National Park Service
U.S. Department of the Interior

Valley Forge National Historical Park
Pennsylvania

Valley Forge National Historical Park

White-tailed Deer Management Plan / Environmental Impact Statement

Final Internal Scoping Report

December 2006

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INTRODUCTION

Valley Forge National Historical Park (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 is also 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. The 3,452-acre park encompasses the site of the 1777-78 winter encampment of the American Continental Army under General George Washington. It protects many cultural resources, including cultural landscapes, historic buildings and structures, archeological sites, and archives and collections. Along with protecting these resources, the highly developed nature of the land around Valley Forge NHP has increased the park's value as a bio-refuge for plants and animals. Supporting over 1,000 plant species and 320 animal species, habitats within the park include oak/tulip poplar forests, tall grass meadows, wetlands, and riparian buffers.

An internal scoping meeting was held on September 12 and 13, 2006 to discuss the management of white-tailed deer (*Odocoileus virginianus*) 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 discussed.

This Internal Scoping Report will be used as the starting point for the environmental planning process mandated by the National Environmental Policy Act (NEPA). It documents the discussion and results of the internal scoping meeting and describes scientific, historical, social, and political information related to the management of white-tailed deer at Valley Forge NHP. Park purpose and significance, relevant laws and policies that apply to National Park Service (NPS) deer management, as well as past and present deer management efforts at Valley Forge NHP, are defined in the report.

PURPOSE OF AND NEED FOR ACTION

An understanding of the purpose of and need for action was developed from analysis of the results of the Valley Forge NHP general management planning process and of data gathered to date. The statement of purpose and need reflects specific conditions at Valley Forge NHP, and also is congruent, as appropriate, with purpose and need statements drafted for ungulate management plans at other units of the national park system.

As defined in NPS Director's Order #12 (DO #12) Handbook, section 2.2:

Purpose is a broad statement of goals and objectives that NPS intends to fulfill by taking action….

Need is a discussion of existing conditions that need to be changed, problems that need to be remedied, decisions that need to be made, and polices or mandates that need to be implemented…. Need is why action is being taken at this time.

The purpose of the white-tailed deer management plan/environmental impact statement (EIS) at Valley Forge NHP is to develop a deer management strategy that supports long-term protection, preservation, and restoration of native vegetation and other natural and cultural resources.

Such a plan is necessary because:

- An increasing number of deer 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 and shrub seedlings by deer has prevented the ability of native forests to grow and mature.

OBJECTIVES IN TAKING ACTION

Objectives are a more specific statement of purpose, i.e., what must be accomplished in a large part for the action to be considered a success.

The action alternatives selected for detailed analysis must resolve the purpose of and need for action and meet the objectives, to a large degree. 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. The following objectives related to deer management at Valley Forge NHP were developed at the internal scoping meeting.

Vegetation

- Protect and promote restoration of the natural abundance, distribution, structure, and composition of native plant communities by reducing browsing, trampling, and non-native seed dispersal by deer.
- Reduce deer browsing pressure enough to ensure 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, non-native plant species.
- Promote natural ecological processes, such as forest regeneration.

Wildlife and Wildlife Habitat

- Maintain a white-tailed deer population within the park while protecting other park resources.
- Protect and preserve the natural abundance, distribution, and diversity of other native wildlife species by promoting the restoration of native plant communities.
- Protect and promote restoration of lower canopy and ground nesting bird habitat.

Threatened, Endangered, and Species of Concern

- Maintain and promote restoration of rare plant and animal species and their habitat.

Cultural Resources

- Protect the integrity of cultural landscape, including the patterns of open versus wooded land, commemorative plantings, and vegetative screenings.

STUDY AREA AND SCOPE OF THE ANALYSIS

Situated in southeastern Pennsylvania along the Schuylkill River in Chester and Montgomery Counties, Valley Forge NHP encompasses 3,452 acres. Within the Piedmont physiographic province, the park lies within the Great Valley and is home to a variety of natural and cultural resources. The study area for this planning effort varies with the particular resource being analyzed, but generally includes the park and extends 1,325 feet beyond the park boundary to include the average home range for the white-tailed deer at the park and the affected neighboring properties (Lovallo, and Tzilkowski 2003).

The study will focus on the development of deer management methods and strategies for Valley Forge NHP, as well as the analysis of existing resource conditions and impacts that may occur to these resources as a result of the proposed management options. The study will be carried out in cooperation with local, state, and regional entities, as well as other federal agencies. A science team (see Appendix A) is proposed to assist with the planning process by: evaluating scientific literature and research on the topic of deer management; reviewing and recommending monitoring protocols for park deer populations and other park resources; and identifying appropriate resource thresholds at which deer management strategies would be implemented. Monitoring protocols and impact thresholds will be incorporated into all action alternatives evaluated in analysis. Established thresholds will reflect the identified plan objectives to maintain the deer population as one component of a balanced, functioning ecosystem and to prevent adverse impacts to other park resources or values. Deer management strategies developed through this

analysis will be adaptive and dynamic, allowing for the incorporation of new scientific information over time that may modify management methods to best meet objectives in taking action.

BACKGROUND

The NPS was established with the charge of conserving "… the scenery and the natural and historic objects and the wildlife 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." NPS units are created by Congress to fulfill specified purposes, based upon the park's significant resources. A park's purpose, as established by Congress, is the foundation for its management of resources and provision of visitor experiences. This chapter explores the purpose and significance of the park, summarizes laws and policies that apply to NPS deer management, and documents past and present deer management efforts at Valley Forge NHP.

VALLEY FORGE NHP LEGISLATION AND PLANNING DOCUMENTS

The following were explored with the park: why the unit was established as a park; what resources Congress recognized as needing NPS protection; and what purpose, mission, and objectives must be fulfilled by the park. After an impact analysis is completed on the alternatives, the issue of whether or not deer management actions fit into the purpose of the park, as defined by its enabling legislation, will be revisited.

Purpose and Significance of Valley Forge NHP

Local and regional interest in the history of Valley Forge and a growing desire to protect the land and its resources inspired the U.S. Congress to establish Valley Forge as a national historical park in 1976. Derived from the common vision for the place, Congress directed that the **purpose** of the park is to

> *"…educate and inform present and future generations about the sacrifices and achievements of General George Washington and the Continental Army at Valley Forge, and the people, events, and legacy of the American Revolution; preserve the cultural and natural resources that embody and commemorate the Valley Forge experience and the American Revolution; and provide opportunities for enhanced understanding."*

The park's **significance** statement is based on the establishing legislation as well as on subsequent scholarship about a place or theme. It identifies the resources and values central to managing the park and expresses the importance of the park to our national heritage. Understanding what is nationally significant about a park helps managers make decisions that preserve the resources and values that were the basis for establishment of the park. Such decisions include setting resource management priorities and identifying interpretive themes and appropriate visitor experiences. A statement of significance focuses efforts and funding on the resources and experiences that matter most:

"Valley Forge National Historical Park is nationally significant as the location of the 1777-78 winter encampment of the Continental Army under General George Washington. Few places evoke the spirit of patriotism and independence, represent individual and collective sacrifice, or demonstrate the resolve, tenacity and determination of the people of the United States to be free as does Valley Forge. The historic landscapes, structures, objects, and archeological and natural resources at Valley Forge are tangible links to one of the most defining events in our nation's history. Here the Continental Army under Washington's leadership emerged as a cohesive and disciplined fighting force. The Valley Forge experience is fundamental to both American history and American myth, and remains a source of inspiration for Americans and the world."

Valley Forge NHP Planning Documents

The purpose, need, and objectives for the white-tailed deer management plan/EIS must be, to a large degree, consistent with park planning documents. These documents include the 1982 *General Management Plan*, the 1999 *Resources Management Plan, the* 2005 *Strategic Plan*, the 2001 *Cultural Landscape Inventory*, the 2002 *Contextual Documentation and Cultural Landscape Plan (Volumes I and II),* and the 2006 *Draft General Management Plan/Environmental Impact Statement*.

Valley Forge NHP General Management Plan (1982)

The *1982 General Management Plan* (GMP) was the first official planning document produced by the NPS for Valley Forge NHP. The plan outlined the existing conditions within the park, future plans for the park, and the impact they may have on Valley Forge as a whole. The 1982 GMP did not address deer management issues and thus left the park without any management guidance on handling related problems.

Valley Forge NHP Resources Management Plan (1999)

The resource management plan tiered from the 1982 GMP by providing details on resource management strategies for the management of Valley Forge NHP. The report outlined the condition of park resources, problems or threats to the condition of the resources, and management strategies for improving adverse conditions. The report called for additional monitoring and research on the white-tailed deer population, including deer exclosures, and annual spotlight counts.

Strategic Plan for Valley Forge NHP: 2005-2008 (2005)

The strategic plan reviews the current state of the park and sets goals for park management. These goals are based on time constraints and financial factors. The most recent plan recognizes that deer management has become a problematic and controversial issue for the park. The plan endorses a more active management strategy towards all natural resources, including deer, for the betterment of the overall environment.

Cultural Landscape Inventory (2001)

This report documents all cultural and natural features that contribute to the National Register significance of the park. Four component landscapes were documented in more detail: the Port Kennedy

area; the Valley Forge farm cluster (Philander C. Knox estate, Lafayette's Quarters, and Stirling's Quarters); the Village of Valley Forge; and Walnut Hill. The cultural landscape report identifies the historic uses of the land and notes areas that have been adversely impacted and no longer match the historic character of the park. Some of these impacts are caused by deer.

Contextual Documentation and Cultural Landscape Plan Volumes I and II (2002)

These documents combine both historic resources studies and cultural landscape reports and includes both contextual research and cultural landscape documentation for the park. These volumes categorize the study area as nationally significant for its association with the encampment of the Continental Army, commemoration, park development, and the Village of Valley Forge development. The cultural landscape inventory and plan do not establish specific landscape treatments, but rather provide general information on the cultural landscapes that exist at Valley Forge NHP. This information can be used to achieve cultural resource objectives of protecting the integrity of cultural landscape, including the patterns of open versus wooded land, commemorative plantings, and vegetative screenings.

Valley Forge NHP Draft General Management Plan/Environmental Impact Statement (2006)

A new GMP is being developed to replace the previous plan, completed in 1982, and is currently in draft form. The new plan establishes management objectives for Valley Forge NHP in terms of resource management, visitor use and experience, and park operations. Natural resources are addressed in this new GMP to allow for resource protection and management. With respect to natural resources within the park, the new GMP provides the following primary objective:

> *Biological resources are managed to preserve and restore natural abundances, diversities, dynamics, and distributions of native plants and animal populations within forested and other naturally occurring communities. In naturally occurring communities where species populations occur in unnaturally high or low concentrations as a result of human influences or extirpation of predators, and such occurrences cause unacceptable impacts on natural resources and natural processes, biological and physical remedial actions would accelerate natural recovery.*

The Draft GMP further emphasized the need for development and implementation of a deer management plan to meet the natural resource objective.

