



Antietam National Battlefield
Monocacy National Battlefield
Manassas National Battlefield Park

RECORD OF DECISION

White-Tailed Deer Management Plan and Final Environmental Impact Statement

Antietam National Battlefield, Monocacy National Battlefield, and Manassas National Battlefield Park, Maryland and Virginia

INTRODUCTION

The Department of the Interior, National Park Service (NPS), has prepared this Record of Decision (ROD) for the Antietam National Battlefield, Monocacy National Battlefield, and Manassas National Battlefield Park White-tailed Deer Management Plan and Final Environmental Impact Statement (final plan/EIS). This ROD states what the decision is, identifies the other alternatives considered and the environmentally preferable alternative, discusses the basis for the decision, lists measures to minimize environmental harm, and briefly describes public and agency involvement in the decision-making process. The non-impairment determination for the selected action, which is required by NPS *Management Policies 2006* (NPS 2006b), is attached to this ROD. References for citations used in the ROD and non-impairment determination are available in the final plan/EIS.

PURPOSE AND NEED FOR THE PLAN/EIS

Although relatively rare at the turn of the 20th century, white-tailed deer populations in the Mid-Atlantic region have grown during recent years. Deer thrive on food and shelter available in the “edge” habitat conditions created by suburban development. In addition, fragmentation of the landscape and an increase in developed areas have reduced suitable hunting opportunities. This is particularly true in Maryland’s growing suburban areas (MD DNR 1998) and in suburban Northern Virginia near Manassas. The size of deer herds and deer population density have increased substantially over the years at all three battlefields. Current deer densities are substantially larger than commonly accepted sustainable densities for this region, estimated at about 15–25 deer per square mile (Bates 2010; deCalesta 1997a; Horsley, Stout, and deCalesta 2003). Results of vegetation monitoring in recent years have documented the effects of the large herd size on forest regeneration in all three battlefields. In addition, deer browsing has resulted in damage to crops and associated vegetation that are key components of the cultural landscapes of the battlefields. It is important to all three battlefields to preserve and restore important cultural landscapes and to preserve agricultural viability within the battlefield grounds. Although the goals vary from battlefield to battlefield, cultural landscape preservation goals are written into the management plans, enabling legislations, and other documents for all three battlefields.

The purpose of this plan/EIS is to develop a deer management strategy that supports preservation of the cultural landscape at all three battlefields through the protection and restoration of native vegetation and other natural and cultural resources. This plan is needed because:

- Attainment of the parks’ cultural landscape preservation goals and mandates are compromised by the high density of white-tailed deer in the parks.
- Browsing of and other damage to native seedlings, saplings, and understory vegetation by deer in the parks has prevented successful forest and riparian buffer regeneration.

- An increasing number of deer in the parks has resulted in adverse impacts on native vegetation and wildlife.
- Opportunities to coordinate with other jurisdictional entities currently implementing deer management actions to benefit the protection of park resources and values can be expanded (e.g., Bull Run Regional Park near Manassas).
- Chronic Wasting Disease (CWD) is proximate to the parks and represents an imminent threat to resources in the parks. There are opportunities to evaluate and plan responses to threats from CWD over the long term.

The objectives of the final plan/EIS are listed below.

Vegetation

- Protect and promote forest regeneration and restoration of the abundance, distribution, structure, and composition of native plant communities by reducing excessive deer impacts (e.g., browsing, trampling, invasive nonnative seed dispersal, and buck rub).

Wildlife and Wildlife Habitat

- Maintain a viable white-tailed deer population within the parks while protecting other park resources.
- Protect and preserve other native wildlife species by promoting the restoration of native plant communities.
- Promote early detection, and reduce the probability of spread of CWD, a transmissible neurological disease of deer and elk that has been detected in the region.

Cultural Resources

- Protect the integrity and character of the cultural landscapes, including the spatial patterns of open versus wooded land, and contributing historic views.
- Protect, preserve, and ensure the viability of the historic agricultural landscape, such as crops, orchards, and pasture lands.

Visitor Use and Experience

- Enhance public awareness and understanding of NPS resource management issues, policies, and mandates, especially as they pertain to deer management.
- Ensure visitors have the opportunity to view and experience the battlefield landscapes within their historic contexts.
- Ensure visitors have the opportunity to view deer in the natural environment at population levels that do not adversely impact visitors' enjoyment of other native species in the natural landscape.

BACKGROUND

Deer thrive on habitat conditions created by suburban development. New roads, housing, and related enterprises fragment forests and farms and create "edge" habitats that provide plenty of food and ample shelter for deer. In addition, in national park system units in the eastern United States, hunting is generally not allowed, and landscapes have traditionally been managed to allow for the preservation and rehabilitation of scenic and historic landscapes. The result is a mixture of forest, fields, shrub, and grassland, which constitutes excellent habitat for white-tailed deer. Direct impacts from intense deer browsing include reductions in plant species richness (number of species), plant density and biomass,

height growth, and the development of vertical structure. Loss of plant species and vertical structure, leading to the decline of animal species that depend on these plants, represents a primary effect of browsing (Latham et al. 2005, Alverson 1988; Anderson 1994; Augustine and Frelich 1998; deCalesta 1994; McShea 2000; McShea and Rappole 2000).

At all three battlefields, deer densities have consistently been higher than deer abundances that interfere with forest regeneration and associated wildlife habitat (Bates 2010). Some researchers reported that regeneration of some woody species can be affected by deer densities as low as 10.36 deer per square mile (Alverson et al. 1988), while others reported that deer populations maintained below 18 deer per square mile allow for regeneration to occur (Tilghman 1989). Horsley, Stout, and deCalesta (2003) demonstrated negative impacts on vegetation at densities exceeding 21 deer per square mile. The NPS National Capital Monitoring Network vital signs monitoring relied on the 21 deer per square mile threshold (Bates 2006). Based on this threshold, ten parks within the National Capital Region (NCR) exceeded desirable population densities in 2009, including all three battlefields. In 2011, deer density at the battlefields was estimated at 130.71 deer per square mile at Antietam, 235.92 deer per square mile at Monocacy, and 172.4 deer per square mile at Manassas. In 2013, deer density was estimated at 142 deer per square mile at Antietam, 185 deer per square mile at Monocacy, and 89 deer per square mile at Manassas, but with a relatively large standard error (Bates, pers. comm., 2014).

The battlefields have been conducting studies to determine the impacts of deer on natural resources. Paired plot (fenced and unfenced, or “open” plots) studies have been conducted at all three parks to assess the effects of deer browsing on forest vegetation. Results of these studies are described in detail in the “Vegetation” section in chapter 3 of the final plan/EIS and are summarized below.

A multi-park study (McShea and Bourg 2009) evaluated the impacts of deer browse on park cultural landscapes and natural resources, specifically native woody vegetation, in Antietam and Monocacy, as well as the Chesapeake and Ohio Canal National Historical Park. Results indicated that for most species there were fewer seedlings in 2009 than 2003, regardless of plot type (open vs. fenced). The majority of the most common sapling species decreased significantly in the open plots from 2003 to 2009, but increased significantly in fenced plots. Although sapling species richness showed two- to ten-fold increases across the parks from 2003 to 2009, this increased richness and abundance was accompanied by an associated increase in richness of invasive nonnative saplings in all plots. Based on McShea and Bourg’s calculated “stocking thresholds,” none of the plots, open or closed, at the two battlefields reached the threshold for successful regeneration (McShea and Bourg 2009).

At Manassas, there is an ongoing study using open control plots and exclosures in three forest types found in the park. Gorsira, Rossell, and Patch (2006) analyzed the results of the study from 2000 to 2004, and a subsequent study examined the differences in plots between 2001 and 2009 (McShea et al. 2009). Results indicated that deer have significant effects on forest structure and woody seedling composition. Deer browsing suppressed both forb cover and vertical plant cover in each forest type. With few exceptions, annual seedling survival rates were consistently significantly lower in the controls than in the exclosures. Deer browsing adversely affected seedling survival rates of all species except for hackberry (*Celtis occidentalis*), blueberry (*Vaccinium* spp.), and redbud (*Cercis canadensis*). Results also indicate that browsing by white-tailed deer may be impacting the herb and shrub layers in the forest interior to levels that may be detrimental to wildlife species that are dependent on a thick understory to thrive (Gorsira, Rossell, and Patch 2006). The subsequent study showed that by 2009, both open and fenced plots showed increases in species richness, but the exclosures contained significantly more woody and herbaceous species than control (open) plots. Also, exclosures and control plots had significant differences in seedling survival rates.

Crop yield reports demonstrate the effects of deer damage on crops grown on the farms within Antietam National Battlefield, which are being maintained as agricultural fields. Data on crop damage has been reported by farmers in the park, because of concern over deer-related crop damage, and compared against expected crop yields published by the Natural Resources Conservation Service in Washington County. When compared with the average crop yields for farms in Washington County, and for soil types more generally, Antietam agricultural cooperators experienced significant to highly significant reductions in corn for grain and silage, soybean, and winter wheat. There were also marginally significant harvest reductions with barley. There was too small a sample size to analyze yields for alfalfa hay. Data show lower harvests overall for all crops at Antietam than county averages (NPS 2011b).

