

National Park Service
U.S. Department of the Interior

Valley Forge National Historical Park
Pennsylvania



FINAL
White-tailed Deer
Management Plan/Environmental Impact Statement

Cover photo courtesy of NPS. Divider photo courtesy of Bill Moses.

Final White-tailed Deer Management Plan/Environmental Impact Statement
Valley Forge National Historical Park
King of Prussia, Pennsylvania
August 2009

This Final White-tailed Deer Management Plan/Environmental Impact Statement (plan/EIS) describes four alternatives for the management of white-tailed deer and for appropriate response to chronic wasting disease (CWD) at Valley Forge National Historical Park (NHP). The Final plan/EIS also describes the environment that would be affected by the alternatives and the environmental consequences for implementing these alternatives. The plan/EIS also responds to and incorporates the public and agency comments received on the Draft plan/EIS.

The purpose of this action is to develop a deer management strategy that supports protection, preservation, and restoration of native vegetation and other natural and cultural resources throughout and beyond the life of this plan/EIS. Action is needed at this time to address declining forest regeneration and to promote the protection and restoration of native vegetation and wildlife, and the protection of cultural resources. Long-term monitoring has determined that excessive deer browsing reduces forest regeneration, resulting in adverse changes to the forest structure (loss of forest understory) and wildlife habitat. Excessive deer browsing in Valley Forge NHP also has adversely affected the natural distribution, abundance, and diversity of native plant communities (herbaceous plants, trees, and shrubs), including species of special concern. Furthermore, changes in the proximity of CWD to the park boundary and other risk factors have resulted in an elevated risk of CWD occurrence within the park.

Under Alternative A (No-action), existing deer management and monitoring efforts would continue. No new actions would be taken to reduce the effects of deer overbrowsing or to address CWD. The action alternatives include various methods to reduce and maintain the deer population at an appropriate density to achieve plan objectives. Alternative B (Combined Nonlethal Actions) would include rotational fencing of select forested areas of the park and the use of reproductive controls, when available and feasible. The park also would increase its CWD surveillance efforts if CWD is confirmed within five miles of the park boundary or the park falls within a state-established CWD containment zone. Alternative C (Combined Lethal Actions) would implement sharpshooting with firearms, as well as limited capture and euthanasia where necessary. Alternative D (Combined Lethal and Nonlethal Actions) is the NPS Preferred Alternative. This alternative would include the reproductive controls included in Alternative B and the lethal actions included in Alternative C. Under Alternative D, the park would implement sharpshooting to rapidly reduce the deer population to the initial deer density goal. Reproductive control would be implemented to maintain the deer population at the deer density goal if/when a chemical reproductive control agent that meets criteria established in the plan/EIS becomes available. Should an acceptable reproductive control agent not become available or is ineffective, then sharpshooting would continue to be implemented as a population maintenance tool. Both Alternatives C and D would implement the full CWD Response Plan, which includes increased surveillance and, if CWD is confirmed within five miles of the park boundary or the park falls within a state-established CWD containment zone, lethal removal of deer within the park for the purposes of assessing disease presence, prevalence, and distribution. These actions may also minimize the likelihood of CWD becoming established, minimize the likelihood of amplification and spread if the disease is introduced, and promote elimination of CWD, if possible. The NPS reviewed public comments received on the draft plan/EIS and made some modifications to the plan which are included in this Final plan/EIS. These changes are summarized in the Executive Summary.

The potential environmental consequences of the alternatives are addressed for vegetation, white-tailed deer population, other wildlife and wildlife habitat, special status species (plants and animals), cultural landscapes, historic structures, archeological resources, visitor use and experience, socioeconomic resources and adjacent lands, public safety, and park operations. Under Alternative A, no action would be taken to reverse the expected long-term continued growth in the deer population, and damage to natural and cultural resources would likely continue. The analysis indicates that impairment to vegetation and special status plant species; other wildlife, wildlife habitat, and special status animal species; cultural landscapes; historic structures; and archeological resources could result if Alternative A was implemented. Analysis also indicates that the implementation of the NPS Preferred Alternative (Alternative D) would not result in impairment of any of the resources and values of Valley Forge NHP.

The Draft plan/EIS was available for public and agency review and comment for 60 days (December 19, 2008 through February 17, 2009). Copies of the document were distributed to individuals, agencies, organizations, and local libraries. This Final plan/EIS provides responses to substantive agency and public comments, incorporates those comments and suggested revisions, where necessary, and provides copies of relevant comment letters. No sooner than 30 days following publication of the Environmental Protection Agency's (EPA) Notice of Availability (NOA) of this Final plan/EIS, the alternative or actions constituting the approved plan will be documented in a record of decision (ROD) that will be signed by the Regional Director of the Northeast Region.

For further information regarding this document, please contact:

Kristina Heister, Natural Resource Manager
Valley Forge National Historical Park
1400 North Outer Line Drive
King of Prussia, PA 19406
610-783-1008
Kristina_Heister@nps.gov

Executive Summary

Significant changes have occurred across Pennsylvania's landscape in recent decades, including the landscape in and around Valley Forge National Historical Park (NHP). Among the most dramatic of these changes is the resurgence of white-tailed deer (*Odocoileus virginianus*). Extremely rare at the turn of the 20th century, deer populations in Pennsylvania have not only rebounded, but are now higher than at any other point in time. The success of the white-tailed deer is attributed to their ability to favorably exploit changes in habitat and a reduction in hunting pressure brought about by changes in land use patterns and a decrease in areas available to hunters associated with suburban development.

This Final White-tailed Deer Management Plan/Environmental Impact Statement (plan/EIS) has been prepared in accordance with the National Environmental Policy Act (NEPA) and the National Park Service's (NPS) Director's Order (DO) 12: Conservation Planning, Environmental Impact Analysis, and Decision-making. The plan/EIS also complies with section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. The plan/EIS presents management alternatives, including NPS preferred alternative, analyzes impacts of these alternatives on the natural, cultural, and physical resources in and around Valley Forge NHP, and addresses public and agency comments on the Draft plan/EIS. No sooner than 30 days following publication of the Environmental Protection Agency's (EPA) Notice of Availability (NOA) of this Final plan/EIS, the alternative or actions constituting the approved plan will be documented in a record of decision (ROD) that will be signed by the Regional Director of the Northeast Region.