NPS ORGANIC ACT, MANAGEMENT POLICIES, AND IMPAIRMENT

By enacting the NPS Organic Act of 1916 (Organic Act), Congress directed the NPS to manage units "to conserve the scenery and the natural and historic objects and wild life therein and to provide for the enjoyment of the same in such a manner and by such a means as will leave them unimpaired for the enjoyment of future generations" (16 USC § 1). Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating that NPS must conduct its actions in a manner that will

ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC § 1a-1).

Despite these mandates, the Organic Act and its amendments afford the NPS latitude when making resource decisions that balance visitor recreation and resource preservation. By these acts, Congress "empowered [the National Park Service] with the authority to determine what uses of park resources are proper and what proportion of the parks resources are available for each use" [*Bicycle Trails Council of Marin v. Babbitt*, 82 F.3d 1445, 1453 (9th Cir. 1996)].

Because conservation remains predominant, the NPS seeks to avoid or to minimize adverse impacts on park resources and values. Yet, the NPS has discretion to allow adverse impacts when necessary (Management Policies 2006, sec. 1.6); however, while some actions and activities cause impacts, the NPS cannot allow an adverse impact that constitutes resource impairment (Management Policies 2006, sec. 1.4.5). The Organic Act prohibits actions that permanently impair park resources unless a law directly and specifically allows for the acts (16 USC § 1a-1). An action constitutes an impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (Management Policies 2006, sec. 1.4.5). An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is

1. Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
2. Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
3. Identified in the park's general management plan or other relevant NPS planning documents as being of significance.

Impairment may result from NPS activities in managing the park, as well as visitor activities or activities undertaken by concessionaires, contractors, and others operating in the park.

Impairment of park resources and values also may develop due to a lack of management or action in response to a condition beyond park control. Due to years of heavy deer browse, the vegetation and wildlife at Valley Forge NHP have been severely impacted and may become impaired if actions are left unchanged. These resources have been identified by the new Draft GMP/EIS as being of significance. The natural abundances, diversities, dynamics, and distributions of native plants and animals are key to a healthy ecological system and important to supporting the park's mission. Monitoring and research have shown a direct link between the deer population and the lack of forest structure, absence of native species, and spread of invasive plants. The white-tailed deer management plan/EIS will analyze these actions to determine whether an impairment of vegetation and wildlife will result, and if so, what steps need to be taken to remove the impairment.

Park units vary based on their enabling legislation, natural resources, cultural resources, and missions; management activities appropriate for each unit, and for areas within each unit, vary as well. An action appropriate in one unit could impair resources in another unit. Thus, the EIS for deer management at

Valley Forge NHP will analyze the context, duration, and intensity of impacts related to deer management within Valley Forge NHP, as well as the potential for resource impairment, as required by DO #12: Conservation Planning, Environmental Impact Analysis, and Decision-making (NPS 2006).

FEDERAL LAWS, REGULATIONS, AND POLICIES

The NPS is governed by laws, regulations, and management plans before, during, and following any management action related to the Valley Forge NHP White-tailed Deer Management Plan/EIS.

National Environmental Policy Act (NEPA), 1969, as Amended

Section 102(2) (c) of this act requires that an EIS be prepared for proposed federal actions that may significantly affect the quality of the human environment or are major or controversial federal actions.

National Parks Omnibus Management Act of 1998 (NPOMA)

NPOMA (16 USC 5901 et seq.) underscores NEPA in that both are fundamental to NPS park management decisions. Both acts provide direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available and provide options for resource impact analysis should this be the case.

NPOMA directs the NPS to obtain scientific and technical information for analysis. The NPS handbook for Director's Order 12 states that if, "such information cannot be obtained due to excessive cost or technical impossibility, the proposed alternative for decision will be modified to eliminate the action causing the unknown or uncertain impact or other alternatives will be selected" (section 4.4).

Redwood National Park Act of 1978, as amended

All NPS units are to be managed and protected as parks, whether established as a recreation area, historic site, or any other designation. This act states that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

Code of Federal Regulations, 1992

Title 36, Chapter 1 of the Code of Federal Regulations (CFR) provides the regulations "for the proper use, management, government, and protection of persons, property, and natural and cultural resources within areas under the jurisdiction of the National Park Service." It states that "the National Park Service has the authority to manage the wildlife in the parks in fulfillment of the Organic Act without the consent of the state and by methods contrary to state law" (16 USC 3).

In section 2.1, the code prohibits the introduction of wildlife into a park ecosystem. Section 2.2 prohibits the taking of wildlife, except by authorized activities; feeding, touching or harassing of wildlife; as well

as limiting where and when hunting may occur. These sections of the code must be considered in determining appropriate management of the deer herd at Valley Forge NHP.

In 43 CFR Part 24, the Department of the Interior is provided with specific guidance for interagency cooperation, preservation, management, and use of fish and wildlife resources. The section specifically notes that each unit of the NPS is guided by its own enabling legislation which dictates if hunting, fishing, or trapping is allowed within the park. If the enabling legislation does not specifically allow for these activities, they are prohibited on NPS lands.

Endangered Species Act of 1973, as Amended

This act requires all federal agencies to consult with the Secretary of the Interior on all projects and proposals having potential impact on federally endangered and threatened plants and animals.

Fish and Wildlife Coordination Act of 1934, as Amended

The Act authorizes the Secretaries of Agriculture and Commerce to provide assistance to and cooperate with federal and state agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes, and other polluting substances on wildlife. The 1958 amendments added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs, and authorized the Secretary of Interior to provide public fishing areas and accept donations of lands and funds (16 USC 661-667e).

National Historic Preservation Act of 1966, as Amended

Section 106 of this act requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the National Register of Historic Places. All actions affecting the parks' cultural resources must comply with this legislation.

Historic Sites Act of 1935

This act declares the preservation of historic sites, buildings, objects, and properties of national significance for public use as national policy. It authorizes the Secretary of the Interior and NPS to restore, reconstruct, rehabilitate, preserve, and maintain historic or prehistoric sites, buildings, objects, and properties of national historical or archaeological significance.

Natural Resources Management Guideline, NPS-77, 1991

The purpose of this document is to provide guidance to park managers for all planned and ongoing natural resource management activities. Managers must follow all federal laws, regulations, and policies. This document provides the guidance for park management to design, implement and evaluate a comprehensive natural resource management program.

Federal Noxious Weed Act, 1974

The Federal Noxious Weed Act (7 USC §§ 2801-2814, January 3, 1975, as amended 1988 and 1994) provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.

Executive Order 13112 – Invasive Species

This executive order requires the NPS to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

Executive Order 11990 - Protection of Wetlands

This executive order directs the NPS to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Executive Order 11988 - Floodplain Management

This executive order directs the NPS to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

Executive Order 11593 - Protection and Enhancement of the Cultural Environment

This executive order directs the NPS to support the preservation of cultural properties and to identify and nominate to the National Register cultural properties within the park and to "exercise caution . . . to assure that any NPS-owned property that might qualify for nomination is not inadvertently transferred, sold, demolished, or substantially altered."

Executive Order 13186 – Protection of Migratory Birds

This executive order was put in place to implement the Migratory Bird Treaty Act of 1918, which affirms agreements made at four international conventions to protect migratory birds. This executive order directs the NPS to avoid actions that have a measurable negative effect on migratory bird populations, and to promote the conservation of migratory bird populations.

STATE AND LOCAL LAWS, REGULATIONS, AND POLICIES

Commonwealth of Pennsylvania Hunting Regulations

Title 34 of the Pennsylvania Code addresses wildlife management through the Pennsylvania Game Commission. This legislation prescribes means for establishing public hunting seasons, hunting permit requirements, allowable takes, tagging requirements, and permissible equipment. These regulations include the prohibition of hunters discharging a firearm within 150 feet of a structure.

Commonwealth of Pennsylvania Wildlife Regulations

Section 141.2 of the Pennsylvania Code outlines the circumstances that may occur to allow the protection of wildlife to be removed. These circumstances include damage to personal property and disease. This section also directs the taking to be carried out in a humane and lawful manner.

HISTORY OF DEER MONITORING AND RELATED RESEARCH AT VALLEY FORGE NHP

Chronological Summary of Events

White-tailed deer are a native species that has been increasing in abundance across the state of Pennsylvania since the mid-1900s, primarily in response to changes in habitat and hunting regulations. Deer population size at Valley Forge NHP has increased significantly over the last two decades, primarily as a result of habitat loss due to urbanization in areas surrounding the park, lack of natural predators and recreational hunting, and the presence of ideal deer habitat within the park. Browsing by deer may affect the species composition, abundance, and distribution of plant communities and associated wildlife, as well as completely eliminating some species from the ecosystem.

Initial surveys of deer population size, herd health, and habitat condition in the early 1980's, led park managers to conclude that management action was not warranted at that time. Population size was relatively low, habitat condition and herd health was considered excellent, and damage to ornamental plantings and crops on adjacent lands was considered insignificant (Cypher et. al. 1985). However, the park initiated annual deer spotlight counts in 1986 to monitor trends in deer population size over time based on survey recommendations.

By the early 1990s park managers and individuals outside the park observed the presence of a "browse line", indicating removal of the forest understory and usually associated with deer browse. The white-tailed deer population also had approximately doubled in size based on 1986-1992 spotlight count data. The park had started to receive complaints from park neighbors regarding damage to ornamental plantings caused by deer and the occurrence of deer-vehicle collisions within the park and surrounding areas. Between 1993 and 2001, there were 5 human fatalities in the region resulting from deer-vehicle collisions – one near the park boundary (Morrison *pers. comm.*). There were also reports of increasing occurrences of Lyme disease.

In response to these concerns, park managers initiated long-term monitoring of plant communities on Mount Misery and Mount Joy and initiated efforts to obtain baseline information on natural resources within the park (e.g. vertebrate and vascular plant inventories, vegetation mapping, etc.). Park staff also participated in a variety of community-based efforts to address concerns related to property damage, deer-vehicle collisions, and Lyme disease. For example, in 1993-1994, park staff participated on State Representative, Carole Rubley's Deer Task Force to share information and approaches to these issues with other state and local government representatives. During the 1990s, park staff also developed educational materials to assist the public in dealing with issues related to deer and conducted a variety of deer-related research activities (see section below).