Crop yield reports for Monocacy show that the deer may not be affecting crops as much at Monocacy as at Antietam. Monocacy experienced a significant decrease in corn yield when compared to average crop yields in Frederick County, as well as when compared to expected yields per soil type, but demonstrated a slightly higher (but not statistically significant) yield than the county average for soybeans (NPS 2012d).

There are no formal deer management plans for the three battlefields currently, but numerous deer monitoring activities are undertaken by NPS staff. Actions taken to address impacts of deer browsing include deer population and vegetation monitoring, and coordination and communication with state personnel and local agencies and communities to understand and address issues associated with deer overabundance in the region. The parks also conduct limited CWD surveillance and provide interpretative and educational materials regarding the impacts of deer on vegetation and the cultural landscapes of the parks. These actions constitute the “no-action” alternative in the final plan/EIS.

DECISION (SELECTED ACTION)

Deer Management

The NPS decision is to implement alternative D, the selected action, which was described as the NPS preferred alternative in the final plan/EIS. The final plan/EIS was released to the public for the required 30-day no-action period beginning August 19, 2014 and ending September 3, 2014. Under the selected action, the NPS will continue current park deer management actions and will also include several additional techniques such as fencing of crops and woodlots; changing crop configurations or selection to substitute crops that are less palatable to deer; and use of aversive conditioning (scaring deer out of certain areas using noise or motion) to prevent adverse deer impacts. The selected alternative has as a primary focus the incorporation of a combination of lethal and nonlethal deer management actions to address high deer density. Lethal actions (including sharpshooting, along with very limited capture/euthanasia if necessary) will be taken initially to reduce the deer herd numbers quickly. Population maintenance could then be conducted either by nonsurgical reproductive control methods, or by sharpshooting as needed. Both of these population maintenance methods are retained as options in order to maintain maximum flexibility for future management.

Details on the costs of the selected action are summarized in the final plan/EIS in tables 12A-12C. Details regarding methods used to implement the plan follow the “Adaptive Management” section, below.

Threshold for Taking Action

Forest Regeneration Threshold

Forest regeneration was selected as the primary measure of plan success. Therefore, tree seedlings must be monitored to determine at what point the browsing impacts would warrant implementation of the selected alternative. The point at which action would be needed is called the “threshold for taking action.”

The appropriate action threshold for tree regeneration at the three battlefields is based on research by Dr. Susan Stout (1998) in a similar eastern hardwood forest environment in Cuyahoga National Recreation Area, now known as Cuyahoga National Park (McWilliams et al. 1995). As further explained in chapter 2 of the final plan/EIS, Dr. Stout's method measures the number of tree seedlings and their heights in circular sampling plots under different levels of deer herbivory. Stout's recommended regeneration thresholds for Cuyahoga were converted to account for the three battlefields' monitoring plot sizes, and the NPS decided to use Stout's suggested regeneration standard as the threshold for taking action under this plan. In order to restore tree seedling recruitment to acceptable levels, monitoring will need to show that at least 67% of the unfenced long-term plots monitored at the battlefields have more than 38.1 seedlings/plot at high deer density (56–64 deer per square mile). The NPS will determine the level of regeneration every three years from data collected from the plots, as described in the monitoring plan presented in appendix A of the final plan/EIS.

Cultural Landscape Thresholds

It was important to have a foundation for management based not only on tree regeneration, but also on the protection of cultural landscapes that are so clearly linked with the parks' missions and enabling legislation, as well as the NPS Organic Act and *Management Policies 2006*. Therefore, indicators or monitoring metrics that show the effects of deer on crops (changes in yield), orchards (damage to trees), and the visual appearance of the landscape (distinctive browse line at the forest edges) were examined. Manassas has no crops or orchards, and its main concerns were addressed by the seedling thresholds and future photographic documentation, so no specific cultural landscape thresholds were adopted for Manassas. However, Antietam has both orchards and crops, and crop damage is a large concern at Monocacy. Therefore, NPS decided on several indicators of deer browse impact for those two parks and established the following thresholds for taking action:

- **Crop Yield Threshold (Antietam and Monocacy).** During early deer management planning at Gettysburg National Battlefield, damage to winter wheat and field corn was assessed (Vecellio, Yahner, and Storm 1994) and an objective of achieving 75% of potential yield for crops was established based on an economic review. Antietam and Monocacy crop yield data show reductions in crop productivity compared to the averages in the surrounding counties (NPS 2011b; NPS 2012d). Based on this information, the planning team agreed to use a threshold tied to crop yield at Antietam and Monocacy, wherein deer management action will be taken when the 3-year average crop yield from farms within Antietam or Monocacy falls below 75% of the average yield reported by the county for similar agricultural production.
- **Orchard Threshold (Antietam Only).** At Antietam, key historic landscape features also include orchards. Orchards have been particularly hard hit by deer, and orchard trees are protected by fencing in highly visible areas. Damage to just new growth (current growing season's tissue) is the most severe type of damage to trees (compared to damage to terminal leaders, older wood, or trunks) and this can drastically affect the ability of trees to survive (Dolan, pers. comm. 2012). Based on this assessment, the planning team decided to use a measure of damage to current growth as an indicator that action needed to be taken to protect orchard trees. Action will be taken when more than 30% of the current growth is removed by deer browse in 1 year. This is based on horticultural standards identifying the loss of more than 25% of live tissue from any given tree in a single year having the likelihood that the tree would not be able to survive. The park conducts deadwood/winter pruning annually, and there is an opportunity to conduct this monitoring in conjunction with the pruning cycle.

Initial Deer Density Goal

The deer density goal for the battlefields is defined as the number of deer per square mile that would allow for natural forest regeneration and preservation or enhancement of the cultural landscape components that contribute to the open/closed pattern of historic uses. The selected alternative establishes a range of 15 to 20 deer per square mile as the initial deer density goal. This deer density is consistent with the density range reported in the scientific literature as necessary for adequate tree regeneration and is based on information provided by the science team that was formed to provide technical information and input into the planning process (see the “Scientific Background” section in chapter 1 of the final plan/EIS). This initial goal may be adjusted based on the results of vegetation and deer population monitoring, as described in the “Adaptive Management” section, below.

Adaptive Management

According to the U.S. Department of the Interior Technical Guide (Williams et al. 2007), “Adaptive management is a systematic approach for improving resource management by learning from management outcomes” (Sexton et al. 1999). The management actions described in the selected alternative will be followed by monitoring to evaluate the results of the action. By using an adaptive management approach, park managers will be able to change the timing or intensity of management treatments as necessary to better meet the goals of the plan as new information is obtained.

Because the goal is to manage for successful forest regeneration and cultural landscape integrity within the parks, not for deer density, the number of deer to be removed annually will be adjusted based on the monitoring of forest regeneration and deer population density surveys. The results of removal will be documented by vegetation monitoring at least every three years. The number of deer to be removed could then be adjusted based on the response of the vegetation to a higher or lower deer density. If vegetation is observed to be at or below target thresholds before the lower deer density was reached, and cultural landscape thresholds were not exceeded, management actions could then be modified or adjusted. Similarly, management actions could be adjusted if the vegetation remained below target thresholds after implementation.

Methods

Sharpshooting

Qualified federal employees or contractors will be used to implement the selected alternative. All employees or contractors used will be experienced with sharpshooting methods and have the necessary sharpshooting qualifications. Training will also address safety measures to protect both visitors and NPS employees. The employees or contractors will coordinate all details related to sharpshooting actions, such as setting up bait stations, locating deer, sharpshooting, and disposition of the deer (donation of meat and/or disposal of waste or carcasses). In most locations, high-power, small caliber rifles will be used from close range. Non-lead ammunition will be used for any lethal removal of deer to preserve the opportunity to donate the meat or to be left in the field for scavenging wildlife. Every effort will be made to make the shootings as humane as possible. Deer injured during the operation will be put down as quickly as possible to minimize suffering. Noise suppression devices and night vision equipment will be used to reduce disturbance to the public. Activities will be conducted in compliance with all relevant firearm laws and regulations.

Sharpshooting with firearms will primarily occur during late fall and winter months, when deer are more visible, and will be done at night (between dusk and dawn), when the parks are closed to visitors. In some areas, sharpshooting may be done during the day if needed, which could maximize effectiveness and minimize the overall time of restrictions. If this is done, the areas will be temporarily closed to park visitors. The public will be notified of any park closures in advance, exhibits regarding deer management

will be displayed at visitor contact facilities, and information will be posted on the parks' websites to inform the public of deer management actions. Visitor access could be limited as necessary while reductions were taking place, and NPS personnel will patrol public areas to ensure compliance with park closures and public safety measures. If more than one shooting location is used, areas will be adequately separated to ensure safety.

