

**UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE**

**FINAL WHITE-TAILED DEER MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT
CATOCTIN MOUNTAIN PARK**

Frederick and Washington Counties, Maryland

Lead Agency: National Park Service (NPS), U.S. Department of the Interior

This *Final White-tailed Deer Management Plan/Environmental Impact Statement* describes four alternatives for the management of deer at Catoctin Mountain Park, as well as the environment that would be affected by the alternatives and the environmental consequences of implementing these alternatives.

The purpose of this action is to develop a deer management plan that supports forest regeneration, and provides for long-term protection, conservation, and restoration of native species and cultural landscapes. Action is needed at this time to address declining forest regeneration and to ensure that natural processes (including the presence of deer) support native vegetation, wildlife, and the cultural landscape. Studies have determined that excessive deer browsing reduces forest regeneration, resulting in adverse changes to the forest structure, composition, and wildlife habitat. Excessive deer browsing in Catoctin Mountain Park could adversely affect the natural distribution, abundance, and diversity of native species, including species of special concern, and has impacted native shrubs, trees, and forest systems that comprise the natural vegetation component of the Camp Misty Mount and Camp Greentop cultural landscapes. Furthermore, action is needed to foster greater cooperation with state and local governments currently implementing deer management actions to help achieve mutual deer management goals.

Under alternative A (no action) the existing deer management plan of limited fencing, use of repellents in landscaped areas, monitoring, data management, and research would continue; no new deer management actions would be taken. Under alternative B several non-lethal actions, such as large-scale exclosures (fencing), increased use of repellents in limited areas, and reproductive control of does, would be taken to protect forest seedlings, promote forest regeneration, and gradually reduce deer numbers in the park. Under alternative C (preferred alternative) direct reduction of the deer herd would be achieved by sharpshooting and by capture and euthanasia of individual deer in certain circumstances where sharpshooting would not be appropriate. Alternative D would combine elements from alternatives B and C and include sharpshooting, capture and euthanasia, and reproductive control of does.

The potential environmental consequences of the alternatives are addressed for vegetation, soils, and water quality, white-tailed deer herd health, other wildlife species and wildlife habitat, sensitive and rare species, archeological resources, cultural landscapes, visitor use and experience, visitor and employee safety, socioeconomic conditions, and park management and operations. Under alternative A, no action would be taken to reverse the expected long-term continued growth in the deer population, and damage to vegetation would likely continue. The analysis indicates that impairment to vegetation, wildlife habitat, deer herd health, and sensitive and rare species could result in the long term if alternative A was implemented.

The *Draft White-tailed Deer Management Plan/ Environmental Impact Statement* was on public review from December 1, 2006 through February 2, 2007. Responses to public comment are addressed in this FEIS. A 30-day no-action period will follow the Environmental Protection Agency's Notice of Availability of the FEIS. After the 30-day period, a Record of Decision will be signed by the Regional Director of the National Capital Parks that will document NPS approval of the *Final White-tailed Deer Management Plan/ Environmental Impact Statement* and identify the selected alternative for implementation. For further information, contact Becky Loncosky:

Becky Loncosky, Park Biologist
Catoctin Mountain Park
6602 Foxville Road
Thurmont, Maryland 21788
(301) 416-0135
Becky_Loncosky@nps.gov

SUMMARY

PURPOSE OF AND NEED FOR ACTION

The purpose of this action is to develop a deer management plan that supports forest regeneration, providing for long-term protection, conservation, and restoration of native species and cultural landscapes. Action is needed at this time to address declining forest regeneration and to ensure that natural processes (including the presence of deer) support native vegetation, wildlife, and the cultural landscape. The following statements further define the need for action:

- Excessive deer browsing reduces forest regeneration, resulting in adverse changes to the forest structure, composition, and wildlife habitat.
- Excessive deer browsing in Catoctin Mountain Park could adversely affect the natural distribution, abundance, and diversity of native species, including species of special concern.
- Excessive deer browsing has impacted native shrubs, trees, and forest systems that comprise the natural vegetation component of the Camp Misty Mount and Camp Greentop cultural landscapes.
- Greater cooperation is needed with state and local governments currently implementing deer management actions to help achieve mutual deer management goals.

This document has been prepared to satisfy the *National Environmental Policy Act of 1969*, as amended, which requires that a range of reasonable alternatives be developed and the potential impacts resulting from these alternatives be analyzed. Four alternatives are presented, which have been developed in accordance with the park's purpose and significance. The document also describes the environment that would be affected by the alternatives and the environmental consequences of implementing any of the alternatives.

PARK PURPOSE AND SIGNIFICANCE

The purpose and significance of Catoctin Mountain Park are based on the park's management documents, which provide the general direction for each alternative. The purpose and significance are stated below to provide the reader with adequate background when examining the summary of the alternatives and the environmental consequences.

Catoctin Mountain Park provides opportunities for resource-compatible outdoor recreation to serve the populations of the Baltimore–Washington, D.C., metropolitan area, as well as other visitors from throughout the nation. Accordingly, Catoctin is administered as a public park, for recreational purposes, to conserve all resources, as a buffer to the Naval Support Facility - Thurmont (NSF), and to record and protect historically significant resources such as the cabin camp facilities at Camp Misty Mount and Camp Greentop.

Among the reasons that Catoctin Mountain Park is significant are the following (NPS 2001d):

- Catoctin Mountain Park was one of 46 Recreational Demonstration areas established in the 1930s. Only 17 remain as part of the National Park System.
- Catoctin Mountain Park represents an outstanding example of a New Deal era program initiated in the 1930s to recast the landscape for recreation and conservation purposes. Camp Misty Mount and Camp Greentop are listed on the National Register of Historic Places as historic districts representing a significant legacy of the New Deal era, as developed by the Civilian Conservation Corps and the Works Progress Administration.
- The diverse cultural resources at Catoctin Mountain Park provide examples of industries ranging from small-scale Native American tool production to a large charcoal/iron industry that supported Colonial America and the American Revolution. Fragments of rural and/or small town industries that may often be overlooked when reviewing our nation's heritage are represented in Catoctin Mountain Park.
- Camp Greentop is home to the oldest operating camp for the disabled in the nation.
- National Park System areas played many roles during World War II, and Catoctin can be included in that wartime effort as a place providing rest and relaxation opportunities for servicemen, and training facilities for the Office of Strategic Services.
- Catoctin Mountain Park hosted the first Job Corps camp, a Great Society program, in the nation at Camp Round Meadow in the 1960s.
- Serving as a natural buffer zone, Catoctin Mountain Park protects the presidential retreat, where international leaders have convened to discuss world peace and international diplomacy since the 1940s.
- Catoctin Mountain Park is a prime example of a regenerated eastern deciduous forest that reflects the geology and wildlife habitats of the Appalachian Mountains. Located at the transition of the Blue Ridge and Piedmont provinces, the park offers outstanding scenic beauty within 60 miles of the Baltimore, Maryland, and Washington, D.C., metropolitan areas.
- Catoctin Mountain Park's streams and wetlands play an important role as part of the watershed for the Monocacy River, the Potomac River, and the Chesapeake Bay. They serve as indicators of the park's overall ecosystem health.

OBJECTIVES IN TAKING ACTION

The following objectives related to deer management were developed for this plan. They are based on the park's purpose, significance, and mission goals, and they are compatible with the direction and guidance provided by the park's *Statement for Management*.