Increasing public concerns over deer-related issues are reflected in the 1995 formation of a non-profit organization, Valley Forge Citizens for Deer Control, dedicated to convincing Valley Forge NHP to implement a deer reduction program. This group conducted an exit poll in Tredyffrin and Schuylkill Townships that indicated 86% of those polled believed that Valley Forge NHP should reduce the number of deer by December 1996 (Morrison *pers. comm.*). Deer reduction programs were implemented at 40 sites (e.g. state, county, township, and city parks) in the 5-county Philadelphia area between 1973 and 2001. Twenty-eight (70%) of these programs were initiated in the 1990's (Morrison *pers. comm.*).

In 2000, Congress directed the NPS to develop a plan to address the issue of deer management at Valley Forge NHP. Initial steps in this effort included the development of natural resource management goals and objectives for the park (through the 2006 *Draft General Management Plan*), completion of a Cultural Landscape Report (Susan Maxman Architects and John Milner Associates 2002), and mapping and classification of the park's vegetation communities (Podniesinski et. al. 2005).

In 2006, the House Appropriations Report (HR 109-465) included the following language:

> *"The public has been patient as the NPS has worked through its process in regard to management of the over-abundance of white-tailed deer at the park. Within existing funds, NPS* ***is directed to begin the environmental impact statement for deer management. The Committee expects that the plan will be funded fully so that it can be completed in fiscal year 2008.*** *The Committee further expects that implementation of the selected action will begin immediately upon signing of the Record of Decision."*

In 2006, the NPS also received funding to initiate development of a White-tailed Deer Management Plan/EIS. The park's intent to develop this plan was published in the *Federal Register* on September 7, 2006.

The issues surrounding resource management, including that of deer, are complex. Park managers are challenged with establishment of vegetation goals related to species abundance, richness, and distribution and achievement of those goals in light of other environmental influences, such as the prevalence of invasive, non-native plant species. White-tailed deer play an important role in maintaining a balanced ecosystem. However, in an ecosystem approach, they are just one of many factors that must be considered in achieving long-term resource management goals. In addition, determining and monitoring the effects of deer and then deciding how and when to take appropriate action must be based upon best available

science and professional judgment. Finally, the human component of this issue is substantive in that many people have different views of wildlife management in units of the NPS. A series of studies are being carried out for the NPS by K.M. Leong, et al. on the attitude of park neighbors towards NPS management activities. These studies started out on a general level, assessing public input on NPS management, and then focused in on specific parks and management efforts, specifically on deer management. A report is currently being completed for the NPS on the Valley Forge community's attitude toward deer management at the park.

Summary of Data and Research

Scientific research related to white-tailed deer populations and the impacts of deer on the environment was initiated at Valley Forge NHP in 1983. This work was conducted in response to recognition by park managers that increasing urbanization in areas surrounding the park, a lack of natural predators and hunting pressure, and the presence of ideal deer habitat within the park had potentially created "an unregulated, 'island' deer population with a high potential for future overpopulation" (Cypher et. al. 1985). From 1983-84, researchers from Pennsylvania State University conducted a study of deer population size and population dynamics and conducted an assessment of deer herd health and habitat condition. Deer population size was estimated at between 165-185 individuals [33-37 deer/square mile (mi^2)] and habitat condition was described as "excellent" with no evidence of a browse line. No population management was recommended based on the results of this research. However, authors did recommend continuing annual deer spotlight counts to monitor trends in deer population size.

Valley Forge NHP staff continued to conduct deer spotlight counts using a standard protocol and will conduct the 20th annual spotlight count in 2006. Annual spotlight counts allow for comparison of deer abundance across years to provide an estimate population growth. This method is generally not considered adequate for estimating actual deer population size unless there is some measure of the number of deer NOT observed during counts. Spotlight count data between 1986 and 2005, indicate an increasing trend in the number of deer within the park over the last two decades (see Figure 1 below). Spring compartment counts have been conducted since 1997, in addition to spotlight counts, to provide a more accurate estimate of deer population size.

Park staff have collected information from deer killed on roadways within the park since 1984. Data recorded includes age, sex, body size (weight, chest girth, total body length, hind leg length), location, cause of death, and other details necessary for monitoring. Measures of body size can be useful indicators of body condition and indirectly deer health as deer size and growth are strongly influenced by the quantity and quality of available forage. Differences in growth between deer populations are often most pronounced in juveniles and are most closely correlated with changes in chest girth and weight. Deer health in 1983-1984 was described as good with no evidence of malnutrition, disease, or limited food resources. Analysis of morphological measures from fawns killed on park roadways between 1992 and 1995, suggest that condition of white-tailed deer may be declining over time (Heister 1996). Additionally, anecdotal evidence in recent years suggests that food resources are becoming increasingly limited and deer more nutritionally challenged (Carfioli *pers. comm*.).

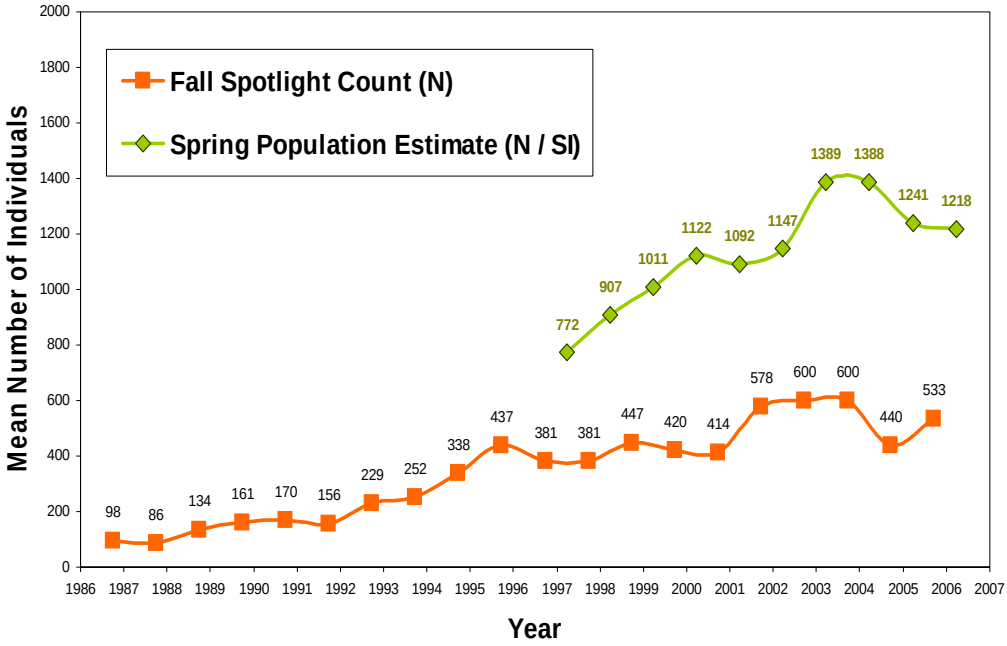

Figure 1. Trend in white-tailed deer population size at Valley Forge NHP between 1986 and 2006, based on fall spotlight counts and spring compartment counts.

Between 1981 and 1985, deer-vehicle collisions were the primary cause of death for deer within the park, accounting for 85% of all reported deaths (Cypher et. al. 1985). Additionally, data reported 51% of deer-vehicle collisions occurred in the fall. Data collected between 1984 and 1995 provide similar results with deer-vehicle collisions accounting for 84% of all reported deaths and with 49% of deer-vehicle collisions occurring in the fall season (Heister 1996).

In 1992, park managers initiated long-term vegetation monitoring on Mount Misery and Mount Joy to evaluate changes in the species composition, abundance, and distribution of forest plant communities over time. Thirty, 2 meter (m) x 2m, fenced plots were randomly established and paired with unfenced control plots in 1992. Data were collected in 1993, 1995, 1998, and 2003. Monitoring results between 1993 and 1998 suggest that fencing has allowed a diverse plant community to develop, dominated by native plant species adapted to specific environmental conditions. Plant communities in unfenced plots have been reduced to a suite of non-preferred or browse resistant plant species that in many cases are non-native species (Figure 2). Non-native plant species were unaffected by fencing (Heister et. al. 2002).

Fencing also significantly affected the density and species composition of tree and shrub seedlings. Tree seedling density in fenced plots was three times higher than in unfenced plots. Red oak seedlings and mountain laurel seedlings were the most influenced by fencing with red oak seedlings only occurring in fenced areas. No seedlings, of any species, between 20 inches and 59 inches (50-150 centimeters (cm)) in height, were present in unfenced plots (Heister et. al. 2002). Continued removal of seedlings in taller height classes by deer browsing will prevent forest regeneration and may significantly impact habitat of associated wildlife species (e.g. lower canopy and ground nesting birds). Data from 2003 is currently being analyzed.

(a) (b)

Figure 2. Comparison of plant communities in fenced (a) versus unfenced (b) plots.

In response to the need to have an accurate estimate of deer population size and understanding of the movements of white-tailed deer relative to the park boundary, a mark-recapture study was initiated in 1997 using radio-telemetry. 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. Spring deer counts or 'compartment' counts, indicate an increase in deer population size from 772 individuals (154 deer/mi^2) in 1997 to 1,218 individuals (244 deer/mi^2) in 2006 (see Figure 1 above).

Home range and movement patterns of deer at Valley Forge NHP are important to understanding patterns of land use, effectiveness of potential management strategies, and provide an indirect measure of adequacy of available food resources. A total of 90 female and 15 male deer were marked and tracked between 1997 and 1999. Seventy-nine percent of females had > 50% of their home range area within the park and traveled on average only 401 feet beyond the park boundary. Average annual home range area for females with >50% of their home range area within the park was 0.46 mi^2. Deer with greater than 50% of their home ranges within the park frequented the center and southern portions of the park (see Figure 3 below). Approximately 21 % of females had <50% of their home range area within the park and traveled, on average, 1,325 feet beyond the park boundary. Average annual home range of female deer with <50% of their home range area within the park was 0.35 square miles (Lovallo and Tzilkowski 2003).

White-tailed deer tended to use forested habitats more frequently during the day and meadows at night. Home ranges for both males and females included approximately 50% forest. Amount of meadow within home ranges for males and females was 25-31% and 37-41%, respectively. When deer moved out of the park at night, they did not use habitats in proportion to their availability. Deer frequented forested and agricultural areas more than expected and residential areas less than expected (Lovallo and Tzilkowski 2003).