Bait stations could be used to attract deer to safe removal locations. The stations will be placed in park-approved locations away from public use areas to maximize the efficiency and safety of the reduction program. Park staff will determine the number of deer to be removed from the parks based on the most recent population survey and the initial deer density goal of 15 to 20 deer per square mile, as well as past experience of other deer management programs, technical feasibility, and success of forest regeneration in later years of plan implementation. Using 2011 deer density data as an example (130 deer per square mile at Antietam, 235 deer per square mile at Monocacy, and 172 deer per square mile at Manassas), the number of deer removed in the first four to five years would be 550 at Antietam, 659 at Monocacy, and 1,645 at Manassas. After the post-removal density reaches the desired 15-20 deer per square mile range, the parks will remove smaller numbers of deer each of the remaining years of the plan to maintain the herd at the desired density; this example predicts the following maintenance removals: Antietam: 14–29 deer per year (years 5–15); Monocacy: 10–21 deer per year (years 6–15); Manassas: 35–73 deer per year (years 6–15).

Both does and bucks will be removed based on opportunity; although there will be a preference for removing does, especially initially, because this will reduce the population level more efficiently over the long term. Buck-only removal would not control population growth, as deer populations are largely dependent on the number of does with potential for reproduction (West Virginia University 1985). The age and gender of all deer removed from the parks will be recorded to aid in defining the local population composition. This information will be compared with composition data collected during park population density surveys. The number of deer removed in years following attainment of the desired density goal will be adjusted as described in the final plan/EIS under "Adaptive Management Approaches Included in the Alternatives." This number may vary annually depending on success of previous removal efforts, deer adaptations to removal efforts, regeneration response, and other factors.

The NPS will donate deer meat (e.g., to local charitable organizations, nonprofit food banks) to the maximum extent possible or practical, as permitted by regulations and NPS guidelines (NPS 2007). If donation is not possible, then carcasses will be disposed of. When donating meat, the parks will follow current guidance from the NPS Office of Public Health and the Biological Resource Management Division with regard to donation of meat from areas affected by CWD, in addition to state and local requirements.

Capture and Euthanasia

Capture and euthanasia will be used in very limited circumstances where sharpshooting is not appropriate due to safety or security concerns. Because capture and euthanasia typically results in increased stress levels in captured deer compared to sharpshooting, this method of population control will be used only in select situations and will supplement the sharpshooting method described earlier only when necessary. None of the parks expects to use this method, but it is included in the plan in case its use is necessary. At most, 5 to 10 deer each year may be taken in this manner.

If capture and euthanasia is required, the preferred technique for this method will be for qualified federal employees or authorized agents to trap the deer, approach them on foot, and euthanize them. Activities will be conducted at dawn or dusk when fewer visitors are in the parks. The number of deer removed by

capture and euthanasia will be recorded, as well as the age and sex of the deer, location of removal, circumstances requiring removal and capture, and lethal method used.

Deer could be captured with nets or traps, similar to the trapping described under the reproductive control option for the initial administration of the selected agent. Deer could also be immobilized by darting with a tranquilizer gun (Schwartz et al. 1997). The method of capture will be selected based on the specific circumstances (e.g., location, number of deer, accessibility, and reasons that sharpshooting is not advised) for each deer or group to be removed. Captured deer will be euthanized as humanely as possible, in accordance with current veterinary recommendations such as those published by American Veterinary Medical Association.

Euthanasia methods could include a combination of penetrating captive bolt gun and potassium chloride, firearm technique, or other humane technique. If for some reason the penetrating captive bolt gun or firearm technique could not be used to euthanize a trapped animal, injecting a lethal dose of a drug (under supervision of a veterinarian or NPS park practitioner) could be used. However, if chemicals were used either for immobilization or for euthanasia, it may not be possible to donate the meat from that animal as food, and the carcass may be unsuitable for surface disposal. In this case, the carcasses will be taken to a local landfill.

Only NPS staff and authorized agents trained in the use of penetrating captive bolt guns, firearms, or tranquilizer guns will perform these euthanasia actions. Training will include safety measures to protect authorized agents, visitors, and NPS employees. Authorized agents may also need to be qualified to handle live deer in order to prevent disease transmission and prevent any harm to the handler. Appropriate safety measures will be followed when setting drop nets or box traps.

Reproductive Control of Does

The selected alternative may include treating female deer with a chemical reproductive control agent to reduce population growth, if reproductive control is used for population maintenance. Several reproductive control agents are currently being developed and tested for use in deer population control (Fraker et al. 2002). Those that could be considered for use are described in detail in appendix B of the final plan/EIS. The current status of research related to nonsurgical reproductive control technologies (immunological and nonimmunological) provides results that are highly variable related to key elements such as efficacy and duration of contraceptive effect. There are also logistical issues related to the administration of these drugs that could affect success of implementation and sustainability of a reproductive control program at the parks. Therefore, only when the criteria listed below are met would reproductive control be implemented as a management technique.

Reproductive Control Agent Criteria	Rationale for Criterion
There is a federally approved fertility control agent for application to free-ranging populations.	It is critical that all aspects of a fertility control program be consistent with federal laws and regulations and NPS policies.
The agent provides multiple-year (3 to 5 years) efficacy.	Modeling efforts have clearly demonstrated that (1) "the efficacy of fertility control as a management technique depends strongly on the [multi-year] persistence of...the fertility control agent;" and (2) the only scenarios in which fertility control is more efficient than culling at maintaining population size is when a multi-year efficacy is achieved (Hobbs, Bowden, and Baker 2000).

Reproductive Control Agent Criteria	Rationale for Criterion
The agent can be administered through remote injection.	Remote delivery reduces the frequency of stressful capture and/or drug delivery operations. Capture would be necessary for the initial application because the animals would need to be marked, but the agent should be able to be delivered remotely for any subsequent doses.
The agent would leave no hormonal residue in the meat (i.e., meat derived from treated animals should be safe for human consumption according to applicable regulatory agencies, and safe for consumption by other animals).	Any fertility control agent applied in free-ranging wildlife populations that are contiguous with areas or with the same species that are hunted must be safe for human consumption, and there should be minimal ecological impacts on other species that could eat deer.
Overall there is substantial proof of success with limited behavioral impacts in a free-ranging population, based on science team review and NPS policy.	No study has demonstrated that fertility control works to reduce deer numbers in free-ranging populations to the extent needed at the parks to allow for tree regeneration, so it is important that the ability to successfully reduce a free-ranging deer population be demonstrated. Also, it is important that any agent used meet NPS policies, including those regarding altered behavior (NPS 2006a, Section 4.4.1).

No reproductive control agents are currently available that meet all these criteria; however, some of the criteria are met by certain agents. It is possible that an agent that meets all the criteria could be developed during the lifetime of this plan; therefore, this option was considered. The NPS will review the status of ongoing reproductive control research on a periodic basis through consultation with subject matter experts and review of new publications. When there are advances in technology that could benefit deer management in the parks, the choice of an appropriate agent will be determined based on how well the criteria were met, availability, cost, efficacy, duration, safety, and feasibility. See appendix B of the final plan/EIS for a detailed overview of reproductive control agents and methods.

If used to maintain the parks' deer populations at or below the target density, reproductive control would be initiated at the desired target deer densities. Assuming that the proportion of does in the population remains the same as described in the final plan/EIS, it will be necessary to treat 70 to 90% of the does in each population. Taking a conservative approach of treating 90% of the remaining does, the NPS would treat 23 does (90% of 25) at Antietam, 19 does (90% of 21) at Monocacy, and 68 does (90% of 75) at Manassas. Does would need to be treated every three years and marked for identification for subsequent retreatment during the initial application in order to keep the population at the desired level.

Assuming a reproductive control agent is used that meets all criteria, does will need to be initially captured and marked to avoid multiple treatments of the same does in the same year and to facilitate tracking for future applications in subsequent years. Several methods of wildlife trapping could be used, including but not limited to drop nets and box traps. Deer could also be immobilized by darting with a tranquilizer gun (Schwartz et al. 1997). This method could be used in cases where deer are not successfully attracted to a trap area.

Most trapping methods involve baiting to attract deer to a specific area or trap. Box traps involve a confined space that safely holds the deer so that staff can approach it. Drop net traps also often use bait to attract deer to the drop zone where suspended nets are triggered to drop over the deer and restrain it for staff to approach (Lopez et al. 1998). The method of capture will be selected based on the specific circumstances (e.g., location, number of deer, accessibility) for each deer or group to be removed. Given the large number of does that will need to be treated, bait piles will be used to concentrate does in certain locations to make the trapping process as efficient as possible. Marking would likely be accomplished using ear tags. Some capture and handling-related mortality could occur under this method due to

tranquilizer use and stress on the doe (DeNicola and Swihart 1997; Kilpatrick, Spohr, and DeNicola 1997); generally, a mortality rate of 2% or less would be expected (Peterson et al. 2003; Kreeger and Arnemo 2012).

