action that may cause changes to wildlife, but the change will be small and of a localized consequence to the population.

Moderate – An action that will cause changes to wildlife. The change will be measurable and may have a sufficient consequence to a specific population.

Major – An action that will cause a noticeable amount of change to wildlife. The change will be measurable and will have a substantial and possible permanent consequence to a specific population.

Cumulative – Impacts, though negligible, add up through time becoming minor to major and may impose changes upon wildlife.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions: Promote natural wildlife populations, minimize degradation, destruction, or loss of habitat and/ species, encourage species diversity, and maintain wildlife habitat to the maximum extent practicable. Do not jeopardize listed species (ESA) or destroy or adversely modify proposed critical habitat.

Source – NPS Organic Act, NPS *Management Policies* (2001), COLO Resource Management Plan (1999), General Management Plan (1993), Endangered Species Act of 1973 (87 Stat.884; as amended; 16 U.S.C. 1531 et seq.), Biological Opinion for Jamestown 2007.

Impacts of Alternative I - No Action

Impact Analysis

Under this alternative no hazardous fuel reduction activities of any kind would occur. The use of aggressive suppression strategies would allow hazard fuel levels to accumulate over time, increasing the potential for long term moderate to major impacts on forest structure and hence on wildlife. Wildland fires would exhibit fire behavior (greater intensity and duration time) driven by the presence of excess fuels, both on the ground (brush, needles, twigs and logs) and in the form of snags (standing dead trees). The potential for fires to occur in the forest canopy, particularly in coniferous species, is greatly increased due to the presence of a “fuel ladder” (continuous fuels from the forest floor to the canopy). As a result of this change in forest structure, wildlife diversity and abundance could be expected to be negatively impacted to a minor to moderate extent over the long term.

Cumulative Effects

The no-action alternative could contribute to long-term moderate to major cumulative impacts on wildlife and associated habitat. Since the remaining local agricultural use

outside of the park will likely be replaced by development along the park boundary, both residential and industrial, it is reasonable to assume that wildlife populations will decline in both number and diversity as well.

Conclusion

This alternative could have moderate to major, and potentially cumulative, impacts on wildlife. Aggressive wildland fire suppression techniques, coupled with a lack of hazardous fuel removal and ecosystem restorative processes such as prescribed fire, would likely lead towards adverse impacts on vegetative/ forest structure and wildlife habitat. Open areas and fields will slowly diminish in both size and ecological diversity with an attendant loss in wildlife attributes.

Mitigation

None

Impacts of Alternative II – Preferred Alternative

Impact Analysis

Under this alternative the application of a variety of strategy and tactics regarding the reduction of hazardous fuels and habitat enhancement would occur. The cumulative effect of these could have negligible to minor short term adverse impacts on wildlife, particularly in regard to the mortality of some individuals during prescribed fire operations. In addition, the short term modification of habitat resulting from increased human traffic during the implementation phase of non-fire hazard fuel reduction, could negatively impact wildlife habitat in the short term. In the long term, increased diversity and abundance of wildlife would occur through improvement and expansion of habitat. The improvement of native grass habitat in open areas would provide increased cover, nesting areas and food sources for wildlife. Gap openings in the forest canopy that have been produced through the effects of prescribed fire and non-fire hazardous fuel reduction would provide opportunities for new forbs and succulent growth to occur, thus providing increased reproduction and nutrient availability through habitat improvement. Immediately following a prescribed burn, many species of wildlife are actually attracted to the burned area. Predators would more easily find prey due to the removal of vegetative cover and leaf litter. Fire damaged trees would provide new homes for many insect species and thus would attract insectivorous birds to the area. Some species however, would avoid burned areas due to the lack of adequate cover to protect them from predators. Generally these impacts would last one growing season. The expected increase in population of forbs, small mammals, and insects would attract a variety of birds and other wildlife to the park, improving overall diversity. Long term moderate beneficial impacts would accrue as a result of the implementation of this alternative. In addition, prescribed fire could be used to reduce the potential for stand-replacing wildland fires, thereby protecting existing habitat and the wildlife who currently reside there.

Cumulative Effects

This alternative could contribute to moderate long-term beneficial and cumulative effects on wildlife based upon the ability to use prescribed fire, non-fire hazardous fuel reduction, and less aggressive fire suppression techniques outside of the park on adjacent lands. The implementation of this alternative through cooperating agencies and adjacent landowners would lead to improved protection of resources both within and outside the park. This is of particular importance since available wildlife habitat outside of the park is rapidly being developed for new homes and industrial sites.

Conclusion

This alternative would provide negligible to minor short term adverse impacts on wildlife during the implementation phase of non-fire hazardous fuel reduction or prescribed fire projects. However, in the long term cumulative moderate beneficial impacts on wildlife populations and diversity would occur.

Mitigation

During prescribed fire operations, larger animals can easily leave the area of a fire, while small mammals, amphibians, and reptiles can burrow or flee to escape. Ground fires can locally impact non-flying insect populations in the short term, but most non-flying insects can also burrow and survive low intensity prescribed fires. Since prescribed fire burn units are rather small in size and will be burned at different time periods, any loss of individuals during prescribed fire operations would have a negligible short term impact on the overall abundance and diversity of wildlife. The availability of un-burned areas adjacent to burn units will provide ample habitat for any animals temporarily displaced by prescribed fire. Prescribed fires will be implemented during times of the year when many species are dormant or in a non-nesting mode, thus significantly reducing the potential impact on wildlife populations.

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

As stated in the evaluation of Alternative I, the lack of ability to use prescribed fire could have minor to moderate adverse impacts on habitat and wildlife. Prescribed fire tends to be the most natural and cost-effective way to restore and maintain both forest structure and open native grass fields. The restoration and enhancement of herbaceous native species is difficult to achieve through strictly non-fire methods, though some progress towards that goal may be achieved through the manipulation of forest structure, and to a lesser degree open fields (Covington and Moore, 1992) that provide habitat for many wildlife species.

Cumulative Effects

This alternative could contribute minor negative long-term cumulative effects on wildlife habitat based upon the lack of ability to use prescribed fire. A reliance on non-fire methods of hazardous fuel reduction would probably contribute to a slight increase in wildlife habitat and population over time, though not to the extent as those perpetuated through prescribed fire. It is also likely that some wildlife species might seek to live outside of the park where habitat more closely meets their needs. As these habitats transition to areas characterized by rapid and pervasive human development, a further loss of habitat is likely to result in reduction of wildlife diversity and population size.

Conclusion

This alternative would have moderate adverse impacts on wildlife in the long term. Non-fire hazardous fuel reduction activities used as a stand-alone process can be utilized to minimize or eliminate negative impacts of undesirable wildland fire; however the lack of ability to use prescribed fire precludes the enhancement of ecosystem diversity and fails to aid reproductive processes in many wildlife species to the maximum extent possible. Despite the fact that this alternative is not as effective as alternative II, its implementation does provide minor opportunities for beneficial impact upon wildlife in the short term.

Mitigation

To the extent practicable, hazardous fuel reduction activities can be undertaken during those times of the year and in those locations where impacts from foot traffic and cutting and removal of materials would be minimized. This typically means that these activities would occur during the non-growing/ reproductive season.

7. SOILS

Affected Environment.

Hydric soils dominate much of the park, as wetlands are extensive. Jamestown Island is within the Levy-Pamunkey-Dogue soil series. These soil types are characterized by deep, very poorly drained to well-drained soils whose composition is primarily clay or loam. The Yorktown unit along the York River is located in the Emporia-Bohicket-Slage soil series composed primarily of clay and loamy soil. The Yorktown Battlefield is in the Bethera-Izagora-Slage soil type, one that is predominantly composed of clay and loam soils. Several soil associations are found on the coastal plains and river terraces along the Colonial Parkway. Soils located at the Green Springs Plantation site are primarily on a Peawich-Emporia-Levy soil association. These soils are characterized by deep, very poorly drained to well-drained soils. Elevations in the park vary from sea level to 130 feet above sea level, and most of the accompanying terrain is level. There are some areas where gentle slopes and ravines occur, but these are primarily limited to the Yorktown area. Erosion of soil along shorelines at Jamestown Island is of considerable management concern. A reduction in mowing, particularly at Yorktown and along the

Colonial Parkway, is intended to minimize the development and proliferation of social trails and the attendant erosion and sedimentation produced. A major goal of park management in the future will be to encourage the re-establishment of native vegetation in selected areas (fields, open meadows, and other open areas). Most of these areas are presently being subjected to extensive mowing as a means to maintain cultural integrity.

Methodology. All available information on soils was compiled from the Resource Management Plan (1999), General Management Plan (1993), and the Soil Conservation Service Information Network. Predictions about short- and long-term site impacts were based on this information. Intensity of effects is defined below.

Negligible - Impacts would be below detectable levels and not measurable.

Minor – Changes to character of soils is detectable but short-term and localized. Any mitigation needed to offset adverse effects would be standard and uncomplicated and would be effective.

Moderate – Changes to character of soils readily apparent and long-term over a large portion of park area. Mitigation measures to offset adverse effects would probably be necessary and likely successful.

Major – Impacts to soils characteristics severe or of exceptional benefit over a wide area for the long-term. Mitigation to offset adverse effects would be needed, but its success not assured.

Cumulative – Impacts, though negligible, add up through time becoming minor to major and may be irreversible

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Condition: Inventory and protection of soil resources, including frequent testing and monitoring of soils, to maintain and enhance the existing condition.

Source – NPS Organic Act, NPS *Management Policies* (2001)

Impacts of Alternative I - No-Action

Impact Analysis

Under the no-action alternative, fire suppression activities could occur that would cause minor to moderate temporary soil stability impacts. Without appropriate vegetative cover, soils could be exposed by wildland fires, and be more susceptible to erosion until grass reestablishes on the site. Aggressive wildland fire suppression actions could have even more adverse impacts to soils. Actual wildland fire effects can be mitigated by

rehabilitating the area with native grass seed soon after the fire. The establishment and maintenance of native grasses has been shown to reduce erosion, however this would be difficult without the use of prescribed fire.

Cumulative Effects

No similar actions.

Conclusion – Aggressive suppression of wildland fires would occur under this alternative. These suppression activities could have temporary minor to moderate impacts on soil stability and thus increase the potential for erosion, unless mitigation were implemented. In the eastern United States, even under severe conditions, soils are unlikely to be damaged seriously by the direct effects of the wildfires themselves (Kozlowski et al, 1991). The adoption of this alternative does not constitute impairment.

Mitigation

Re-seeding and fireline rehabilitation activities could be undertaken as soon as possible after a wildland fire occurrence.

Impacts of Alternative II – Preferred Alternative

Impact Analysis

Under the preferred alternative, activities relating to fire management would occur that could temporarily impact soil stability. Some vegetative cover can be expected to be removed as the result of wildland and prescribed fire activities. As a result, soils can be temporarily exposed to the effects of weather and be more susceptible to erosion until vegetation is re-established. Utilizing the appropriate management response method of wildland fire suppression allows fire managers the opportunity to minimize the impacts associated with suppression activities, primarily through pre-identification and avoidance. Often it is possible to utilize pre-existing breaks in fuel such as trails, streams, roads, etc as natural fuel breaks, eliminating the need to construct fireline. The implementation of minimal ground disturbing methods of line construction such as establishment of wet lines, cold-trailing, and burn-out operations contribute to a significant reduction in soil disturbance. Actual wildland fire effects can be mitigated by rehabilitating the area with native vegetative seed soon after the fire. Prescribed fire impacts can be mitigated by varying the intensity of the fire and burning during the time of year that would facilitate natural re-vegetation. Establishment and maintenance of grasses, both native and non-native, have been shown to reduce erosion. The restoration of both hardwood and pine forests should likely lead to a more open understory that will support a variety of vegetation types and produce a lighter fuel load in the event of a wildland fire.

Cumulative Effects

No similar actions

Conclusion – Under this alternative fire management activities would occur that could have temporary negligible to minor impacts on soil erosion, most of which could be mitigated. The adoption of this alternative does not constitute impairment.

Mitigation

Wildland fire suppression techniques implemented as a part of the appropriate management response would be designed to protect sensitive soils. This would occur primarily through the avoidance of traditional hand line construction, instead substituting less obtrusive methods such as the use of water and foam to stop fire spread. Avoidance of sensitive soil areas altogether would contribute to the protection of soil resources. The ability to balance the use of prescribed fire and non-fire treatments would allow managers to mitigate negative impacts effectively, particularly in those areas where access to personnel and equipment is limited and/ or potentially harmful to soil resources.

Any soil series found on steep slopes (>15%), requires careful forest management practices so as to minimize damage. This would best be achieved through total avoidance, or the use of less invasive non-fire methods of fuel reduction. Because the primary soil types of the park are frequently intermixed, any heavy mechanized equipment use associated with hazardous fuel reduction activities would be confined to dry periods of the year so as to minimize any potential damage to the soil.

Prescribed fire could be used in those situations where hazardous fuels could safely be consumed without threatening the integrity of soils. This would generally confine the use of prescribed fire to those areas where moderate to light fuel concentrations (< 15 tons / acre) were located.

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

As with alternative II, wildland fire suppression actions could be initiated utilizing those strategies and tactics that minimize impacts through the implementation of appropriate management response techniques. Actual wildland fire effects could be mitigated through rehabilitation of the area with native grass seed or other desirable species soon after the fire. There would be no direct impact on soils from prescribed fire from this alternative; however, the inability to use prescribed fire could lead to the accumulation of increased fuel and additional disturbance to soil resources through the use of increased non-fire treatments.

Cumulative Effects

No similar actions.

Conclusion

This alternative would potentially have temporary negligible to minor impacts on soil erosion. The ability to utilize appropriate management response techniques during fire suppression would largely eliminate activities that contribute to soil erosion. The increase in hazardous fuel reduction necessary to offset the inability to use prescribed fire could lead to increased adverse impacts on soil resources, and would be caused by the cumulative effects of personnel and equipment walking and working on soils.

Mitigation

Same as Alternative II, except no prescribed fire.

8. Floodplains, Wetlands and Water Quality

Affected Environment.

Colonial National Historical Park is bounded on either side by approximately 30 miles of the York and James Rivers. There are approximately 14 miles of perennial streams within the park. Intermittent and ephemeral streams add approximately 40 miles of drainage ways. Waters within the Yorktown section of the park include Wormley Pond, Great Run Creek, Baptist Run Creek, Beaver Dam Creek, Yorktown Creek, and Ballard Creek. Jamestown Island is composed mostly of wetlands and contains bodies of water such as Sandy Bay, Back River, Kingsmill Creek, Passmore Creek and the Thorofare. There are 11 bodies of water found along the length of the Colonial Parkway including Brackens Pond, Indian Field Creek, Felgates Creek, Kings Creek, Queens Creek, Cheatham Pond, Jones Mill Pond, Halfway Creek, College Creek, Papermill Creek, and Powhatan Creek.