VEGETATION

- Reduce adverse effects of deer browsing pressure to ensure tree regeneration sufficient to reach the desired condition of a sustainable eastern hardwood forest with a native and diverse forest structure.
- Provide protection for threatened, endangered, and sensitive plant species and their habitats (e.g., the large purple-fringed orchid) from adverse impacts related to deer browsing.
- Maintain, restore, and promote a mix of native herbaceous plant species, and reduce the competitive advantage of invasive exotic plant species over native plant species through effective deer management.

WILDLIFE AND WILDLIFE HABITAT

- Maintain a viable white-tailed deer population within the park while protecting other park resources.
- Protect lower canopy and ground-nesting bird and other wildlife habitat from adverse impacts from deer browsing.

CULTURAL RESOURCES

- Ensure that vegetation contributing to the park's cultural landscape is protected from the adverse effects of deer behavior (browsing, trampling, seed dispersal).

VISITOR EXPERIENCE

- Educate the public regarding the deer population and the forest regeneration process and diversity, including the role of deer as part of a functioning park ecosystem.
- During implementation of any management action, minimize disruption to visitor use and experience or adverse impacts to visitor and community safety.

WHITE-TAILED DEER AT CATOCTIN MOUNTAIN PARK

Extremely rare at the turn of the 20th century, white-tailed deer populations in Maryland have not only rebounded, but now number more than at any other time in their history. Deer have adapted to landscape-level changes such as alteration

and changing land use patterns associated with suburban development (Maryland Department of Natural Resources [MD DNR] 1998).

Deer thrive on habitat conditions created by suburban development, as new roads, housing, and related enterprises fragment forests and farms, creating “edge” habitat that provides plenty of food. Protection and shelter are found in landscapes such as Catoctin where hunting is prohibited. Increases in agricultural productivity have also increased availability of nutritious foods for deer. Concurrently, habitat fragmentation, along with changing social habits (the number of hunters has steadily decreased since the 1980s), have resulted in reduced hunting pressure, particularly in Maryland’s growing suburban areas (MD DNR 1998).

When Catoctin Mountain Park was established in 1936, it is likely that no white-tailed deer existed within its boundaries. In the 1970s problems related to an overabundance of deer were suspected. Park staff first raised the issue of adverse impacts from deer browsing in the early 1980s because it could cause a long-term decline in both the abundance and diversity of native plant species. The park’s 1988 *Resource Management Plan* mentions concerns about the potential loss of long-term forest regeneration, changes in water quality that might arise from the loss of vegetation, and the potential transmission of disease and parasites from deer to humans (NPS 2000e).

Through the 1990s park staff conducted a number of monitoring studies to document the size of the deer population, as well as plant growth occurring in the understory of the mature forest canopy. Generally, data collected by park staff and researchers indicated that forest regeneration was nearly absent within the majority of the park, due in large part to high deer numbers. Park staff have coordinated with several technical experts and researchers to develop methods and protocols for monitoring deer population size and forest regeneration within the park. As a result, it was determined that the park’s current deer management plan needed to be revised.

ALTERNATIVES CONSIDERED

The alternatives under consideration include a required “no-action” alternative plus three action alternatives that were developed by an interdisciplinary planning team and through feedback from the public and the scientific community during the planning process. The three action alternatives would meet, to a large degree, the deer management objectives for Catoctin Mountain Park and also the purpose of and need for action.

Under alternative A (no action) the existing deer management plan of limited fencing, use of repellents in landscaped areas, monitoring, data management, and research would continue. No new deer management actions would be taken.

Under alternative B a combination of several non-lethal actions is proposed to protect forest seedlings, promote forest regeneration, and gradually reduce deer numbers in the park. This alternative would use large-scale exclosures (fencing), increased use of repellents in limited areas, and reproductive control of does.

Under alternative C (preferred alternative), sharpshooting and capture and euthanasia (where appropriate) would be used to reduce deer numbers.

Alternative D would combine elements from alternatives B and C, and include sharpshooting, capture and euthanasia, and reproductive control of does.

ENVIRONMENTAL CONSEQUENCES

The summary of environmental consequences considers the actions being proposed and the cumulative impacts from occurrences inside and outside the park. The potential environmental consequences of the actions are addressed for vegetation, soils and water quality, white-tailed deer herd health, other wildlife species and wildlife habitat, sensitive or rare species, archeological resources, cultural landscapes, visitor use and experience, employee safety, public safety, socioeconomic conditions, and park management and operations.

TABLE S-1: COMPARISON OF ALTERNATIVES

	Alternative A: No-Action Alternative	Alternative B: Combined Non-Lethal Actions	Alternative C: Combined Lethal Actions (Preferred Alternative)	Alternative D: Combined Lethal and Non-Lethal Actions
Management Actions	Continue limited use of fencing and repellents, plus deer monitoring, data gathering, data management and research, herd health checks, and education.	All actions under alternative A, plus: <ul style="list-style-type: none"> • Construct 15 large exclosures to protect resources throughout the park if needed. • Increased use of repellents where fences would be undesirable near buildings. • Implement reproductive control of does. 	All actions under alternative A, plus: <ul style="list-style-type: none"> • Use direct reduction methods (sharpshooting and capture / euthanasia where sharpshooting would not be advisable) to reduce deer herd numbers. • Focus in areas of the park documented to have substantial browsing impacts. • Donate meat, if possible. 	All actions under alternative A, plus use a combination of techniques from alternatives B and C: <ul style="list-style-type: none"> • Use direct reduction methods (sharpshooting and capture / euthanasia where sharpshooting would not be advisable) to reduce deer herd numbers. • Apply reproductive controls to maintain population size, with direct reduction used periodically, if needed. • Donate meat, if possible.
Reduction in Deer Population	None, other than natural sources of mortality.	Potentially reduce deer population if reproductive controls could be applied parkwide and then only after the first several years of treatment or until natural mortality exceeded reproduction and reduced the population. Population reduction would be gradual.	Initially remove an estimated 468 deer, with fewer deer in subsequent years. To maintain the population at target levels (15–20 deer/sq. mi.), remove an estimated 50–100 deer annually.	Initially similar to alternative C. Potential for future reductions through reproductive control used as a population maintenance tool.
Time Required to Achieve Desired Forest Regeneration	Forest regeneration cannot be achieved without reducing browsing impacts.	Twelve percent of park woody vegetation would be protected or regenerated by end of plan due to exclosures; reproductive control not likely to contribute to additional forest regeneration.	Direct reduction would reduce deer population by year three, with regeneration changes observed in monitoring by year six, and trends toward regeneration success by end of plan.	Same as alternative C.
Handling of Deer	Any handling, if any, of animals would be conducted to minimize stress and would follow American Society of Mammalogists guidelines.	No physical handling of deer required to drive them out of fenced areas. With telemetry dart application, physical handling of deer required to administer reproductive control (leuprolide). The dart is then recovered, the doe marked, the control agent administered, and the doe released.	No capture required for sharpshooting activities. For capture and euthanasia, minimized handling to reduce stress in accordance with American Veterinary Medical Association guidelines. Increased stress levels in captured deer compared to sharpshooting method.	Same as alternative B for reproductive control and alternative C for other actions.