Deer and Vegetation Monitoring

Deer population numbers will be monitored through the continuation of ongoing monitoring efforts that are currently in place. These include the following:

- Monitoring deer numbers by parkwide sampling, using the established Distance 5.1 protocol to estimate the deer population density annually (Underwood, Verret, and Fischer 1998).
- Monitoring population composition (e.g., sex ratios) using distance sampling surveys.
- Monitoring tree seedlings using an existing vegetation monitoring protocol to determine the status of forest regeneration. Paired plots (fenced and unfenced plots) are present at all three parks. All parks also have long-term monitoring plots (open plots; not paired) that are monitored by the network staff periodically.
- Tracking of research related to deer management, the outcome of actions being taken in neighboring jurisdictions, and the latest research on various deer management methods, including reproductive control.
- Monitoring deer health if the population shows signs of disease or if a disease has been discovered within the region.
- Monitoring the costs of the monitoring actions, including staff time, training, administrative, legal, and public communications costs.

The parks will use distance sampling to document trends in population size.

Throughout the removal actions, vegetation monitoring will be conducted to document any changes in the intensity of deer browsing and forest regeneration that might result from reduced deer numbers. Vegetation monitoring will be conducted at least as frequently as every three years to document vegetation recovery. If the park objectives were being met and forest regeneration was successful at the initial deer density goal, removal efforts will be maintained at the level necessary to keep the deer population at the target density. However, it will take several years for seedling numbers to respond to lower deer numbers and this response directly depends on how quickly the population is reduced. Likewise, the number of deer to be removed in subsequent years will be adjusted based on the success of previous removal efforts, projected population size, and vegetation and deer monitoring results. Park management could adjust the removal goal in either direction from the initial density goal depending on how well the parks' forest regeneration objectives had been met (see the "Adaptive Management Approaches Included in the Alternatives" section of the final plan/EIS).

Chronic Wasting Disease

In addition to the lethal and non-lethal deer management actions described above, the selected alternative includes a long-term CWD management plan. Surveillance and testing and implementation of the Antietam/Monocacy CWD Detection and Initial Response Plan will continue; in addition, the selected alternative provides for a longer-term response to CWD when it is in or within 5 miles of the parks. The long-term CWD management plan is based on evidence that high deer population densities generally support greater rates of disease transmission (Wilson et al. 2002; Swinton et al. 2002) and have been found to be positively correlated with the prevalence of CWD (e.g., Farnsworth et al. 2005; Conner et al. 2008), and that immediate action is needed to reduce the deer population rapidly in order to reduce amplification of CWD and to coordinate with the states on sampling needed to assess the situation.

The plan includes lethal removal of deer to substantially reduce deer density and will allow the three battlefields the option to reduce the deer population to a density similar to that found outside the parks or even to a lower level as needed to cooperate with state program and testing requirements.

Threshold for Taking Action—Long-term CWD Response

For all three battlefields, the long-term CWD response plan will be triggered only if a positive case of CWD is found within park boundaries or within 5 miles of the park boundaries, which means that the parks would fall within a state CWD containment area. While the plan will allow for reduction of the deer population to a density similar to that found outside the parks (or a lower level as needed to cooperate with state program and testing requirements), the deer population will not be reduced below 10 deer per square mile. Removals will be done quickly and in a similar manner to the lethal deer management methods described above. Deer will be removed for surveillance monitoring in subsequent years, with the number removed dependent on the conditions at the time and coordination with the state.

CWD Response

Sharpshooting activities will initially target areas immediately surrounding or closest to the positive case to ensure removal of animals that have been in contact with CWD-positive animals, in order to potentially decrease the local prevalence of CWD. Areas where deer movements across the park boundary into surrounding communities are frequent and areas with higher concentrations of deer also may be targeted for removal activities to reduce the probability of spread and promote elimination of the disease, if possible. During initial removal efforts, both male and female adult deer will be targeted due to the increased probability of infection in older animals and the spread potential posed by males (which have a larger home range than does). Removal actions will be carried out rapidly, and most likely in coordination with state efforts to reduce deer populations, so it is not possible to predict exactly how many deer would be removed or how long the action will last. It is expected that removals will be essentially the same for all parks, realistically taking about 4–6 years to accomplish. However, removals could be accelerated if needed to better coordinate with state response efforts. This will be dependent on available staffing and resources.

Reduction to Ten Deer per Square Mile as a Lower Limit

Implementation of a more intense reduction of the deer population to not less than 10 deer per square mile will be an option and will be based on coordination with the state. For the purpose of disease response, the NPS does not wish to reduce the number of deer within the parks to a density far below that outside the parks because it may increase the likelihood of potentially infected deer repopulating the parks from surrounding areas. The NPS also does not wish to maintain a deer density that is substantially higher than in surrounding communities, because that may increase the likelihood of disease amplification and spread into the parks. This approach allows the parks flexibility to work cooperatively with the state to address CWD if the state is able to achieve a population density lower than 15–20 deer per square mile in areas surrounding the parks. A deer density of 10 deer per square mile is considered appropriate as a lower limit for this action because it is consistent with recommendations in the scientific literature related to appropriate deer density to ensure adequate forest regeneration, which ranges from 10–40 deer per square mile. It is also consistent with the stated objective of the plan/EIS to maintain a deer population in the parks. The parks will also have the option to maintain the population density as low as 10 deer per square mile to remain consistent with surrounding deer densities and continued need to avoid amplification of the disease. Additional removals that are part of this reduction will be based on available staffing and resources and may take more time to achieve, depending on the state's actions to reduce the deer population outside the parks.

Testing and Carcass Disposal

Carcasses will be disposed of in accordance with NPS Public Health Program guidelines for donation of meat from an area affected by CWD for the purpose of human consumption (NPS 2012f) and the current state CWD response plan. Public health guidelines require that the people consuming the meat be fully informed and take full responsibility for any long-term unanticipated effects of eating meat from animals coming from a CWD-affected area. When CWD is within 5 miles of the parks, these guidelines preclude the donation of meat to food pantries, soup kitchens, or any entity that intends to redistribute the meat (NPS 2012f). Park staff will remain in close contact with appropriate state agencies regarding disposal of CWD-positive deer and integration of the park and state approaches to carcass disposal. Three disposal methods are appropriate for CWD-positive carcasses: land filling (in licensed lined landfills if they are available and accepting deer carcasses), incineration, and alkaline (tissue) digestion. These methods will be carried out at off-site disposal facilities. Carcasses will be kept at the parks in refrigerated units pending test results, and transported to off-site disposal facilities that accept the deer carcasses (either negative or positive).

Measures to Minimize Harm

A number of mitigation measures will be implemented as part of the selected alternative to ensure protection of park resources and reduce the risk of injury to employees, park visitors, and adjacent landowners during implementation of population reduction and maintenance activities. These actions include the following:

- Non-lead ammunition will be used for any lethal removal of deer to preserve the opportunity to donate the meat or for the carcass to be left in the field for scavenging wildlife.
- Sharpshooting with firearms will primarily occur at night (between dusk and dawn), during late fall and winter months when deer are more visible and fewer visitors are in the parks. Similarly, any capture and euthanasia actions or treatment of does will occur during the off-peak visitor hours (early morning and evening) and weekdays to the extent possible.
- Areas could be temporarily closed to park visitors, and NPS park rangers would patrol public areas to ensure compliance with park closures and public safety measures. The public would be notified of any park closures in advance. Information regarding deer management would be available at visitor contact facilities posted on the parks' websites to inform the public of deer management actions. If more than one shooting location were used, areas would be adequately separated to ensure safety.
- For sharpshooting, noise suppression devices and night vision equipment will be used to reduce disturbance to the public. Activities will be in compliance with all federal firearm laws and regulations.
- Bait stations will be placed in park-approved locations away from public use areas to maximize the efficiency and safety of the reduction program.
- Capture and euthanasia will be used only in limited circumstances where sharpshooting may not be appropriate due to the potential for stress to animals during this activity.
- Does treated with a reproductive control agent will be appropriately marked or tagged to facilitate identification of treated individuals and to prevent human consumption if necessary.
- When donating meat, the parks would follow current guidance from the NPS Office of Public Health and the Biological Resource Management Division with regard to donation of meat from areas affected by CWD, in addition to state and local requirements.

- Only NPS staff and authorized agents will be used to administer lethal removal or reproductive control agents.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The NPS has identified alternative C as the environmentally preferred alternative. Of all the alternatives considered, alternative C would best protect the biological and physical environment by ensuring an immediate reduction in deer population numbers that could be sustained with proven methods over the life of the plan. Alternative D would also protect, preserve, and enhance the cultural and natural processes that support the parks' forests and cultural landscapes by providing multiple management options to maintain low deer numbers. However, alternative D includes the possible use of a chemical agent within the white-tailed deer population to reduce population size. Although this would be beneficial to the vegetation and other resources currently impacted by the deer population, there is some uncertainty about its success, and the introduction of a chemical agent into the herd could have adverse impacts on the deer, such as behavioral effects as well as adverse effects of capture. Although any product that meets the NPS criteria would need to have minimal impacts to be selected for use, and alternatives C and D are very close in meeting the guidance for identification of the environmentally preferred alternative, alternative C was selected primarily because it uses the least environmentally damaging option.