A large percentage of lands within the park are classified designated as Zone A Flood Areas; those that have been designated as having unknown or uncalculated flood elevations. Where average base flood elevations have been calculated for Colonial National Historical Park, they have been found to be in the 7-foot range. Approximately 33% of the park, 3,061 acres, are within the 100-year floodplain; most are near the James and York Rivers and are subject to periodic flooding from hurricanes and large coastal storms. Floodplain maps from the Federal Emergency Management Agency show that most of the tidal creeks in the park (for example Indian Field Creek) to be within the 100 year floodplain as well. Almost all of Jamestown Island is within the 100-year and 500-year floodplain; only a few scattered small upland areas are outside the flood zone. Along the Colonial Parkway, which crosses at major creeks such as

Felgates Creek, there are flood-prone areas on the approach to Jamestown Island and in small areas along the York River.

According to the United States Fish and Wildlife Service (USFWS) wetlands inventory map, much of the park contains wetland resources. The park's GIS database classifies approximately 26% of the park as wetlands (marshes and swamps). Jamestown Island is covered extensively by estuarine emergent and forested wetlands (see vegetation map in appendix C). Major wetland types found in and around the park are; estuarine intertidal areas such as those found along the York River; estuarine emergent lands like King's and Queen's Creeks; lacustrine areas like Jones Mill Pond, and various palustrine forested wetlands covered with emergent or forest vegetation. Queen Creek, in the Cheatham Pond area, is the largest marsh creek wetland system in York County. Almost all of the estuarine creeks in the park serve as nursery areas for fish species such as white perch and striped bass. Wetlands throughout the park are part of larger wetland systems that largely exist outside of park boundaries (see Appendix C).

There are 31 documented springs found scattered throughout the park. In addition, a total of 9 Coastal Plain Seasonal Ponds are found in the park in the Yorktown Battlefield area. These ponds are a part of the larger Grafton Ponds Complex, a group of significant water-related resources that are of particular natural resource significance primarily due to fact that they occur on limited substrates and are known to support rare species. According to the Virginia Division of Natural Heritage, the Grafton Ponds Complex is one of the most ecologically important areas in the state of Virginia.

Methodology. All available information on wetland and floodplains was compiled from the General Management Plan (1993), Resource Management Plan (1999), and associated studies and plans relating to wetlands and floodplains. Map locations of wetlands and floodplains were compared with locations of proposed prescribed and non-fire projects to assist in the determination of potential impacts. Predictions about impacts were based on this information. Intensity of impacts is defined below.

Negligible – An action that may change a population or individuals of a species or a natural physical resource, but the change, if measurable, will be so small and localized consequence to the population.

Minor – An action that may change a population or individuals of a species or a natural physical resource; but the change, if measurable, will be a small and localized consequence to the population.

Moderate – An action that will have some change to a population of individuals of a species or a natural physical resource. The change will be measurable and will have a sufficient consequence to the population but is more localized.

Major – An action that will have a noticeable change to a population or individuals of a species or a natural physical resource. The change will be measurable and will have a substantial and possible permanent consequence to the population.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Condition: Minimize destruction, loss, or degradation of wetlands and floodplains and preserve their natural and beneficial values.

Source: Clean Water Act; Executive Order 11988 Floodplain Management; Executive Order 11990 Protection of Wetlands; National Park Service Management Policies.

Impacts of Alternative I - No Action

Impact Analysis

This alternative foregoes any activity to manage wildland fire in a pro-active manner, other than those enacted through seasonal preparation and training of response personnel. Because suppression operations are aimed at keeping wildland fire at the smallest possible size, the use of aggressive suppression operations could have minor to moderate localized adverse short term impacts on water quality and wetlands. This would primarily occur as a direct result of fireline construction, whether by hand or by mechanized equipment, in or near wetland areas, and would result from soil erosion. Use of firefighting foams and chemical suppressant agents can also have negative effects on water quality and wildlife in wetland areas, and their use is contraindicated. Firefighting foam may only be used at distances greater than 300 feet from aquatic ecosystems (DOI policy). Because wetlands typically contain vegetation that is succulent and has inherent fire-resistant tendencies, the potential and extent for fire in many areas is greatly reduced. In addition, environmental conditions in wetland areas generally are not favorable to the spread and propagation of wildland fire. Relative humidity and fuel moistures are typically very high in wetland areas. These factors may work individually or in unison to exert significant dampening influences on the ignition, propagation, and intensity of wildland fires. Though wildland fires occur in the park at a frequency of approximately four fires each year, the fire history in wetland areas is quite rare.

Cumulative Effects

As the area around Colonial National Historical Park becomes more developed, the presence of wetlands and floodplains in the park provides more and more important critical habitats for the plants and animals that live and reproduce in these ecosystems. As a result, any degradation of these resources is to be avoided or minimized since they are at risk outside of the park. The proliferation of some invasives, both inside and outside of the park, such as common reed (*Phragmites australis*), provides increased opportunities for such invasives as this and other invasives to expand their range into the park. This process may be accelerated since invasive control activities may not be executed to the same extent outside of park boundaries as they are within the park. Fire

intensities in some of these fuel types are outside the range of many suppression forces to effectively handle.

Conclusion – This alternative could have minor to moderate short term to long term impacts on wetlands. The use of aggressive wildland fire suppression in these areas can have detrimental effects on vegetation and the wildlife that utilizes these ecosystems for their habitat.

Mitigation

Areas impacted by wildland fire and suppression operations can be re-seeded with native vegetation as soon as possible after a wildland fire event in order to restore pre-fire conditions. Temporary erosion and sedimentation control measures can be installed until re-vegetation has stabilized areas of concern. Although it may not be practicable in all cases, total avoidance (within 300 feet) of aquatic resources (streams, ponds, lakes, rivers, riparian zones, and wetlands during wildland fire suppression operations may be desirable.

Impacts of Alternative II – Preferred Alternative

Impact Analysis

Under this alternative prescribed fire, non-fire hazardous fuel reduction, and appropriate management response fire suppression activities would occur that could have negligible adverse impacts on wetlands. Prescribed burns and non-fire methods of fuel reduction and vegetation management can be designed to minimize or eliminate impacts to wetland areas, and in fact, may provide minor to moderate benefit to wetlands habitat in the long term. The use of prescribed fire and non-fire techniques allows park managers the opportunity to reduce hazard fuels and manipulate vegetation in wetland environments at the locations and times when impacts are either absent altogether or negligible. For example, some invasive species, *Phragmites australis* for example, can be reduced in density through the effective use of appropriately timed prescribed burning in conjunction with follow-up treatments of mechanical removal. These activities can be planned during advantageous times of the year so as to maximize results while at the same time exerting negligible impacts on nesting birds and other species that inhabit wetland areas. Wildland fire suppression operations utilizing appropriate management response strategy and tactics can be managed to minimize impacts on wetlands. The use of appropriate management response techniques allows fire managers options to avoid areas where fireline suppression activities might do more harm than the effects of the actual wildfire itself.

Cumulative Effects

The preferred alternative could contribute to minor to moderate positive long-term impacts on wetlands and floodplains through the implementation of well planned and executed prescribed burns and other non-fire treatments that benefit wetland ecosystems and habitat, thus protecting and enhancing existing limited wetlands habitat

still found in the park, but that are placed under considerable pressure outside of the park primarily due to encroaching development.

Conclusion

This alternative could have negligible to minor impacts on wetlands. The management prescriptions for prescribed fire and non-fire treatments can minimize or eliminate negative impacts on wetlands, while at the same time providing for habitat improvement. Appropriate management response for wildland fire suppression will help minimize, and in most case eliminate altogether adverse impacts on wetland areas.

Mitigation

Same as Alternative I.

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

Under this alternative activities would occur that could have negligible to minor adverse impacts on wetlands. Although non-fire fuel reduction can be designed to minimize or eliminate impacts to wetland areas, it does not provide the same level of ecological benefit in many species that prescribed fire provides. Since prescribed fire will not be used in this alternative, an increased reliance on non-fire treatments will likely create an elevated potential for disturbance of wetlands. This will typically manifest itself in the form of increased foot travel by suppression and project crews as well as impacts caused by mechanized equipment and/ or the use of mechanical devices and chemicals. Wildland fires and suppression operations could still be managed through the appropriate management response mode to allow management to minimize detrimental effects of suppression operations in sensitive areas. Wildland fire occurrences under this alternative may increase over time, since fuel reduction and vegetation modification will most likely proceed at a slower pace than those identified in alternative I.

Cumulative Effects

Under this alternative, wetlands and floodplains would receive limited protection and enhancement through the implementation of non-fire vegetation and hazard fuel reduction projects, as well as benefiting from appropriate management response strategies when wildland fires do occur. However, the level of benefit and protection would be limited by the inability to utilize prescribed fire as an efficient cost effective tool across the general landscape.

Conclusion

This alternative could have negligible to minor adverse impacts on wetlands. An increased reliance on non-fire vegetation and hazard fuel treatments has the potential to lead to more disturbances of wetlands through increased impacts caused by foot travel and the use of mechanized equipment and chemicals. The inability to use such techniques as prescribed fire, a process that replicates natural processes, limits the ability of park management to restore and enhance wetlands vegetation and wildlife.

Mitigation

Management prescriptions for non-fire hazard fuel reduction and vegetation management treatments can be designed to minimize impacts on wetlands. This can be accomplished in a variety of ways, including varying seasonal timing of treatments in order to minimize impacts on vegetation and nesting species, or through avoidance strategies where benefits accrued through a limited treatment protocol would not outweigh the impacts caused by non-fire treatment methods.

9. Threatened and Endangered Species

Affected Environment.

The Virginia Department of Conservation and Recreation, Division of Natural Heritage, (VDNH) at the request of Colonial National Historical Park, conducted an extensive species survey of the park beginning in 1999. According to the information gathered as a result of that survey, Colonial National Historical Park hosts the second highest number of rare, threatened, and endangered species of all the National Park Units found in the state of Virginia. Additional communication with the Virginia department of Game and Inland Fisheries (VDGIF) and the U.S. Fish and Wildlife Service (USFWS) indicates that several federal and state-listed species, as well as some species of special concern, have been documented within and adjacent to the park. Current files of these agencies show that many plant species considered rare by the state are found in the park. At the present time 13 rare plant element occurrences have been recorded, representing 11 species that are of special concern to Virginia. Jamestown Island has the highest concentration of rare plants. A globally rare forest type has been recently discovered at Green Spring in a new parcel of land that has just been donated to COLO. Also identified in the survey was one rare natural community type (mid-height herbaceous estuarine wetland) located in the Cheatham Pond area. Though this area is no longer a part of the park and is now under the ownership of the United States Navy, its close proximity to COLO could impact wildland fire operations that cross agency boundaries. Cheatham Pond also contains a rare community element including up to four rare plant species.

The only federally listed species found in the park are the bald eagle (*Haliaeetus leucocephalus*), and sensitive joint vetch (*Aeschynomene virginica*). The latter is located

at the Neck-o-Land area of the park. Other federal candidate species can be found in the records of both York and James City Counties. The survey results identified 7 rare animal habitat areas representing 5 species within the park: great blue heron (five rookeries), great egret, bald eagle (seven nests), and least bittern. It appears that many of these species use the park for breeding and nesting sites. For example, at the current time there are seven bald eagle nesting sites and five heron rookeries located within the park.

In addition, significant natural communities in the park have been documented. A number of sites have been designated as Virginia Natural heritage Sites, the first time that federal lands in the state of Virginia have been so designated. The state of Virginia may designate these areas “peninsula natural areas” under the auspices of the recently passed Chesapeake Bay regulations. Many of them are brackish marshes, old growth forest, bluff or freshwater wetlands environments that contain species of concern. These areas are eligible for designation as resource protection sub-zones when they occur within established cultural resource areas.

Methodology: Impacts to threatened and endangered species were qualitatively assessed by means of literature review of the effects of fire on these species, consultation with biologists and agencies, review of park management documents (such as the COLO General Management Plan (2003), Resource Management Plan (1999), Jamestown Project EIS (2003), Green Springs EIS (2003) and associated plans and research documents and studies as well as professional judgment.

Negligible – An action that may change a population or individuals of a species or a natural physical resource, but the change, if measurable, will be so small and localized consequence to the population.

Minor – An action that may change a population or individuals of a species or a natural physical resource; but the change, if measurable, will be a small and localized consequence to the population.

Moderate – An action that will have some change to a population of individuals of a species or a natural physical resource. The change will be measurable and will have a sufficient consequence to the population but is more localized.

Major – An action that will have a noticeable change to a population or individuals of a species or a natural physical resource. The change will be measurable and will have a substantial and possible permanent consequence to the population.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Condition: Minimize destruction, loss, or degradation of rare and endangered species and preserve their natural habitat to the extent possible.

Source: Endangered Species Act of 1973, as amended (16 USC 1531 et seq.), Bald Eagle Act (16 USC 668), National Park Service Management Policies.

Impacts of Alternative I - No Action

Impact Analysis

This alternative foregoes any activity to manage wildland fire in a pro-active manner, other than those enacted through seasonal preparation and training of response personnel. Because suppression operations are aimed at keeping wildland fires to the smallest possible size, the use of aggressive suppression tactics could have minor to moderate long term localized adverse impacts on listed species. While this alternative could potentially reduce exposure of listed species to just the direct impacts of a wildland fire, the exclusion of all fire from the ecosystem would perpetuate the ongoing, long-term decline in value of park vegetation communities and the accompanying effects on wildlife. Among the federally listed species, the primarily fish-eating, shoreline–nesting bald eagle would most likely be largely unaffected (no effect) in the long term. In the short term, the presence of suppression personnel, and equipment, could interrupt normal nesting and feeding activities. On the other hand, low intensity wildland fires may provide increased opportunities for hunting prey species by removing vegetative cover and creating dead trees, or snags, that eagles utilize both for nesting and hunting. Under this alternative, there is the potential for buildup of hazardous fuels through a continued use of a suppression-only fire policy. The increased fuel accumulations that occur over time could fuel wildland fires that burn with greater intensity and whose effect upon forest vegetation could lead to destruction of forest canopy and remove older growth species from availability as nesting sites and hunting perches.

A federally listed species, sensitive joint vetch (*Aeschynomene virginica*) and a federally listed candidate species, Virginia least trillium (*trillium pusillum*, var. *virginianum*) have been found in the park. Sensitive joint vetch grows in the intertidal zone of marsh habitat that is flooded twice daily at COLO, and hence it is unlikely to be affected directly by wildland fire, either directly or through suppression activities. If retardants or foam suppressant used in fire suppression were spilled or misapplied in the vicinity of these species, they could conceivably have a direct effect, but it is uncertain whether this would be either a positive or a negative effect. In either case, the likelihood of this occurring is remote since the park has a policy of allowing no chemical retardant or suppressive within 300 feet of any wetland, water or riparian resource. The Virginia least trillium grows in wetland mixed hardwood forest habitat. The presence of fire in

these systems is largely naturally contraindicated due to the presence of standing water and high relative humidity. Periods of extended drought could allow for wildland fire potential in the latter species however. A grass species listed as a State rare species, gaping panic grass (*Steinchisma hians*), has also been located in a population on Jamestown Island in a wetland area. There is presently no information available regarding the effects of wildland fire on this species, but since this population is the most extant in the state, every effort should be made to protect this population from any negative impacts resulting from either fire or fire suppression. In the event of a large-scale, high intensity wildland fire, such as those that manifest themselves during periods of extended drought, and when accompanied by low relative humidity and high winds, direct or indirect adverse impacts to these species could occur as the result of intense heat and/ or severe erosion. This could occur as an adjunct effect to soil exposure as the result of an exceptionally intense fire. Sediments could then be washed into wetlands and watercourses, smothering submerged and emergent plants and decreasing water depth at least temporarily.