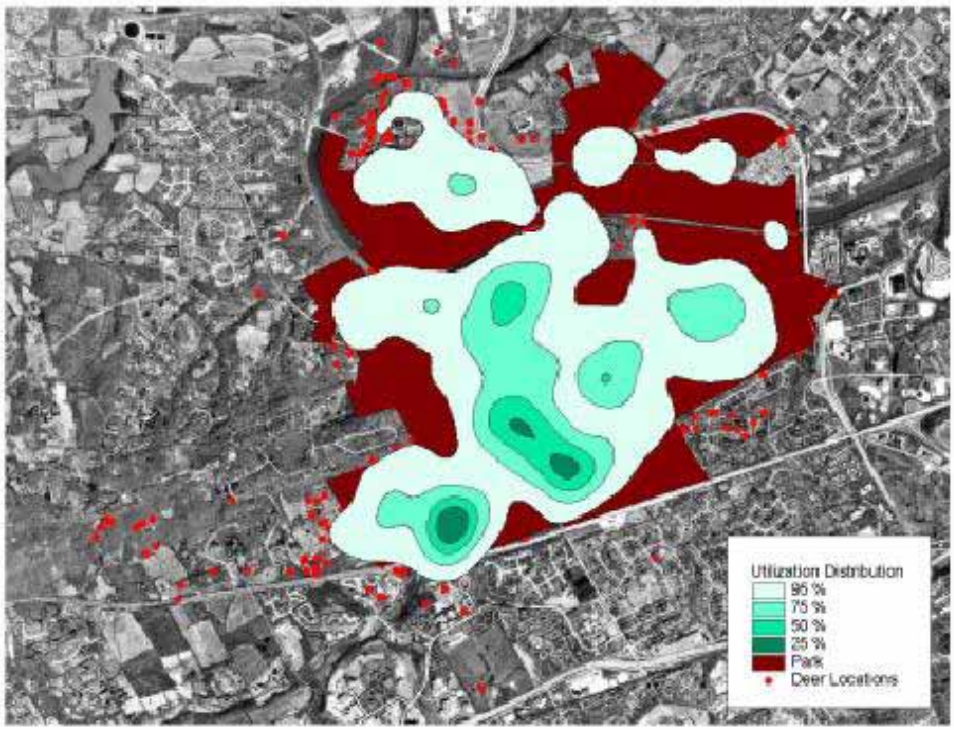

Figure 3. Land use by radio-marked white-tailed deer that had > 50% home range area within Valley Forge NHP between 1997 and 1999.

Between 1992 and 1999, a variety of additional data collection efforts were conducted related to white-tailed deer. These projects were conducted primarily by college-level students working on an independent study or as part of their student internship experience at Valley Forge NHP, although one master's thesis also was completed. Topics of study include: (1) motorist speed between deer-crossing signs in 1994-1997; (2) predicting future forest composition; (3) body size and condition of white-tailed deer fawns in 1997-1999; (4) utilization of woody browse by white-tailed deer; (5) comparison of plant communities in a fenced versus unfenced area at Walnut Hill; (6) Lyme disease infection rates in deer ticks; and (7) analysis of deer-vehicle collision sites.

IMPACT ISSUES AND TOPICS

ISSUES CONSIDERED

Issues associated with white-tailed deer management at Valley Forge NHP were identified by park staff during the internal scoping meeting at the park using the Environmental Screening Form. The issues identified are discussed below.

Vegetation

Issue: At certain population levels, deer browsing and activity patterns may adversely affect native plant communities. Deer are considered by many researchers and ecologists to be a 'keystone' herbivore. A keystone species may be defined as one that "(1) affects the distribution or abundance of many other species, (2) can affect community structure by strongly modifying patterns of relative abundance among competing species, or (3) affects community structure by affecting the abundance of species at multiple trophic levels" (Waller and Alverson 1997). In the Allegheny National Forest of Pennsylvania, Waller and Alverson (1997) reported that deer browsing "strongly affects the absolute and relative abundance of woody species; may depress regeneration of several valuable hardwood species; results in a slow but steady conversion of stands to less palatable species; and at very high deer densities and under certain conditions, seedlings and saplings of all species are eliminated and stands with park-like, grass and fern-dominated understories emerge." Other research indicates that species diversity and abundance of plant communities may be negatively impacted at deer densities as low as 10 deer per square mile (deCalesta 1997).

Results of Discussion with Park: Deer browsing and other activities are impacting vegetation resources within the park. The park has conducted studies, including exclosure plots, to study the impact of deer on park vegetation. Monitoring results between 1993 and 1998 suggest that fencing has allowed a diverse plant community to develop, dominated by native plant species adapted to specific environmental conditions. Plant communities in unfenced plots have been reduced to a suite of non-preferred or browse resistant plant species that in many cases are non-native species (Figure 2). Non-native plant species were unaffected by fencing (Heister et. al. 2002). Fencing also significantly affected the density and species composition of tree and shrub seedlings. Tree seedling density in fenced plots was three times higher than in unfenced plots. Red oak seedlings and mountain laurel seedlings were the most influenced by fencing with red oak seedlings only occurring in fenced areas. No seedlings, of any species, between 20 inches and 59 inches (50-150 cm) in height, were present in unfenced plots (Heister et. al. 2002). Continued removal of seedlings in taller height classes by deer browsing will prevent forest regeneration and may significantly impact habitat of associated wildlife species (e.g. lower canopy and ground nesting birds).

Wildlife and Wildlife Habitat

Issue: Other wildlife are affected by increasing deer density primarily as a result of the alteration of available suitable habitat or direct competition for limited food resources Direct competition is generally considered as it relates to impacts on mast-dependent small mammal communities (McShea 2000). The removal of understory forest vegetation as a result of increasing deer density impacts forest communities at multiple trophic levels. Impacts of overbrowsing on forest bird communities are well documented and include changes in species composition, abundance, and distribution. In Northwestern Pennsylvania, the threshold at which negative impacts to songbird populations were documented was between 20 and 38 deer per square mile (Latham et. al. 2005).

Results of Discussion with Park: Valley Forge NHP has not conducted studies on the impact of deer density on bird or other wildlife communities. However, baseline inventory data related to bird communities in the park have documented the low density of ground-nesting and shrub-nesting bird species within park woodlands. It was suggested that density of these bird species would remain low until the herbaceous and shrub layers in park woodlands are restored (Yahner et. al. 2001).

Deer Population

Issue: Growing deer populations will have adverse effects on their own species by limiting the quantity and quality of available food resources and increasing susceptibility to disease and starvation during severe winters.

Results of Discussion with Park: Condition of white-tailed deer was first assessed at Valley Forge NHP in 1983-1984. Deer condition or health was described as good with no evidence of malnutrition, disease, or limited food resources (Cypher et. al. 1985). Analysis of morphological measures from fawns killed on park roadways between 1992 and 1995, suggest that condition of white-tailed deer may be declining over time (Heister 1996). Additionally, anecdotal evidence in recent years suggests that food resources are becoming increasingly limited and deer more nutritionally challenged (Carfioli pers. comm.). A decrease in the quantity and quality of food resources may result in a decrease in body condition, expansion of deer home range, consumption of less preferred plant species, and starvation.

Special Status Species

Issue: Habitat for state-listed threatened or endangered species, rare and unusual species, or species of special concern may be vulnerable to impact from high levels of deer browsing activity.

Results of Discussion with Park: No species currently listed as federally endangered or threatened reside in Valley Forge NHP. However, 8 plant species and 20 animal species within the park are considered special status species. These primarily include species that are listed by the commonwealth of Pennsylvania as endangered, threatened, rare, or imperiled/vulnerable. At least one state-listed endangered plant species (*Viburnum nudum*) has been fenced to prevent extirpation from the park.

Cultural Landscapes

Issue: The pattern of wooded versus open habitats, commemorative plantings, and vegetative screening are identified as important elements of the park cultural landscape. In some cases, the presence and activities of high numbers of deer may affect the character of the cultural landscape.

Results of Discussion with Park: As the white-tailed deer population increases, heavy browsing of vegetation (and thus character-defining features of the cultural landscape) may increase. These important cultural resources could be lost.

Historic Structures

Issue: The park's historic structures include many earthworks which are protected from erosion by vegetation. As the growing deer population searches and competes for food they have begun using the vegetation that covers the earthworks as a source of food. Browsing of this vegetation leads to trampling and compaction of the earthworks and also exposes them to erosion.

Results of Discussion with Park: There is the potential for increased impact to these resources as browsing and trampling escalate with the growing population.

Visitor Use and Experience

Issue: If deer management activities were to decrease the numbers of deer in the park, sightings by visitors would also decrease. Conversely, as the number of deer increase, other resources that visitors come to see would decrease (see K.M. Leong 2006 under the "Background" section of this document).

Results of Discussion with Park: Some visitors to the park may view deer sightings as an integral part of their visit. Deer management actions may decrease the potential for visitors to observe deer within the park, causing less visitor satisfaction. Conversely, there are visitors who come to the park for other resources, such as songbirds. Increased deer browse has the potential to impact these other resources and impact the satisfaction of these visitors.

Socioeconomic Resources and Adjacent Lands

Issue: Based on the findings of the NPS radio tracking program it is clear that deer browsing affects neighboring land users. The presence of deer on neighboring properties has been linked to loss and damage of ornamental vegetation as well as safety concerns described below.

Results of Discussion with Park: The surrounding communities believe that the park is a source and/or refuge for deer that are damaging their landscaping and are asking the park to take action to reduce or eliminate the problem.

Public Health and Safety

Issue: Deer-related diseases may pose health risks to park visitors or area residents. Collisions between deer and motor vehicles have become an increasing concern for the park and surrounding community. Implementation of deer management activities must also account for the safety of the public and park employees. In addition to collision concerns, the deer herd also serves as a host for ticks carrying Lyme disease. Though the deer cannot transmit the disease to humans, a high deer population provides more hosts and may support a higher than normal tick population than may be expected.

Result of Discussion with Park: Deer ticks carry Lyme disease, and the CDC has stated that abundant deer and rodent hosts are necessary to maintain the spirochete *Borrelia burgdorferi*. Also, traffic volume within the park has increased in recent years, and is expected to continue to increase. High densities of deer and an increase in traffic could affect the safety of visitors and employees using park roads, as deer/vehicle collisions have occurred in the past and could increase. Finally, deer management activities will need to be conducted in a manner to ensure the safety of park visitors and employees.