Although alternative C is considered the environmentally preferable alternative, it was not selected for implementation because it does not provide the same flexibility of management techniques as the selected action. Alternative D provides for the opportunity to use a wider variety of management methods, including reproductive control, which would be an option when the criteria established by the NPS are met. Alternative D provides for an efficient initial removal of deer and also flexibility in management methods to address future removals in different ways. Costs of alternative D are about the same as alternative C and if reproductive control is used, costs would go down after the first capture, and some studies have shown that reproductive control costs can decrease over time, although there is uncertainty regarding that method.

Alternatives A and B were not considered environmentally preferred because of their lack of effect on the deer population numbers, which would result in potential or continued adverse impacts on the biological and cultural resources of the parks over the life of the plan.

ALTERNATIVES CONSIDERED BUT NOT SELECTED

Alternative A: No Action (Existing Management Continued)

Under the "no action" alternative, the three battlefields would continue to implement current management actions and policies related to deer and their effects. This would include deer population monitoring (e.g., distance sampling), vegetation monitoring, and activities to protect plantings and crops (e.g., protective tree tubes, fencing, repellents). Monitoring efforts would continue to assess forest regeneration and/or deer population numbers within each battlefield although specific monitoring actions would vary from battlefield to battlefield and could be modified or discontinued over time, depending on the results and the need for monitoring. Educational and interpretive activities would continue to be used to inform the public about deer ecology and park resource issues, and cooperation with regional entities and stakeholders would continue. No additional deer management actions would take place under this alternative.

The actions that would continue under alternative A are described in detail on pages 58 to 62 of the final plan/EIS. These actions would also be common to all action alternatives as well.

Alternative B: Nonlethal Deer Management

In addition to the actions described under alternative A (with some modifications to monitoring schedules), Alternative B would include several additional techniques to prevent adverse deer impacts. However, the main focus of alternative B is the use of a combination of nonlethal actions including the construction of large-scale deer exclosures (fencing) for the purposes of forest regeneration and the use of nonsurgical reproductive control of does to restrict population growth. The NPS would implement nonsurgical reproductive control of does if an appropriate reproductive control agent meets the criteria listed under this alternative.

The actions that would take place under alternative B are described in detail on pages 63 to 76 of the final plan/EIS.

Alternative C: Lethal Deer Management

Alternative C would include all actions described under alternative A (with some modifications to monitoring schedules) and the additional techniques to prevent adverse deer impacts described under alternative B, but would have a primary focus on using lethal deer management actions to reduce the herd size. Direct reduction of the deer herd would be accomplished mainly by sharpshooting with firearms, with a limited use of capture and euthanasia if sharpshooting is not considered appropriate due to safety concerns. These actions would be used to achieve initial deer density goals of 15–20 deer per square mile, and the population would be maintained at an appropriate density over time by sharpshooting, as determined by adaptive management.

The actions that would take place under alternative C are described in detail on pages 77 to 85 of the final plan/EIS.

BASIS FOR DECISION

In selecting alternative D (Combined Lethal and Nonlethal Deer Management) for implementation, the NPS evaluated each alternative based on its ability to meet the plan objectives (see table 11 of the final plan/EIS), the potential impacts on the environment (“Chapter 4: Environmental Consequences” of the final plan/EIS), anticipated effort with implementation, and degree of management flexibility.

Alternatives C and D are very close in their meeting of all plan objectives and their relative impacts. However, alternative C does not provide the same flexibility of management techniques as alternative D. Alternative D provides for the opportunity to use a wider variety of management methods, including reproductive control, which would be an option when the criteria established by the NPS are met. Alternative D provides for an efficient initial removal of deer and flexibility in management methods to address future removals in different ways. Costs of alternative D are about the same as alternative C and if reproductive control is used, costs would go down after the first capture; some studies have shown that reproductive control costs can decrease over time, although there is uncertainty regarding that method.

Alternative B only partially meets many of the objectives, because of the lack of immediate reduction in deer numbers and the uncertainty that the deer density goal would be achieved even over an extended period of time. Many impacts on park resources, especially impacts on vegetation, wildlife habitat, and cultural landscapes, would be greater under alternative B because of the length of time required before deer numbers would be reduced, thus continuing the adverse impacts of deer browse on vegetation in the parks. Alternative A (no action) fails to meet or fully meet the objectives of the plan, since no action would be taken to reduce deer numbers or effect a change in conditions that are the basis for the purpose of and need for action.

PUBLIC AND AGENCY INVOLVEMENT IN THE PLANNING PROCESS

Public Scoping

Public scoping for the plan/EIS began with the mailing of a public scoping newsletter on March 25, 2011, to the project's preliminary mailing list of government agencies, tribes, organizations, businesses, and individuals. The brochure announced public scoping meetings to be held in May 2011, summarized the purpose of and need for the plan, listed preliminary alternatives, provided background information on deer monitoring and research and findings at the parks, and presented instructions on how to comment on the plan. The public was invited to submit comments on the scope of the planning process and potential alternatives through September 2, 2011. The official notice of intent was published in the *Federal Register* on July 19, 2011. During the scoping period, three public scoping meetings were held:

- Tuesday, May 24, 2011, from 6:00 p.m. to 8:00 p.m. at the Manassas National Battlefield Park Visitor Center, Manassas, Virginia
- Wednesday, May 25, 2011, from 6:00 p.m. to 8:00 p.m. at the Antietam National Battlefield Visitor Center, Sharpsburg, Maryland
- Thursday, May 26, 2011, from 6:00 p.m. to 8:00 p.m. at the Monocacy National Battlefield Visitor Center, Frederick, Maryland

The meetings were held in an open-house format and included handouts and display boards that illustrated the project background; draft purpose, need, and objectives; park research; and preliminary concepts for deer management at the parks. NPS personnel or contractors provided additional information about the plan, answered questions or concerns of community members, and recorded comments. Comment sheets were also provided to meeting attendees as an additional method for providing comments. Additionally, meeting attendees were directed to the EIS brochure, which provided information on other opportunities to comment on the project, including submitting comments through the NPS Planning, Environment, and Public Comment (PEPC) website at either, <http://parkplanning.nps.gov/anti>, <http://parkplanning.nps.gov/mono>, or <http://parkplanning.nps.gov/mana>. During the three meetings, a total of 45 attendees signed in.

The Notice of Intent to prepare an environmental impact statement (EIS) was published in the *Federal Register* on July 19, 2011, and the public comment period ended on September 2, 2011, although comments were also accepted prior to the publication of the Notice of Intent from the start of the public meetings in May. In total, the NPS received 199 pieces of correspondence, representing 340 comments. Commenters provided numerous suggestions for elements that could be incorporated into the preliminary alternatives. A large portion of such comments addressed reproductive control. Among such comments were proposals for conducting contraceptive research, suggestions for a variety of ways to administer reproductive control, and concerns over the effectiveness of contraception. A number of comments also requested that public safety be taken into consideration in the plan/EIS. Specific concerns were related to damage to property, the possibility of human injury if the alternative involves shooting, and the danger related to bucks during the rut. The most frequently addressed topics in public comments were the opposition of lethal management and consideration of trapping as an alternative in addressing deer management.

Public Review of the Draft Plan/EIS

The draft plan/EIS was made available for review through a Notice of Availability on July 26, 2013. Following the release of the draft plan/EIS, a 60-day public comment period was open between July 26, 2013, and September 27, 2013. This public comment period was announced on the park's website (<http://parkplanning.nps.gov/battlefielddeerplan>), on flyers posted at the parks' visitor centers, on Facebook, and announced through press releases. The draft plan/EIS was made available through several

outlets, including the NPS PEPC website at <http://parkplanning.nps.gov/battlefielddeerplan>, as well as on CD or hard copy obtainable upon request from the parks. Hard copies and CDs of the draft plan/EIS were mailed to interested parties, elected officials, and appropriate local and state agencies. A limited number of hard copies were made available at the Urbana Regional Library (Frederick, MD), C. Burr Artz Library (Frederick, MD), Washington County Library (Hagerstown, Boonsboro, Keedysville, and Sharpsburg, MD), Manassas Central Library (Manassas, VA), Bull Run Regional Library (Manassas, VA), Fairfax Central Library (Fairfax, VA), and Manassas City Museum (Manassas, VA). The public was encouraged to submit comments regarding the draft plan/EIS through the NPS PEPC website, by submitting comment cards to Joe Calzarette at Antietam National Battlefield, or by mailing letters to the park superintendents. In addition to the public review and comment period, a public meeting was held at each park the week of August 26, 2013. The first meeting was held at Antietam National Battlefield on August 27; the second meeting was held at Monocacy National Battlefield on August 28; and the third meeting was held at Manassas National Battlefield Park on August 29. The public meetings were held to continue the public involvement process, provide information on the draft plan/EIS, and obtain community feedback on the proposed draft plan/EIS. Release and availability of the draft plan/EIS, as well as announcements of the public meetings, were advertised as described above.