State listed birds and the habitats they engender, are associated with wetlands and are unlikely to be directly affected, in anything other than the short-term, by any fire management activities. Even ground nesting birds disturbed by fire can, and often do, re-nest after a fire has passed (Eliason, 2002).

Cumulative Effects

As the area around Colonial National Historical Park becomes more developed, the presence of wetlands, floodplains, and forested areas in the park provides critical habitat for the plants and animals that live and reproduce in these ecosystems. For example, the small whorled pogonia (*Isotria medeoloides*), a federally listed endangered species, as well as several candidate species, prairie senna (*Cassia fasciculata*, var. *macrosperma*), Parker's pipewort (*Eriocaulon parkeri*), and New Jersey rush (*Juncus caesariensis*), have been found near Colonial National Historical Park. Though these species have not been found in the park, they may exist, largely due to the presence of appropriate habitat and environmental conditions in the park. Any degradation of these species is to be avoided or minimized since they are at risk. In addition, the proliferation of some invasives outside of the park, such as common reed (*Phragmites australis*), provides increased opportunities to expand their range into the park. This process may be accelerated since invasive control activities may not be executed to the same extent outside of park boundaries as they are within. Fire intensities in some of these fuel types, particularly *Phragmites*, are often outside the range of many suppression forces to effectively handle. This could result in increased risk to species of concern and lead to moderate adverse long term impacts.

Conclusion – This alternative could have minor to moderate long term impacts on threatened and endangered species as well as other species of concern. The use of aggressive wildland fire suppression in areas where these species are found can have direct impacts upon vegetation and, as a secondary result, on the wildlife that utilizes these ecosystems for their everyday activities.

In sum, with regard to the federally listed species protected under the 1973 Endangered Species Act, Alternative I would likely result in the following impacts:

- Bald eagle – may effect, but not likely to adversely affect.
- Sensitive joint vetch – may effect, but not likely to adversely affect.

Mitigation

Under this alternative, the following mitigation measures would be implemented:

- All bald eagle nests, sensitive plant locations, or any other listed species identified as being at risk due to a wildland fire, would be protected from the effects of those incidents chiefly through avoidance during fire suppression operations.
- Maps of all known locations of species of concern will be made available for all personnel responding to wildland fire incidents.
- Minimum Impact Suppression Tactics (MIST) will be taught at all park fire training sessions.
- In the event that an avoidance strategy fails during wildland fire operations, any fire that threatens an active bald eagle nest or population of a sensitive plant species will be suppressed immediately.

Impacts of Alternative II – Preferred Alternative

Impact Analysis

Generally, this alternative would have impacts upon threatened and endangered species that are best classified as long term, and if successfully implemented, largely beneficial. Through a thoughtful and well-executed program of prescribed fire and the utilization of non-fire hazardous fuel and invasive species reduction, this alternative would allow park management the opportunity to make marked progress in the direction of restoring vital ecosystem components and allowing the park to closely mimic the natural fire regime that was previously found in the ecosystem. For reasons discussed in the previous alternative, listed species like the bald eagle would benefit from the restoration of both wetlands and forest ecosystems by allowing more favorable habitat for nesting and hunting activities.

Under this alternative, the proposed five-year plan would be fully implemented. When subjected to the treatments of prescribed fire and non-fire treatments, listed species would likely suffer negligible to minor temporary adverse impacts. These would chiefly take the form of temporary effects of smoke and human presence during the implementation phase of any treatment. In the long term, the implementation of this alternative would likely benefit these species through a reduction in invasives and accompanying increase in native species that provide levels of forage and cover more

in keeping with the park ecosystem.

Cumulative Effects

The preferred alternative would contribute to minor to moderate positive long-term impacts on species of concern. This would largely be accomplished through restoration of habitat, both wetlands and associated forest types. It would be achieved through the implementation of well planned and executed prescribed burns and other non-fire treatments that benefit wetland and forest ecosystems and the animals that use them. Enhancing the existing limited wetlands habitat that are still found in the park, but that are under considerable pressure outside of the park due to encroaching development, would provide long term benefit to species of concern, particularly the bald eagle.

Conclusion

This alternative could have negligible to minor impacts on species of concern. The management prescriptions for prescribed fire and non-fire treatments can minimize or eliminate negative impacts on wetlands and forests, while at the same time providing for habitat improvement. The use of appropriate management response strategies and tactics for wildland fire suppression would help minimize, and in most cases, eliminate adverse impacts on wetlands and forest ecosystems.

In sum, with regard to the Federal listed species protected under the 1973 Endangered Species Act, Alternative II would likely result in the following impacts:

- Bald eagle – no effect
- Sensitive joint vetch – no effect

Mitigation

- All bald eagle nests, sensitive plant locations, or any other listed species identified as being at risk due to a wildland fire, would be protected from the effects of those incidents chiefly through avoidance during fire suppression operations.
- In order to ensure that they are not impacted, all bald eagle nests, sensitive plant locations, or other listed species identified as being present in or near the close proximity (generally <100 feet) to a prescribed burn unit, would receive mitigation as described in the individual prescribed burn plan prepared for that specific burn.
- Fire management personnel would provide the Chief of Natural Resources and the Prescribed Fire Committee with copies of prescribed burn plans far enough in advance to allow a detailed survey of the area before implementation.

- Fire management staff would inform the Chief of Natural Resources of wildland fire suppression activities as soon as possible.
- Maps of all known locations of species of concern would be made available for all personnel responding to wildland fire incidents.
- Minimum Impact Suppression Tactics (MIST) will be taught at all park and cooperating agency fire training sessions.
- In the event that an avoidance strategy fails during wildland fire operations, any fire that threatens an active bald eagle nest or sensitive plant population would be immediately suppressed.

Impacts of Alternative III – Appropriate Management Response and Non-Fire Fuels Management

Impact Analysis

Under this alternative activities would occur that could have negligible to minor impacts on species of concern. Although non-fire fuel reductions can be designed to minimize or eliminate impacts to wetland areas and forest ecosystems, they do not allow for the same level of ecological benefit in many species that the use of prescribed fire allows. Since prescribed fire will not be used in this alternative, an increased reliance on non-fire treatments will likely create an elevated potential for disturbance of wetlands. This will typically manifest itself in the form of increased foot travel by suppression and project crews as well as impacts caused by mechanized equipment and/ or the use of mechanical devices and chemicals. Wildland fires and suppression operations could still be managed through the appropriate management response mode to allow management to minimize detrimental effects of suppression operations in sensitive areas. Wildland fire occurrences under this alternative may increase over time, since fuel reduction and vegetation modification will most likely proceed at a slower pace than those identified in alternative I.

Cumulative Effects

Under this alternative, wetlands, floodplains, and forested areas would receive limited protection and enhancement through the implementation of non-fire vegetation and hazard fuel reduction projects, as well as benefit from appropriate management response strategies when wildland fires do occur. However, the level of benefit and protection would be limited, perhaps in a significant manner, by the inability to utilize prescribed fire as an efficient cost effective tool across the general landscape.

Conclusion

This alternative could have negligible to minor impacts on species of concern. An increased reliance on non-fire vegetation and hazard fuel treatments has the potential to lead to more disturbances of wetlands through increased impacts caused by foot travel and the use of mechanized equipment and chemicals. The inability to use such techniques as prescribed fire, a process that replicates natural processes, limits the

ability of park management to restore and enhance wetlands and forest vegetation that support species of concern.

In sum, with regard to the Federal listed species protected under the 1973 Endangered Species Act, Alternative II would likely result in the following impacts:

- Bald eagle – no effect
- Sensitive joint vetch – no effect

Mitigation

Management prescriptions for non-fire hazard fuel reduction and vegetation management treatments can be designed to minimize impacts on species of concern, chiefly through manipulation of wetland and forest habitat. This can be accomplished in a variety of ways, including varying the seasonal timing in order to minimize impacts on vegetation or on nesting species, or by avoiding those areas altogether where benefits accrued through a limited treatment protocol would not outweigh the impacts caused by non-fire treatment methods.

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APPENDIX A
National Fire Plan
Glossary of Wildland Fire Terms

A

Aerial Fuels: All live and dead vegetation in the forest canopy or above surface fuels, including tree branches, twigs and cones, snags, moss, and high brush.

Aerial Ignition: Ignition of fuels by dropping incendiary devices or materials from aircraft.

Air Tanker: A fixed-wing aircraft equipped to drop fire retardants or suppressants.

Agency: Any federal, state, or county government organization participating with jurisdictional responsibilities.

Anchor Point: An advantageous location, usually a barrier to fire spread, from which to start building a fire line. An anchor point is used to reduce the chance of firefighters being flanked by fire.

Appropriate Management Response (AMR): Specific actions taken in response to a wildland fire in order to implement protection and fire use objectives. AMR allows for a full range of strategies to be applied, from an intense full suppression response to wildland fire use (wildland fire to meet resource objectives).

Aramid: The generic name for a high-strength, flame-resistant synthetic fabric used in the shirts and jeans of firefighters. Nomex, a brand name for aramid fabric, is the term commonly used by firefighters.

Aspect: Direction toward which a slope faces.

B

Backfire: A fire set along the inner edge of a fireline to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convection column.

Backpack Pump: A portable sprayer with hand-pump, fed from a liquid-filled container fitted with straps, used mainly in fire and pest control. (See also Bladder Bag.)

Bambi Bucket: A collapsible bucket slung below a helicopter. Used to dip water from a variety of sources for fire suppression.

Behave: A system of interactive computer programs for modeling fuel and fire behavior that consists of two systems: BURN and FUEL.

Bladder Bag: A collapsible backpack portable sprayer made of neoprene or high-strength nylon fabric fitted with a pump. (See also Backpack Pump.)

Blow-up: A sudden increase in fire intensity or rate of spread strong enough to prevent direct control or to upset control plans. Blow-ups are often accompanied by violent convection and may have other characteristics of a fire storm. (See Flare-up.)

Brush: A collective term that refers to stands of vegetation dominated by shrubby, woody plants, or low growing trees, usually of a type undesirable for livestock or timber management.

Brush Fire: A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.

Bucket Drops: The dropping of fire retardants or suppressants from specially designed buckets slung below a helicopter.

Buffer Zones: An area of reduced vegetation that separates wildlands from vulnerable residential or business developments. This barrier is similar to a greenbelt in that it is usually used for another purpose such as agriculture, recreation areas, Parks, or golf courses.

Bump-up Method: A progressive method of building a fire line on a wildfire without changing relative positions in the line. Work is begun with a suitable space between workers. Whenever one worker overtakes another, all workers ahead move one space forward and resume work on the uncompleted part of the line. The last worker does not move ahead until completing his or her space.

Burn Out: Setting fire inside a control line to widen it or consume fuel between the edge of the fire and the control line.

Burning Ban: A declared ban on open air burning within a specified area, usually due to sustained high fire danger.

Burning Conditions: The state of the combined factors of the environment that affect fire behavior in a specified fuel type.

Burning Index: An estimate of the potential difficulty of fire containment as it relates to the flame length at the most rapidly spreading portion of a fire's perimeter.

Burning Period: That part of each 24-hour period when fires spread most rapidly, typically from 10:00 a.m. to sundown.

C

Campfire: As used to classify the cause of a wildland fire, a fire that was started for cooking or warming that spreads sufficiently from its source to require action by a fire control agency.

Candle or Candling: A single tree or a very small clump of trees that is burning from the bottom up.

Chain: A unit of linear measurement equal to 66 feet.

Closure: Legal restriction, but not necessarily elimination of specified activities such as smoking, camping, or entry that might cause fires in a given area.

Cold Front: The leading edge of a relatively cold air mass that displaces warmer air. The heavier cold air may cause some of the warm air to be lifted. If the lifted air contains enough moisture, the result may be cloudiness, precipitation, and thunderstorms. If both air masses are dry, no clouds may form. Following the passage of a cold front in the Northern Hemisphere, westerly or northwesterly winds of 15 to 30 or more miles per hour often continue for 12 to 24 hours.

Cold Trailing: A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire, digging out every live spot, and trenching any live edge.

Command Staff: The command staff consists of the information officer, safety officer, and liaison officer. They report directly to the incident commander and may have assistants.

Complex: Two or more individual incidents located in the same general area, which are assigned to a single incident commander or unified command.

Contain a fire: A fuel break around the fire has been completed. This break may include natural barriers or manually and/or mechanically constructed line.

Control a fire: The complete extinguishment of a fire, including spot fires. Fireline has been strengthened so that flare-ups from within the perimeter of the fire will not break through this line.

Control Line: All built or natural fire barriers and treated fire edge used to control a fire.

Cooperating Agency: An agency supplying assistance other than direct suppression, rescue, support, or service functions to the incident control effort; e.g., Red Cross, law enforcement agency, telephone company, etc.

Coyote Tactics: A progressive line construction duty involving self-sufficient crews that build fire line until the end of the operational period, remain at or near the point while off duty, and begin building fire line again the next operational period where they left off.

Creeping Fire: Fire burning with a low flame and spreading slowly.

Crew Boss: A person in supervisory charge of usually 16 to 21 firefighters and responsible for their performance, safety, and welfare.

Crown Fire (Crowning): The movement of fire through the crowns of trees or shrubs more or less independently of the surface fire.

Curing: Drying and browning of herbaceous vegetation or slash.

D

Dead Fuels: Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.

Debris Burning: A fire spreading from any fire originally set for the purpose of clearing land or for rubbish, garbage, range, stubble, or meadow burning.

Defensible Space: An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, "defensible space" is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

Deployment: See Fire Shelter Deployment.

Detection: The act or system of discovering and locating fires.

Direct Attack: Any treatment of burning fuel, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Dispatch: The implementation of a command decision to move a resource or resources from one place to another.

Dispatcher: A person employed who receives reports of discovery and status of fires, confirms their locations, takes action promptly to provide people and equipment likely to be needed for control in first attack, and sends them to the proper place.

Dispatch Center: A facility from which resources are directly assigned to an incident.

Division: Divisions are used to divide an incident into geographical areas of operation. Divisions are established when the number of resources exceeds the span-of-control of the operations chief. A division is located with the Incident Command System organization between the branch and the task force/strike team.

Dozer: Any tracked vehicle with a front-mounted blade used for exposing mineral soil.

Dozer Line: Fire line constructed by the front blade of a dozer.

Drip Torch: Hand-held device for igniting fires by dripping flaming liquid fuel on the materials to be burned; consists of a fuel fount, burner arm, and igniter. Fuel used is generally a mixture of diesel and gasoline.

Drop Zone: Target area for air tankers, helitankers, and cargo dropping.

Drought Index: A number representing net effect of evaporation, transpiration, and precipitation in producing cumulative moisture depletion in deep duff or upper soil layers.

Dry Lightning Storm: Thunderstorm in which negligible precipitation reaches the ground. Also called a dry storm.

Duff: The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, leaves, and immediately above the mineral soil.

E

Energy Release Component (ERC): The computed total heat released per unit area (British thermal units per square foot) within the fire front at the head of a moving fire.

Engine: Any ground vehicle providing specified levels of pumping, water, and hose capacity.