TABLE S-1: COMPARISON OF ALTERNATIVES (CONTINUED)

	Alternative A: No-Action Alternative	Alternative B: Combined Non-Lethal Actions	Alternative C: Combined Lethal Actions (Preferred Alternative)	Alternative D: Combined Lethal and Non-Lethal Actions
Monitoring	Continued inventorying vegetation monitoring and monitoring of deer population numbers to assess impacts.	Continued monitoring as described under alternative A, plus monitoring of plants for signs of recovery within exclosures. For reproductive control, monitoring of treated deer using additional spotlight surveys to determine reproductive control effectiveness.	Annual monitoring of plants for six years after deer density goal reached to identify any signs of forest recovery, plus continued monitoring as described under alternative A.	Same as alternatives B and C.
Regulatory Considerations	No specific regulatory requirements. Application rate restrictions would apply to different repellents that could be used.	Application rate restrictions could apply to different repellents that could be used. Veterinarian prescription required pursuant to the <i>Animal Drug Use and Clarification Act</i> for off-label use in deer. Additional requirements could be prescribed by a veterinarian (e.g., meat withdrawal period, marking). Follow Public Health guidelines for CWD.	No prohibition of spotlights or suppression devices that could be used along with night vision equipment to reduce disturbance to the public. Any necessary ATF permits would be obtained. Coordination with state / local / nonprofit / private entities might be needed to donate meat.	Same as alternatives B and C.
CWD Testing	Testing coordinated with the state and conducted opportunistically. Targeted removal and testing of animals with clinical signs of chronic wasting disease as described under alternative A, page 47.	Same as alternative A.	Same as alternative A.	Same as alternative A.
Park Closure or Restricted Access	None.	Restricted access within exclosures or in areas of active reproductive control activities.	Areas closed or access restricted during direct reduction activities; closures or restrictions minimized by conducting activities during periods around dawn and dusk and in winter.	Areas closed or access restricted during direct reduction and reproductive control activities; closures or restrictions minimized by conducting activities during periods around dawn and dusk and in winter.
Adaptive Management	No specific adaptive management included under this alternative.	Relocation of vegetation monitoring plots, changes in action thresholds or deer density goals, possible changes in repellent use and number and locations of large exclosures, possible change in reproductive control agent used and its application procedures.	Relocation of vegetation monitoring plots, changes in action thresholds or deer density goals or possible changes to implementation procedures for direct reduction.	Relocation of vegetation monitoring plots, changes in action thresholds or deer density goals, possible change in reproductive control agent used and its application procedures, as well as number of direct reduction actions needed.
Estimated Cost (15-Year Plan)	\$172,500	\$9,590,400	\$738,600 – \$941,100	\$1,425,600 – \$1,628,100

TABLE S-2: SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No-Action Alternative	Alternative B: Combined Non-Lethal Actions	Alternative C: Combined Lethal Actions (Preferred Alternative)	Alternative D: Combined Lethal and Non-Lethal Actions
Vegetation	<p><i>Direct/Indirect Impact:</i> Adverse, long-term, and major impacts due to large numbers of deer browsing on a very large percentage of the park's woody and herbaceous vegetation, limiting natural regeneration.</p> <p><i>Cumulative Impact:</i> Would result in both adverse and beneficial impacts, with adverse, long-term, major cumulative impacts.</p> <p><i>Potential for Impairment:</i> It is expected that impairment of vegetation resources would occur over the long term.</p>	<p><i>Direct/Indirect Impact:</i> Adverse, long-term, and major impacts as the young woody vegetation and herbaceous ground cover decreased in quantity and diversity in the majority of the park, since benefits of reproductive control would not be fully realized within the life of this plan.</p> <p><i>Cumulative Impact:</i> Would result in adverse, long-term and moderate to major cumulative impacts.</p> <p><i>Potential for Impairment:</i> It is not expected that impairment of vegetation resources would occur over the long term.</p>	<p><i>Direct/Indirect Impact:</i> Beneficial, long-term impacts because vegetation could recover. As natural forest regeneration occurred, current adverse, long-term, major impacts would be reduced to minor levels.</p> <p><i>Cumulative Impact:</i> Would result in beneficial, long-term cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of vegetation resources would occur.</p>	<p><i>Direct/Indirect Impact:</i> Beneficial, long-term impacts because vegetation could recover. As natural forest regeneration occurred, current adverse, long-term, major impacts would be reduced to minor levels.</p> <p><i>Cumulative Impact:</i> Would result in beneficial, long-term cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of vegetation resources would occur.</p>
Soils and Water Quality	<p><i>Direct/Indirect Impact:</i> Adverse, long-term, negligible to minor impacts on soils and water quality could result from soil erosion and sedimentation due to loss of vegetation from increased deer browsing.</p> <p><i>Cumulative Impact:</i> Activities both inside and outside the park, when combined with the continued pressure on forest resources expected, would result in adverse, short- and long-term, minor to moderate impacts on soil and water quality.</p> <p><i>Potential for Impairment:</i> No impairment of park soils or water resources would occur.</p>	<p><i>Direct/Indirect Impact:</i> Adverse, long-term, minor impacts to soils and water quality could occur outside the fenced exclosures, resulting in increased loss of vegetation in those areas and a potential increase in soil erosion.</p> <p><i>Cumulative Impact:</i> Would result in adverse, short- and long-term, and minor to moderate cumulative impacts due to the large portion of the creeks' watersheds that are outside the park boundary, and beneficial long-term impacts occurring inside the park would offset cumulative impacts only slightly.</p> <p><i>Potential for Impairment:</i> No impairment of park soils or water resources would occur.</p>	<p><i>Direct/Indirect Impact:</i> Beneficial, long-term impacts on soils and water quality would result from immediately reducing the number of deer in the park. Vegetative ground cover would be able to reestablish itself, helping reduce soil erosion and sediment loading in the park's creeks.</p> <p><i>Cumulative Impact:</i> Would result in adverse, short- and long-term, and minor to moderate due to the large portion of the creeks' watersheds occurring outside the park boundary; the beneficial, long-term impacts would offset cumulative impacts only slightly.</p> <p><i>Potential for Impairment:</i> No impairment of park soils or water resources would occur.</p>	<p><i>Direct/Indirect Impact:</i> Beneficial, long-term impacts on soil and water quality would result from immediately reducing the number of deer in the park. Vegetative ground cover would be able to reestablish itself, helping reduce soil erosion and sediment loading in the park's creeks.</p> <p><i>Cumulative Impact:</i> Would result in adverse, short- and long-term, and minor to moderate due to the large portion of the creeks' watersheds occurring outside the park boundary; the beneficial, long-term impacts would offset cumulative impacts only slightly.</p> <p><i>Potential for Impairment:</i> No impairment of park soils or water resources would occur.</p>

Table S-2: Summary of Environmental Consequences (continued)