A total of 73 people attended the three meetings. Thirty-one people attended the meeting at Antietam; 18 attended the meeting at Monocacy; and 24 attended the meeting at Manassas. Each meeting followed the same format: an open house period, followed by a welcome by the superintendent, and then further opportunity for the public to discuss details or ask questions at stations around the room in an open house format. Attendees were encouraged to submit their comments to the PEPC site or to provide comments on the comment cards, which were distributed at the meetings with copies of a newsletter that announced the release of the proposed draft plan/EIS and described key elements of the draft plan/EIS.

During the comment period, 167 pieces of correspondence were received, two of which were form letters containing 60 signatures. Correspondence was received by the following methods: email, hard copy letter via U.S. mail, comment sheet submitted at the public meetings, or entered directly into the Internet-based PEPC system. Letters received by email or through the U.S. mail and comments received at the public meetings were entered into the PEPC system for analysis. Once all the correspondences were entered into PEPC, each was read, and specific comments within each piece of correspondence were identified. A total of 448 comments were derived from the correspondences received, and these comments were further identified as substantive or non-substantive.

Comments in favor of or against the proposed action or alternatives, or comments that only agree or disagree with NPS policy, are not considered substantive. All substantive comments were analyzed to identify common concerns or issues for response from the NPS. Members of the NPS planning team responded to the identified concern statements, and the responses are included in appendix E of the final plan/EIS.

Approximately 60% of the comments received related to 4 of the 109 codes. These codes were related to lethal management, opposing lethal management, non-lethal management, and support for alternative B. The majority of the comments were categorized under code *AL1550 Alternatives: Oppose Lethal Management (Non-Substantive)*, which accounted for 17.28% of the total comments received. Comments under code *AL6005 Alternatives: Support Alternative B (Non-Substantive)* were the second most common comment, representing 15.53% of the total comments received. Comments under code *AL16550 Alternatives: Non-Lethal Management (Substantive)* were the third most common comment, representing 13.59% of the total comments received. The fourth most comments fell under code *AL15550 Alternatives: Lethal Management (Substantive)*, with 13.01% of the total comments. Of the 167 correspondences, 48 (28.74%) were from within Virginia, 23 (13.77%) were from Maryland, 14 (8.38%) were from New Jersey, and 12 (7.19%) were from California. The remaining pieces of correspondence came from 23

other states, and 10 correspondences came from unidentified locations. The majority of comments (86.83%) were from unaffiliated individuals.

Final Plan/EIS

All comments received were carefully considered and incorporated into the final plan/EIS. Changes made in the final plan/EIS as a result of public comment are factual in nature and did not result in changes to the NPS preferred alternative or the outcome of the impact analysis for any of the management alternatives considered.

The final plan/EIS was available for public inspection for a 30-day no-action period, which began with the publication of the U.S. Environmental Protection Agency Notice of Availability of the final plan/EIS on August 1, 2014, and ended on September 3, 2014. As with the draft plan/EIS, the NPS issued its own *Federal Register* Notice of Availability of the final plan/EIS on August 1, 2014. The NPS also announced the availability of the final plan/EIS on the park's websites and by press releases. As with the draft plan/EIS, notification of the availability of the final plan/EIS was sent directly to the parks' mailing lists of interested parties, elected officials, and appropriate local and state agencies. This included the distribution of hardcopies and CDs of the document. The final plan/EIS was also made available through several outlets, including the PEPC websites at <http://parkplanning.nps.gov/anti>, <http://parkplanning.nps.gov/mono> or <http://parkplanning.nps.gov/mana>; local libraries; and on CD or hardcopy by contacting the park superintendents.

Agency Consultation

Letters initiating consultation under Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act (NHPA) and/or requesting information or comments were sent to the agencies as described below. Copies of these letters and any responses are provided in appendix D of the final plan/EIS. Letters received from agencies are also included in the Public Comment Response report, appendix E, of the final plan/EIS.

U.S. Fish and Wildlife Service

A letter dated March 15, 2011, from Antietam National Battlefield, a letter dated April 18, 2011, from Manassas National Battlefield Park, and a letter dated May 7, 2012, from Monocacy National Battlefield initiated informal Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) about the presence of federally listed rare, threatened, or endangered species in or near the parks. No federally listed endangered or threatened species are known to occur in any of the three battlefields. A copy of the draft plan/EIS was also sent to the USFWS. No response was received either during scoping or during the draft plan/EIS comment period. A copy of this final plan/EIS was sent to the USFWS.

Maryland Department of Natural Resources, and Virginia Departments of Conservation and Recreation, and Game and Inland Fisheries

A letter dated March 15, 2011, from Antietam National Battlefield and a letter dated May 7, 2012, from Monocacy National Battlefield were sent to the Maryland Department of Natural Resources (MD DNR), and letters dated April 18, 2011, were sent from Manassas National Battlefield Park to the Virginia Natural Heritage Division in the Department of Conservation and Recreation, and Department of Game and Inland Fisheries. These letters initiated informal consultation with the state natural resource departments about the presence of state-listed rare, threatened, or endangered species in or near the parks. A copy of the draft plan/EIS was also sent to these agencies. No response was received during scoping, and one response was received from the Virginia Department of Environmental Quality that included responses from the Department of Conservation and Recreation, and Department of Game and Inland

Fisheries during the draft plan/EIS comment period. This letter is contained in appendix E. A copy of this final plan/EIS was sent to these agencies.

Maryland and Virginia State Historic Preservation Offices

A letter dated March 19, 2011, from Antietam National Battlefield and a letter dated May 7, 2012, from Monocacy Maryland Historical Trust, and a letter dated April 18, 2011, from Manassas National Battlefield Park were sent to the Virginia State Historic Preservation Office in accordance with Section 106 of the NHPA, and initiated consultation with the State Historic Preservation Officers. Virginia Department of Historic Resources responded concerning Manassas on May 2, 2012 (letter available in appendix D), and the Maryland Historical Trust responded regarding Monocacy on May 22, 2012. Neither response offered substantive comments. A copy of this final plan/EIS was sent to these agencies.

U.S. Environmental Protection Agency

The NPS received a letter from the U.S. Environmental Protection Agency providing its comments on the draft plan/EIS, and rating the draft plan/EIS as LO, Lack of Objections. The U.S. Environmental Protection Agency's letter is in appendix E of the final plan/EIS.

CONCLUSION

Overall, among the four alternatives considered, the selected action best meets the purpose, need, and objectives of the plan/EIS and is expected to support the long-term protection, preservation, and restoration of native vegetation and other natural and cultural resources at Antietam National Battlefield, Monocacy National Battlefield, and Manassas National Battlefield Park. It incorporates all practical means to avoid or minimize environmental harm and will not result in the impairment of park resources and values or violate the NPS Organic Act.

The required "no-action period" before approval of the ROD was initiated on August 1, 2014 with the U.S. Environmental Protection Agency's *Federal Register* notification of the filing of the final plan/EIS (79 FR 44860)

The official responsible for implementing the selected action are the Superintendents of Antietam National Battlefield and Monocacy National Battlefield, Maryland, and Manassas National Battlefield Park, Virginia.

Approved by:

Lisa A. Mendelson-Ielmini

Lisa A. Mendelson-Ielmini, Acting Regional Director
National Capital Region, National Park Service

Sept 19, 2014

Date

Attachment A: Non-Impairment Determination

Pursuant to the NPS Guidance for Non-Impairment Determinations and the NPS NEPA Process (NPS 2011¹), a non-impairment determination for the selected action is included here as an appendix to the Record of Decision.

Chapter 1 of the final plan/EIS describes the related federal acts and policies regarding the prohibition against impairing park resources and values in units of the national park system. The prohibition against impairment originates in the National Park Service (NPS) Organic Act, which directs that the NPS shall:

promote and regulate the use of the...national parks...which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 USC 1-4).

According to NPS *Management Policies 2006*, an action constitutes an impairment when its impact “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” (NPS 2006b, sec. 1.4.5). To determine impairment, the NPS must evaluate “the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts” (NPS 2006b, sec. 1.4.5).

National park system units vary based on their enabling legislation, natural and cultural resources present, and park missions. Likewise, the activities appropriate for each unit and for areas in each unit also vary. For example, an action appropriate in one unit could impair resources in another unit.

As stated in the NPS *Management Policies 2006* (NPS 2006b, sec. 1.4.5), an impact on any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified in the park’s general management plan or other relevant NPS planning documents as being of significance

The resource impact topics carried forward and analyzed for the NPS-selected alternative, which is the same as the preferred alternative (alternative D) in the final plan/EIS, and for which a non-impairment determination was completed, include: vegetation; white-tailed deer, other wildlife and wildlife habitat, special status species, and cultural landscapes.