Purpose of and Need for Action

The purpose of the plan/EIS at Valley Forge NHP is to develop a deer management strategy that supports protection, preservation, and restoration of native vegetation and other natural and cultural resources throughout and beyond the life of this plan/EIS. The purpose of the plan/EIS also is to provide appropriate response to chronic wasting disease at Valley Forge NHP.

Forest regeneration has been selected as the primary measure of plan success (PGC 2006b). Although other factors may affect forest regeneration, such as the forest canopy, nonnative invasive species, pests/disease, fire, and forest fragmentation, this plan focuses on the role and impact of white-tailed deer in the ecological environment, which has been documented through research and long-term monitoring at Valley Forge NHP.

Action is needed at this time to address declining forest regeneration and to ensure the protection and restoration of native vegetation, wildlife, and the cultural landscape. The following statements further define the need for action:

- An increasing number of deer in the park over the past two decades has resulted in unacceptable changes in the species composition, structure, abundance, and distribution of native plant communities and associated wildlife.

- Browsing of tree seedlings and shrubs by deer in the park has prevented successful forest regeneration.
- Changes in the proximity of chronic wasting disease to the park boundary and other risk factors have resulted in an elevated risk of chronic wasting disease occurrence within the park.

Objectives in Taking Action

Objectives are “what must be achieved to a large degree for the action to be considered a success” (NPS 2001). Objectives for managing deer populations must be grounded in the park’s enabling legislation, purpose, significance, and mission goals, and must be compatible with the direction and guidance provided by the park’s general management plan (GMP) (NPS 2007i). The action alternatives selected for detailed analysis must resolve the purpose of and need for action and meet the plan objectives. The following objectives related to deer management at Valley Forge NHP were developed for this plan.

Vegetation

- Protect and promote restoration of the natural abundance, distribution, structure, and composition of native plant communities by reducing deer browsing.
- Reduce deer browsing pressure enough to promote tree and shrub regeneration that results in a diverse forest structure dominated by native species.
- Promote a mix of native herbaceous plant species and reduce the competitive advantage of invasive, nonnative plant species.

Wildlife and Wildlife Habitat

- Maintain a white-tailed deer population within the park that allows for protection and restoration of native plant communities.
- Protect and preserve other native wildlife species by promoting the restoration of native plant communities.
- Reduce the probability of occurrence, promote early detection, and reduce the probability of spread of chronic wasting disease.

Threatened, Endangered, and Special Status Species

- Protect and promote restoration of special status plant and animal species and their habitat.

Cultural Resources

- Protect the integrity of the cultural landscape, including the patterns of open versus wooded land, commemorative plantings, and vegetative screenings.
- Protect archeological resources by promoting the growth and maintenance of native vegetative cover and reducing trampling and soil erosion.

Description of Valley Forge NHP

Valley Forge NHP is located in southeastern Pennsylvania, 18 miles northwest of center city Philadelphia. Situated in rapidly growing suburbs, the park spans portions of two counties: northeastern Chester County and southwestern Montgomery County. The park also is part of five townships: Schuylkill and Tredyffrin Townships to the west and south in Chester County; and Lower Providence, West Norriton, and Upper Merion Townships to the north and east in Montgomery County. Chester and Montgomery Counties are located within the Greater Philadelphia Area, comprised of three additional counties: Bucks, Delaware, and Philadelphia.

The park comprises the site of the 1777-78 winter encampment of General George Washington's Continental Army. It protects many significant cultural resources, including cultural landscapes, historic buildings and structures, archeological sites, and archives and collections. As suburban sprawl increasingly covers the land around Valley Forge NHP, the park also increases in value as a bio-refuge for plants and animals. Supporting over 1,300 species of flora and fauna, habitats within the park include oak/tulip forests, tall grass meadows, wetlands, and forested floodplains.

In addition to its varied cultural and natural resources, the park offers visitors interpretive programming, self-guided walking and driving tours, and newly updated exhibits at the Welcome Center. Overall, many regional visitors appreciate it as a place of recreation and renewal, with approximately 80% of its visitors enjoying the park while walking, biking, boating, fishing, horseback riding, and picnicking.

The park boundary was established in 1976 by the enabling legislation that designated the former Valley Forge State Park as a unit of the national park system, transferring ownership from the Commonwealth of Pennsylvania to the NPS. The boundary was expanded by congress in 1980. A number of private parcels were included within the park's boundary at the time of its establishment, with the expectation that these parcels would eventually be ceded or sold to the park. Today, most of these parcels have been acquired by the federal government. The park will continue to pursue acquisitions of certain parcels within park boundaries.

White-tailed Deer at Valley Forge NHP

White-tailed deer occur throughout Pennsylvania, as well as the contiguous United States (with the exception of portions of the Southwest). Prior to European settlement, North American white-tailed deer populations are estimated to have been between 23 and 24 million, or about 8-11 deer per square mile (McCabe and McCabe 1984). Deer population numbers declined dramatically in the eastern United States after European settlement. In Pennsylvania, the declining deer population size was attributed to unregulated deer harvests, including subsistence and market hunting, and the extensive logging of forests across the state in the 19th and early 20th centuries (PGC 2003, Latham et al 2005).