Engine Crew: Firefighters assigned to an engine. The Fireline Handbook defines the minimum crew makeup by engine type.

Entrapment: A situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near misses."

Environmental Assessment (EA): EAs were authorized by the National Environmental Policy Act (NEPA) of 1969. They are concise, analytical documents prepared with public

participation that determine if an Environmental Impact Statement (EIS) is needed for a particular project or action. If an EA determines an EIS is not needed, the EA becomes the document allowing agency compliance with NEPA requirements.

Environmental Impact Statement (EIS): EISs were authorized by the National Environmental Policy Act (NEPA) of 1969. Prepared with public participation, they assist decision makers by providing information, analysis, and an array of action alternatives allowing managers to see the probable effects of decisions on the environment. Generally, EISs are written for large-scale actions or geographical areas.

Equilibrium Moisture Content: Moisture content that a fuel particle will attain if exposed for an infinite period in an environment of specified constant temperature and humidity. When a fuel particle reaches equilibrium moisture content, net exchange of moisture between it and the environment is zero.

Escape Route: A preplanned and understood route firefighters take to move to a safety zone or other low-risk area, such as an already burned area, previously constructed safety area, a meadow that won't burn, or natural rocky area that is large enough to take refuge without being burned. When escape routes deviate from a defined physical path, they should be clearly marked (flagged).

Escaped Fire: A fire that has exceeded or is expected to exceed initial attack capabilities or prescription.

Extended Attack Incident: A wildland fire that has not been contained or controlled by initial attack forces, and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander.

Extreme Fire Behavior: "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, and strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

F

Faller: A person who fells trees. Also called a sawyer or cutter.

Field Observer: Person responsible to the Situation Unit Leader for collecting and reporting information about an incident obtained from personal observations and interviews.

Fine (Light) Fuels: Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Fingers of a Fire: The long narrow extensions of a fire projecting from the main body.

Fire Behavior: The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire Behavior Forecast: Prediction of probable fire behavior, usually prepared by a Fire Behavior Officer, in support of fire suppression or prescribed burning operations.

Fire Behavior Specialist: A person responsible to the Planning Section Chief for establishing a weather data collection system and for developing fire behavior predictions based on fire history, fuel, weather, and topography.

Fire Break: A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

Fire Cache: A supply of fire tools and equipment assembled in planned quantities or standard units at a strategic point for exclusive use in fire suppression.

Fire Crew: An organized group of firefighters under the leadership of a crew leader or other designated official.

Fire Front: The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

Fire Intensity: A general term relating to the heat energy released by a fire.

Fire Line: A linear fire barrier that is scraped or dug to mineral soil.

Fire Load: The number and size of fires historically experienced on a specified unit over a specified period (usually one day) at a specified index of fire danger.

Fire Management Plan (FMP): A strategic plan that defines a program to manage wildland and prescribed fires, and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans, and prevention plans.

Fire Perimeter: The entire outer edge or boundary of a fire.

Fire Season: 1) Period(s) of the year during which wildland fires are likely to occur, spread, and affect resource values sufficient to warrant organized fire management

activities. 2) A legally enacted time during which burning activities is regulated by state or local authority.

Fire Shelter: An aluminized tent offering protection by means of reflecting radiant heat and providing a volume of breathable air in a fire entrapment situation. Fire shelters should only be used in life-threatening situations, as a last resort.

Fire Shelter Deployment: The removing of a fire shelter from its case and using it as protection against fire.

Fire Storm: Violent convection caused by a large continuous area of intense fire. Often characterized by destructively violent surface indrafts, near and beyond the perimeter, and sometimes by tornado-like whirls.

Fire Triangle: Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

Fire Use Module (Prescribed Fire Module): A team of skilled and mobile personnel dedicated primarily to prescribed fire management. These are national and interagency resources, available throughout the prescribed fire season, that can ignite, hold, and monitor prescribed fires.

Fire Weather: Weather conditions that influence fire ignition, behavior, and suppression.

Fire Weather Watch: A term used by fire weather forecasters to notify using agencies, usually 24 to 72 hours ahead of the event, that current and developing meteorological conditions may evolve into dangerous fire weather.

Fire Whirl: Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to more than 500 feet in diameter. Large fire whirls have the intensity of a small tornado.

Firefighting Resources: All people and major items of equipment that can or potentially could be assigned to fires.

Flame Height: The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope.

Flame Length: The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity.

Flaming Front: The zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front. Also called fire front.

Flanks of a Fire: The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

Flare-up: Any sudden acceleration of fire spread or intensification of a fire. Unlike a blow-up, a flare-up lasts a relatively short time and does not radically change control plans.

Flash Fuels: Fuels such as grass, leaves, draped pine needles, fern, tree moss and some kinds of slash that ignite readily and are consumed rapidly when dry. Also called fine fuels.

Forb: A plant with a soft, rather than permanent woody stem, that is not a grass or grass-like plant.

Fuel: Combustible material. Includes vegetation, such as grass, leaves, ground litter, plants, shrubs and trees that feed a fire. (See Surface Fuels.)

Fuel Bed: An array of fuels usually constructed with specific loading, depth and particle size to meet experimental requirements; also, commonly used to describe the fuel composition in natural settings.

Fuel Loading: The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.

Fuel Model: Simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

Fuel Moisture (Fuel Moisture Content): The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212 degrees Fahrenheit.

Fuel Reduction: Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

Fuel Type: An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

Fusee: A colored flare designed as a railway warning device and widely used to ignite suppression and prescription fires.

G

General Staff: The group of incident management personnel reporting to the incident commander. They may each have a deputy, as needed. Staff consists of operations section chief, planning section chief, logistics section chief, and finance/administration section chief.

Geographic Area: A political boundary designated by the wildland fire protection agencies, where these agencies work together in coordination and effective utilization.

Ground Fuel: All combustible materials below the surface litter, including duff, tree or shrub roots, punchy wood, peat, and sawdust that normally support a glowing combustion without flame.

H

Haines Index: An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire.

Hand Line: A fireline built with hand tools.

Hazard Reduction: Any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

Head of a Fire: The side of the fire having the fastest rate of spread.

Heavy Fuels: Fuels of large diameter such as snags, logs, and large limb wood that ignite and are consumed more slowly than flash fuels.

Helibase: The main location within the general incident area for Parking, fueling, maintaining, and loading helicopters. The helibase is usually located at or near the incident base.

Helispot: A temporary landing spot for helicopters.

Helitack: The use of helicopters to transport crews, equipment, and fire retardants or suppressants to the fire line during the initial stages of a fire.

Helitack Crew: A group of firefighters trained in the technical and logistical use of helicopters for fire suppression.

Holding Actions: Planned actions required to achieve wildland prescribed fire management objectives. These actions have specific implementation timeframes for fire

use actions but can have less sensitive implementation demands for suppression actions.

Holding Resources: Firefighting personnel and equipment assigned to do all required fire suppression work following fireline construction but generally not including extensive mop-up.

Hose Lay: Arrangement of connected lengths of fire hose and accessories on the ground, beginning at the first pumping unit and ending at the point of water delivery.

Hotshot Crew: A highly trained fire crew used mainly to build fireline by hand.

Hotspot: A particular active part of a fire.

Hotspotting: Reducing or stopping the spread of fire at points of particularly rapid rate of spread or special threat, generally the first step in prompt control, with emphasis on first priorities.

I

Incident: A human-caused or natural occurrence, such as wildland fire, that requires emergency service action to prevent or reduce the loss of life or damage to property or natural resources.

Incident Action Plan (IAP): Contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written. When written, the plan may have a number of attachments, including: incident objectives, organization assignment list, division assignment, incident radio communication plan, medical plan, traffic plan, safety plan, and incident map.

Incident Command Post (ICP): Location at which primary command functions are executed. The ICP may be co-located with the incident base or other incident facilities.

Incident Command System (ICS): The combination of facilities, equipment, personnel, procedure and communications operating within a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.

Incident Commander: Individual responsible for the management of all incident operations at the incident site.

Incident Management Team: The incident commander and appropriate general or command staff personnel assigned to manage an incident.

Incident Objectives: Statements of guidance and direction necessary for selection of appropriate strategy(ies), and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed.

Infrared Detection: The use of heat sensing equipment, known as Infrared Scanners, for detection of heat sources that are not visually detectable by the normal surveillance methods of either ground or air patrols.

Initial Attack: The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

J

Job Hazard Analysis: This analysis of a project is completed by staff to identify hazards to employees and the public. It identifies hazards, corrective actions, and the required safety equipment to ensure public and employee safety.

Jump Spot: Selected landing area for smokejumpers.

Jump Suit: Approved protection suit worn by smokejumpers.

K

Keech Byram Drought Index (KBDI): Commonly used drought index adapted for fire management applications, with a numerical range from 0 (no moisture deficiency) to 800 (maximum drought).

Knock Down: To reduce the flame or heat on the more vigorously burning parts of a fire edge.

L

Ladder Fuels: Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure the continuation of crowning.

Large Fire: 1) For statistical purposes, a fire burning more than a specified area of land e.g., 300 acres. 2) A fire burning with a size and intensity such that its behavior is determined by interaction between its own convection column and weather conditions above the surface.

Lead Plane: Aircraft with pilot used to make dry runs over the target area to check wind and smoke conditions, topography, and to lead air tankers to targets and supervise their drops.

Light (Fine) Fuels: Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Lightning Activity Level (LAL): A number, on a scale of 1 to 6, which reflects frequency and character of cloud-to-ground lightning. The scale is exponential, based on powers of 2 (i.e., LAL 3 indicates twice the lightning of LAL 2).

Line Scout: A firefighter who determines the location of a fire line.

Litter: Top layer of the forest, scrubland, or grassland floor, directly above the fermentation layer, composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves or needles, little altered in structure by decomposition.

Live Fuels: Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

M

Micro-Remote Environmental Monitoring System (Micro-REMS): Mobile weather monitoring station. A Micro-REMS usually accompanies an incident meteorologist and ATMU to an incident.

Mineral Soil: Soil layers below the predominantly organic horizons; soil with little combustible material.

Mobilization: The process and procedures used by all organizations, federal, state and local for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

Modular Airborne Firefighting System (MAFFS): A manufactured unit consisting of five interconnecting tanks, a control pallet, and a nozzle pallet, with a capacity of 3,000 gallons, designed to be rapidly mounted inside an unmodified C-130 (Hercules) cargo aircraft for use in dropping retardant on wildland fires.

Mop-up: To make a fire safe or reduce residual smoke after the fire has been controlled by extinguishing or removing burning material along or near the control line, felling snags, or moving logs so they won't roll downhill.

Multi-Agency Coordination (MAC): A generalized term which describes the functions and activities of representatives of involved agencies and/or jurisdictions who come together to make decisions regarding the prioritizing of incidents, and the sharing and use of critical resources. The MAC organization is not a part of the on-scene ICS and is not involved in developing incident strategy or tactics.

Mutual Aid Agreement: Written agreement between agencies and/or jurisdictions in which they agree to assist one another upon request, by furnishing personnel and equipment.

N

National Environmental Policy Act (NEPA): NEPA is the basic national law for protection of the environment, passed by Congress in 1969. It sets policy and procedures for environmental protection, and authorizes Environmental Impact Statements and Environmental Assessments to be used as analytical tools to help federal managers make decisions.

National Fire Danger Rating System (NFDRS): A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.

National Wildfire Coordinating Group: A group formed under the direction of the Secretaries of Agriculture and the Interior and comprised of representatives of the U.S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service, and Association of State Foresters. The group's purpose is to facilitate coordination and effectiveness of wildland fire activities and provide a forum to discuss, recommend action, or resolve issues and problems of substantive nature. NWCG is the certifying body for all courses in the National Fire Curriculum.

Nomex ®: Trade name for a fire resistant synthetic material used in the manufacturing of flight suits, pants, and shirts used by firefighters (see Aramid).

Normal Fire Season: 1) A season when weather, fire danger, and number and distribution of fires are about average. 2) Period of the year that normally comprises the fire season.

O

Operations Branch Director: Person under the direction of the operations section chief who is responsible for implementing that portion of the incident action plan appropriate to the branch.

Operational Period: The period of time scheduled for execution of a given set of tactical actions as specified in the Incident Action Plan. Operational periods can be of various lengths, although usually not more than 24 hours.

Overhead: People assigned to supervisory positions, including incident commanders, command staff, general staff, directors, supervisors, and unit leaders.

P

Pack Test: Used to determine the aerobic capacity of fire suppression and support personnel, and assign physical fitness scores. The test consists of walking a specified distance, with or without a weighted pack, in a predetermined period of time, with altitude corrections.

Paracargo: Anything dropped, or intended for dropping, from an aircraft by parachute, by other retarding devices, or by free fall.

Peak Fire Season: That period of the fire season during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

Personnel Protective Equipment (PPE): All firefighting personnel must be equipped with proper equipment and clothing in order to mitigate the risk of injury from, or exposure to, hazardous conditions encountered while working. PPE includes, but is not limited to: 8-inch high-laced leather boots with lug soles, fire shelter, hard hat with chin strap, goggles, ear plugs, aramid shirts and trousers, leather gloves, and individual first aid kits.

Preparedness: Condition or degree of being ready to cope with a potential fire situation.

Prescribed Fire: Any fire ignited by management actions under certain, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. A written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition.

Prescribed Fire Plan (Burn Plan): This document provides the prescribed burn boss information needed to implement an individual prescribed fire project.

Prescription: Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

Prevention: Activities directed at reducing the incidence of fires, including public education, law enforcement, personal contact, and reduction of fuel hazards.

Project Fire: A fire of such size or complexity that a large organization and prolonged activity is required to suppress it.

Pulaski: A combination chopping and trenching tool, which combines a single-bitted axe-blade with a narrow adze-like trenching blade fitted to a straight handle. Useful for grubbing or trenching in duff and matted roots. Well-balanced for chopping.

R

Radiant Burn: A burn received from a radiant heat source.

Radiant Heat Flux: The amount of heat flowing through a given area in a given time, usually expressed as calories/square centimeter/second.

Rappelling: Technique of landing specifically trained firefighters from hovering helicopters; involves sliding down ropes with the aid of friction-producing devices.

Rate of Spread: The relative activity of a fire in extending its horizontal dimensions. It is expressed as a rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

Reburn: The burning of an area that has been previously burned but that contains flammable fuel that ignites when burning conditions are more favorable; an area that has reburned.

Red Card: Fire qualification card issued to fire rated persons showing their training needs and their qualifications to fill specified fire suppression and support positions in a large fire suppression or incident organization.

Red Flag Warning: Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

Rehabilitation: The activities necessary to repair damage or disturbance caused by wildland fires or the fire suppression activity.

Relative Humidity (RH): The ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure.

Remote Automatic Weather Station (RAWS): An apparatus that automatically acquires, processes, and stores local weather data for later transmission to the GOES Satellite, from which the data is re-transmitted to an earth-receiving station for use in the National Fire Danger Rating System.

Resources: 1) Personnel, equipment, services, and supplies available, or potentially available, for assignment to incidents. 2) The natural resources of an area, such as timber, crass, watershed values, recreation values, and wildlife habitat.

Resource Management Plan (RMP): A document prepared by field office staff with public participation, and approved by field office managers that provides general guidance and direction for land management activities at a field office. The RMP identifies the need for fire in a particular area and for a specific benefit.