Vegetation

Antietam National Battlefield supports 576 vascular plant species including species of the highly diverse limestone woodlands (Snavelly Ford woods) and relatively extensive riparian woodlands along Antietam Creek. The majority of the land within the battlefield is in agricultural production (crops, grass/hay, or pasture), with woodland stands scattered throughout. The vegetation composition and patterns at Monocacy National Battlefield are indicative of the open natural and agricultural landscape in the Piedmont region of Maryland. The park is approximately 40% forested and 60% agricultural land and

¹ “Guidance for Non-Impairment Determinations and the NPS NEPA Process.” National Park Service, 2011.

represents a patchwork of upland and riparian forested areas interspersed with agricultural lands and open fields. Portions of the park are undergoing old-field succession; whereas, other portions are second or third growth forests with mature hardwoods. The diverse nature of the landscape offers a number of vegetation and habitat types. The vegetation at Manassas National Battlefield Park is an assortment of open fields and forest in a range of successional stages, as well as some stream and wetland areas. Fields and grasslands are maintained by agricultural lease holders. Many of the fields and grasslands contain native grass communities (Indiangrass [*Sorghastrum nutans*] and little bluestem [*Schizachyrium scoparium*]) and cover about 35% of the park or 1,500 acres. Approximately 50% of the park is deciduous forest and includes stands of oak/hickory, pine/cedar, mixed pine/hardwood, and bottomland hardwood (figure 11 in the final plan/EIS). Throughout Manassas, more than 700 taxa of vascular plants can be found, six of which are considered rare in Virginia, and 128 of which were classified as nonnative species (Fleming and Belden 2004).

Native vegetation as well as fields, crops, and orchards are necessary to fulfill the purposes for which the parks were established and are key to the natural and cultural integrity and enjoyment of the parks. Vegetation contributes to the cultural landscapes of the parks that are to be preserved or restored in the battlefields. Park planning documents recognize natural resources of the parks, including vegetation, as being important to the regional ecology and historic context of the parks and promote protection of natural resources. The overall impact on vegetation under the preferred alternative will be long-term and beneficial because the relatively rapid deer herd reduction will allow the abundance and diversity of vegetation throughout the parks to recover. The selected alternative will enhance natural forest regeneration by quickly reducing deer browsing pressure and by maintaining a smaller deer population. It will also help to preserve cropland and orchards that are critical elements of the parks' cultural landscapes. This will result in long-term beneficial impacts, as both woody and herbaceous vegetation could thrive and recover throughout the parks, and damage to crops and orchards will be reduced. Observed seedling densities will be expected to show that fair to good regeneration was occurring. There will be short-term negligible impacts (mainly from trampling) from deer management implementation actions, and benefits from the limited use of deer management techniques to reduce impacts in certain locations or circumstances. CWD plan actions will have short-term negligible impacts (mainly from trampling) from surveillance, and benefits from the reduction of deer and deer browse on vegetation. The overall cumulative impact will be long-term and beneficial, and the selected alternative will contribute appreciable beneficial increments to the cumulative impact on vegetation. Because there will be only slight adverse impacts and primarily long-term beneficial impacts, the selected alternative will not result in impairment to vegetation.

White-tailed Deer

The white-tailed deer populations at all three battlefields have varied and will continue to vary over time, depending on factors such as winter temperature, snow depth and duration, disease, habitat conditions, deer movements, and acorn production. However, based on distance sampling observations for over 10 years, the deer populations continue to exceed deer densities and interfere with forest regeneration and associated wildlife habitat (around 15–20 deer per square mile).

Deer density surveys at Antietam have been conducted every April and November since 2001 to estimate the size of the herd within the battlefield. In 2010, the deer herd at Antietam was estimated at 130.71 deer per square mile (50.47 deer per square kilometer). This was the second highest population density recorded at the park in the previous ten years. In 2013, deer density was estimated at 142 deer per square mile (Bates, pers. comm. 2014). In 2011, the deer herd at Monocacy was estimated at 235.92 deer per square mile (91.09 deer per square kilometer). This population density represents a noticeable increase over 2010's relatively low number (142.19 deer per square mile (54.9 deer per square kilometer)) in the ongoing fluctuation of the park's deer population. In 2013, the deer density was estimated at 185 deer per

square mile (71.5 deer per square kilometer) (Bates, pers. comm. 2014). In 2011, the deer herd at Manassas was estimated at 172.4 deer per square mile (66.59 deer per square kilometer). This figure represents an increase after 2 years of lower, but still high densities. In 2013, deer density was again estimated lower at about 89 deer per square mile (34.35 per square kilometer), but with a relatively large standard error.

Viable wildlife populations, which include white-tailed deer, are important components of the natural landscape of the parks. Park planning documents recognize natural resources of the parks, which would include deer, as being important to the regional ecology, but also promote managing deer to protect resources from being harmed by overbrowsing. The overall impact on white-tailed deer under the selected alternative will be long-term and beneficial, because the relatively rapid deer herd reduction will allow the abundance and diversity of vegetation throughout the three parks to recover and better protect wildlife habitat, and the reduced density will minimize the potential for nutritional stress and disease. There will be short-term, negligible, adverse effects from implementing deer management actions (because of noise and disturbance), and short-term moderate adverse impacts on the parks' deer populations from removing a relatively large percentage of the population over a short period of time to achieve the desired long-term benefit. Removal and reproductive control actions would adversely impact individual deer, due to handling stress and the possible physiological or behavioral changes due to the use of sterilization/reproductive controls. However, although changes to numbers, structure, or other demographic factors would occur, the parks' populations are expected to remain viable. CWD plan actions will have short-term negligible impacts from surveillance and long-term benefits from the reduction of the potential for disease amplification, spread and establishment. The overall cumulative impact will be long-term and beneficial, and alternative D will contribute appreciable beneficial increments to the cumulative impact on the white-tailed deer population. Because adverse effects will be mainly limited to individual deer and because there will be long-term benefits to deer at the population level especially from the ability to implement CWD management, the selected alternative will not result in impairment of white-tailed deer.

Other Wildlife and Wildlife Habitat

The mix of fields and wooded areas at the battlefields provide habitat for a variety of mammals, birds, reptiles, and amphibians that could be affected by actions taken for deer management. The final plan/EIS provides examples for all three parks and notes that many species found in the battlefields nest on or near the ground or in low-growing vegetation or use that habitat for concealment. The forest understory most affected by deer overbrowsing is the herbaceous and woody vegetation, which affects other species of wildlife. A number of studies have shown distinct changes in bird abundance as a result of reducing deer density by exclosures (McShea and Rappole 2000). One researcher found that songbird habitat was negatively impacted with 20 to 39 deer per square mile (8 to 15 deer per square kilometer) within a cherry/maple forest (deCalesta 1997b). Similarly, a nine-year study in the mid-Atlantic region found that a reduction in deer density changed the composition of forest bird populations (McShea and Rappole 2000). Gorsira, Rossell, and Patch (2006) found that deer browsing had suppressed forb and vertical plant cover across all forest types at Manassas.

Viable wildlife populations and wildlife habitat are key to the natural integrity of the parks and to opportunities for enjoyment of the parks. Park planning documents recognize natural resources of the parks, including wildlife, as being important to the regional ecology and historic context of the parks and promote protection of natural resources. The Antietam general management plan calls for increasing habitat for sensitive species. The Monocacy general management plan recognizes the value of natural resources beside their role in the cultural landscape, and the Manassas general management plan mentions the effects of deer on vegetation and ground-nesting birds. The overall impact on wildlife of the selected alternative will be long-term and beneficial because the relatively rapid deer herd reduction will allow

vegetation used as food and cover for many wildlife species to become more abundant. Impacts on other wildlife will be long-term and beneficial because of rapidly reduced deer numbers in the parks. This will result in decreased browsing pressure and natural forest regeneration, allowing increased abundance and diversity of other wildlife that depend on understory vegetation. There could be long-term minor adverse effects on some species that prefer open habitat because there will be regrowth of understory, and short-term negligible adverse impacts from disturbance and noise during the implementation of the action and use of deer management. However, the impacts of deer management actions under the selected alternative on other wildlife will be mostly beneficial and long-term, depending on the species. CWD plan actions will have short-term negligible impacts (mainly from trampling) from surveillance, and benefits from the reduction of deer and associated deer browse on vegetation and wildlife habitat. The overall cumulative impact will be long-term and beneficial, and the selected alternative will contribute appreciable beneficial increments to the cumulative impact on wildlife habitat. For these reasons, primarily because there because of the low magnitude of adverse effects from management actions and the benefits that will result from reduced deer browsing pressure will be long-term benefits to wildlife and wildlife habitat, the selected alternative will not result in impairment of wildlife and wildlife habitat.

Special Status Species

The NPS is required under the Endangered Species Act to ensure that federally listed species and their designated critical habitats are protected on lands within the agency's jurisdiction. In addition, the NPS considers state-listed or other rare species similarly in taking actions that may affect these species. No federally listed, proposed, or candidate species are known to occur within the three battlefields; therefore, the final plan/EIS only addresses state special status species that could be affected by the proposed actions.