Deer were described as scarce by 1895, when the Pennsylvania Game Commission (PGC) was created to protect and preserve game species. To restore the state's deer population, over 1,200 deer were released between 1906 and 1925 and hunting laws were established and enforced (PGC 2003). Across Pennsylvania the deer population recovered rapidly in response to laws regulating deer harvest and protecting

antlerless deer as well as the abundance of early successional habitat created as a result of past logging activities (PGC 2003). This increase is mirrored by the buck harvest which increased nearly 160-fold between 1915 and 2001 (Porter et al. 1994, Latham et al. 2005). Locally, this recovery was noted by the Valley Forge Park Commission in 1939, which describes, “deer in small numbers are making extended stays in the park.” Concern over escalating deer densities and alteration of forest plant communities was noted by PGC biologists as early as the mid-1940s (Latham et al 2005). Despite these concerns, antlerless deer seasons were not held annually until 1956. Between 1982 and 1999, deer density across Pennsylvania was maintained at 50-100% above the recommended PGC density goal (Latham et al. 2005, PGC 2003).

In national park units in the eastern U.S., such as Valley Forge NHP, landscapes have traditionally been managed to allow for the preservation and rehabilitation of scenic and historic landscapes. The result is a mixture of forest and field, which constitutes excellent habitat for white-tailed deer. As a result of low mortality rates, due to lack of natural predators and recreational hunting opportunities, loss of habitat due to urbanization in areas surrounding the park, and the availability of ideal habitat within the park, the population of deer has greatly increased.

Today the deer density in the park is approximately 241 deer per square mile (NPS 2009b) and researchers have established that such high deer densities can have direct and indirect negative impacts on plant and animal communities (Alverson 1988, Anderson 1994, Augustine and Frelich 1998, deCalesta 1994, McShea 2000, McShea and Rappole 2000). Direct impacts from intense 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 them represents the primary indirect effect of browsing (Latham et al 2005).

From 1983-1985, researchers from The Pennsylvania State University (PSU) provided a baseline estimate of deer population size based on a combination of data from aerial surveys, fecal pellet group counts, spotlight counts, diurnal observations of deer, and browsing-grazing surveys (Cypher et al. 1985). The maximum population size park-wide was estimated to be 165-185 individuals (summer) potentially declining to 110-120 individuals after fall, winter, and spring mortality (Cypher et al. 1985). The corresponding estimate of deer density was 31-35 deer per square mile in summer and 21-23 deer per square mile in spring. Park staff have continued to conduct spotlight counts on an annual basis to determine trends in deer abundance over time. Spotlight count data indicate that the deer population at Valley Forge NHP has increased significantly between 1986 and 2008. On average, the deer population has increased about 10% each year, with significant fluctuations appearing after 1996.

Park staff conducts spring compartment counts on an annual basis according to the protocol established by Lovallo and Tzilkowski (2003) to evaluate changes in deer population size over time. The protocol is based on a mark-recapture study conducted by researchers from PSU between 1997 and 1999. Mark-recapture is a standard method used to obtain accurate estimates of deer population size through development of a sighting index, allowing estimation of the proportion of the deer population not observed during deer counts. A total of 90 female and 15 male deer were marked with ear tags and radio-collars (ear-tag transmitters for males) and served as the basis for developing the park sighting index (Lovallo and Tzilkowski 2003).

Data from spring compartment counts indicate an increase in estimated deer population size from 772 individuals to 1,277 individuals between 1997 and 2009, reaching a maximum of 1,643 in 2008. This reflects a change in deer density from 146 to 241 deer per square mile. The highest densities of deer have been recorded in central and southwestern portions of the park (Lovallo and Tzilkowski 2003).

Alternatives Considered

The alternatives selected for detailed analysis are summarized below. The National Environmental Policy Act of 1969, as amended, (NEPA) requires federal agencies to explore a range of reasonable alternatives and to analyze what impacts the alternatives could have on the human environment, which the act defines as the natural and physical environment and the relationship of people with that environment. The analysis of impacts is presented in Chapter 4: Environmental Consequences.

The alternatives under consideration include a no-action alternative, as prescribed by NEPA regulations at 40 CFR 1502.14. The no-action alternative (Alternative A) in this document is the continuation of the park's current deer management activities and continuation of limited CWD surveillance. The three action alternatives (Alternatives B, C, and D) contain actions to support forest regeneration to protect, conserve, and restore native plant communities and other natural and cultural resources.

The alternatives also include implementation of the park's CWD Response Plan (Appendix C). CWD response actions include disease surveillance (detection), as well as actions to assess disease prevalence and distribution, minimize the likelihood of spread to surrounding communities and amplification within local deer populations, and if possible, elimination of CWD. The CWD Response Plan was developed cooperatively with the Pennsylvania Game Commission and all actions would be closely coordinated with the PGC and Pennsylvania Department of Agriculture (PDA) due to the scale of management identified as necessary to address CWD (minimum 79 square miles) relative to park size (5.3 square miles).

Action alternatives were developed by the interdisciplinary planning team, with feedback from the public and the science teams during the planning process. These alternatives meet, to varying degrees, the management objectives for Valley Forge NHP and also the purpose of and need for action, as expressed in Chapter 1: Purpose of and Need for Action. Because these action alternatives would meet the park's objectives and would be technically and economically feasible, they are considered "reasonable."

Under **Alternative A, No-action**, existing deer management and monitoring efforts would continue. These actions include continued deer population and vegetation monitoring, maintaining small fenced areas to protect selected vegetation, roadkill removal, public education, coordination with the PGC, and continuation of limited CWD surveillance as described in the CWD Response Plan. No new actions would occur to reduce the effects of deer overbrowsing or to address CWD.

Alternative B, Combined Nonlethal Actions: In addition to the actions included under Alternative A, Alternative B would incorporate nonlethal actions to protect native plant communities, promote forest regeneration, gradually reduce the deer population in the park, and enhance CWD surveillance. This would include rotational fencing of selected forest areas of the park. The location of fenced areas

would be selected based on the availability of forested areas of appropriate size (e.g. where a 10-acre enclosure could be rotated four times to cover 40 acres of forest), to be inclusive of the different forest types in the park, to promote park-wide distribution, and facilitate easy maintenance. The fencing would be rotated as forests within fenced areas reached acceptable levels of regeneration. The rotational fencing would be implemented in conjunction with reproductive control to gradually reduce and then maintain the deer population at an appropriate density. Reproductive controls would be implemented via a chemical reproductive control agent, when an acceptable agent becomes available. Until such an agent is available, the rotational fencing would be the sole means of promoting regeneration of the park's vegetation. It is expected that both actions would occur throughout the life of this plan (15 years). When the initial deer density goal is achieved and acceptable levels of tree seedling recruitment have been reached it may be possible to eliminate or reduce rotational fencing. This would be assessed using adaptive management.