Impact Topic	Alternative A: No-Action Alternative	Alternative B: Combined Non-Lethal Actions	Alternative C: Combined Lethal Actions (Preferred Alternative)	Alternative D: Combined Lethal and Non-Lethal Actions
White-tailed Deer Herd Health	<p><i>Direct/Indirect Impact:</i> Adverse, long-term, major impacts on the health of the deer herd due to excessive deer browsing and the continued growth of the population.</p> <p><i>Cumulative Impact:</i> Would result in adverse, long-term, major cumulative impacts.</p> <p><i>Potential for Impairment:</i> Since alternative A would not reverse the expected long-term continued increase in the deer population, adverse health effects would continue or worsen, and impairment of the white-tailed deer herd in the park would occur over the long term.</p>	<p><i>Direct/Indirect Impact:</i> Adverse, long-term, and major impacts would occur due to limited use of large-scale exclosures and repellents, and since the effect of reproductive control on the deer population would not be seen for many years. The overall long-term effect would be expected to remain at major adverse levels for the life of this plan.</p> <p><i>Cumulative Impact:</i> Would result in adverse, long-term, moderate to major cumulative impacts.</p> <p><i>Potential for Impairment:</i> Since alternative B would provide for reproductive control of the deer herd and a potential for gradual reduction in deer herd numbers over an extended period of time, it is not expected that impairment of the white-tailed deer herd in the park would occur.</p>	<p><i>Direct/Indirect Impact:</i> The relatively rapid reduction of the deer herd and the resultant regeneration of forage would result in beneficial effects on deer herd health and reduce adverse impacts to negligible or minor levels over the long term as the deer population decreased. Adverse impacts would still range from minor to moderate while habitat recovered.</p> <p><i>Cumulative Impact:</i> Would result in beneficial, long-term cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of the white-tailed deer population in the park would occur.</p>	<p><i>Direct/Indirect Impact:</i> Implementing long-term deer population management through the use of direct reduction would have long-term and beneficial effects, and adverse impacts to deer herd health would be reduced to negligible or minor levels over the long term as the deer population decreased. Reproductive controls, with the current technology, would help maintain adverse impacts at lower levels.</p> <p><i>Cumulative Impact:</i> Would result in beneficial, long-term cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of the white-tailed deer population in the park would occur.</p>
Other Wildlife and Wildlife Habitat	<p><i>Direct/Indirect Impact:</i> Even though some species may benefit from an open understory, the continued impacts of large numbers of deer browsing on vegetation would adversely affect a large percentage of habitats for other wildlife resulting in adverse, long-term, and potentially major impacts, depending on the species.</p> <p><i>Cumulative Impact:</i> Would result in both adverse and beneficial impacts, with adverse, long-term, major cumulative impacts.</p>	<p><i>Direct/Indirect Impact:</i> Overall, impacts to other wildlife would be adverse, long-term, and negligible to potentially major, depending on the species, due to the majority of habitat would continue to be subject to a high degree of deer browsing, adversely impacting ground/shrub layer habitat for many wildlife species until reproductive controls took effect and reduced the deer population (more than 15 years).</p> <p><i>Cumulative Impact:</i> Would result in both adverse and beneficial impacts, with adverse, long-term, moderate to major cumulative impacts on other wildlife.</p>	<p><i>Direct/Indirect Impact:</i> Impacts on other wildlife would be long term and beneficial because of rapid reductions in deer numbers in the park, thereby reducing deer browsing pressure on natural forest regeneration, allowing increased abundance and diversity of other wildlife that depend on understory vegetation. Over time, present adverse, long-term impacts would be reduced to negligible or minor levels.</p> <p><i>Cumulative Impact:</i> Would result in beneficial, long-term cumulative impacts to other wildlife.</p>	<p><i>Direct /Indirect Impact:</i> Impacts on other wildlife would be long term and beneficial because of rapidly reductions in deer numbers in the park, thereby reducing deer browsing pressure on natural forest regeneration, allowing increased abundance and diversity of other wildlife that depend on understory vegetation. Over time, present adverse, long-term impacts would be reduced to negligible or minor levels.</p> <p><i>Cumulative Impact:</i> Would result in beneficial, long-term cumulative impacts to other wildlife.</p>

Table S-2: Summary of Environmental Consequences (continued)

Impact Topic	Alternative A: No-Action Alternative	Alternative B: Combined Non-Lethal Actions	Alternative C: Combined Lethal Actions (Preferred Alternative)	Alternative D: Combined Lethal and Non-Lethal Actions
	<p><i>Potential for Impairment:</i> Since alternative A would not reverse the expected long-term continued growth in the deer population, and wildlife habitat would likely continue to be degraded, it is expected that impairment of certain wildlife species and habitat would occur over the long term.</p>	<p><i>Potential for Impairment:</i> Since alternative B would provide continued protection of certain areas of the park over the long term and would introduce reproductive controls that could reduce deer numbers over an extended period of time, it is not expected that impairment of other wildlife species or habitat would occur.</p>	<p><i>Potential for Impairment:</i> No impairment of other wildlife species or habitat would occur.</p>	<p><i>Potential for Impairment:</i> No impairment of other wildlife species or habitat would occur.</p>
<p>Sensitive and Rare Species (including rare plant communities)</p>	<p><i>Direct/Indirect Impact:</i> Overall, adverse, long-term, moderate to major impacts to sensitive and rare plant species due to excessive deer browsing and the resulting suppression of new viable populations in the park even though some fencing of rare species would occur.</p> <p><i>Cumulative Impact:</i> Would result in both adverse and beneficial impacts. Adverse cumulative impacts would be long term and moderate.</p> <p><i>Potential for Impairment:</i> Since alternative A would not reverse the expected long-term continued growth in the deer population, and damage to vegetation would likely continue, it is expected that impairment of sensitive and rare species would occur over the long term.</p>	<p><i>Direct/Indirect Impact:</i> Overall, adverse, long-term, minor to moderate impacts to sensitive and rare plant species due to excessive deer browsing continuing outside the exclosures.</p> <p><i>Cumulative Impact:</i> Would result in both adverse and beneficial impacts. Adverse cumulative impacts would be long term and minor.</p> <p><i>Potential for Impairment:</i> No impairment of sensitive and rare species is expected because known populations would be protected from deer-browsing pressure.</p>	<p><i>Direct/Indirect Impact:</i> Beneficial impacts would be expected as a result of a relatively rapid reduction in deer density and browsing pressure on rare and sensitive plant communities.</p> <p><i>Cumulative Impact:</i> Would result in both beneficial and adverse impacts. Adverse cumulative impacts would be long term and minor.</p> <p><i>Potential for Impairment:</i> No impairment of rare or sensitive plant species in the park would occur.</p>	<p><i>Direct/Indirect Impact:</i> Beneficial impacts would be expected as a result of a relatively rapid reduction in deer density and browsing pressure on rare and sensitive plant communities.</p> <p><i>Cumulative Impact:</i> Would result in both beneficial and adverse impacts. Adverse cumulative impacts would be long term and minor.</p> <p><i>Potential for Impairment:</i> No impairment of rare or sensitive plant species in the park would occur.</p>
<p>Archeological Resources</p>	<p><i>Direct/Indirect Impact:</i> Installing small fences to protect individual plant groupings would result in adverse, long-term, negligible impacts to park archeological resources since fences would be located so as to avoid direct impacts to archeological resources.</p> <p><i>Cumulative Impact:</i> Would result in no cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of park archeological resources would occur.</p>	<p><i>Direct/Indirect Impact:</i> Similar to alternative A, installing small fences around individual plant groupings could result in adverse, long-term, negligible impacts to park archeological resources.</p> <p><i>Cumulative Impact:</i> Would result in adverse, long-term, and negligible cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of park archeological resources would occur.</p>	<p><i>Direct/Indirect Impact:</i> Similar to alternative A, the installation of small fences could result in adverse, long-term, negligible impacts to park archeological resources, as fences, bait stations and trapping locations would avoid known archeological resources.</p> <p><i>Cumulative Impact:</i> Would result in no cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of park archeological resources would occur.</p>	<p><i>Direct/Indirect Impact:</i> Similar to alternative A, the installation of small fences could result in adverse, long-term, negligible impacts to park archeological resources, as fences, bait stations and trapping locations would avoid known archeological resources.</p> <p><i>Cumulative Impact:</i> Would result in no cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of park archeological resources would occur.</p>