The Maryland Wildlife and Heritage Service Natural Heritage Program tracks the status of over 1,100 native plants and animals that are among the rarest in Maryland and most in need of conservation efforts as elements of the state's natural diversity. Of these species, the MD DNR officially recognizes 607 species and subspecies as endangered, threatened, in need of conservation, or endangered extirpated. The primary state law that allows and governs the listing of endangered species is the Nongame and Endangered Species Conservation Act (Annotated Code of Maryland 10-2A-01). This act is supported by regulations (Code of Maryland Regulations 08.03.08) which contain the official State Threatened and Endangered Species list. The list for Antietam includes 33 plants, one mammal, 17 birds, and one insect (Wenschhof, pers. comm. 2012c). In addition, at least two species on the USFWS list of birds of conservation concern, the bald eagle (*Haliaeetus leucocephalus*) and cerulean warbler (*Dendroica cerulean*), can be found at Antietam. The list for Monocacy includes 14 plants and 8 birds. In addition to the bald eagle and cerulean warbler, the wood thrush and Kentucky warbler (*Oporornis formosus*) are birds that can be found at Monocacy that are on the USFWS list of birds species of conservation concern for the Piedmont (NPS n.d.b; USFWS 2008).

In Virginia, two state agencies, the Virginia Department of Game and Inland Fisheries (VDGIF) and the Department of Agriculture and Consumer Services, have legal authority for endangered and threatened species and are responsible for their conservation. Also, the Virginia Department of Conservation and Recreation Heritage Program has designated a number of diabase conservation areas throughout Manassas, Virginia, including one within the park. The Manassas Diabase Conservation Area is known to support two state listed rare species: the marsh hedgenettle (*Stachys pilosa* var. *arenicola*), and purple milkweed (*Asclepias purpurascens*). According to the Virginia Department of Conservation and Recreation, there is potential for a number of additional rare plant species that may occur in diabase conservation areas including earleaf foxglove (*Agalinis auriculata*), blue-hearts (*Buchnera americana*), downy phlox (*Phlox pilosa*), and stiff goldenrod (*Oligoneuron rigidum*) (NPS 2008a). Nine state-listed plants and four state-listed birds could occur at Manassas. In addition, seven migratory bird species at

Manassas are on the USFWS 2008 list of Birds of Conservation Concern for the Piedmont. In addition to the bald eagle and cerulean warbler, the remaining five species are Henslow's sparrow (*Ammodramus henslowii*), wood thrush, blue-winged warbler (*Vermivora cyanoptera*), Kentucky warbler, and prairie warbler (*Dendroica discolor*) (NPS n.d.c; USFWS 2008).

Viable populations of special status species are key to the natural integrity of the parks and to opportunities for enjoyment of the parks. As noted under "Wildlife," park planning documents recognize natural resources of the parks, which includes special status species, as being important to the regional ecology and promote protection of natural resources. Under the selected alternative, the long-term reduction and controls on deer population growth will allow vegetation used as food and cover for sensitive wildlife to become more abundant and will decrease browse on sensitive plants. For these reasons, the selected alternative will result in mostly beneficial and long-term impacts on special status species, depending on the species. There could be long-term minor adverse effects on some species that prefer open habitat and short-term negligible adverse impacts from disturbance during the implementation of the action. Impacts on species listed or considered special status species by Maryland and Virginia, as well as their habitat, will be beneficial and long term as a result of rapid reductions in deer numbers in the parks that will reduce deer browsing pressure on woody and herbaceous vegetation and allow increased abundance and diversity of other species that depend on understory vegetation. There will be no long-term observable or measurable adverse impacts to these species, and impacts will not affect critical periods (e.g., breeding, nesting, denning, feeding, or resting) or habitat. CWD plan actions will have short-term negligible impacts (mainly from trampling) from surveillance, and benefits from the reduction of deer and associated deer browse on vegetation and wildlife habitat. The overall cumulative impact will be long-term and beneficial, and the selected alternative will contribute appreciable beneficial increments to the cumulative impact on special status species. Because adverse effects will be limited and there will be primarily long-term beneficial effects, the selected alternative will not result in impairment to special status species.

Cultural Landscapes

Cultural landscapes are an issue in deer management because an overabundance of deer and resultant deer browse could adversely affect the cultural landscapes within the battlefields, as could the erection of fences and large exclosures. A cultural landscape, as defined by The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes, consists of "a geographic area (including both cultural and natural resources and *the wildlife or domestic animals therein*) [emphasis added] associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (NPS 1996).

The three battlefield parks each constitute cultural landscapes in their entirety; however, they may be subdivided into component landscapes. The most common forms of cultural landscapes within the three battlefield parks are historic sites and historic vernacular landscapes. Maintenance of the landscapes as active cropland, hay fields, or orchards, in a way that more fully supports the listing of these battlefields and their landscapes on the National Register of Historic Places rather than allowing the land to lie fallow or be maintained as mown fields, is achieved through partnerships with local farmers who work the land.

Both Antietam and Monocacy were designated as national battlefields because of the important roles they played during the American Civil War. All of Antietam National Battlefield, including the private properties within the boundary, is listed on the National Register of Historic Places as a historic district. Contributing features to the cultural landscape of the battlefield include farm fields, woods, orchards, and fence lines that were known to exist just before the battle. Antietam preserves an area that has deep national significance. The battlefield is considered one of the best-preserved Civil War areas in the

national park system. The farms and farmlands in and near the national battlefield appear much as they did on the eve of the battle in 1862.

Monocacy was listed in the National Register of Historic Places in 1966, and its nomination was updated recently to include new properties. In 1973, the Secretary of the Interior designated Monocacy National Battlefield a National Historic Landmark, recognizing it as a site of exceptional importance possessing national significance. The properties that make up Monocacy reflect nearly three centuries of historic occupation and development around the Monocacy River crossroads. The buildings, structures, circulation systems, materials, organization, and open space all contribute to the historic agricultural, milling, and early twentieth century commemorative landscape qualities of the battle site. Monocacy's many remaining historic structures combine with the railroad, highways, and farm fields to form a remarkably intact eighteenth and nineteenth century agrarian landscape.

Manassas National Battlefield Park was established by Congress in 1940. The land outside the boundaries of the NPS reserve, property that was historically associated with the battles, largely remained rural in nature, with a limited number of late-twentieth-century housing developments and commercial ventures. Today, the battleground is sufficiently intact to allow vistas not unlike those observed by the commanding generals and the thousands of soldiers who fought there. The battlefield retains integrity of location, setting, feeling, and association with the historic events that occurred on the property during the Civil War. A cultural landscape report has been prepared for the park's fences, fields and forests, and for Brawner Farm, which was the site where the second battle of Manassas opened. Reflecting traditional land use rather than later development trends, nearly half of the battlefield property is presently forested; the remainder is open land. The NPS uses a lease program for hay production in an effort to maintain these open areas.

Preservation of cultural landscapes is necessary to fulfill the purposes for which the parks were established and are key to the cultural integrity of the parks. Tree lines, orchards, crops, and—by extension—views and vistas are contributing features to the cultural landscapes of the battlefields and are vulnerable to the degradation by the deer browsing. Each park's purpose is tied to the preservation or restoration of cultural landscapes that contribute to the national significance of the battles fought on these lands. The overall impact on cultural landscapes under the selected alternative will be long-term and beneficial because of decreased browsing and thus decreased deer depredations of agricultural crops. Enhancing natural forest regeneration by quickly reducing deer browsing pressure and maintaining a smaller deer population will result in beneficial, long-term impacts because vegetation, which is an important component of cultural landscapes, could thrive and recover throughout the parks. Also, the reduction in deer density and associated browsing pressure that will result from the selected alternative will help reduce damage to crops, landscaping, and orchards. This will lead to increased chances of viability for the parks' farm ventures and maintain the open and closed patterns of the cultural landscape. There will be short-term negligible impacts (mainly trampling) from deer management implementation actions, and benefits from the limited use of deer management techniques to reduce impacts in certain locations or circumstances. CWD plan actions will have similar impacts, with short-term negligible impacts (mainly trampling) from surveillance, and benefits from the reduction of deer and deer browse on vegetation. The overall cumulative impact will be long-term and beneficial, and the selected alternative will contribute appreciable beneficial increments to the cumulative impact on cultural landscapes. The combined actions under the selected alternative will result in no adverse effect under Section 106 of the NHPA. Because there will be few adverse impacts and primarily long-term beneficial impacts, the selected alternative will not result in impairment to cultural landscapes.

SUMMARY

The NPS has determined that the implementation of the NPS selected alternative (alternative D) will not constitute an impairment of the resources or values of the parks. As described above, implementing the selected alternative is not anticipated to result in adverse impacts constituting impairment of resources or values whose conservation is necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the parks, key to the natural or cultural integrity of the parks or to opportunities for enjoyment of the parks, or identified as significant in the parks' general management plans or other relevant NPS planning documents. This conclusion is based on the consideration of the parks' purpose and significance, a thorough analysis of the environmental impacts described in the final plan/EIS, relevant scientific studies, the comments provided by the public and others, and the professional judgment of the decision maker guided by the direction of the NPS *Management Policies 2006* (NPS 2006b).