If a confirmed case of CWD were detected within 5 miles of the park boundary or the park fell within a state-established CWD containment zone, then surveillance would be enhanced using live testing (via tonsillar biopsy) of deer and removal of CWD-positive members of the population.

Alternative C, Combined Lethal Actions: In addition to the actions included under Alternative A, Alternative C would incorporate lethal actions to protect native plant communities, promote forest regeneration, and quickly reduce the deer population in the park. The additional actions would include deer population reduction, and maintenance at an appropriate deer density, by lethal actions. Sharpshooting would involve the use of firearms and occur in conjunction with limited capture and euthanasia of individual deer in certain circumstances where sharpshooting would not be appropriate. Population maintenance would also be conducted using lethal methods.

If a confirmed case of CWD were detected within 5 miles of the park boundary or the park fell within a state-established CWD containment zone, then active lethal surveillance would be implemented for the purposes of assessing disease presence, prevalence, and distribution. Lethal reduction actions already being taken under Alternative C would be accelerated to achieve the target deer density more quickly. Additionally, a one-time population reduction action, to a density of not less than 10 deer per square mile, may be considered. This action would be based on the success of state agencies in lowering deer densities to less than 31-35 deer per square mile in the state-established CWD containment zone surrounding the park for the purposes of disease management.

Alternative D, Combined Lethal and Nonlethal Actions: In addition to the actions included under Alternative A, Alternative D would incorporate lethal and nonlethal actions to protect native plant communities, promote forest regeneration, and quickly reduce the deer population in the park. This would include all of the actions included under Alternative A, as well as the reproductive controls included in Alternative B, and the lethal actions included in Alternative C. Initially, this alternative would use lethal reduction via sharpshooting and capture/euthanasia to quickly reduce the deer population and achieve the initial deer density goal. Population maintenance would be conducted via reproductive control when an acceptable agent becomes available. Until an acceptable and effective reproductive control agent becomes available, population maintenance would be conducted using lethal methods.

If a confirmed case of CWD were detected within 5 miles of the park boundary or the park fell within a state-established CWD containment zone, then lethal reduction actions, if already being implemented, would be accelerated to achieve the target deer density more quickly. If reproductive control was already being implemented, then the park would return to lethal removal actions until CWD monitoring, conducted for a period of time consistent with current knowledge of the environmental persistence of CWD infectious agents, revealed no additional CWD-positive deer within the park. At that time, the park would return to reproductive control methods for population maintenance. Additionally, during the CWD response, a one-time population reduction action could be implemented to achieve a deer density of not less than 10 deer per square mile. This action would be based on the success of state agencies in lowering deer densities to less than 31-35 deer per square mile in areas surrounding the park for the purposes of disease management.

Environmental Consequences

The summary of environmental consequences considers the actions being proposed and the cumulative impacts from occurrences inside and outside the park. The potential environmental consequences of the actions are addressed for vegetation and special status plant species; white-tailed deer population; other wildlife, wildlife habitat, and special status animal species; cultural landscapes; historic structures; archeological resources; visitor use and experience; socioeconomic resources and adjacent lands; public safety; and park operations.

Alternative A

Under Alternative A, there would be long-term, unavoidable, adverse impacts to vegetation, the white-tailed deer population, other wildlife and wildlife habitat, and special status species due to the continued increase in the deer population over time and the associated damage to park vegetation. There would be long-term, unavoidable, adverse effects to historic structures and archeological resources due to trampling and erosion. There would also be long-term, unavoidable, adverse impacts on visitor use and experience, because of the lack of vegetation and the associated wildlife and scenery which park visitors enjoy. There would be long-term, unavoidable, adverse impacts to socioeconomic resources and adjacent lands, as well as public safety, as the deer population would continue to grow or stabilize at a high density. This population would continue to inflict damage on local properties and lead to a significant number of deer-vehicle collisions. Unavoidable adverse impacts would continue on park operations, due to the demand on park staff related to continued deer monitoring and resource management.

Alternative B

Over the life of the plan, Alternative B would include most of the unavoidable adverse impacts described for Alternative A, as the benefits of reproductive control would not be realized until much later. Unavoidable adverse impacts to some plant species, some historic structures, and some archeological resources could be mitigated, but not eliminated, by the use of rotational fencing, however. Reproductive controls may have some unavoidable adverse impacts if the actions were visible or audible to park visitors. Reproductive controls may adversely impact deer population behavior. Providing interpretive materials may help mitigate some of this effect; however, reproductive control as proposed under this alternative would likely occur during relatively high visitor use periods and would require a

substantial effort to treat the required number of deer. Unavoidable adverse impacts to park operations would remain relatively the same as Alternative A, as the fence construction and reproductive control implementation would be completed by a contractor or other federal employees.

Alternative C

Unavoidable adverse impacts for Alternative C would be greatly reduced compared to Alternatives A and B. The reduction in deer numbers would occur relatively rapidly and the park's vegetation would begin to recover within the life of the plan. This would mitigate adverse effects to vegetation, white-tailed deer population, other wildlife and wildlife habitat, special status species, historic structures, and archeological resources. Some wildlife that prefer more open habitat would be unavoidably impacted as the vegetation recovered. There may be some unavoidable adverse effects to visitors relating to the implementation of the lethal reduction. Conducting lethal reduction at night and providing interpretive materials would help mitigate some adverse effects. Unavoidable adverse impacts to operations and management would remain relatively the same as Alternative A, as the lethal reduction would be administered by a contractor or other federal employees.