Resource Order: An order placed for firefighting or support resources.

Retardant: A substance or chemical agent that reduces the flammability of combustibles.

Run (of a fire): The rapid advance of the head of a fire with a marked change in fire line intensity and rate of spread from that noted before and after the advance.

Running: A rapidly spreading surface fire with a well-defined head.

S

Safety Zone: An area cleared of flammable materials used for escape in the event the line is outflanked, or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas, which can be used with relative safety by firefighters and their equipment in the event of a blowup in the vicinity.

Scratch Line: An unfinished preliminary fire line hastily established or built as an emergency measure to check the spread of fire.

Severity Funding: Funds provided to increase wildland fire suppression response capability necessitated by abnormal weather patterns, extended drought, or other events causing abnormal increase in the fire potential and/or danger.

Single Resource: An individual, a piece of equipment and its personnel complement, or a crew or team of individuals with an identified work supervisor that can be used on an incident.

Size-up: To evaluate a fire to determine a course of action for fire suppression.

Slash: Debris left after logging, pruning, thinning or brush cutting; includes logs, chips, bark, branches, stumps, and broken understory trees or brush.

Sling Load: Any cargo carried beneath a helicopter and attached by a lead line and swivel.

Slop-over: A fire edge that crosses a control line or natural barrier intended to contain the fire.

Smokejumper: A firefighter who travels to fires by aircraft and parachute.

Smoke Management: Application of fire intensities and meteorological processes to minimize degradation of air quality during prescribed fires.

Smoldering Fire: A fire burning without flame and barely spreading.

Snag: A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.

Spark Arrester: A device installed in a chimney, flue, or exhaust pipe to stop the emission of sparks and burning fragments.

Spot Fire: A fire ignited outside the perimeter of the main fire by flying sparks or embers.

Spot Weather Forecast: A special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

Spotter: In smokejumping, the person responsible for selecting drop targets and supervising all aspects of dropping smokejumpers.

Spotting: Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

Staging Area: Locations set up at an incident where resources can be placed while awaiting a tactical assignment on a three-minute available basis. Staging areas are managed by the operations section.

Strategy: The science and art of command as applied to the overall planning and conduct of an incident.

Strike Team: Specified combinations of the same kind and type of resources, with common communications, and a leader.

Strike Team Leader: Person responsible to a division/group supervisor for performing tactical assignments given to the strike team.

Structure Fire: Fire originating in and burning any part or all of any building, shelter, or other structure.

Suppressant: An agent, such as water or foam, used to extinguish the flaming and glowing phases of combustion when direction applied to burning fuels.

Suppression: All the work of extinguishing or containing a fire, beginning with its discovery.

Surface Fuels: Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

Swamper: (1) A worker who assists fallers and/or sawyers by clearing away brush, limbs and small trees. Carries fuel, oil, and tools, and watches for dangerous situations. (2) A worker on a dozer crew who pulls winch line, helps maintain equipment, etc., to speed suppression work on a fire.

T

Tactics: Deploying and directing resources on an incident to accomplish the objectives designated by strategy.

Temporary Flight Restrictions (TFR): A restriction requested by an agency and put into effect by the Federal Aviation Administration in the vicinity of an incident, which restricts the operation of nonessential aircraft in the airspace around that incident.

Terra Torch ®: Device for throwing a stream of flaming liquid, used to facilitate rapid ignition during burn out operations on a wildland fire or during a prescribed fire operation.

Test Fire: A small fire ignited within the planned burn unit to determine the characteristic of the prescribed fire, such as fire behavior, detection performance, and control measures.

Timelag: Time needed under specified conditions for a fuel particle to lose about 63 percent of the difference between its initial moisture content and its equilibrium moisture content. If conditions remain unchanged, a fuel will reach 95 percent of its equilibrium moisture content after four timelag periods.

Torching: The ignition and flare-up of a tree or small group of trees, usually from bottom to top.

Two-way Radio: Radio equipment with transmitters in mobile units on the same frequency as the base station, permitting conversation in two directions using the same frequency in turn.

Type: The capability of a firefighting resource in comparison to another type. Type 1 usually means a greater capability due to power, size, or capacity.

U

Uncontrolled Fire: Any fire that threatens to destroy life, property, or natural resources.

Underburn: A fire that consumes surface fuels but not trees or shrubs. (See Surface Fuels.)

V

Vectors: Directions of fire spread as related to rate of spread calculations (in degrees from upslope).

Volunteer Fire Department (VFD): A fire department of which some or all members are unpaid.

W

Water Tender: A ground vehicle capable of transporting specified quantities of water.

Weather Information and Management System (WIMS): An interactive computer system designed to accommodate the weather information needs of all federal and state natural resource management agencies. Provides timely access to weather forecasts, current and historical weather data, the National Fire Danger Rating System (NFDRS), and the National Interagency Fire Management Integrated Database (NIFMID).

Wet Line: A line of water, or water and chemical retardant, sprayed along the ground, that serves as a temporary control line from which to ignite or stop a low-intensity fire.

Wildland Fire: Any non-structure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Implementation Plan (WFIP): A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire being managed for resource benefits.

Wildland Fire Situation Analysis (WFSA): A decision-making process that evaluates alternative suppression strategies against selected environmental, social, political, and economic criteria. Provides a record of decisions.

Wildland Fire Use: The management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in predefined geographic areas outlined in Fire Management Plans.

Wildland Urban Interface: The line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Wind Vectors: Wind directions used to calculate fire behavior.

Appendix B
Prescribed Fire/ Hazard Fuel Location Maps

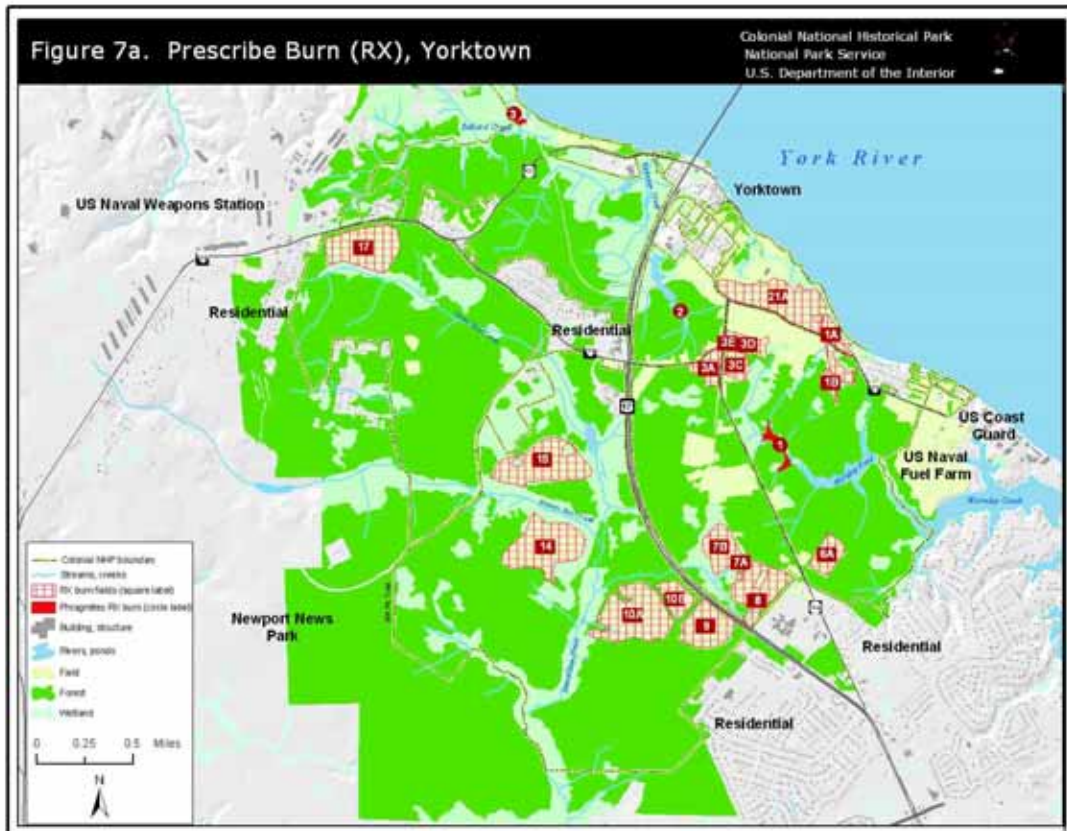
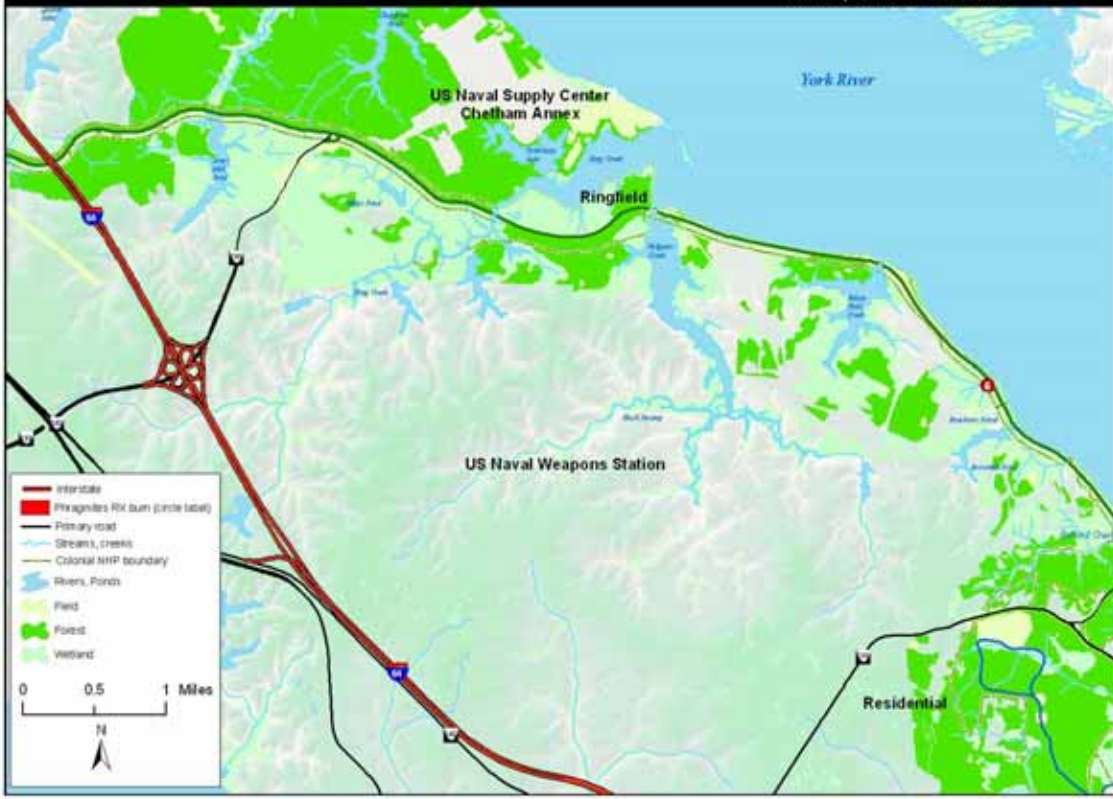
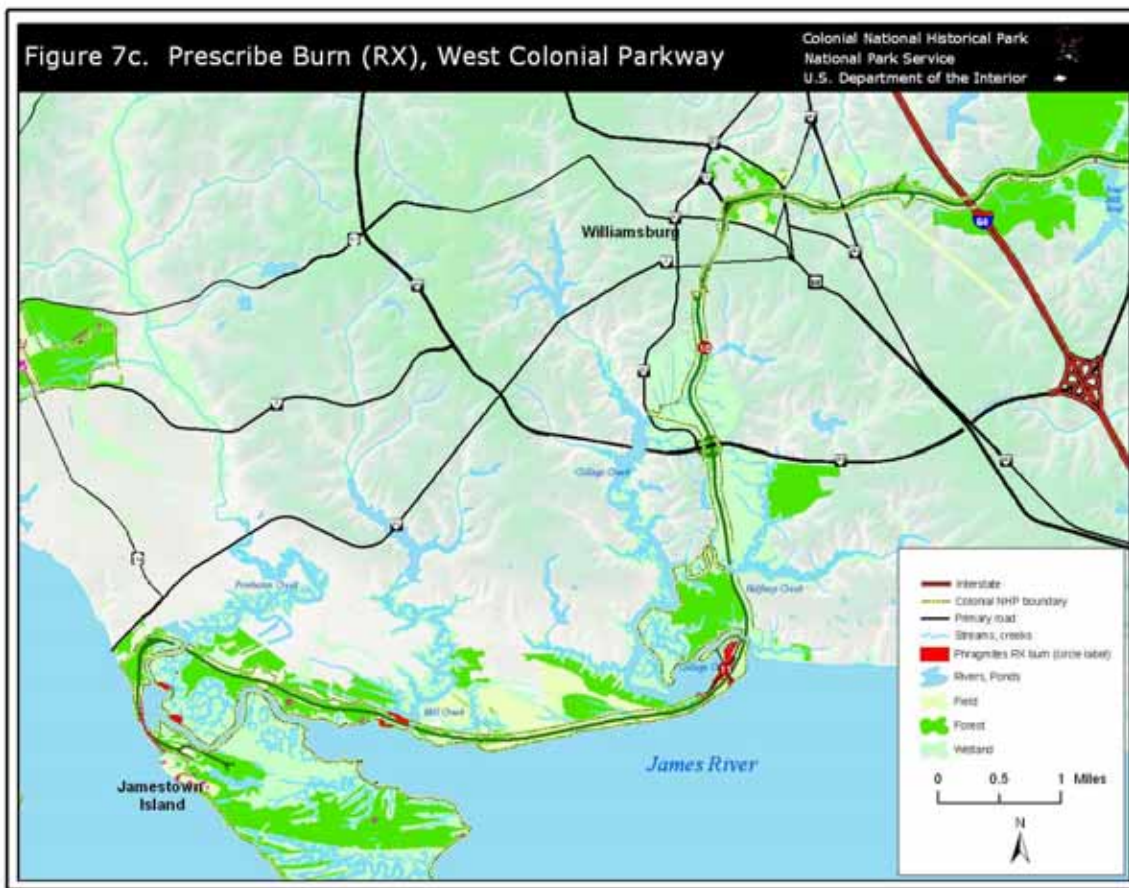
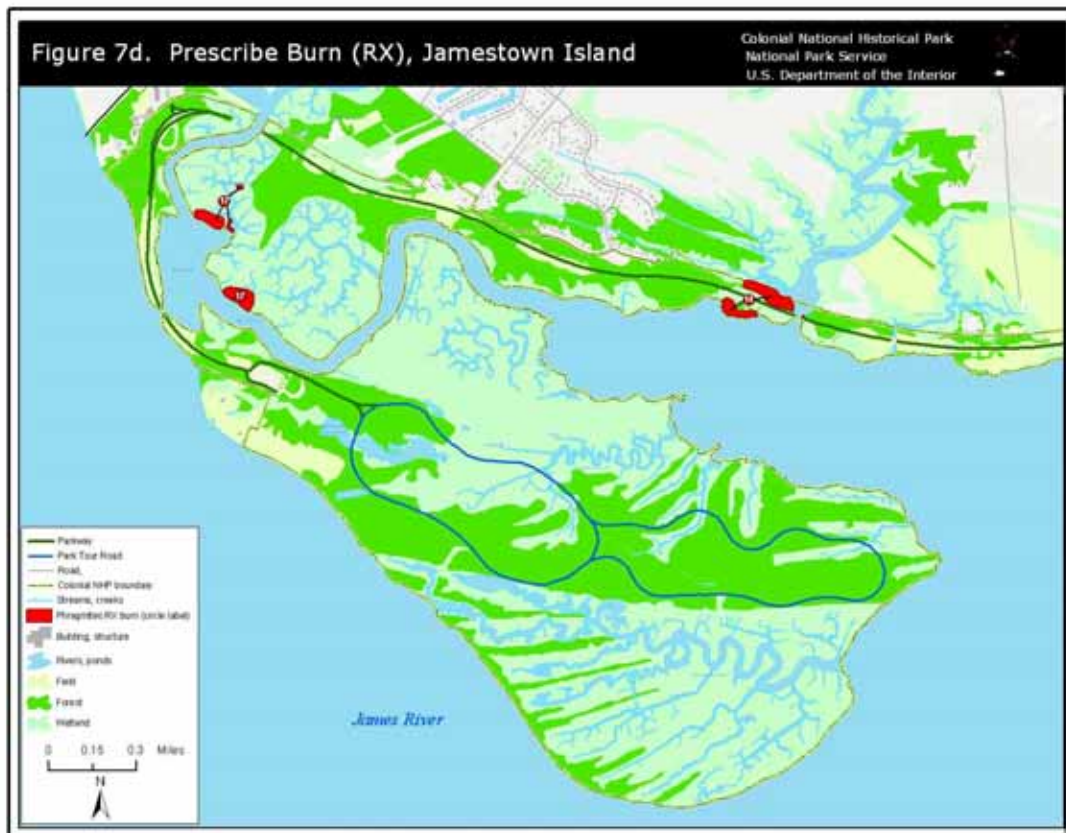