ISSUES ELIMINATED FROM FURTHER CONSIDERATION

- **Geohazards:** There are no known geohazards within the park that would be affected by deer management activities or that would affect deer management activities.
- **Soils and Water Quality:** Although overbrowsing by deer can be related to increased rates of erosion and sedimentation of surrounding water resources, the impact is not at a scale great enough to be measured or evaluated in this plan.
- **Air Quality:** Impacts from loss of forest cover in a highly urban area are possible; however, this is too speculative in nature to consider or quantify.
- **Energy Resources:** The implementation of a deer resources management plan would not be expected to impact energy resources within the park.
- **Prime Farmlands:** No “unnecessary and irreversible conversion of farmland to non-agricultural uses” (Farmland Protection Policy Act of 1980) is expected under this action. Thus, no impacts to prime and unique farmlands are expected.
- **Paleontological Resources:** There are four known paleontological sites within the park, but they would not be affected by or interfere with deer management activities.
- **Floodplains:** No occupancy, modification, or development of floodplains is expected under this plan. The removal of ground vegetation through deer browsing could have the potential to increase stormwater runoff and flood events. However, it was determined that impacts related to an increase in water quantity would be negligible. Therefore, this topic was dismissed from further analysis.
- **Soundscapes:** Due to the urban setting of the park and the large amount of through-traffic, no natural soundscapes exist within the park. The proposed actions would not cause a noticeable change to the existing sound levels.

- **Archeological Resources:** Although some resources may be impacted by soil erosion (see above), the impact is not at a scale great enough to be measured or evaluated in this plan.
- **Museum Collections:** None of the proposed actions would affect museum collections.
- **Ethnographic Resources:** No specific sites, structures, or objects at Valley Forge NHP have been identified as ethnographic resources.
- **Indian Sacred Sites:** This plan would not restrict access to Indian sacred sites for ceremonial uses.
- **Environmental Justice:** The actions under this plan are not expected to have a disproportionate or significant adverse effect on any low income or minority populations in the area.

CUMULATIVE IMPACT SCENARIO

The CEQ regulations that implement NEPA require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as impacts which result when the impact of the proposed action is added to the impacts of other present and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions (40 CFR 1508.7).

During the internal scoping meeting, the study team initiated a discussion on cumulative impact topics. While there was no detailed discussion of impacts, the group identified potential projects and resources that may be considered in the analysis. Potential cumulative impact projects were associated with proposals made in the *Valley Forge NHP Draft GMP/EIS* as well as other projects both inside and outside park boundaries.

Valley Forge NHP Plans, Policies, and Actions

Valley Forge NHP has conducted numerous studies and continues long-term monitoring activities to gather data on trends in the park's deer population and forested plant communities, including deer spotlight surveys, spring deer counts, and fenced versus unfenced vegetation plots.

The park is preparing to release its new Draft GMP/EIS for public comment. The document lays out the management for the park over the next 10-15 years. Management objectives include cultural resource protection, natural resource management, as well as new educational and recreational opportunities. Natural resource management includes addressing invasive species and other altered habitats within the park. Proposed future actions are as follows:

- Acquire key remaining lands within the authorized boundary.
- Maintain tall grass cover on historic earthworks to prevent erosion and discourage trampling.
- Develop and implement a formal invasive species management plan.
- Fully protect sensitive habitats associated with state-listed rare, threatened, or endangered species to protect the viability of the species population.

- Work with Chester County and townships to preserve Valley Creek's and Fisher's Run's values as open space corridors.
- Reforest Fuller field and Waggonseller field.
- Manage select agricultural fields to encourage preservation of grassland species.
- Remove dams.
- Work with partners and community to restore Walnut Hill Run, Lamb Run, Fawn Run, and Meyer's Run.
- Remove both commuter and visitor vehicular traffic from the tour roads.
- Close Gulph Road to public traffic and restore it as a historic trace.
- Remove ranger station from the Mordecai Moore House and relocate to Park Support Zone.
- Stabilize and/or Rehabilitate historic structures.
- Demolish post-encampment era historic structures for which there is no feasible use.
- Remove remaining coal silt from siltation basins and replant native species.
- Fill the quarries within the Grand Parade.
- Expand the welcome enter and/or construct a new collection facility.
- Bury remaining overhead electric lines.
- Enhance the trail system within the park.
- Reopen link between Outer Line and Inner Line Drives for shuttle use only.
- Demolish non-contributing buildings in the park for which there is no feasible use.
- Re-establish important viewsheds.
- Rehabilitate and establish Interpretive Focus Areas at Muhlenberg's and the Grand Parade.
- Establish a shuttle system.
- Strengthen regional and internal trail connections.
- Implement traffic calming along Routes 252 and 23.
- Construct a new pedestrian bridge over the Schuylkill River.
- Construct a new pedestrian bridge/tunnel over/under Route 422.
- Move the maintenance complex from Grand Parade to Park Support Zone.
- Construct a new museum.

Local/State Plans, Policies, and Actions

The Pennsylvania Game Commission has produced its own *Management Plan for White-tailed Deer in Pennsylvania: 2003-2007*. The report was written to define the Pennsylvania deer population and explore management options to frame the future of Pennsylvania's deer management program. This report addresses deer populations throughout the state and may have already placed certain practices and procedures into motion which could affect the Valley Forge deer population over the long-term. Likewise, surrounding townships have also initiated efforts to manage the growing deer population. If the efforts of the NPS and these other groups are not in harmony, the deer population will not be safely or effectively managed. The following table illustrates these efforts.

Table 1: Chronology of Events in Community Deer Reduction Programs

Year	Site	County
1945	French Creek State Park	Chester
1973	Nockammixon State Park	Bucks
1974	Marsh Creek State Park	Chester
1976	Evansburg State Park	Montgomery
1983	Ridley Creek State Park	Delaware
1983	Nottingham County Park	Chester
1984	Pennypack Preserve	Montgomery
1987	Tyler State Park	Bucks
1987	White Clay Creek Preserve	Chester
1990	Brandywine Conservancy	Chester
1991	Natural Lands Trust	Bucks, Chester, Delaware, Montgomery
1992	Tyler Arboretum	Delaware
1994	Warwick County Park	Chester
1996	Morris Arboretum	Philadelphia
1997	Alverthorpe Township Park	Montgomery
1999	Wissahickon Park	Philadelphia
1999	Tredyffrin Township	Chester
2000	Jenkins Arboretum	Chester
2000	Schuylkill Center for Environmental Education	Philadelphia
2000	Pennypack Park	Philadelphia
2001	Lorimar County Park	Montgomery

Future development plans in the surrounding communities could potentially have impacts on park resources either directly through development activities, or indirectly through the alteration of habitat adjacent to the park and increased human population densities. The other projects include, but are not limited to, the following:

Valley Creek Restoration Plan

Following the discovery of polychlorinated biphenyl (PCB) contamination of Valley Creek, the Valley Creek Trustee Council was formed to develop a plan for recovery of the creek's natural and recreational values. The plan calls for projects to infiltrate stormwater, stabilize stream channels, maintain greenways along the creeks in the watershed, increase access by anglers and other users of the watershed, and restore a population of brook trout in Crabby Creek. Grant money is available for projects in the watershed that meet these goals.

Valley Creek Integrated Stormwater Management Plan

The Chester County Water Resources Authority is leading an initiative to develop an Integrated Stormwater Management Plan for the approximately 23 square miles of the East Valley Creek watershed,

of which about one square mile is in Valley Forge NHP. The plan will include both a Pennsylvania Act 167 stormwater management study for a watershed-wide approach to preservation and restoration, and also a natural stream assessment (fluvial geomorphology study) to identify how well various stream reaches are functioning.

River Crossing Complex Projects

The project includes the Betzwood Bridge replacement project, the US 422/PA 23 interchange with North Gulph Road relocation, and the US 422/PA 363 interchange with US 422 widening from Trooper Road to US 202.

Schuylkill Valley Metro Transit Improvement

The Schuylkill Valley Metro public transportation project is proposed for the Schuylkill Valley Corridor, extending approximately 62 miles between Reading, Pennsylvania and Philadelphia. It is a joint project sponsored by the Berks Area Reading Transportation Authority and the Southeastern Pennsylvania Transportation Authority (SEPTA). The region within the corridor is one of the fastest growing areas in southeastern Pennsylvania. Its two principal highways, the Schuylkill Expressway (I-76) and the US 422 Expressway, as well as many arterial and secondary roads, are plagued by congestion. Existing public transportation consists of limited bus service, concentrated primarily toward the Reading and Philadelphia ends of the corridor and a commuter rail service between Philadelphia and Norristown and Philadelphia and Paoli that does not directly serve the newer centers of growth in the corridor.

Improvements to PA 23 Upper Merion Township

The project study area is 12,100 acres in size and focuses on existing PA 23 between US 422 in the west and US 202 in the east. In order to consider a reasonable range of project alternatives, the study area includes roadways generally parallel to PA 23, such as US 202 to the south to Trooper Road/Egypt Road/Main Street on the north side of the Schuylkill River. The study area also includes Valley Forge NHP to assess the possible impacts and benefits of the project on the park. Concurrence on project need for the improvements to PA 23 in Upper Merion Township was obtained from the agency coordination meeting in late 2002. The alternatives considered included: no-action; Transportation Systems Management (TSM); mass transit; improvements to west end of Route 23; widen existing Route 23; and relocate Route 23 on new alignment and widen Trooper Road/Egypt Road/Main Street. The project is in the preliminary alternatives analysis phase (step 4 of PennDOT's 10 Step Transportation Project Development Process).

Pennsylvania Turnpike Widening

The section of the PA Turnpike between mileposts 326 (Valley Forge) and 333 (Norristown) was originally built in the 1950s. Reconstruction of this portion of the highway began in 1998 with the $35.6 million Schuylkill River Bridge Project that resulted in a new six-lane bridge. Funding is now available to complete the reconstruction (including widening of the turnpike to six lanes) of the area between the Valley Forge and Norristown interchanges. The work would be done in stages that would impact motorists and the turnpike's neighbors in different ways.

Asbestos Release Site

In January 1997, during the installation of a fiber optic cable in the Amphitheater Quarry of Valley Forge NHP, park staff discovered a suspicious substance in the soil later confirmed to contain asbestos. At the request of the NPS, the EPA initiated an emergency response action between May and October 1997 to abate the immediate risks to public health, welfare, and the environment posed by contaminated soils. The impacted area is referred to as the Valley Forge Asbestos Release Site (ARS). The site is currently being investigated so that a long-term remedy can be implemented. Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP), a separate public process will evaluate a suite of alternatives for cleaning up the site and returning the contaminated areas to safe and beneficial public use.

PRELIMINARY ALTERNATIVES

Alternatives, at a minimum, must meet objectives to a large degree, while meeting the purpose of and need for action. See Director's Order12, 2.7;4.5 (EIS); 5.3 (EA)

The discussion of preliminary alternatives during the internal scoping meeting focused on the components or potential actions that could become part of an alternative. The discussion did not proceed to the point where a complete set of alternatives could be formulated. Therefore, this chapter describes the No-Action Alternative, *preliminary* alternative management strategies as they were developed during the internal scoping meeting, as well as alternative management strategies that were considered but dismissed. All alternatives must be consistent with the purpose and significance of Valley Forge NHP and NPS law and policy, and must meet the purpose of and need for action, as well as the management objectives. The preliminary alternative management strategies could be used individually or in some combination that would be appropriate for achieving the management objectives. The alternatives may be further developed using the following list and other issues derived from public and additional agency scoping.