Alternative D

Unavoidable adverse impacts for Alternative D would be greatly reduced compared to Alternatives A and B. The reduction in deer numbers would occur relatively rapidly and the park's vegetation would begin to recover within the life of the plan. This would mitigate adverse effects to vegetation, white-tailed deer population, other wildlife and wildlife habitat, and special status species, historic structures, and archeological resources. Some wildlife that prefer more open habitat would be unavoidably impacted as the vegetation recovered. There may be some unavoidable adverse effects to visitors relating to the implementation of the lethal reduction. Conducting lethal reduction at night and providing interpretive materials would help mitigate some adverse effects. Unavoidable adverse impacts to park operations and management would remain relatively the same as Alternative A, as the lethal reduction and reproductive controls would be administered by a contractor or other federal employees.

Consultation and Coordination

Many public agencies; federal, state, and local governments; nonprofit organizations; institutions; and individual citizens have an interest in deer management at Valley Forge NHP. Reaching out to these interested parties for their ideas and expertise and listening to their concerns is an important step in the development of the plan/EIS. A combination of activities, including internal workshops, formal public meetings, and agency and government briefings has helped the NPS gain important guidance in developing alternatives for the plan/EIS.

The Notice of Intent to prepare the plan/EIS was published in the Federal Register on September 7, 2006. This represented the initiation of the project and the beginning of the public scoping and outreach process.

An internal scoping meeting was held on September 12 and 13, 2006 to initiate the plan/EIS process. Attendees included park officials, representatives from the NPS Northeast Region office, the NPS Environmental Quality Division (EQD), and their

consultants. Discussions at the meeting focused on the management of white-tailed deer as part of a healthy and functioning ecosystem at Valley Forge NHP. The goal of this meeting was to determine the purpose, need, and objectives for managing deer at the park, as well as to identify issues and concerns associated with the deer populations and their impact on the park ecosystem. Preliminary alternative management strategies were also discussed. Following this meeting, an Internal Scoping Report was drafted to inform development of the environmental planning process (NPS 2006b).

In addition to internal scoping, the NPS assembled two science teams to address deer and vegetation management and CWD. The first team was composed of regional and national experts on forest regeneration, vegetation management, and wildlife management, and individuals with specific experience in deer management (see References: Planning Team, Contributors, and Consultants). The science team participated in regular phone meetings for the first three months of 2007 to discuss and review literature, studies, and professional experience related to measuring impacts of deer browsing, evaluating the success of deer management in forests similar to those at Valley Forge NHP, and the best management strategies available to Valley Forge NHP. Following the science team's final meeting, an internal report was prepared to document the group's discussions and recommendations (NPS 2007g). This report was used to inform the alternatives development.

The second science team, which focused on CWD, was composed of regional and national wildlife management experts from the NPS and PGC (see References: Planning Team, Contributors, and Consultants). The group participated in several phone meetings in 2008 to discuss and review existing literature, studies, and professional experience related to CWD. The group's discussion focused on the park's proposed response to CWD within the park and its consistency with Pennsylvania's Chronic Wasting Disease Response Plan (PCWDTF 2007, 2008). A summary memorandum was prepared to document the results of the group's discussions and recommendations (NPS 2008d). This memorandum was used to inform the CWD Response Plan for Valley Forge NHP (see Appendix C).

On November 8 and 9, 2006, two public meetings were held. The first meeting was held at the park's Education Center, and the second was held at the Tredyffrin Township building. These meetings were advertised in local papers and on the park's web site, and a brochure with background information and meeting times and locations was mailed to over 4,000 area residents and known stakeholders. Attendees were provided with an information packet on the proposed project, as well as the opportunity to review large scale graphics and posters explaining different details of the project. Park staff provided a short presentation on the background of deer research at the park, issues related to the deer population, and issues related to managing the deer population. Attendees were then divided into small groups where they discussed goals, issues, and concerns with NPS staff and their consultants. Public comments were recorded on flipcharts and later transcribed for further analysis. Additional comments were received through official public comment forms. Following the meeting, the NPS held a 30-day public comment period. Upon the conclusion of the public comment period, all of the comments received at or following the meeting were included in the Public Comment Analysis Report (NPS 2007f). This report was used to inform the alternatives development process and was also posted for public review on the NPS Planning, Environmental, and Public Comment (PEPC) web site, <<http://parkplanning.nps.gov/vafo>>.

The Draft plan/EIS for Valley Forge NHP was available for public and agency review for 60 days (December 19, 2008 through February 17, 2009). Another set of public meetings was held January 14 and 15, 2009. The meetings were held in the same locations and format as the previous scoping meetings. During the 2009 meetings, the NPS presented the alternatives analyzed in the Draft plan/EIS and identified the preferred alternative. Attendees were then divided into small groups where they discussed the proposed alternatives with NPS staff and their consultants. Public comments were recorded on flipcharts and later transcribed for further analysis. Additional comments were received through official public comment forms. Upon the conclusion of the public comment period, all of the comments received at or following the meeting were entered and analyzed in PEPC. Responses are provided for comments that meet the definition of a substantive comment. A summary of the comments received, substantive comments, responses, and copies of relevant comment letters are provided in Appendix F.

Based on the comments received during the public review, several changes were made to the Draft plan/EIS, however the NPS preferred alternative remained the same (Alternative D: Combined Lethal and Nonlethal Actions). Text additions and clarifications between the Draft plan/EIS and this Final plan/EIS are summarized below. For a more substantial discussion of public comments and how those comments have been incorporated, see Appendix F: Comments and Responses on the Draft Plan/Environmental Impact Statement.