Figure 7b. Prescribe Burn (RX), East Colonial Parkway

Colonial National Historical Park
National Park Service
U.S. Department of the Interior







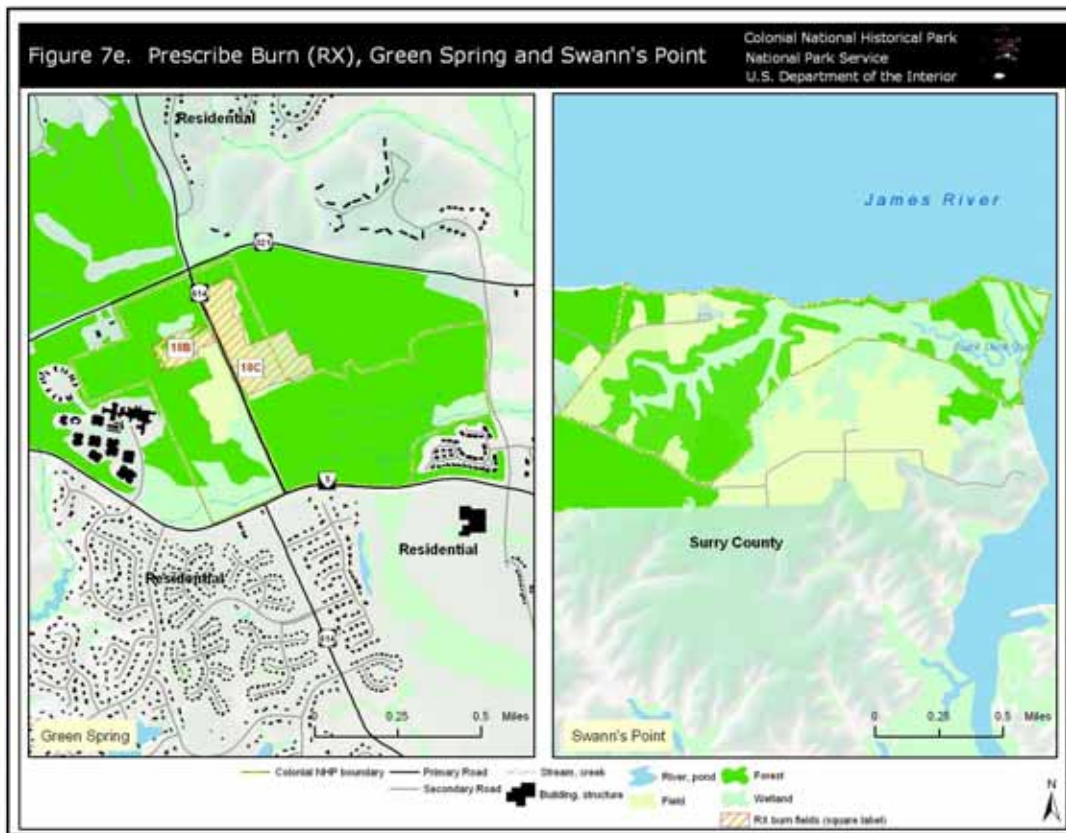


Table 2 - 5-Year Hazard Fuel Plan

- The Draft 5-Year Plan that follows is intended to provide for the maximum number of management-ignited prescribed fires and non-fire hazardous fuel reduction projects needed to achieve fuel reduction and resource/ cultural management objectives. The implementation of these projects according to the established schedule is problematical. Limitations from environmental factors such as weather (temperature, relative humidity, wind direction, wind speed, mixing heights), as well as from other factors such as highly variable phenological stages of vegetative development, budget restrictions, management considerations, etc, all may combine to cause change(s) in scheduling. The results of fire effects monitoring will largely influence the decision to proceed with the proposed burning schedules.
- Prescribed fire acreages shown in the following 5-year plan may vary somewhat from final acreages shown after completion of a prescribed fire project. The difference between the target acreages described in this plan and actual implementation acreages are usually quite small (< 1 acre) and can be attributed to operational contingencies relating to fireline placement and hazard mitigation during the operational phase of a prescribed burn .

Alpha	WUI/ RM CS or HF	Planning Year	Project Name	Activity Type	Treat Type	NEPA	Target Acres
COLO	RM	YR01	Phragmites1	Monitoring	Fire/ Manual	Within FMP NEPA	6.03
COLO	RM	YR02	Phragmites1	Treatment	Fire/ Manual	Within FMP NEPA	6.03
COLO	RM	YR03	Phragmites1	Monitoring	Fire/ Manual	Within FMP NEPA	6.03
COLO	RM	YR01	Phragmites2	Monitoring	Fire/Manual	Within FMP NEPA	.06
COLO	RM	YR02	Phragmites2	Treatment	Fire/Manual	Within FMP NEPA	.06
COLO	RM	YR03	Phragmites2	Monitoring	Fire/Manual	Within FMP NEPA	.06
COLO	RM	YR01	Phragmites3	Monitoring	Fire/Manual	Within FMP NEPA	1
COLO	RM	YR02	Phragmites3	Treatment	Fire/Manual	Within FMP NEPA	1
COLO	RM	YR03	Phragmites3	Monitoring	Fire/Manual	Within FMP NEPA	1
COLO	RM	YR01	Phrgamites6	Monitoring	Fire/Manual	Within FMP NEPA	5
COLO	RM	YR02	Phragmites6	Treatment	Fire/Manual	Within FMP NEPA	5
COLO	RM	YR03	Phragmites6	Monitoring	Fire/Manual	Within FMP NEPA	5
COLO	RM	YR01	Phragmites10	Monitoring	Fire/Manual	Within FMP NEPA	.02
COLO	RM	YR02	Phragmites10	Treatment	Fire/Manual	Within FMP NEPA	.02
COLO	RM	YR03	Phragmites10	Monitoring	Fire/Manual	Within FMP NEPA	.02
COLO	RM	YR01	Phragmites11	Monitoring	Fire/Manual	Within FMP NEPA	20
COLO	RM	YR02	Phragmites11	Treatment	Fire/Manual	Within FMP NEPA	20
COLO	RM	YR03	Phragmites11	Monitoring	Fire/Manual	Within FMP NEPA	20
COLO	RM	YR01	Phragmites14	Monitoring	Fire/Manual	Within FMP NEPA	12
COLO	RM	YR02	Phragmites14	Treatment	Fire/Manual	Within FMP NEPA	12
COLO	RM	YR03	Phragmites14	Monitoring	Fire/Manual	Within FMP NEPA	12
COLO	RM	YR01	Phragmites17	Monitoring	Fire/Manual	Within FMP NEPA	5
COLO	RM	YR02	Phragmites17	Treatment	Fire/Manual	Within FMP NEPA	5
COLO	RM	YR03	Phragmites17	Monitoring	Fire/Manual	Within FMP NEPA	5
COLO	RM/CR	YR01	1A	Monitoring	Fire	Within FMP NEPA	11.4
COLO	RM/CR	YR02	1A	Treatment	Fire	Within FMP NEPA	11.4
COLO	RM/CR	YR03	1A	Monitoring	Fire	Within FMP NEPA	11.4
COLO	RM/CR	YR05	1A	Treatment	Fire	Within FMP NEPA	11.4
COLO	RM/CR	YR01	1B	Monitoring	Fire	Within FMP NEPA	4.9
COLO	RM/CR	YR02	1B	Treatment	Fire	Within FMP NEPA	4.9
COLO	RM/CR	YR03	1B	Monitoring	Fire	Within FMP NEPA	4.9
COLO	RM/CR	YR05	1B	Treatment	Fire	Within FMP NEPA	4.9
COLO	RM/CR	YR01	3A	Monitoring	Fire	Within FMP NEPA	19.2
COLO	RM/CR	YR02	3A	Treatment	Fire	Within FMP NEPA	19.2
COLO	RM/CR	YR03	3A	Monitoring	Fire	Within FMP NEPA	19.2

Alpha	WUI/ RM CS or HF	Planning Year	Project Name	Activity Type	Treat Type	NEPA	Target Acres
COLO	RM/CR	YR05	3A	Treatment	Fire	Within FMP NEPA	19.2
COLO	RM/CR	YR01	3C	Monitoring	Fire	Within FMP NEPA	10
COLO	RM/CR	YR02	3C	Treatment	Fire	Within FMP NEPA	10
COLO	RM/CR	YR03	3C	Monitoring	Fire	Within FMP NEPA	10
COLO	RM/CR	YR05	3C	Treatment	Fire	Within FMP NEPA	10
COLO	RM/CR	YR01	3D	Monitoring	Fire	Within FMP NEPA	10.7
COLO	RM/CR	YR02	3D	Treatment	Fire	Within FMP NEPA	10.7
COLO	RM/CR	YR03	3D	Monitoring	Fire	Within FMP NEPA	10.7
COLO	RM/CR	YR05	3D	Treatment	Fire	Within FMP NEPA	10.7
COLO	RM/CR	YR01	3E	Monitoring	Fire	Within FMP NEPA	3.9
COLO	RM/CR	YR02	3E	Treatment	Fire	Within FMP NEPA	3.9
COLO	RM/CR	YR03	3E	Monitoring	Fire	Within FMP NEPA	3.9
COLO	RM/CR	YR05	3E	Treatment	Fire	Within FMP NEPA	3.9
COLO	RM/CR	YR01	6A	Monitoring	Fire	Within FMP NEPA	14.9
COLO	RM/CR	YR02	6A	Treatment	Fire	Within FMP NEPA	14.9
COLO	RM/CR	YR03	6A	Monitoring	Fire	Within FMP NEPA	14.9
COLO	RM/CR	YR05	6A	Treatment	Fire	Within FMP NEPA	14.9
COLO	RM/CR	YR01	7A	Monitoring	Fire	Within FMP NEPA	7.7
COLO	RM/CR	YR02	7A	Treatment	Fire	Within FMP NEPA	7.7
COLO	RM/CR	YR03	7A	Monitoring	Fire	Within FMP NEPA	7.7
COLO	RM/CR	YR05	7A	Treatment	Fire	Within FMP NEPA	7.7
COLO	RM/CR	YR01	7B	Monitoring	Fire	Within FMP NEPA	12
COLO	RM/CR	YR02	7B	Treatment	Fire	Within FMP NEPA	12
COLO	RM/CR	YR03	7B	Monitoring	Fire	Within FMP NEPA	12
COLO	RM/CR	YR05	7B	Treatment	Fire	Within FMP NEPA	12
COLO	RM/CR	YR01	8	Monitoring	Fire	Within FMP NEPA	31.9
COLO	RM/CR	YR02	8	Treatment	Fire	Within FMP NEPA	31.9
COLO	RM/CR	YR03	8	Monitoring	Fire	Within FMP NEPA	31.9
COLO	RM/CR	YR05	8	Treatment	Fire	Within FMP NEPA	31.9
COLO	RM/CR	YR01	9	Monitoring	Fire	Within FMP NEPA	28.3
COLO	RM/CR	YR02	9	Treatment	Fire	Within FMP NEPA	28.3
COLO	RM/CR	YR03	9	Monitoring	Fire	Within FMP NEPA	28.3
COLO	RM/CR	YR05	9	Treatment	Fire	Within FMP NEPA	28.3
COLO	RM/CR	YR01	10A	Monitoring	Fire	Within FMP NEPA	22.4
COLO	RM/CR	YR02	10A	Treatment	Fire	Within FMP NEPA	22.4

Alpha	WUI/ RM CS or HF	Planning Year	Project Name	Activity Type	Treat Type	NEPA	Target Acres
COLO	RM/CR	YR03	10A	Monitoring	Fire	Within FMP NEPA	22.4
COLO	RM/CR	YR05	10A	Treatment	Fire	Within FMP NEPA	22.4
COLO	RM/CR	YR01	10B	Monitoring	Fire	Within FMP NEPA	13.3
COLO	RM/CR	YR02	10B	Treatment	Fire	Within FMP NEPA	13.3
COLO	RM/CR	YR03	10B	Monitoring	Fire	Within FMP NEPA	13.3
COLO	RM/CR	YR05	10B	Treatment	Fire	Within FMP NEPA	13.3
COLO	RM/CR	YR01	14	Monitoring	Fire	Within FMP NEPA	74.6
COLO	RM/CR	YR02	14	Treatment	Fire	Within FMP NEPA	74.6
COLO	RM/CR	YR03	14	Monitoring	Fire	Within FMP NEPA	74.6
COLO	RM/CR	YR05	14	Treatment	Fire	Within FMP NEPA	74.6
COLO	RM/CR	YR01	15	Monitoring	Fire	Within FMP NEPA	55.5
COLO	RM/CR	YR02	15	Treatment	Fire	Within FMP NEPA	55.5
COLO	RM/CR	YR03	15	Monitoring	Fire	Within FMP NEPA	55.5
COLO	RM/CR	YR05	15	Treatment	Fire	Within FMP NEPA	55.5
COLO	RM/CR	YR01	17	Monitoring	Fire	Within FMP NEPA	44.8
COLO	RM/CR	YR02	17	Treatment	Fire	Within FMP NEPA	44.8
COLO	RM/CR	YR03	17	Monitoring	Fire	Within FMP NEPA	44.8
COLO	RM/CR	YR05	17	Treatment	Fire	Within FMP NEPA	44.8
COLO	RM/CR	YR01	18B	Monitoring	Fire	Within FMP NEPA	13.7
COLO	RM/CR	YR02	18B	Treatment	Fire	Within FMP NEPA	13.7
COLO	RM/CR	YR03	18B	Monitoring	Fire	Within FMP NEPA	13.7
COLO	RM/CR	YR05	18B	Treatment	Fire	Within FMP NEPA	13.7
COLO	RM/CR	YR01	18C	Monitoring	Fire	Within FMP NEPA	29.2
COLO	RM/CR	YR02	18C	Treatment	Fire	Within FMP NEPA	29.2
COLO	RM/CR	YR03	18C	Monitoring	Fire	Within FMP NEPA	29.2
COLO	RM/CR	YR05	18C	Treatment	Fire	Within FMP NEPA	29.2
COLO	RM/CR	YR01	21A	Monitoring	Fire	Within FMP NEPA	54.8
COLO	RM/CR	YR02	21A	Treatment	Fire	Within FMP NEPA	54.8
COLO	RM/CR	YR03	21A	Monitoring	Fire	Within FMP NEPA	54.8
COLO	RM/CR	YR05	21A	Treatment	Fire	Within FMP NEPA	54.8