Table S-2: Summary of Environmental Consequences (continued)

Impact Topic	Alternative A: No-Action Alternative	Alternative B: Combined Non-Lethal Actions	Alternative C: Combined Lethal Actions (Preferred Alternative)	Alternative D: Combined Lethal and Non-Lethal Actions
Cultural Landscapes	<p><i>Direct/Indirect Impact:</i> Continued growth of the deer population and the associated ongoing decline in the abundance and diversity of the native plant communities would result in an adverse, long-term, minor impact to the park's cultural landscape.</p> <p><i>Cumulative Impact:</i> Adverse, long-term, minor cumulative impacts would result from the ongoing decline of native plant communities as a result of disease and deer browsing, despite benefits from the use of small fences and repellents and exotic species control.</p> <p><i>Potential for Impairment:</i> No impairment of cultural landscapes would occur.</p>	<p><i>Direct/Indirect Impact:</i> Large exclosures would allow regeneration of native woody plant populations within 6% to 12% of the park over the life of the plan, a character-defining vegetation feature, and small fenced areas and repellents would be used to protect specific landscaped areas, orchard trees, and landscape plantings, resulting in beneficial, long-term, minor impacts.</p> <p><i>Cumulative Impact:</i> Beneficial, long-term, minor cumulative impacts would result from some regeneration of native plant populations and the control of nonnative species, although disease and continued deer browsing would offset this impact.</p> <p><i>Potential for Impairment:</i> No impairment of cultural landscapes would occur.</p>	<p><i>Direct/Indirect Impact:</i> Reduced browsing pressure from direct reduction of the deer population would allow native plant populations to regenerate throughout the park, and small fenced areas and repellents would help protect other character-defining vegetation such as orchard trees. These actions would result in beneficial, long-term impacts to the park and component cultural landscapes.</p> <p><i>Cumulative Impact:</i> Regeneration of native plant populations would benefit the forested landscape, resulting in beneficial, long-term, moderate cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of cultural landscapes would occur.</p>	<p><i>Direct/Indirect Impact:</i> Reduced browsing pressure from direct reduction and reproductive control of the deer population would allow native plant populations to regenerate throughout the park, and small fenced areas and repellents would help protect other character-defining vegetation such as orchard trees. These actions would result in beneficial, long-term impacts to the park and component cultural landscapes.</p> <p><i>Cumulative Impact:</i> Regeneration of native plant populations would benefit the forested landscape, resulting in beneficial, long-term, moderate cumulative impacts.</p> <p><i>Potential for Impairment:</i> No impairment of cultural landscapes would occur.</p>
Visitor Use and Experience	<p><i>Direct/Indirect Impact:</i> Overall impacts to visitor use would be adverse, long term, and moderate as they experience a decreased ability to view scenery (including native vegetation) and other wildlife, which a large majority of visitors rated as important.</p> <p><i>Cumulative Impact:</i> Would result in both adverse and beneficial impacts (depending on an individual visitor's goals). Adverse cumulative impacts would be long term and moderate.</p>	<p><i>Direct/Indirect Impact:</i> Adverse, short term impacts would eventually give way to beneficial, long-term impacts as the need for exclosures diminished and the deer population declined, resulting in a restored forest ecosystem throughout the park. However, many years would be required to achieve these beneficial results.</p> <p><i>Cumulative Impact:</i> Cumulative impacts to visitors would be mostly beneficial and long term due to the effects of combined forest regeneration activities.</p>	<p><i>Direct/Indirect Impact:</i> Beneficial, long-term impacts would occur as a result of forest regeneration, which would have a moderate effect on visitors due to the restoration of natural resources.</p> <p><i>Cumulative Impact:</i> As under alternative B, cumulative impacts to visitors would be mostly beneficial and long term due to combined forest regeneration activities.</p>	<p><i>Direct/Indirect Impact:</i> Beneficial, long-term impacts would occur as a result of forest regeneration and visitors could see increased plant and animal diversity, and enjoy enhanced scenery.</p> <p><i>Cumulative Impact:</i> Cumulative impacts to visitors' ability to enjoy the park's scenery and species diversity, regardless of the type of activity involved, would be primarily beneficial and long term.</p>
Visitor Safety	<p><i>Direct/Indirect Impact:</i> Adverse, long-term, negligible impacts could occur, as it is expected that no discernible effects to visitor safety would result from deer management actions.</p>	<p><i>Direct/Indirect Impact:</i> This alternative includes measures to protect visitors from accident or injury. Therefore, any adverse impacts to visitors would be short and long term and negligible.</p>	<p><i>Direct/Indirect Impact:</i> Although this alternative includes actions that could be dangerous to visitors, adverse, short- and long-term, negligible impacts would occur, as safety measures are included to protect visitors.</p>	<p><i>Direct/Indirect Impact:</i> Although this alternative includes actions that could be dangerous to visitors, adverse, short- and long-term, negligible impacts would occur, as safety measures are included to protect visitors.</p>

Table S-2: Summary of Environmental Consequences (continued)

Impact Topic	Alternative A: No-Action Alternative	Alternative B: Combined Non-Lethal Actions	Alternative C: Combined Lethal Actions (Preferred Alternative)	Alternative D: Combined Lethal and Non-Lethal Actions
	<i>Cumulative Impact:</i> Cumulative impacts would primarily be related to other injuries that visitors could sustain in the park; these impacts would result in adverse, long term, and negligible.	<i>Cumulative Impact:</i> Would result in adverse, long term, and negligible cumulative impacts.	<i>Cumulative Impact:</i> Would result in adverse, long term, and negligible cumulative impacts.	<i>Cumulative Impact:</i> Would result in adverse, long term, and negligible cumulative impacts.
Employee Safety	<i>Direct/Indirect Impact:</i> Would be adverse, long term, and negligible, as it is expected that no discernible effects to employee safety would occur as a result of deer management actions. <i>Cumulative Impact:</i> Would be related to other injuries that employees could sustain while working in the park; these impacts would also be adverse, long term, and negligible.	<i>Direct/Indirect Impact:</i> Would be adverse, long term, and negligible, as it is expected that no discernible effects to employee safety would occur as a result of deer management actions. <i>Cumulative Impact:</i> Would result in adverse, long-term, and negligible cumulative impacts.	<i>Direct/Indirect Impact:</i> Would be adverse, long term, and negligible, as it is expected that no discernible effects to employee safety would occur as a result of deer management actions. <i>Cumulative Impact:</i> Would result in adverse, long-term, and negligible to minor cumulative impacts.	<i>Direct/Indirect Impact:</i> Would be adverse, long term, and negligible, as it is expected that no discernible effects to employee safety would occur as a result of deer management actions. <i>Cumulative Impact:</i> Would result in adverse, long-term, and negligible to minor cumulative impacts.
Socioeconomic Effects	<i>Direct/Indirect Impact:</i> Browsing damage to adjacent land and crops would continue resulting in adverse, long-term, minor to moderate impacts to farmers, with the extent of damage and the degree of impact dependent on the farmer's crop, crop location, and whether deer expand or shift their home range as browse became scarcer within the park. <i>Cumulative Impact:</i> Would be adverse, short and long-term, and moderate due to crop damage.	<i>Direct/Indirect Impact:</i> Adverse, long-term impacts to farmers would be moderate, with the extent of damage and the degree of impact dependent on factors such as the farmer's crop, crop location, whether deer expand or shift their home range as fences make browse scarcer within the park. Reproductive controls (if successful) would allow for only a gradual reduction in the number of deer under the duration of plan. <i>Cumulative Impact:</i> Would result in adverse, short and long-term, and moderate on crops.	<i>Direct/Indirect Impact:</i> The degree of reduction in crop damage is unknown; however, the reduction would most likely be measurable, reducing adverse impacts to farmers and other landowners to minor over the short and long-terms by increasing harvested yield and preserving landscaping. <i>Cumulative Impact:</i> Would result in beneficial compared to alternative A; adverse impacts would be reduced to minor over the short and long-term.	<i>Direct/Indirect Impact:</i> The degree of reduction in crop damage is unknown; however, the reduction would most likely be measurable, reducing adverse impacts to farmers and other landowners to minor over the short and long-terms by increasing harvested yield and preserving landscaping. <i>Cumulative Impact:</i> Would result in beneficial compared to alternative A, and adverse impacts would be reduced to minor over the short- and long-term.
Park Management and Operations	<i>Direct/Indirect Impact:</i> Impacts to park operations and maintenance would be adverse, long-term, and moderate as present. Deer management actions allow the park's deer population to continue to fluctuate and increase over the long-term, resulting in long-term demands on park staff and funding with minimal result. <i>Cumulative Impact:</i> Would result in adverse, long-term, moderate cumulative impacts.	<i>Direct/Indirect Impact:</i> Would result in adverse, long-term, moderate impacts on park management and operations from installing and maintaining large exclosures, applying repellents, and implementing and monitoring reproductive controls. <i>Cumulative Impact:</i> Would result in adverse, long-term, moderate cumulative impacts.	<i>Direct/Indirect Impact:</i> Would reduce the number of deer over a short period of time, and use of qualified federal employees or contractors, allowing park staff to have more time to apply their efforts to other areas of the park when compared to alternative A, which would reduce adverse, long-term impacts from moderate to minor. <i>Cumulative Impact:</i> Would result in adverse, long-term, minor to moderate cumulative impacts.	<i>Direct/Indirect Impact:</i> Would result in adverse, long-term, moderate impacts, as park staff involvement would be required for coordination and monitoring. Once the deer herd was reduced, more staff time would be available for other activities, resulting in adverse, long-term, minor impacts. <i>Cumulative Impact:</i> Would result in adverse, long-term, minor to moderate cumulative impacts.