- Editorial revisions (where appropriate)
- Updated throughout with most recent information on deer population size and trends in abundance from 2008 and 2009 data (where appropriate)
- Updated Section 1.5.3: Deer Management by Other Federal and State Agencies, and Local Communities to include any known information on objectives for deer management and success in achieving those objectives
- Brief description of forest fragmentation added to Section 1.5.4: Other Vegetation Management Issues
- Clarification of no current cases of CWD in Pennsylvania (where appropriate)
- Magnitude of population decline relative to reproductive controls updated but does not change total time to achieve target density
- Clarification of the use of volunteers in implementing deer management actions as well as required training elements (Section 2.5.1: Use of Volunteers and throughout document where appropriate)
- Updated Section 2.5.2: CWD Response Plan and Appendix C: CWD Response Plan for Valley Forge NHP to include recently published literature on the long-term impacts of CWD on cervid populations
- Updated information on surgical reproductive controls and why this option has been dismissed (Section 2.10.3: Surgical Reproductive Control)
- Updated information on supplemental feeding and why this option has been dismissed (Section 2.10.7: Supplemental Feedings)
- Revised Section 2.11: Consistency with Sections 101(b) and 102(1) of the National Environmental Policy Act to more accurately address the criteria

- Revised Section 2.12: Environmentally Preferred Alternative to more accurately address the guidance from the CEQ on determining the environmentally preferred alternative
- Updated Section 2.13.2: NPS Preferred Alternative to more clearly define why Alternative D is the NPS preferred alternative
- Updated information on the occurrence and protection of state-listed plants (where appropriate)
- Added definitions of Pennsylvania species of special concern (where appropriate)
- Updated park-specific deer mortality and reproductive rate information (where appropriate)
- Clarified deer condition (where appropriate)
- Removed economic losses from deer-vehicle collisions (where appropriate)
- Clarified that no agricultural leasing occurs on NPS lands currently (where appropriate)
- Updated Section 4.3.2: Impacts on White-tailed Deer Population to include analysis of impacts related to genetic diversity (where appropriate)
- Clarified the intensity thresholds for public safety related to the likelihood of encountering a deer tick and being involved in a deer-vehicle collision (Section 4.7: Impacts on Public Safety)
- Updated Section 4.8: Impacts on Park Operations to reflect requested increase in Operation of the National Park System (ONPS) funding (not approved or guaranteed)
- Updated Appendix D: Detailed Cost Estimates and related sections of the plan/EIS to reflect changes in cost associated with updated deer population numbers for 2008 and 2009
- Updated Appendix E: Review of White-tailed Deer Reproductive Control with current literature, expert review and comments, and more detailed explanation of criteria for accepting reproductive controls. Associated sections of the plan/EIS (Section 2.6.1: Additional Actions Proposed Under Alternative B) updated to reflect changes to Appendix E.

This page intentionally left blank.

Contents

Cover Sheet.....	i
Executive Summary	iii
Contents.....	xv
Acronyms.....	xxi
Chapter 1: Purpose and Need for Action	1-1
1.1 Introduction.....	1-1
1.2 Purpose of and Need for Action.....	1-1
1.2.1 Purpose of the Plan/EIS	1-2
1.2.2 Need for Action.....	1-2
1.2.3 Objectives in Taking Action	1-2
1.2.4 Authority to Manage White-tailed Deer	1-3
1.3 Description of Valley Forge NHP	1-4
1.3.1 Project Site Location	1-4
1.3.2 Overview of Park Resources	1-4
1.3.3 Boundary and Size	1-7
1.3.4 Origin and Legislative History.....	1-7
1.3.5 Park Purpose, Significance, and Mission	1-11
1.4 Scientific Background: Deer and Vegetation Management	1-12
1.4.1 Deer Management Issues and Research Overview	1-12
1.4.2 Regional Landscape-Level Changes	1-13
1.4.3 Population and Ecological Characteristics of White-tailed Deer at Valley Forge NHP.....	1-14
1.4.4 Effects of White-tailed Deer on Vegetation Structure and Diversity at Valley Forge NHP.....	1-16
1.5 Other Management Actions	1-17
1.5.1 Valley Forge NHP’s Current Deer Management	1-17
1.5.2 Deer Management within the NPS.....	1-18
1.5.3 Deer Management by Other Federal and State Agencies, and Local Communities	1-19
1.5.4 Other Vegetation Management Issues	1-23
1.6 Scoping Process and Public Participation.....	1-28
1.6.1 Survey of Public Attitudes Towards Deer Management in the Valley Forge Area.....	1-28
1.6.2 Internal Scoping	1-28
1.6.3 Science Teams.....	1-29
1.6.4 Public Scoping and Outreach	1-31
1.7 Impact Topics	1-31
1.7.1 Impact Topics Retained for Further Analysis	1-31
1.7.2 Issues and Impact Topics Considered but Dismissed from Further Analysis.....	1-35
1.8 Related Laws, Policies, Plans, and Constraints	1-39
1.8.1 National Park Service Organic Act.....	1-39