COLO Fuels Treatment Unit Designations

PROPOSED NON-FIRE / PRESCRIBED FIRE TREATMENT AREAS

Unit	Primary Fuel Model(s)	Acres	Treatment Objectives
Phragmites1	3(100%)	6.03	Remove Phragmites biomass in conjunction with herbicide treatment (hand spraying and wicking).
Phragmites2	3 (100%)	.06	One time burning to remove Phragmites biomass in conjunction with hand spraying and wicking of herbicide.
Phragmites3	3 (100%)	1.0	One time burning to remove Phragmites biomass in conjunction with hand spraying and wicking of herbicide.
Phragmites6	3 (100%)	5.0	One time burning to remove Phragmites biomass in conjunction with hand spraying and wicking of herbicide.
Phragmites10	3 (100%)	.02	One time burning to remove Phragmites biomass in conjunction with hand spraying and wicking of herbicide.
Phragmites11	3(100%)	20.0	One time burning to remove Phragmites biomass in conjunction with hand spraying and wicking of herbicide.
Phragmites14	3 (100%)	12	One time burning to remove Phragmites biomass in conjunction with hand spraying and wicking of herbicide.
Phragmites17	3 (100%)	5	One time burning to remove Phragmites biomass in conjunction with hand spraying and wicking of herbicide.
Unit 1A	3(50%) 1(50%)	11.4	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 1B	3(50%) 1(50%)	4.9	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 3A	3(50%) 1(50%)	19.2	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 3C	3(50%) 1(50%)	10.0	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 3D	3(60%) 1(40%)	10.7	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 3E	3(30%) 1(70%)	3.9	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 6A	3(50%) 1(50%)	14.9	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 7A	3(50%) 1(50%)	7.7	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 7B	3(50%) 1(50%)	12	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 8	3(45%) 1(55%)	31.9	Restore cultural scene/ restore and maintain native warm season grasses.

Unit	Primary Fuel Model(s)	Acres	Treatment Objectives
Unit 9	3(60%) 1(40%)	28.3	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 10A	3 (50%) 1(50%)	22.4	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 10B	3 (50%) 1(50%)	13.3	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 14	3 (65%) 1(35%)	74.6	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 15	3 (75%) 1(25%)	55.5	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 17	3(70%) 1(30%)	44.8	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 18B	3 (50%) 1(50%)	13.7	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 18C	3 (50%) 1(50%)	29.2	Restore cultural scene/ restore and maintain native warm season grasses.
Unit 21A	3(50%) 1(50%)	54.8	Restore cultural scene/ restore and maintain native warm season grasses.

Table 3-COLO PROPOSED PRESCRIBED FIRE/ NON-FIRE FUEL TREATMENT UNITS

(Alternative II and III)

Alternative II

Name of the Unit: Phragmites1

Area: 6.03

Type of Burn: Biomass removal

Fuels: Large dense patch of Phragmites/ assorted marsh grasses, sedges, etc

Purpose of the Burn: Reduce invasive species

Vegetation Type	Acres	Hectares	
Wetland and Marsh habitat	6.03		
TOTAL	6.03		
Geology / Soils	Wetland		
Water Resources	Wormley Pond		
Flood Plain / Wetlands	Non-tidal upper marsh zone of tidal creek		
Vegetation	see above		
Wildlife / Fisheries	Wildlife/ fisheries typical of coastal wetlands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: Phragmites2

Area: .06 acres

Type of Burn: Biomass removal

Fuels: Small stand of monotypic Phragmites

Purpose of the Burn: One-time burning in conjunction with hand spray and wicking of herbicide.

Vegetation Type	Acres	Hectares	
Mixed composition wetland	.06		
TOTAL	.06		
Geology / Soils	Wetland		
Water Resources	Wormley Pond		
Flood Plain / Wetlands	Non-tidal wetland adjacent		
Vegetation	see above		
Wildlife / Fisheries	Wildlife/ fisheries typical of coastal wetlands.		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: Phragmites3

Area: 1 acre

Type of Burn: Biomass removal

Fuels: Small clonal population of Phragmites/ Spartina alterniflora

Purpose of the Burn: One time burning to remove biomass in conjunction with herbicide treatment.

Vegetation Type	Acres	Hectares	
Phragmites australis (90%)	2.0		
TOTAL	2.0		
Geology / Soils	Wetland		
Water Resources	Ballard Creek		
Flood Plain / Wetlands	On high mash edge and extending into tidal marsh		
Vegetation	see above		
Wildlife / Fisheries	Wildlife/ fisheries typical of coastal wetlands.		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: Phragmites6

Area: 5

Type of Burn: Biomass removal

Fuels: Marsh grasses, sedges, largely dominant stand of Phragmites australis.

Purpose of the Burn: One-time burn to remove invasive P. australis in conjunction with hand spraying and hand wicking of herbicide.

Vegetation Type	Acres	Hectares	
Wetland grasses, sedges, P. australis	5		
TOTAL	5		
Geology / Soils	Wetland		
Water Resources	York River		
Flood Plain / Wetlands	River wetland		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal marsh		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: Phragmites10

Area: .02 acres

Type of Burn: Biomass removal

Fuels: Marsh grasses, sedges, typical marsh vegetation

Purpose of the Burn: One time burn to remove well-defined invasive monotypic patch of Phragmites australis in conjunction with hand spraying and hand wicking of transitional edges of invasive.

Vegetation Type	Acres	Hectares	
Marsh grasses, sedges, P australis	.02		
TOTAL	.02		
Geology / Soils	Wetland		
Water Resources	Paper Mill Creek		
Flood Plain / Wetlands	Wetland associated with creek		
Vegetation	see above		
Wildlife / Fisheries	Wildlife/ fisheries typical of coastal marsh		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: Phragmites11

Area: 20 acres

Type of Burn: Biomass removal

Fuels: Marsh grasses, sedges, P. australis

Purpose of the Burn: One time burn to remove well-defined, very large, and dense population of Phragmites australis in conjunction with hand spraying of herbicide.

Vegetation Type	Acres	Hectares	
Marsh grasses, sedges, P. australis	20		
TOTAL	20		
Geology / Soils	Wetland		
Water Resources	College Creek		
Flood Plain / Wetlands	Wetland associated with College Creek		
Vegetation	see above		
Wildlife / Fisheries	Wildlife/ fisheries typical of coastal wetlands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: Phragmites14

Area: 12acres

Type of Burn: Biomass removal

Fuels: Marsh grasses, sedges, P. australis

Purpose of the Burn: One time burn to assist in removal of large mix of clonal and mixed populations of Phragmites australis in conjunction with application of herbicide.

Vegetation Type	Acres	Hectares	
Marsh grasses, sedges, P. australis	20.0		
TOTAL	20.0		
Geology / Soils	Wetland		
Water Resources	Back River		
Flood Plain / Wetlands	Wetland associated with Back River.		
Vegetation	see above		
Wildlife / Fisheries	Wildlife/ fisheries typical of coastal wetlands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: Phragmites17

Area: 5 acres

Type of Burn: Broadcast burn

Purpose of the Burn: Prescribed burn to assist in removal of several large clonal populations scattered throughout the area. Burn utilized in conjunction with herbicide application.

Fuels: Marsh grasses, sedges, P. australis

Vegetation Type	Acres	Hectares	
Marsh grasses, sedges, P. australis	5		
TOTAL	5		
Geology / Soils	Wetlands		
Water Resources	Sandy Bay/ Back River		
Flood Plain / Wetlands	Wetlands associated with Sandy Bay and Back River		
Vegetation	see above		
Wildlife / Fisheries	Wildlife/ fisheries typical of coastal wetlands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 1A

Area: 11.4 acres

Type of Burn: Broadcast burn between early March to mid-May.

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/ forbs	11.4		
TOTAL	11.4		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 1B

Area: 4.9 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	4.9		
TOTAL	4.9		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 3A

Area: 19.2 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	19.2		
TOTAL	19.2		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 3C

Area: 10.0 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	10.0		
TOTAL	10.0		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 3D

Area: 10.7 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	10.0		
TOTAL	10.0		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 3E

Area: 3.9 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	3.9		
TOTAL	3.9		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 6A

Area: 14.9 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	14.9		
TOTAL	14.9		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 7A

Area: 7.7 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	7.7		
TOTAL	7.7		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 7B

Area: 23.96 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	23.96		
TOTAL	23.96		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	See above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 8

Area: 31.92 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	31.92		
TOTAL	31.92		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 9

Area: 28.3 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	28.3		
TOTAL	28.3		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 10A

Area: 55.4 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	55.4		
TOTAL	55.4		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 10B

Area: 13.3 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	13.3		
TOTAL	13.3		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 14

Area: 74.6 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	74.6		
TOTAL	74.6		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 15

Area: 55.5 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	55.5		
TOTAL	55.5		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 17

Area: 44.8 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	44.8		
TOTAL	44.8		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 18B

Area: 13.7 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	13.7		
TOTAL	13.7		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 18C

Area: 29.2 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	29.2		
TOTAL	29.2		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Name of the Unit: 21A

Area: 54.8 acres

Type of Burn: Broadcast prescribed burn between early March to mid-May

Fuels: Mixed grasses/ forbs

Purpose of the Burn: Restore native warm season grasses/ cultural scene restoration.

Vegetation Type	Acres	Hectares	
Mixed grasses/forbs	54.8		
TOTAL	54.8		
Geology / Soils	Soil data unavailable		
Water Resources	None		
Flood Plain / Wetlands	None		
Vegetation	see above		
Wildlife / Fisheries	Wildlife typical of coastal grasslands		
Threatened / Endangered / Sensitive Species	Animals	None Known	
	Plants	None Known	
Proposed Wilderness	No		

Alternative III

Because this alternative would not utilize prescribed fire as a management tool to manage vegetation, reduce hazardous fuel, or reduce invasive species, all of the projects described in Alternative II could be implemented under the auspices of this alternative, though not to the extent of ecological benefit as described in that alternative. Manual and/ or mechanical reduction of invasives would be the technique used in the projects aimed at invasive reduction, while mechanical mowing and herbicide would be utilized for the projects relating to native warm season grass restoration. At the present time, the park has many areas where excessive fuel accumulations have occurred. These are primarily the result of Hurricane Isabel in the fall of 2003. However, the location, assessment, and mapping of these areas have not yet been completed. It is anticipated that there will be considerable project work identified for hazardous fuel reduction utilizing non-fire as well as prescribed fire in the future. In many of those cases, piles of debris would be burned under favorable environmental conditions and in accordance with the policies established in RM-18 after the completion of manual fuel reduction.

APPENDIX C

Maps showing the major natural resources (rivers, springs, seeps, seasonal ponds, wetlands, open fields, forested areas and designated conservation zones) of Colonial National Historical Park.

Figure 5a. Natural Resources, Yorktown

Colonial National Historical Park
National Park Service
U.S. Department of the Interior

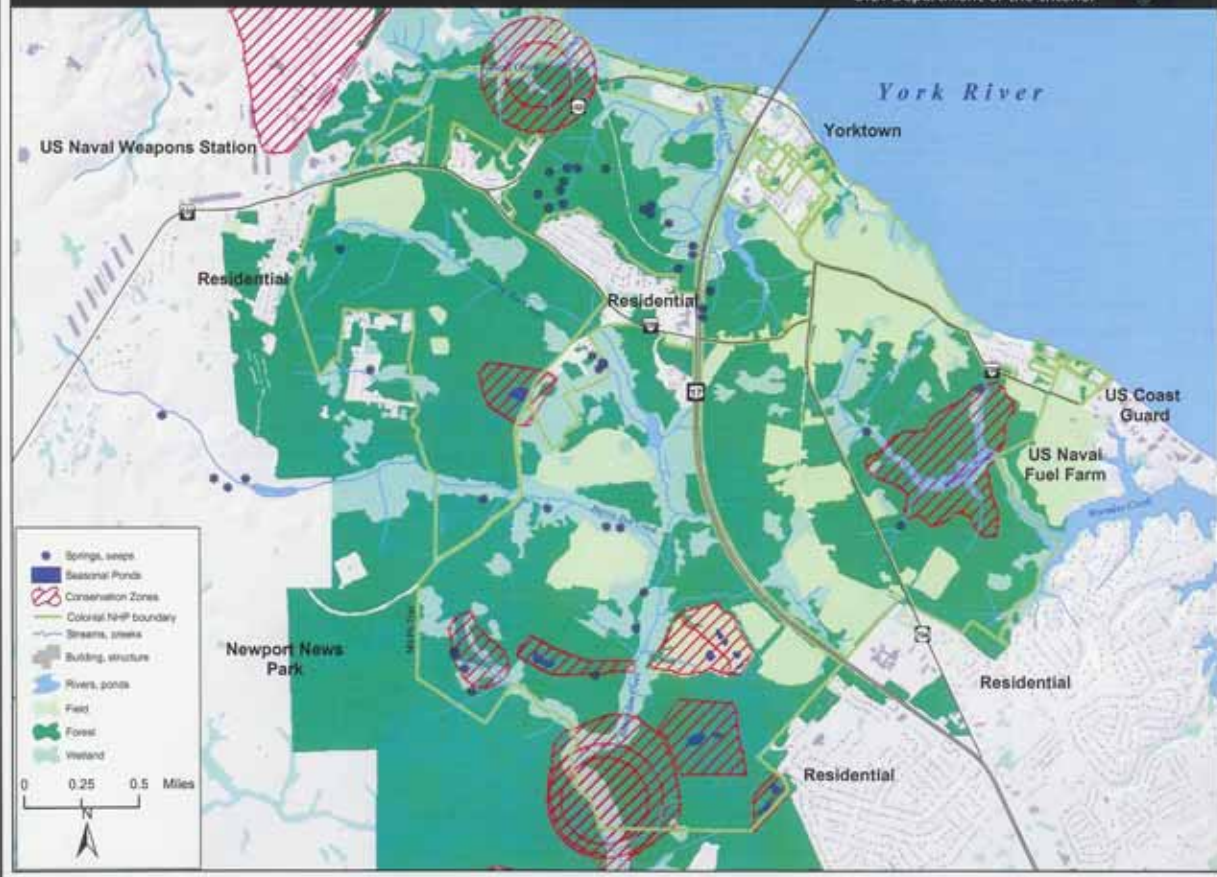


Figure 5b. Natural Resources, East Colonial Parkway

Colonial National Historical Park
National Park Service
U.S. Department of the Interior