CONTENTS

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

PURPOSE OF AND NEED FOR ACTION.....	3
Purpose of the Plan / Environmental Impact Statement.....	3
Need for Action.....	3
Objectives in Taking Action	4
Vegetation	4
Wildlife and Wildlife Habitat	4
Cultural Resources.....	5
Visitor Experience	5
Project Site Location.....	5
PARK BACKGROUND.....	9
History of Catoctin Mountain Park.....	9
Evolution of the Public Park Concept	10
Camp Misty Mount	10
Camp Greentop.....	10
Camp Round Meadow	11
History of Catoctin’s Forests.....	11
Catoctin Mountain Park’s Purpose and Significance.....	12
Purpose	12
Significance.....	12
Management Goals.....	13
SCIENTIFIC BACKGROUND: DEER AND VEGETATION MANAGEMENT	15
Deer Management Issues and Research Overview.....	15
Regional Landscape-level Changes	15
Documentation of Deer Damage at Catoctin	16
Population and Ecological Characteristics of White-tailed Deer at Catoctin Mountain Park.....	16
Effects of White-tailed Deer on Vegetation Structure and Diversity at Catoctin Mountain Park.....	18
Catoctin’s Current Deer Management Plan	19
Recommended Regeneration Threshold for Trees	19
Other Deer Management Efforts	20
Other Vegetation Management Issues	21
Role of Invasive Exotic Plant Species.....	21
Role of Pests and Disease.....	22
Role of Fire.....	25
DESIRED CONDITIONS.....	26
A Viable Deer Population	26
A Naturally Regenerating and Sustainable Forest	26

SCOPING PROCESS AND PUBLIC PARTICIPATION 27

 Issues and Impact Topics..... 27

 Vegetation 27

 Rare or Unusual Vegetation..... 27

 Soils..... 27

 Water Quality 28

 Species of Special Concern..... 28

 Wildlife and Wildlife Habitat 28

 Visitor Use and Experience..... 28

 Cultural Landscapes 28

 Archeological Resources 29

 Socioeconomic Conditions..... 29

 Visitor and Employee Safety..... 29

 Park Management and Operations..... 29

 Other Issues Considered but Dismissed from Further Analysis..... 29

RELATED LAWS, POLICIES, PLANS, AND CONSTRAINTS 32

 NPS Organic Act..... 32

 NPS Management Policies 2001 33

 Director’s Order #12: Conservation Planning, Environmental Impact Analysis,
 and Decision-making..... 34

 Natural Resource Reference Manual 77 34

 Other Legislation, Compliance, and NPS Policy 34

 National Environmental Policy Act of 1969, as Amended..... 35

 The National Historic Preservation Act of 1966, as Amended..... 35

 Code of Federal Regulations, Title 43 35

 Code of Federal Regulations, Title 36 35

 Executive Order 11990, “Protection of Wetlands” 35

 Migratory Bird Treaty Act of 1918 35

 Relationship to Other Planning Documents for Catoctin Mountain Park..... 36

 Statement for Management (1996) 36

 Strategic Plan (2000) 36

 FY 2005 Annual Performance Plan 36

 Resource Management Plan (1998 Update) 37

 White-tailed Deer Management Environmental Assessment (1995) 37

 Fire Management Plan (2004) 37

 Hemlock Woolly Adelgid Suppression Environmental Assessment (2003)..... 37

 Integrated Pest Management Plan (2003)..... 37

 Related Legislation and Policies..... 37

 Maryland Department of Natural Resources Deer Management Plan 38

 Cunningham Falls State Park Hunting Regulations..... 38

CHAPTER 2: ALTERNATIVES

ALTERNATIVES 41

INTRODUCTION AND OVERVIEW OF ALTERNATIVES 42

DEER DENSITY GOAL AND THRESHOLD FOR TAKING ACTION UNDER ALTERNATIVES B, C, AND D 44

 Threshold for Taking Action..... 44

 Initial Deer Density Goal..... 45

ALTERNATIVE A: NO ACTION (EXISTING MANAGEMENT CONTINUED) 46

 Current Actions 46

 Fencing of Small Areas 46

 Limited Application of Repellents 47

 Testing for Chronic Wasting Disease (Deer Health Check)..... 47

 Monitoring, Data Management, and Research 48

 Education 49

 Implementation Costs 50

ALTERNATIVE B: COMBINED NON-LETHAL ACTIONS — LARGE EXCLOSURES, INCREASED USE OF REPELLENTS, AND REPRODUCTIVE CONTROL OF DOES 51