1.8.2	NPS Management Policies 2006.....	1-39
1.8.3	Director’s Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-Making.....	1-40
1.8.4	Natural Resource Reference Manual 77	1-41
1.8.5	Other Federal Legislation, Compliance, and NPS Policy	1-41
1.8.6	Related State Laws, Regulations, and Policies	1-43
1.8.7	Relationship to Other Planning Documents for Valley Forge NHP	1-44
	Chapter 2: Alternatives	2-1
2.1	Introduction.....	2-1
2.2	Deer Density Goal and Threshold for Taking Action Under Alternatives B, C, and D	2-1
2.2.1	Threshold for Taking Action	2-1
2.2.2	Initial Deer Density Goal.....	2-2
2.3	Overview of Alternatives.....	2-3
2.3.1	No-action Alternative	2-4
2.3.2	Action Alternatives.....	2-4
2.4	Alternative A: No-Action (Existing Management Continued)	2-5
2.4.1	Current Actions.....	2-5
2.4.2	Implementation Costs	2-12
2.5	Elements Common to the Action Alternatives	2-12
2.5.1	Use of Volunteers	2-12
2.5.2	CWD Response Plan.....	2-14
2.6	Alternative B: Combined Nonlethal Actions.....	2-24
2.6.1	Additional Actions Proposed Under Alternative B	2-24
2.6.2	Monitoring	2-35
2.6.3	Implementation Costs	2-35
2.7	Alternative C: Combined Lethal Actions	2-36
2.7.1	Additional Actions Proposed Under Alternative C	2-36
2.7.2	Monitoring	2-43
2.7.3	Implementation Costs	2-43
2.8	Alternative D: Combined Lethal and Nonlethal Actions	2-44
2.8.1	Additional Actions Proposed Under Alternative D	2-44
2.8.2	Monitoring	2-45
2.8.3	Implementation Costs	2-46
2.9	Adaptive Management Approaches Included in the Action Alternatives	2-46
2.9.1	Using the Adaptive Management Process	2-47
2.9.2	Potential Adaptive Management Approaches.....	2-48
2.10	Options Considered but Rejected.....	2-51
2.10.1	Public Hunting	2-51
2.10.2	Fencing the Entire Park	2-52
2.10.3	Surgical Reproductive Control	2-53
2.10.4	Reintroduction of Predators	2-54
2.10.5	Capture and Relocation.....	2-54
2.10.6	Repellents, Plantings, and Other Deterrents	2-54

2.10.7	Supplemental Feedings	2-55
2.10.8	Poisons	2-55
2.10.9	Use the Deer Population as a Research Model	2-55
2.11	Consistency with Sections 101(b) and 101(1) of the National Environmental Policy Act.....	2-56
2.11.1	Alternative A: No-action.....	2-56
2.11.2	Alternative B: Combined Nonlethal Actions	2-57
2.11.3	Alternative C: Combined Lethal Actions.....	2-57
2.11.4	Alternative D: Combined Lethal and Nonlethal Actions	2-58
2.12	Environmentally Preferred Alternative	2-58
2.13	NPS Preferred Alternative	2-59
2.13.1	How Alternatives Meet Objectives	2-59
2.13.2	NPS Preferred Alternative.....	2-59
Chapter 3: Affected Environment.....		3-1
3.1	Introduction.....	3-1
3.2	Natural Resources	3-2
3.2.1	Vegetation and Special Status Plant Species	3-2
3.2.2	White-tailed Deer Population.....	3-11
3.2.3	Other Wildlife, Wildlife Habitat, and Special Status Animal Species	3-25
3.3	Cultural Resources.....	3-29
3.3.1	Cultural Landscapes.....	3-29
3.3.2	Historic Structures.....	3-31
3.3.3	Archeological Resources.....	3-30
3.4	Visitor Use and Experience	3-32
3.5	Socioeconomic Resources and Adjacent Lands.....	3-34
3.6	Public Safety	3-35
3.7	Park Operations	3-36
Chapter 4: Environmental Consequences		4-1
4.1	Introduction.....	4-1
4.1.1	Summary of Laws and Policies.....	4-1
4.2	Methodology for Assessing Impacts	4-2
4.2.1	General Analysis Methods	4-2
4.2.2	Assumptions.....	4-2
4.2.3	Cumulative Impact Analysis Methodology	4-3
4.2.4	Impairment Analysis Methodology.....	4-12
4.3	Impacts on Natural Resources	4-14
4.3.1	Impacts on Vegetation and Special Status Plant Species	4-14
4.3.2	Impacts on White-tailed Deer Population	4-27
4.3.3	Impacts on Other Wildlife, Wildlife Habitat, and Special Status Animal Species.....	4-38
4.4	Impacts on Cultural Resources.....	4-51
4.4.1	Impacts on Cultural Landscapes	4-51
4.4.2	Impacts on Historic Structures	4-58
4.4.3	Impacts on Archeological Resources	4-63

4.5	Impacts on Visitor Use and Experience	4-69
4.6	Impacts on Socioeconomic Resources and Adjacent Lands.....	4-77
4.7	Impacts on Public Safety.....	4-85
4.8	Impacts on Park Operations.....	4-91
4.9	Summary of Impact Analysis.....	4-99
4.9.1	Unavoidable Adverse Impacts	4-99
4.9.2	Sustainability and Long-Term Management	4-100
4.9.3	Irreversible or Irretrievable Commitments of Resources.....	4-102
	Chapter 5: Consultation and Coordination	5-1
5.1	Introduction.....	5-1
5.2	The Scoping Process	5-1
5.2.1	Internal Scoping.....	5-1
5.2.2	Public Scoping	5-2
5.3	Agency Consultation.....	5-6
5.3.1	Pennsylvania Game Commission	5-6
5.3.2	Tribal Consultations.....	5-6
5.3.3	Section 7 Consultation	5-7
5.3.4	Section 106 Consultation.....	5-7
5.3.5	U.S. Environmental Protection Agency	5-7
5.4	Document Review and List of Recipients	5-8
5.4.1	Review Process for the Deer Management Plan/EIS.....	5-8
5.4.2	List of Recipients	5-9
	Appendices	A-1
	A Deer and Vegetation Monitoring Protocol.....	A-1
	B Relevant Correspondence.....	B-1
	C CWD Response Plan for Valley Forge NHP	C-1
	D Detailed Cost Estimates	D-1
	E Review of White-tailed Deer Reproductive Control	E-1
	F Comments and Responses on the Draft Plan/Environmental Impact Statement ..	F-1
	References	Ref-1
	Glossary	Ref-1
	Selected Bibliography.....	Ref-9
	Planning Team, Contributors, and Consultants	Ref-53
	Index	Ref-57