NO-ACTION ALTERNATIVE

As required under CEQ regulations 40 CFR 1502.14(d) the alternatives analysis in an EIS must "include the alternative of no-action." According to the CEQ, there are two distinct interpretations of "no action" that must be considered, depending on the nature of the proposal being evaluated. The first situation might involve an action such as updating a land management plan where ongoing programs initiated under existing legislation and regulations will continue, even as new plans are developed. In these cases "no action" is (CEQ FAQs, n.d.):

> *"…no change" from current management direction or level of management intensity. To construct an alternative that is based on no management at all would be a useless academic exercise. Therefore, the "no-action" alternative may be thought of in terms of continuing with the present course of action until that action is changed. Consequently, projected impacts of alternative management schemes would be compared in the EIS to those impacts projected for the existing plan. In this case, alternatives would include management plans of both greater and lesser intensity, especially greater and lesser levels of resource development."*

As a mandated alternative, the no-action alternative "sets a baseline of existing impact continued into the future against which to compare impacts of action alternatives" (Director's Order 12, Section 2.7). Under the No-Action Alternative, no management actions would be undertaken to manage deer populations (see History of Deer Monitoring and Research at Valley Forge NHP on page 11). Current monitoring efforts would continue to record deer impacts and deer population numbers within the park. Other existing resource management efforts within the park would continue. The proposed action alternatives will be

compared to the existing management actions. Currently, deer management on NPS lands within the park includes only fencing to exclude deer from selected areas for the purpose of monitoring or resource protection. However, deer management (including fencing, repellents, and direct population reduction) occurs outside the park on adjacent lands. Under a no-action alternative, those management actions would continue. Current deer-related activities at Valley Forge NHP include:

- Vegetation monitoring / exclosure studies
- Deer population monitoring: fall spotlight counts and spring compartment counts
- Restored area fencing: riparian areas and around the Caprifoliaceae (*Viburnum nudum*)
- Road kill removal / morphometrics of road-killed deer
- Public education: flyers on fawns available at kiosks and on the park website, bi-annual program for population biology classes, responding to daily inquiries
- Moveable deer crossing sign
- Coordination with PGC on monitoring/preventing occasional poaching
- Initiating Chronic Wasting Disease monitoring

POTENTIAL ALTERNATIVE DEER MANAGEMENT STRATEGIES

Reproductive Control (Chemical)

Reproductive controls can generally be divided into contraception (i.e., preventing conception) and contragestation (i.e., preventing gestation or pregnancy). There are two chemical methods biologists utilize to inhibit deer conception (Winand n.d.):

- Synthetic hormones (either digested or implanted) that cause deer to inhibit or block any stimulation from the brain for ovulation to occur.
- Immunocontraception which “vaccinates” deer to stimulate the immune system to produce antibodies against certain proteins involved in fertilization and ultimately prevents sperm from penetrating and fertilizing the egg.

Contraceptive methods that utilize either supplemental synthetic hormones or immunocontraceptive vaccines have successfully prevented conception in individually treated deer (Warren 2002). Delivery of synthetic hormones via ingestion or implantation limits use of this method due to concerns related to ingestion by non-target species, ensuring proper dosage, and costs associated with the need to physically capture deer for implantation. Additionally, implants must be embedded prior to the breeding season when food is plentiful and deer are most difficult to capture.

Immunocontraception is the most widely used method and has the best potential for use in urban environments. This “vaccine” is administered to female deer remotely via a single-dart delivery system.

This system requires an initial dose in year one and then a follow-up booster shot in year two to be effective in preventing conception. The same deer will need to be re-treated periodically to continue to prevent pregnancy.

Fencing of Targeted Vegetation Communities

Fencing landscape plants and crops is an effective way to eliminate deer browsing (API 2000). Fencing is most successful for smaller areas of vegetation such as small orchards and gardens (Maryland DNR 2002). Valley Forge NHP covers more than 3,452 acres and includes relatively undeveloped land situated within a highly developed region, and surrounded by residential and industrial development and transportation corridors. The alternative of fencing the entire perimeter of the park is not feasible due to public accessibility, cost, and maintenance requirements; however, fencing could be used in select locations to prevent deer browsing. The fence would need to be a minimum height of 8 feet, to be effective in preventing deer from jumping the fence, and require monitoring and maintenance.

Lethal Reduction with Firearms by Specially Trained Professionals

This option would require NPS personnel or authorized agents of the park to shoot deer in an effort to reduce the population. Only qualified federal employees or contractors that are highly skilled and trained in the use of firearms and public safety would participate in the reduction. Visitor access would be restricted as necessary during the time the reduction is taking place and the park would be patrolled by NPS law enforcement to ensure public safety. Harvested deer would be collected, field-dressed, processed, and stored in a manner consistent with federal and state laws and regulations. Data such as age, weight, and sex would be recorded on each deer. Venison would be donated to local charity organizations.

Lethal Reduction without Firearms by Specially Trained Professionals (Archery)

Under this alternative, archery would be used for deer reduction rather than firearms. As noted above, qualified federal employee or contractor would implement this strategy.

Lethal Reduction without Firearms by Specially Trained Professionals (Capture/Euthanasia)

Under this option, deer would be trapped using a standard capture method (e.g. baited box traps, clover traps, or drop nets) and subsequently euthanized by head shots using a firearm or penetrating captive bolt gun in accordance with guidelines of the American Veterinary Medical Association. Euthanized deer would be field-dressed, processed, and stored in a manner consistent with federal and state laws and regulations. Data such as age, weight, and sex would be recorded on each deer. Venison would be donated to local charity organizations.

ALTERNATIVE MANAGEMENT STRATEGIES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

Other potential alternatives for consideration broached during internal scoping follow. These alternatives were eliminated due to the reasons provided.

Fencing of Entire Park

This alternative would involve fencing the entire park unit to prevent deer from entering or leaving Valley Forge NHP. The minimum fence height would need to be approximately 8 feet to prevent deer from jumping over the barrier. Fencing would prevent deer from being pushed into Valley Forge NHP from surrounding areas during hunting season, and it would also prevent deer from the park entering the adjacent neighborhoods, alleviating impacts to the community. However, vegetation within Valley Forge NHP would continue to suffer the effects of deer browse, the deer population within the fenced area would continue to increase, and the health of the contained herd would eventually suffer. Therefore, all deer within the fence would either need to be removed or the deer population within the fence would need to be managed with other methods to meet the goals of the park management plan. Furthermore, because Route 23 passes through the park, fencing would have to be designed to not block the road. This would require increased logistics for access to the park and would reduce the image of the park. Large fencing could also adversely impact the cultural landscape at Valley Forge NHP. For these reasons, this alternative management strategy was dismissed.

Hazing of Deer from the Park

36 CFR Section 2.2 prohibits “The feeding, touching, teasing, frightening or intentional disturbing of wildlife nesting, breeding, or other activities.” Hazing could also increase the chances for collisions between motor vehicles and deer. Hazing would also push the deer out of the park and into surrounding communities. This would increase impacts to surrounding properties, an unacceptable consequence. Therefore hazing of deer from the park to adjacent areas was dismissed.

Reproductive Control (Surgical)

This option would involve a tranquilizing agent administered via a dart by qualified personnel. Once the tranquilizing agent had taken effect, surgery in the field would be performed by a qualified veterinarian to remove select reproductive organs from male deer. This approach would focus on male deer since similar surgery on female deer would be highly invasive and represent a significant risk to the animal. Due to the ability of male deer to impregnate multiple females this approach would require treatment of ALL males in the population. Because this option is cost prohibited, surgical reproductive control was dismissed.

Reintroduction of Predators

This alternative is not feasible at Valley Forge NHP due to a lack of suitable habitat that is sizable enough to support populations of large predators such as gray wolves or cougars. Moreover, the park is

surrounded by developed area and the proximity to humans is not appropriate for reintroduction of large predators. Coyotes (*Canis latrans*) are present in the park and bobcats (*Lynx rufus*) potentially could be supported by habitats within the park. However, these predators have been shown not to exert effective control on white-tailed deer populations (Coffey and Johnston 1997). Based on these reasons, this option was dismissed.

Public Hunting

Public hunting has been considered and rejected based on legal and policy constraints. The NPS has a legislative mandate to protect the natural and cultural resources within national parks; it does not have a mandate to allow public hunting in parks. In NPS units where Congress intended to allow hunting, such as National Recreation Areas, it has been specifically authorized. NPS units designated at National Historical Parks are prohibited from even considering public hunting. Consistent with this approach, the history, policies, and regulations of the NPS clearly show that the NPS has interpreted the Organic Act to mean that hunting should not be allowed in national parks unless specifically authorized by Congress. Courts have upheld this interpretation as reasonable, and the NPS recently re-affirmed its no-hunting policy in its 2006 management policies. Therefore an alternative that would allow hunting in national parks where Congress has not already specifically authorized hunting is not likely to be implemented. Because the prospect that the NPS will change its long-standing regulations and policies regarding hunting is remote and speculative, and because hunting in national parks without Congressional authorization is in conflict with the basic policy objectives of the NPS, an alternative that allows public hunting in national parks has been considered and rejected.

Translocation

Live-capture of white-tailed deer and their relocation to another environment may be considered when dealing with small deer populations. Live-capture and relocation as an alternative may have limited success in controlling a small, isolated population, or in removing animals from one area to augment populations in other areas where the deer population is below desired levels (Coffey and Johnston 1997). Live-capture and relocation can be stressful (DeNicola and Swihart 1997) and result in high mortality rates in the relocated deer (Warren 2002). Additionally, the Pennsylvania Game Commission has an unwritten policy that translocation of deer is an undesirable deer management strategy due to risk to the animal and potential for transmission of disease (Doug Killough, pers. comm.). Therefore, this option was dismissed.

Repellents, Plantings (Sacrificial and Replacement), and Other Deterrents

Chemical repellents and the selection of plants that are not palatable to deer are good options for individual homeowners to discourage deer from destroying residential yards and gardens. There are two types of repellents: contact and area. These repellents can be sprayed on or attached to nearby vegetation, thus protecting individual plants or larger areas (Coffey and Johnston 1997). Repellents are removed by rainfall, requiring repeated applications. At high deer densities, repellents may be totally ineffective (Maryland DNR 2002). Therefore, it would be impractical to effectively manage deer in a large natural park setting. Visual and sound deterrents are also available to scare deer away from areas (API 2000).