Figure 5c. Natural Resources, West Colonial Parkway

Colonial National Historical Park
National Park Service
U.S. Department of the Interior



Figure 5d. Natural Resources, Jamestown Island

Colonial National Historical Park
National Park Service
U.S. Department of the Interior

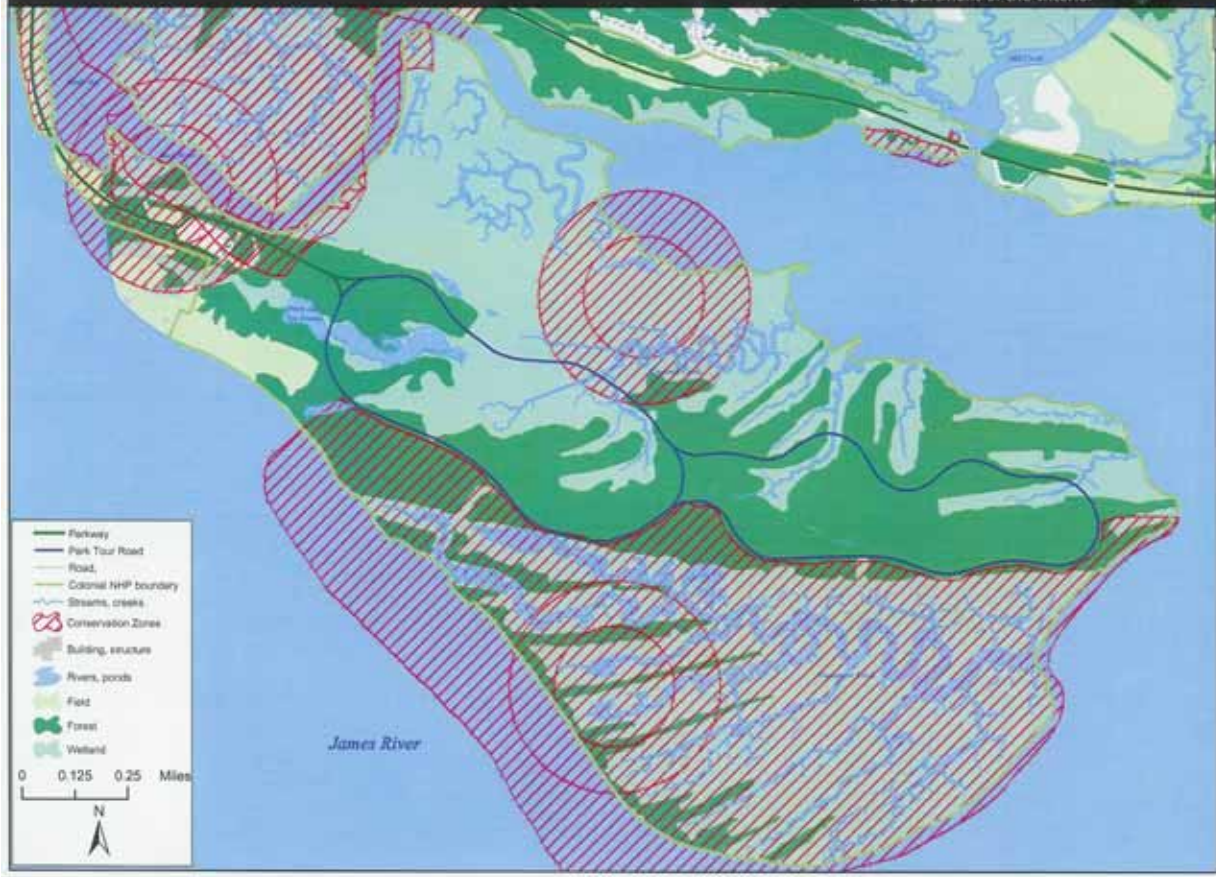
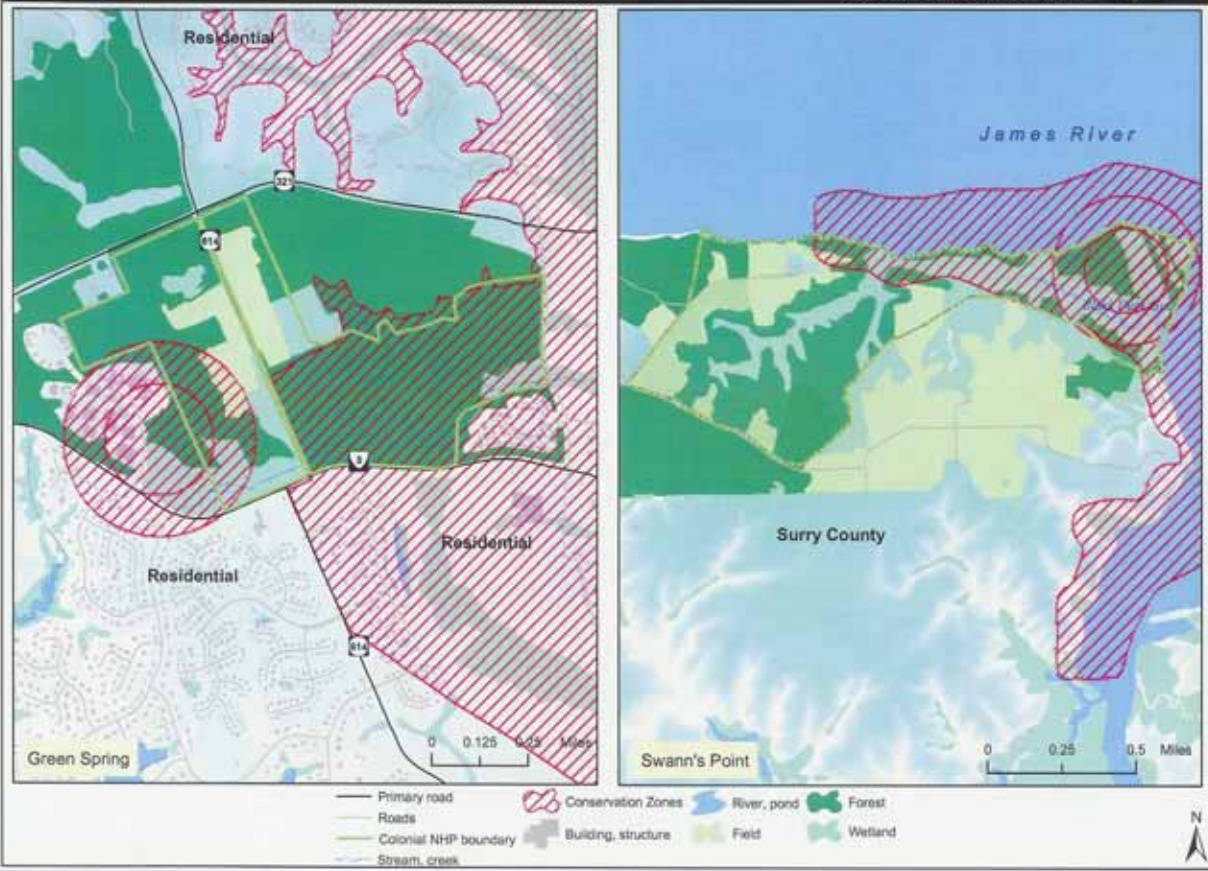


Figure 5e. Natural Resources, Green Spring and Swann's Point

Colonial National Historical Park
National Park Service
U.S. Department of the Interior



APPENDIX D

Maps showing the major infrastructure items (housing developments, individual buildings, utilities and roads of Colonial National Historical Park and immediate vicinity.

Figure 6a Infrastructure, Yorktown

Colonial National Historical Park
National Park Service
U.S. Department of the Interior



Figure 6b. Infrastructure, East Colonial Parkway

Colonial National Historical Park
National Park Service
U.S. Department of the Interior



Figure 6c. Infrastructure, West Colonial Parkway

Colonial National Historical Park
National Park Service
U.S. Department of the Interior



Figure 6d. Infrastructure, Jamestown Island

Colonial National Historical Park
National Park Service
U.S. Department of the Interior

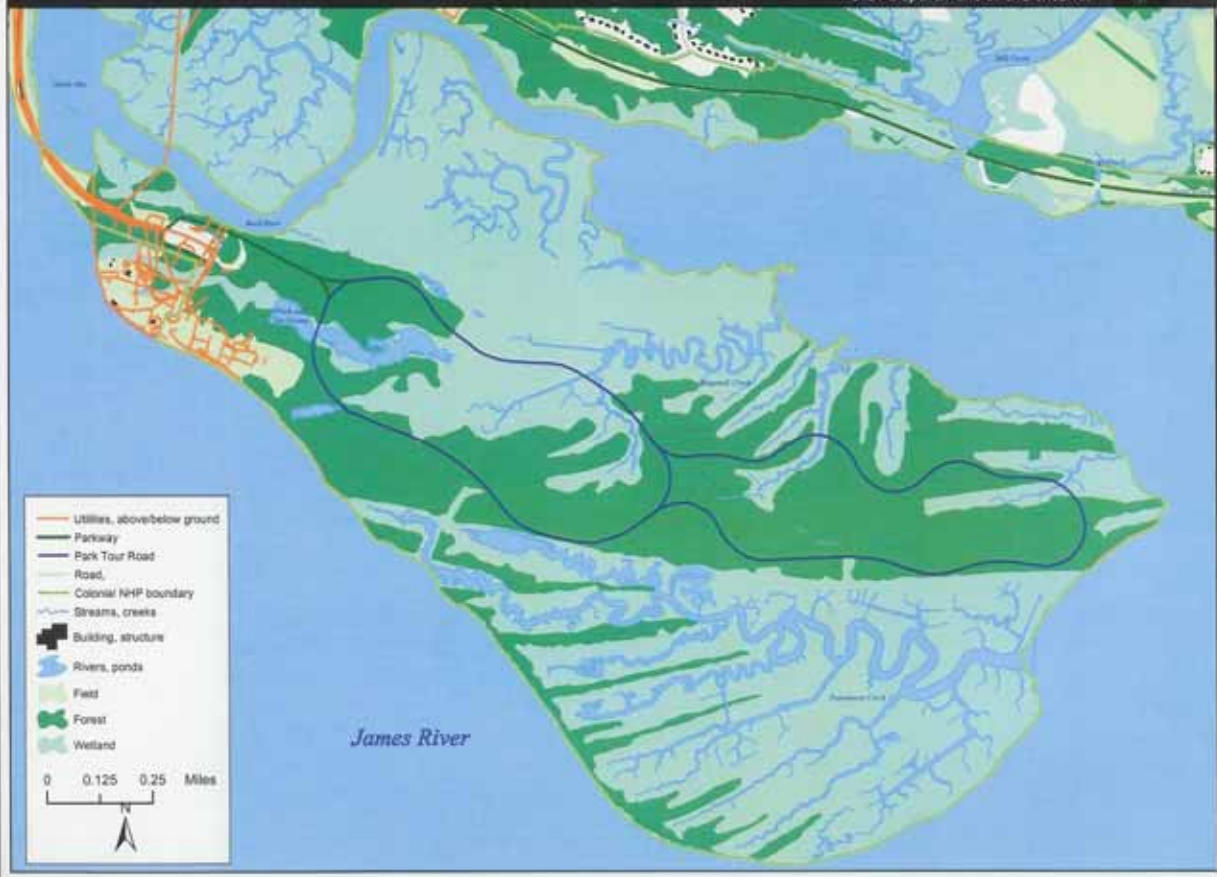


Figure 6e. Infrastructure, Green Spring and Swann's Point

Colonial National Historical Park
National Park Service
U.S. Department of the Interior



Appendix E

MINIMUM IMPACT SUPPRESSION TACTICS (MIST)

The change in emphasis from fire control to fire management has added a new perspective to the role of fire manager and firefighter. The old objective of putting the fire "dead-out", by a specified period of time has been replaced by the need to make unique decisions for each fire start, to consider the land and resource objectives, and to decide the appropriate management response and tactics which result in minimum costs and resource damage. Fire management activities within the park will be carried out in a manner that minimizes impacts to the park's natural and cultural resources. Incident facilities, when practical, will be located outside of natural and historic zones. Suppression forces will choose methods and equipment appropriate with suppression needs and a strategy that will least alter the landscape or disturb park resources. Of primary importance is the need to impress upon suppression forces the minimum impact suppression guidelines found in RM-18, Chapter 9. These guidelines take the park ethic into account in firefighting practices; they are not an excuse to relax normal safe firefighting practices. Techniques and policies of minimum impact firefighting that will be used in the park include (but are not limited to):

- a. Minimize use of retardant. The park's aquatic ecosystem requires protection for various reasons. The streams support a diverse fish population with state-listed species, plus some of the most diverse aquatic insect populations in the area. **As a result, it will be standard practice to keep chemical retardant use at least 300 feet from any water source. This includes areas where intermittent streams and/or ephemeral ponds are found, even if they do not have water in them at the time of the suppression effort.**
- b. Cold-trailing the fire edge when practical.
- c. Use of natural firebreaks or wetlines wherever possible (in lieu of handline construction). Waterbars will be constructed on all handlines on steep slopes (15%>).
- d. Use of soaker hose or foggers in mop-up to avoid "boring" and hydraulic action on soils.
- e. Firelines kept to the minimum width needed to allow backfiring, burnout, or the creation of a safe blackline. Natural barriers should be used wherever possible.
- f. Minimal tree-falling. Snags within or adjacent to firelines will be removed only if they show evidence of fire, present hazard to firefighters, or constitute a legitimate threat to the fireline integrity. Living trees will be undisturbed whenever possible. Lower branches will be limbed whenever possible to remove ladder fuels rather than removing the tree.
- g. Maximize archeological protection measures in order to protect cultural resources.
- h. Debris scattered or removed as prescribed by the Resource Advisor.
- i. All firelines, camps, or other disturbance in visually sensitive areas will be rehabilitated to maintain a natural appearance.
- j. After the fire emergency is over, transport of personnel, equipment, and trash out of the Park that is consistent with Park resource management objectives.
- k. Engines will be used only on established roads, including dirt fire roads and trails, within park boundaries, unless approval from the Superintendent or FMO has been obtained to leave park roads.
- l. Bulldozers allowed only with written authorization from the Superintendent, who may authorize their use when high value resources are at risk. In these cases, Archeologists, Para-archeologists and/or Natural Resource Specialists will be assigned to dozers (if possible) to minimize damage to resources.

- m. Utilize a “consumption strategy” when dealing with mop-up operations. This minimizes the exposure of firefighters to the physical hazards present along fire lines, i.e.; falling snags, rolling material, stump holes, etc., and allows for opportunities for the fire to consume fuels inside of the line without placing firefighters at unnecessary risk. Firefighters can monitor particularly hazardous areas along the line by initiating patrol actions from outside the line. Maximize the opportunity for the fire to consume fuels inside of the line without extensive mop-up activity by crews. The use of this strategy does NOT imply that the fire is left to its own devices, but rather that a coordinated approach of mop-up activity is utilized that allows for minimum exposure to firefighters during this phase of the fire suppression effort.