 Additional Actions Proposed under Alternative B..... 51

 Large Exclosures 51

 Increased Use of Repellents 52

 Reproductive Control of Does 55

 Monitoring 57

 Large Exclosures and Repellents 57

 Reproductive Control 58

 CWD Testing..... 58

 Implementation Costs 58

 Large Exclosures 59

 Repellents 59

 Reproductive Control 59

ALTERNATIVE C: COMBINED LETHAL ACTIONS — SHARPSHOOTING AND CAPTURE AND EUTHANASIA (PREFERRED ALTERNATIVE) 61

 Additional Proposed Actions under Alternative C (Preferred Alternative) 61

 Sharpshooting 61

 Capture and Euthanasia 64

 Monitoring 65

 Sharpshooting 65

 Capture and Euthanasia 66

 CWD Testing..... 66

 Implementation Costs 66

 Sharpshooting 67

 Capture and Euthanasia 67

ALTERNATIVE D: COMBINED LETHAL AND NON-LETHAL ACTIONS 68

 Additional Proposed Actions under Alternative D..... 68

 Sharpshooting 68

 Capture and Euthanasia 68

 Reproductive Control 68

CONTENTS

Monitoring 69

Implementation Costs 69

 Sharpshooting 70

 Capture and Euthanasia 70

 Reproductive Control 70

ADAPTIVE MANAGEMENT APPROACHES INCLUDED IN THE ALTERNATIVES 71

 Using the Adaptive Management Process 71

 Potential Adaptive Management Approaches 73

 Plot Locations for Vegetation Monitoring 73

 Action Threshold 73

 Deer Removal Goal 74

 Large Enclosures and Repellents 75

 Reproductive Control 75

 Alternative D Implementation 75

HOW ALTERNATIVES MEET OBJECTIVES 76

ALTERNATIVES CONSIDERED BUT REJECTED 86

 Managed Hunt 86

 Reproductive Control of Bucks 88

 Predator Reintroduction 89

 Use of Poison 89

 Capture and Relocation 90

 Supplemental Feeding 90

 Surgical Sterilization of Does 90

 Fencing the Entire Park 90

 Use the Deer Population as a Research Model 91

 Ecosystem Management Alternative 91

 Bow Hunting Only 92

 Haze Deer into the State Park 92

 Providing Birth Control Drugs in Deer Food 92

CONSISTENCY WITH THE PURPOSES OF THE NATIONAL ENVIRONMENTAL POLICY ACT 93

 Alternative A: No Action 93

 Alternative B: Combined Non-Lethal Actions 94

 Alternative C: Combined Lethal Actions (Preferred Alternative); and Alternative D:
 Combined Lethal and Non-Lethal Actions 94

ENVIRONMENTALLY PREFERRED ALTERNATIVE 95

NPS PREFERRED ALTERNATIVE 96

CHAPTER 3: AFFECTED ENVIRONMENT

AFFECTED ENVIRONMENT..... 99

VEGETATION 100

 Overview..... 100

 Woody Species..... 100

 Herbaceous Species 104

 Current Vegetation Status and the Role of Deer..... 104

 Invasive Exotic Plant Species..... 107

SOILS AND WATER QUALITY..... 109

 Soils 109

 Water Quality 109

WHITE-TAILED DEER HERD HEALTH 116

 General Ecology 116

 Home Range..... 117

 Population Density..... 117

 Deer Herd Health..... 118

 Diseases of Concern 119

 Parasitism 119

 Malnutrition..... 120

 Bluetongue Virus..... 120

 Epizootic Hemorrhagic Disease..... 120

 Chronic Wasting Disease..... 121

OTHER WILDLIFE AND WILDLIFE HABITAT 122

 Mammals 122

 Birds..... 123

 Reptiles and Amphibians..... 124

 Fish 125

 Current Status of Wildlife and the Role of Deer 126

SENSITIVE AND RARE SPECIES (INCLUDING RARE PLANT HABITATS) 128

 Sensitive and Rare Plants 128

 Rare Plant Habitats 130

 Owens Creek Wetland 130

 Hog Rock Wetland 130

CULTURAL RESOURCES 132

 Archeological Resources..... 132

 Cultural Landscapes 133

VISITOR USE AND EXPERIENCE 138

 Visitation 138

Visitor Activities.....	139
Viewing Wildlife and Scenery.....	140
Driving through the Park	141
Hiking	141
Overnight Stays.....	141
Rock Climbing.....	142
Visiting Historic / Cultural Sites	142
Horseback Riding.....	142
Cross-country Skiing.....	142
Picnicking	142
Fishing.....	145
Noise	145
Interpretation Goals and Themes.....	146
VISITOR AND EMPLOYEE SAFETY	148
Visitor Safety.....	148
Employee Safety.....	148
SOCIOECONOMIC RESOURCES.....	149
Regional and Socioeconomic Overview	149
Agriculture in Frederick County	150
Economic Impacts to Agriculture from Deer Damage	153
Deer Damage to Crops	153
Deer Damage Permits.....	155
Economic Impacts to Landscaping from Deer Damage.....	156
PARK MANAGEMENT AND OPERATIONS	157
Resource Management	157
Resource Education and Visitor Protection	159
Resource Education.....	159
Visitor Protection.....	159
Maintenance	160

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

ENVIRONMENTAL CONSEQUENCES	163
INTRODUCTION.....	164
Summary of Laws and Policies	164
General Methodology for Establishing Impact Thresholds and Measuring Effects by Resource	165
General Analysis Methods.....	165
Assumptions	165
Cumulative Impacts Analysis Method.....	167
Cumulative Impact Scenario.....	167
Past Actions within and Around Catoctin.....	167
Current Actions in and Adjacent to Catoctin Mountain Park	174
Foreseeable Future Actions	177