Again, visual and sound deterrents would be impractical in a large park setting and could have impacts on visitor experience, therefore this option was dismissed.

Supplemental Feeding

Providing supplemental food to deer as a way of reducing damage to natural or ornamental vegetation is often suggested. Increasing food sources through supplemental feeding could increase survivability and reproduction, thus compounding problems that already exist. Providing alternative food sources may provide temporary relief from browsing on plants needing protection, but will not provide a long-term solution. In addition, supplemental feeding on a park-wide basis would be logistically and economically impractical (Maryland DNR 2002). For these reasons, this option was dismissed.

Poisons

Currently, there are no toxicants, poisons or lethal baits registered for deer control. Quick-acting lethal chemicals are available, but there are no safe methods for delivering lethal dosages to free-ranging deer. The use of toxicants carries many hidden risks that may be socially unacceptable. These include potential human health risks, particularly if poisoned free-roaming deer occur in areas open to legal hunting as well as risks to non-target animals, including pets that might eat baits or scavenge carcasses of poisoned deer (Bishop et al. 1999). For these reasons, this option was dismissed.

AFFECTED ENVIRONMENT

DO-12 says (in accordance with NPOMA) that if information critical to decision-making is lacking, then the action should be modified to eliminate the portion of the action where impacts are uncertain. In addition, NEPA and CEQ specify what must be done in absence of info: "When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking" (Section 1502.22). The "Affected Environment" should state clearly what information is available, where conflicts exist in the data/interpretation and what information is lacking.

See Director's Order 12 Handbook 2.8; and Director's Order 12 4.4 and 4.5 (unavailable information and use of technical and scientific analysis in decision making).

The following resources related to deer management at Valley Forge NHP have been collected or will be collected. These documents and other references will be used to prepare the Affected Environment chapter of the EIS.

Legislation

Unrau, Harlan D. September 1985. *Administrative History: Valley Forge NHP Pennsylvania*.

Valley Forge NHP Planning Documents

NPS. 1982. *General Management Plan*
NPS. 1992. *Field Management Plan: Valley Forge National Historical Park*
NPS. 1999. *Valley Forge National Historical Park Resource Management Plan.*
NPS. 2000. *Strategic Plan for Valley Forge NHP, Fiscal Year 2001-2005*
NPS. 2001. *Cultural Landscape Inventory*
JMA. 2002. *Contextual Documentation and Cultural Landscape Plan Volumes I and II*
NPS. 2006. Draft *General Management Plan/EIS*
NPS. 2006a. *Valley Forge National Historical Park Business Plan*

Valley Forge NHP Resource Information

Anderson, Roger C. 2001. *High white-tailed deer density has negative impact on tallgrass prairie forbs.*

Bashore, Terry L. 1985. *Analysis of Deer-Vehicle Collision Sites in Pennsylvania*
Batcheller, Michele. 2004. *Implementation of Deer Management Plan Costs.*

Bowersox, T.W. and D.S. Larrick. 1999. *Long-Term Vegetation Monitoring of Forested Ecosystems at Hopewell Furnace National Historic Site and Valley Forge National Historical Park.*

Connecticut DEP, Wildlife Bureau. 1988. *An Evaluation of Deer Management Options.*
Cooper, Helen. 1997. *Deer Population Discussed by Townships.*
Cornell Cooperative Extension. 2005. *Managing White-Tailed Deer in Suburban Environment.*
Cornell University Cooperative Extension. 2005. *Reducing Deer-Vehicle Crashes.*
Curtis, Paul D. and John R. Hauber. 1997. *Public Involvement in Deer Management Decisions.*
Cypher, B.L. et al. 1985. *Ecology and Management of White-tailed Deer at Valley Forge National Historical Park.*
Cypher, B.L. et al. 1988. *Seasonal Food Use by White-tailed Deer at Valley Forge National Historical Park, Pennsylvania, USA.*

deCalesta, David S. 1993. *Effective Diversity Carrying Capaicty: An Expanded Concept for Deer.*
deCalesta, David S. 1993. *Impact of Deer on Songbirds within Intensively Managed Forestland.*
deCalesta, David S. 2003. *Deer, Ecosystem Damage, and Sustaining Forest Resources.*
Decker, Daniel J. et al. 2004. *A Practitioner's Guide to Community-Based Deer Management.*
Dunn, Cindy. 2003. *The Importance of Deer Overabundance.*

Fraker, Mark A. et al. 2002. *Long-Lasting, SingleDose Immunocontraception of Feral Fallow.*
Frattaroli, Leslie. 1998. *The Effect of White-tailed deer on Reforestation at Valley Forge.*

Gill, Robin. 2000. *The Impact of Deer on Woodland Biodiversity.*

Heister, Kristina. 1995. *White-tailed Deer Data Summary: 1984-1995.*
Heister, Kristina M. et al. 2002. *Analysis of Understory Vegetation in Fenced and Unfenced Plots at Valley Forge National Historical Park, 1993-1998.*

Knauer, Josh. 1995. *Deer Overpopulation in Western Pennsylvania: An Analysis of Impacts.*

Largay, Ery and Lesley Sneddon. 2006. *Desired Forest Conditions at Valley Forge National Historical Park (Draft).*
Latham, Roger Earl et. al. 2005. *Managing White-tailed Deer in Forest Habitat From an Ecosystem Perspective.*
Leong and Decker. 2005 *Identifying Capacity for Local Community Participation in Biological Resource Management Planning on Federal Reserves.*
Leong, Kristin et al. 2005. *White-tailed Deer Issues in NPS units: Insights from Natural Resource Managers in the Northeastern U.S.*
Lovallo, M.J. and W.M Tzilkowski. 2003. *Abundance of White-tailed Deer (Odocoileus virginianus) within Valley Forge National Historical Park and Movements Related to Surrounding Private Lands.*

McShea, W.J. and J.H. Rappole. 2000. *Deer Can Threaten Forest Birds.*
Miller, Lowell, Ph.D. 2002. *Summary of PZP Research White-Tailed Deer.*

Montgomery County. 1994. *Report of the Task Force to Study White-tailed deer Management.*
Montgomery County. 1995. *Comprehensive Management Plan for White-tailed Deer in Montgomery County, Maryland.*
Moser, Charles and Kristina Heister. 1997. *Distribution and Borrelia Burgdorferi Infection Rates in Ixodes Scapularis at Valley Forge NHP.*

NPS. 1985. *Ecology and Management of White-tailed Deer at Valley Forge National Historical Park.*
NPS. 1995. *Final EIS White Tailed Deer Management Plan for Gettysburg NMP.*
NPS. 1996. *Forest Management and the Restoration of Historic Scenes: Petersburg National Battlefield Park, Virginia.*
NPS. 2005. *Human Dimensions of White-tail Deer Issues at Valley Forge National Historical Park.*

Pennsylvania Game Commission. *A Plan to Reduce Deer-Human Conflicts in Developed Areas.*
Pennsylvania Game Commission. 2002. *Draft Management Plan for White-Tailed Deer in Pennsylvania.*
Pennsylvania Game Commission. 2002. *Deer Management 2002 Taking the Next Step Forward.*
Pennsylvania Game Commission. 2005. *Pennsylvania's Chronic Wasting Disease Response Plan.*
Pennsylvania Game Commission. 2006. *A Plan To Reduce Deer-Human Conflicts in Developed Areas.*
Podniesinski, G. et. al. 2005. *Vegetation Classification and Mapping of Valley Forge National Historical Park.*
Pomerantz, Joanne T. and Joan M.1996. *Utilization of Woody Browse by White-Tailed Deer in Valley Forge National Historical Park.*
Ponge, Jean-Francois et al. 1998. *The Forest Regeneration Puzzle: Biological Mechanisms in Humus Layer.*
Porter, William F. et al. 1991. *Social Organization in Deer: Implications for Localized Management.*

Rhoads, Ann F., Douglas Ryan, and Ella W. Aderman. 1989. *Land Use Study of Valley Forge NHP, Final Report.*
Rosenbaum, George et al. 2000. *Predicting the Future Forest Composition in Valley Forge National Historical Park.*
Rosoff, Barbara. 2001. Deer in the Headlights: *An Analysis of Deer-Vehicle Collision Sites in Valley Forge National Historical Park.*
Rowe, Amber and Kristina Heister. 1999. *Morphological Characteristics of White-Tailed Deer Fawns at Valley Forge National Historical Park between 1997 and 1999.*

Storm, Gerald L. et al. 1995. *Movements and Habitat Use by Female Deer in Historic Areas.*

The Wildlife Society. 1998. *Managing Abundant White-tailed deer populations in the Eastern United States.*
Townsend, Daniel S. and Andrew D. 2002. *Rapid Recovery of Witch Hazel (Hamamelis virginiana) by Sprouting, following Release from Deer Browsing.*
Townsend, Daniel S. et. al. 2002. *Structure and Composition of a Northern Hardwood Forest Exhibiting Regeneration Failure.*

Yahner, R.W. et. al. 2001. *Comprehensive Inventory Program for Birds at Six National Parks.*

ENVIRONMENTAL CONSEQUENCES

Important changes have been made in the way the NPS analyzes, describes, and documents (formats) its NEPA analysis. It is mandated by DO-12, section 4.5 (g).

Using the best available data, the context duration, and intensity of impacts, including cumulative impacts, must be defined. NPS must systematically analyze the impact of each alternative in terms of its context, duration, and intensity of effect on unit resources and values and based on this analysis determine the potential for impairment.

As required by NEPA, potential impacts are described in terms of type (beneficial or adverse, direct or indirect), context (site-specific, local, or regional), duration (short-term or long-term), and level of intensity (negligible, minor, moderate, or major). Overall, the impact analyses and conclusions will be based on a review of existing literature and Valley Forge NHP studies, information provided by on-site experts and other agencies, professional judgments and park staff insight, and federal agencies. The following general definitions will be used to assess impacts in the Environmental Consequences chapter of the EIS.

Type

"Type of impact" is the effect that an action has on a resource.

- **Beneficial**: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
- **Adverse**: A change that moves the resource away from a desired condition or detracts from its appearance or condition.

- **Direct:** An impact that is caused by an action and occurs at the same time and place.
- **Indirect:** An impact that is caused by an action but is later in time or farther removed in distance, but still reasonably foreseeable.

Context

Context is the setting within which an impact is analyzed.

- **Site-specific**: The impact would affect the project site.
- **Local:** The impact would affect the park.
- **Regional:** The impact would affect localities, cities, or towns surrounding the park.

Duration

For all resources and values, the duration of impacts in this document is defined as follows:

- **Short-term:** Impacts that occur only during the initial implementation.
- **Long-term:** Impacts that last longer than one year.