Figures

1	Park Vicinity/Regional Map	1-5
2	Park Map	1-9
3	Location of Fenced Long-term Monitoring Plots on Mount Joy and Mount Misery	2-7
4	CWD Implementation Zones at Valley Forge NHP	2-16
5	Proposed Rotational Fencing Plot Locations	2-27
6	The Two-phased Approach to Adaptive Management	2-47
7	Vegetative Communities	3-3
8	Average Distance Traveled by Female White-tailed Deer from the Valley Forge NHP Boundary	3-13
9	Deer Crossing Areas Along the Park Boundary	3-15
10	Number of Deer Observed during Fall Spotlight Surveys between 1986 and 2007	3-17
11	Spring Survey Compartments for White-tailed Deer Population Monitoring	3-19
12	Estimated Deer Population Size based on Spring Compartment Counts between 1997 and 2007	3-18

Tables

1	Changes in Pennsylvania's Deer Management Program by PGC between 2002 and 2006	1-20
2	Implementation of Deer Reduction Programs within the Greater Philadelphia Area	1-21
3	Relationship between CWD Surveillance and Response Actions and Deer Management Strategies	2-21
4	Reproductive Control Agents	2-30
5	Evaluation of Fertility Control Agents Based on Selection Criteria for Valley Forge NHP	2-31
6	Summary of Alternatives	2-61
7	How the Alternatives Meet the Objectives	2-69
8	Summary of Environmental Consequences	2-73
9	Special Status Plant Species Confirmed within Valley Forge NHP	3-7
10	High Priority Invasive Plant Species	3-10
11	Bird Species of Special Concern	3-26

12 Special Status Animal Species Confirmed within Valley Forge NHP 3-28

13 Valley Forge NHP Operating Budget for 2006 and 2007 3-37

14 Valley Forge NHP Deer Management Operating Budget 3-38

15 Cumulative Impact Analysis Actions 4-103

16 Running List of Briefings, Consultations, and Public Involvement Related to the Scoping Process 5-3

A-1 Height Class Categories for Enumeration of Seedlings A-6

A-2 Preliminary Herbaceous Target Species to be Measured in Twelve 1-square-meter Quadrats A-7

C-1 CWD Science Team Members C-3

C-2 Known or Suspected CWD Risk Factors Identified for Valley Forge NHP..... C-6

C-3 Actions Associated with CWD Response Based on Established Implementation Zones at Valley Forge NHP..... C-9

C-4 Relationship Between CWD Surveillance and Response Actions and Deer Management Strategies Described in the Plan/EIS C-15

C-5 Alternative A: CWD Costs by CWD Implementation Zones C-19

C-6 Alternative B: CWD Costs by CWD Implementation Zones C-20

C-7 Alternative C CWD Costs by CWD Implementation Zones C-21

D-1 Cost Estimate for Alternative A: No-action..... D-1

D-2 Cost Estimate for Alternative B: Combined Nonlethal Actions D-6

D-3 Cost Estimate for Alternative C: Combined Lethal Actions..... D-9

D-4 Cost Estimate for Alternative D: Combined Lethal and Nonlethal Actions D-12

E-1 Evaluation of Fertility Control Agents Based on Selection Criteria for Valley Forge NHP E-12

F-1 Content Analysis Report F-1

F-2 Correspondence Distribution by Correspondence Type F-9

F-3 Correspondence Signature Count by Organization Type F-9

F-4 Correspondence Distribution by State F-10

F-5 Correspondence Distribution by Country F-11

F-6 Index Coding by Organization..... F-12

Acronyms

ACHP	Advisory Council on Historic Preservation
APHIS	Animal and Plant Health Inspection Service
ARS	Asbestos Release Site
ASMIS	Archeological Sites Management Information System
BRMD	Biological Resource Management Division
BSE	bovine spongiform encephalopathy
CCPRD	Chester County Parks and Recreation Department
CDC	Centers for Disease Control and Prevention, Department of Health and Human Services
CESS	Cost Estimating Software System
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CJD	Creutzfeldt-Jakob disease
CLI	Cultural Landscape Inventory
CLR	Cultural Landscape Report
cm	centimeter(s)
CMA	Centennial and Memorial Association
CWD	Chronic Wasting Disease
dbh	diameter at breast height
DCNR	Pennsylvania Department of Conservation and Natural Resources
deer/km²	deer per square kilometer
deer/mi²	deer per square mile
DMAP	Deer Management Assistance Program
DOI	U.S. Department of the Interior
EHD	Epizootic Hemorrhagic Disease
EPA	U.S. Environmental Protection Agency
EPMT	Exotic Plant Management Team
EQD	Environmental Quality Division (National Park Service)
FDA	U.S. Food and Drug Administration
FIA	Forest Inventory and Analysis
FMP	Fire Management Plan

FPC	Fairmount Park Commission
GMP	general management plan
GnRH	gonadotropin releasing hormone
HR	House Report
HSUS	Humane Society of the United States
I&M	Inventory and Monitoring Program
INAD	Investigational New Animal Drug
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
kg/ha	kilograms per hectare
kmh	kilometers per hour
LCS	List of Classified Structures
LEAD	Letterkenny Army Depot
m	meter(s)
MIDN	Mid-Atlantic Inventory and Monitoring Network
mph	miles per hour
NEPA	National Environmental Policy Act
NHP	National Historical Park
NHPA	National Historic Preservation Act
NPOMA	National Parks Omnibus Management Act of 1998
NPS	National Park Service
NRHP	National Register of Historic Places
ONPS	Operation of the National Park System
PADLS	Pennsylvania Animal Diagnostic Laboratory System
PDA	Pennsylvania Department of Agriculture
PEPC	Planning, Environment, and Public Comment
PGC	Pennsylvania Game Commission
PGF_{2α}	Prostaglandin F _{2α}
plan/EIS	White-tailed Deer Management Plan/Environmental Impact Statement
PRS	Pennsylvania Regeneration Study
PSU	The Pennsylvania State University

PZP	Porcine Zona Pellucida
ROD	Record of Decision
SHPO	state historic preservation officer
TSE	transmissible spongiform encephalopathies
USC	United States Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VFCD	Valley Forge Citizens for Deer Control
VFPC	Valley Forge Park Commission
WDNR	Wisconsin Department of Natural Resources
WMU	Wildlife Management Unit

This page intentionally left blank.