Impairment Analysis Method 177

VEGETATION 179

 Guiding Regulations and Policies..... 179

 Assumptions, Methodology, and Intensity Thresholds 179

 Area of Analysis..... 181

 Impacts of the Alternatives 181

 Alternative A: No-Action Alternative (Existing Management Continued)..... 181

 Alternative B: Combined Non-Lethal Actions 184

 Alternative C: Combined Lethal Actions (Preferred Alternative) 187

 Alternative D: Combined Lethal and Non-Lethal Actions 190

SOILS AND WATER QUALITY..... 194

 Guiding Regulations and Policies..... 194

 Assumptions, Methodology, and Intensity Thresholds 194

 Area of Analysis..... 195

 Impacts of the Alternatives 196

 Alternative A: No-Action Alternative (Existing Management Continued)..... 196

 Alternative B: Combined Non-Lethal Actions 197

 Alternative C: Combined Lethal Actions (Preferred Alternative) 199

 Alternative D: Combined Lethal and Non-Lethal Actions 199

WHITE-TAILED DEER HERD HEALTH 201

 Guiding Regulations and Policies..... 201

 Assumptions, Methodology, and Intensity Thresholds 201

 Area of Analysis..... 202

 Impacts of the Alternatives 202

 Alternative A: No-Action Alternative (Existing Management Continued)..... 202

 Alternative B: Combined Non-Lethal Actions 204

 Alternative C: Combined Lethal Actions (Preferred Alternative) 205

 Alternative D: Combined Lethal and Non-Lethal Actions 206

OTHER WILDLIFE AND WILDLIFE HABITAT 208

 Guiding Regulations and Policies..... 208

 Assumptions, Methodology, and Intensity Thresholds 208

 Area of Analysis..... 209

 Impacts of the Alternatives 209

 Alternative A: No-Action Alternative (Existing Management Continued)..... 209

 Alternative B: Combined Non-Lethal Actions 212

 Alternative C: Combined Lethal Actions (Preferred Alternative) 214

 Alternative D: Combined Lethal and Non-Lethal Actions 216

SENSITIVE AND RARE SPECIES (INCLUDING RARE PLANT HABITATS) 219

 Guiding Regulations and Policies..... 219

 Assumptions, Methodology, and Intensity Thresholds 219

 Area of Analysis..... 220

 Impacts of the Alternatives 220

Alternative A: No-Action Alternative (Existing Management Continued) 220

Alternative B: Combined Non-Lethal Actions 222

Alternative C: Combined Lethal Actions (Preferred Alternative) 223

Alternative D: Combined Lethal and Non-Lethal Actions 224

CULTURAL RESOURCES 226

 Guiding Regulations and Policies..... 226

 Assumptions and Methodology 226

 Archeological Resources..... 228

 Methodology and Intensity Thresholds 228

 Area of Analysis 229

 Impacts of the Alternatives 229

 Cultural Landscapes 233

 Methodology and Intensity Thresholds 233

 Area of Analysis 235

 Impacts of the Alternatives 235

VISITOR USE AND EXPERIENCE 243

 Guiding Regulations and Policies..... 243

 Assumptions, Methodology, and Intensity Thresholds 243

 Area of Analysis..... 244

 Impacts of the Alternatives 244

 Alternative A: No-Action Alternative (Existing Management Continued)..... 244

 Alternative B: Combined Non-Lethal Actions 247

 Alternative C: Combined Lethal Actions (Preferred Alternative) 251

 Alternative D: Combined Lethal and Non-Lethal Actions 254

VISITOR AND EMPLOYEE SAFETY 256

 Guiding Regulations and Policies..... 256

 Assumptions, Methodology, and Intensity Thresholds 256

 Visitor Safety 256

 Area of Analysis 256

 Impacts of the Alternatives 257

 Employee Safety..... 261

 Area of Analysis 261

 Impacts of the Alternatives 261

SOCIOECONOMIC EFFECTS 265

 Guiding Regulations and Policies..... 265

 Assumptions, Methodology, and Intensity Thresholds 265

 Area of Analysis..... 267

 Impacts of the Alternatives 267

 Alternative A: No-Action Alternative (Existing Management Continued)..... 267

Alternative B: Combined Non-Lethal Actions	271
Alternative C: Combined Lethal Actions (Preferred Alternative)	273
Alternative D: Combined Lethal and Non-Lethal Actions	275
PARK MANAGEMENT AND OPERATIONS	276
Methodology and Intensity Thresholds.....	276
Area of Analysis.....	276
Impacts of the Alternatives	276
Alternative A: No-Action Alternative (Continue Existing Management).....	276
Alternative B: Combined Non-Lethal Actions	278
Alternative C: Combined Lethal Actions (Preferred Alternative)	280
Alternative D: Combined Lethal and Non-Lethal Actions	282
UNAVOIDABLE ADVERSE IMPACTS	284
Alternative A: No-Action Alternative (Continue Existing Management).....	284
Alternative B: Combined Non-Lethal Actions	284
Alternative C: Combined Lethal Actions (Preferred Alternative) and Alternative D: Combined Lethal and Non-Lethal Actions.....	284
SUSTAINABILITY AND LONG-TERM MANAGEMENT	286
Alternative A: No-Action Alternative (Continue Existing Management).....	286
Alternative B: Combined Non-Lethal Actions	286
Alternative C: Combined Lethal Actions (Preferred Alternative) and Alternative D: Combined Lethal and Non-Lethal Actions.....	287
IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES.....	288
Alternative A: No-Action Alternative (Continue Existing Management).....	288
Alternative B: Combined Non-Lethal Actions	288
Alternative C: Combined Lethal Actions (Preferred Alternative) and Alternative D: Combined Lethal and Non-Lethal Actions (Preferred Alternative).....	288

CHAPTER 5: CONSULTATION AND COORDINATION

CONSULTATION AND COORDINATION	291
HISTORY OF PUBLIC INVOLVEMENT	291
The Scoping Process	291
Internal Scoping	291
Public Scoping	292
Public Notification	294
Agency Consultation.....	294
U.S. Fish and Wildlife Service	294
Maryland Department of Natural Resources	295
Maryland State Historic Trust	295
U.S. Environmental Protection Agency	295
LIST OF RECIPIENTS OF THE DRAFT PLAN / ENVIRONMENTAL IMPACT STATEMENT	296
Federal Departments and Agencies	296
Maryland Agencies	296

CONTENTS

County and Local Agencies 296
Media, Organizations, and Businesses 297
SCIENCE TEAM MEMBERS 299
LIST OF PREPARERS AND CONSULTANTS 300
References 305
Personal Communication 326
Glossary 331
Acronyms 338
Index 339

A P P E N D I X E S

Appendix A: 1985 Summary of Browsing Impacts on Catoctin's Vegetation 343
Appendix B: Letters of Consultation 347
Appendix C: Overview of Deer Management Activities at Catoctin Mountain Park 353
Appendix D: Chronic Wasting Disease 359
Appendix E: A Review of White-tailed Deer Reproductive Control 364
Appendix F: Deer Population and Vegetation / Regeneration Monitoring Methods 371
Appendix G: 2002 Catoctin Mountain Park Visitor Use Survey Natural Resource Issue Questions 374
Appendix H: Comments and Responses on the Draft Plan / Environmental Impact Statement 383
 Comment Summary 385
 Comment/Concern Statements and Responses 387
 Index A: Index of Authors, Organizations, and Codes 449
 Index B: Index by Code 451
 Index C: Original Substantive Comments Letters 455

M A P S

Park Location Map 7
Proposed Exclosure Locations Map 53
Vegetation Map 101
Soil Erodibility Map 111
Water Quality Testing Map 113
Visitor Use Areas Map 143
Land Use Areas Map 151

FIGURES

1: An Illustration of the Adaptive Management Approach for the Action Alternatives..... 72
 2: Average Catoctin Monthly Visitation, 2000–2004..... 139
 3: MD DNR Crop Damage Permit Data for the Catoctin Mountain Park Area, 1985–2004..... 156

TABLES

1: Cost Estimate — Alternative A: No Action 50
 2: Reproductive Control Agents..... 55
 3: Cost Estimate — Alternative B: Combined Non-Lethal Actions 58
 4: Cost Estimate — Alternative C: Combined Lethal Actions (Preferred Alternative) 66
 5: Cost Estimate — Alternative D: Combined Lethal and Non-Lethal Actions..... 69
 6: Comparison of Alternatives 77
 7: Analysis of How the Alternatives Meet Objectives 79
 8: Summary of Environmental Consequences 81
 9: Native Plant Species at Catoctin Mountain Park with Reduced Abundance 105
 10: Invasive Exotic Plant Species Found at Catoctin Mountain Park..... 108
 11: Average Annual Turbidity Levels for Owens Creek and Big Hunting Creek, 1984–2003 115
 12: Estimated Deer Density in Catoctin Mountain Park 118
 13: 2001 Small Mammal Survey, Catoctin Mountain Park 123
 14: Species of Special Concern in Catoctin Mountain Park..... 129
 15: Owens Creek Wetland Plant Species 130
 16: Hog Rock Wetland Plant Species..... 131
 17: Catoctin Mountain Park Cultural Landscape Contributing Features 134
 18: Catoctin Visitation 138
 19: Activity Ranking by Visitors 140
 20: 1996 Crop Loss due to Deer Damage — Central Maryland 154
 21: 2001 Crop Loss from Deer — Central Maryland 155
 22: Maryland Yield Losses per Acre under Different Control Instruments 156
 23: Catoctin Mountain Park 2005 and 2006 Operating Budgets 157
 24: Catoctin Mountain Park Deer Management Operating Budget..... 158
 25: Cumulative Actions 169
 26: Economic Loss from a 10% Increase in the Local Deer Population 266

CONTENTS