Level of Intensity

"Level of intensity" is measured by severity and magnitude of impact, i.e. negligible, minor, moderate, or major. Because the level of intensity varies by impact topic, intensity threshold definitions will be provided separately for each impact topic considered in the EIS. The following general definition can be applied:

- **Negligible:** The change to the resource would not be measurable or perceptible.
- **Minor:** The change to the resource would be detectable but would require effort to measure. The consequences of the impact would not be readily apparent and the area affected would be small.
- **Moderate:** The change to the resource would be clearly measurable.
- **Major:** The change to the resource would be readily apparent and cause substantial or permanent losses/benefits. The area affected would be large-scale.

CONSULTATION AND COORDINATION

Since the beginning of the planning process for the *Valley Forge NHP Draft GMP/EIS*, the park and its planning team reached out to stakeholders including the general public, interested individuals, local governments, organizations, and any agencies having jurisdiction by law or expertise for assistance in determining the scope of issues that should be addressed by the plan. One of the primary concerns voiced by the public was the need to manage the growing deer population. The interest in this subject was so great that the NPS felt it necessary to table any discussion on the proposed management until after the GMP was complete. With the completion of the GMP, the NPS can move forward with the public to focus on managing the Valley Forge NHP deer population.

A public involvement plan is designed to provide a complete record of public involvement efforts from initial meeting notices and the Notice of Intent to the decision document, the Record of Decision. The entire plan is designed to be a dynamic and flexible document, easily modified to be responsive to the different phases of the environmental analysis process and to changing needs.

The purpose of the public involvement plan is to establish a process that maximizes public participation and information and creates opportunities for neighboring citizens (including private land holdings within the park), park visitors, neighboring jurisdictions, agencies, and other members of the interested or affected public to provide input throughout the environmental analysis process. It is equally important that agency and public issues and concerns are effectively conveyed to the project team to ensure a comprehensive environmental analysis. People can effectively evaluate and comment on the *Valley Forge NHP White-tailed Deer Management Plan/ EIS* only when they understand what the actions are and have been adequately informed about proposed management actions under each alternative and the potential environmental consequences of implementation.

Activities initially proposed to meet the public involvement goals will include announcements in the *Federal Register*; public meetings and/or open houses; media interaction; preparation and dissemination of informational materials, press releases, and news articles; and responding to questions and comments.

REFERENCES

BIBLIOGRAPHY

Alverson, W.S. 1988. *Forests to Deer: Edge Effects in Northern Wisconsin*. Conservation Biology 2:348-358.

Anderson, R.C. 1994. *Height of white-flowered trillium (Trillium grandiflorum) as an Index of Deer Browsing Intensity*. Ecological Applications 4:104-109.

Animal Protection Institute (API). 2000. *Humane Ways to Live with Deer*. Animal Protection Institute Fact Sheet. Available at www.api4animals.org/doc. Last revised June 6, 2000.

Augustine and Frelich 1998. *Effects of White-tailed Deer on Populations of an Understory Forb in Fragmented Deciduous Forest*. Conservation Biology 12:995-1004.

Bishop, P.J. et al. 1999. *A Citizen's Guide to the Management of White-tailed Deer in Urban and Suburban New York*. New York State Department of Environmental Conservation.

Coffey, M.A. 1999. *White-tailed deer in National Parks*. NPS-Natural Resource Information Division Fact Sheet. National Park Service, U.S. Department of Interior. Available at www.nature.nps.gov/facts/fdeer2.htm.

Coffey, M.A. and G.H. Johnston 1997. *A Planning Process for Managing White-tailed Deer in Protected Areas: Integrated Pest Management*. Wildlife Society Bulletin 1997, 25(2):433-439.

Cypher, B. L., R. H. Yahner and E. A. Cypher. 1985. Ecology and Management of White-tailed Deer at Valley Forge National Historical Park. U. S. Dept. of Interior, National Park Service, Valley Forge National Historical Park. NPS Contract No: 14-16-0009-1548.

Cypher, B.L. et al. 1988. *Seasonal Food Use by White-tailed Deer at Valley Forge National Historical Park, Pennsylvania, USA.*

deCalesta, D.S. 1994. *Effect of White-tailed Deer on Songbirds within Managed Forests in Pennsylvania*. Journal of Wildlife Management. 58:711-718.

deCalesta, D. S. 1997. *Deer and ecosystem management*. Pages 267-279 in McShea, W. J., H. B. Underwood, and J. H. Rappole eds. The Science of Overabundance. Smithsonian Institution Press, Washington, DC.

deNicola, A.J. and R.K. Swihart 1997. *Capture-induced Stress in White-tailed Deer*. Wildlife Society Bulletin 25:500-503. As cited in Warren 2002.

Heister, K. M. 1996. *White-tailed Deer Data Summary: 1984-1995*. U. S. Dept. of Interior, National Park Service. Unpublished Report.

Heister, K. M., G. W. Fairchild and A. M. Faulds. 2002. *Analysis of Understory Vegetation, in Fenced and Unfenced Plots at Valley Forge National Historical Park, 1993-1998*. U. S. Dept. of Interior, National Park Service. Unpublished Report.

Killough, Doug. 2006. Personal communication.

Latham, Roger Earl et. al. 2005. *Managing White-tailed Deer in Forest Habitat from an Ecosystem Perspective Pennsylvania Case Study*.

Lovallo, M. J. and W. M. Tzilkowski. 2003. *Abundance of White-tailed Deer* (*Odocoileus virginianus*) *within Valley Forge National Historical Park and Movements Related to Surrounding Private Lands*. U.S. Dept. of Interior, National Park Service, Technical Report NPS/NERCHAL/NRTR-03/091. 164p.

Maryland DNR 2002. *Deer Management Options*. Available at www.dnr.state.md.us/wildlife/options.html.

McCabe, R.E. and T.R. McCabe 1984. *Of slings and arrows: an historical retrospection. White-tailed Deer Ecology and Management*. Edited by L.K. Halls, Pages 19-72.

McShea, W.J. 2000. *The Influence of Acorn Crops on Annual Variation in Rodent and Bird Populations*. Ecology. 81:228-238.

McShea, W.J. and J.H. Rappole 2000. *Managing the Abundance and Diversity of Breeding Birds Populations through Manipulation of Deer Populations*. Conservation Biology. 14:1161-1170.

National Park Service. 2006. *Management Policies 2006*. U.S. Department of the Interior, National Park Service. Washington, D.C.

Pennsylvania Game Commission. 2002. *Draft Management Plan for White-Tailed Deer in Pennsylvania (2003-2007)*.

Podniesinski, G., L. Sneddon, J. Lundgren, H. Devine, B. Slocumb and F. Koch. 2005. *Vegetation Classification and Mapping of Valley Forge National Historical Park.* U. S. Dept. of Interior, National Park Service, Technical Report NPS/NER/NRTR—2005/028.

Pomerantz, Joanne T. et. al. 1996. *Utilization of Woody Browse by White-Tailed Deer in Valley Forge National Historical Park.*

Porter, W.F. 1991. *White-tailed Deer in Eastern Ecosystems: Implications for Management and Research in National Parks*. PS Natural Resources Report. NPS/NRSUNY/NRR-91-05.

Ruthberg, Allen T., Jay F. Kirkpatrick, and Mark E. Fraker. 2002. *Improving the effectiveness of immunocontraceptives for the control of white-tailed deer* (*Odocoileus virginianus) populations*

Waller, D. M., and W. S. Alverson. 1997. *The white-tailed deer: a keystone herbivore*. The Wild. Soc. Bull. 25(2): 217-226.

Warren, R.J. 2002. *Deer Population Management Through Hunting and Alternative Means of Control.* Available at www.arec.umd.edu/Policycenter/Deer-Management-in-Maryland/warren.htm.

Winand, C.J. n.d. *The Deer Pill*. Published in the October Issue of BuckMasters Magazine. Available at http://www.bowsite.com/bowsite/features/armchair_biologist/immunocontraception/PILL1.htm.

Yahner, Richard H., Bradley D. Ross, Gregory S. Keller, and David S. Klute. 2001. *Comprehensive Inventory Program for Birds at Six Pennsylvania National Parks.*

APPENDIX A: SCIENCE TEAM

Table A-1: Science Team Members

Name	Position	Agency	Education	Area of Expertise
Dr. Duane R. Diefenbach	Assistant Unit Leader and Adjunct Associate Professor of Wildlife Ecology	U.S. Geological Survey; PA Cooperative Fish and Wildlife Research Unit	B.S., Washington State University M.S., University of Maine Ph.D., University of Georgia	• Long-term vegetation monitoring • Population monitoring • Harvest management
Dr. Brian Underwood	Adjunct Assistant Professor, State University of New York (SUNY)	U.S. Geological Survey	B.S., Wildlife Resources, West Virginia University M.S., Wildlife Ecology, SUNY, College of Environmental Science & Forestry Ph.D., Wildlife Ecology, SUNY, College of Environmental Science & Forestry	• White-tailed deer population effects • Birth control methods • White-tailed deer behavior • Lyme disease
Michael Mayer	Environmental Protection Specialist	National Park Service, Environmental Quality Division	B.S., Fish and Wildlife Biology, University of Massachusetts, Amherst M.S., Wildlife and Fisheries Conservation, University of Massachusetts, Amherst J.D., Northwestern School of Law, Lewis and Clark College; Certification in Environmental Law	• White-tailed deer management techniques • White-tailed deer management thresholds • NPS policy on white-tailed deer management
Harris Glass	State Director, Wildlife Services	USDA-Animal and Plant Health Inspection Service (APHIS)	B.S., Wildlife Management, Texas Tech University M.S. , Wildlife Management, Sul Ross State University	• Habitat protection • Human health issues • Wildlife disease • Lethal means of managing deer

Table A-1: Science Team Members

Name	Position	Agency	Education	Area of Expertise
Dr. Christopher Rosenberry	Supervisor, Deer Management Section	Pennsylvania Game Commission	B.S., Juniata College Ph.D., North Carolina State Univ.	• Wildlife biometrics • Deer damage assistance • Deer management planning
Merlin Benner	Wildlife Biologist	Pennsylvania Department of Conservation and Natural Resources	B.S., Wildlife Science, Unity College in Maine M.S., Wildlife Biology, Tennessee Technological University	• Forest management • Wildlife impacts • Deer management planning
Jim Comiskey, Ph.D.	Mid-Atlantic Network Coordinator, Inventory and Monitoring Program	National Park Service	B.S., Ecology, University of London Ph.D., Biology, University of London	• Wildlife and ecology • Vegetative monitoring • NPS policy on white-tailed deer management

APPENDIX B: INTERNAL SCOPING MEETING HANDOUTS AND NOTES (INTERNAL COPY ONLY)