

# CHAPTER 2: ALTERNATIVES

## INTRODUCTION

This chapter describes the various actions that could be implemented to protect and restore native ecosystems by managing non-native ungulates at Hawai‘i Volcanoes. This includes a description of the “no-action” alternative (alternative A), which is the continuation of current non-native ungulate management activities. NEPA regulations require consideration of the no-action alternative and a range of reasonable alternatives.

The interdisciplinary NPS planning team developed the action alternatives (alternatives B through E) discussed in this chapter, taking into consideration feedback from the public and the science team (see “Chapter 5: Consultation and Coordination”). Action alternatives retained for detailed analysis must meet, to a large degree, the purpose of and need for action and the management objectives described in chapter 1.

Chapter 2 describes the alternatives in detail, including elements common to all alternatives and elements common to all action alternatives, and provides an overview of the alternatives in table form. The remainder of the chapter addresses how alternatives meet objectives, alternatives that were considered but eliminated from detailed analysis, and consistency with the purposes of NEPA.

## OVERVIEW OF ALTERNATIVES

As required by NEPA, the alternatives described in this chapter represent a full spectrum of options for protecting and restoring native ecosystems by managing non-native ungulates at Hawai‘i Volcanoes. As a result of the alternatives development process, four action alternatives were selected for detailed analysis. Table 3 shows a summary of actions proposed under each alternative.

## ELEMENTS COMMON TO ALL ALTERNATIVES

Many actions related to non-native ungulate management in the park would be common to all alternatives, including the no-action alternative (alternative A) and the four action alternatives (alternatives B through E). Implementation of any action described below would be subject to available funding.

References to the “old” section of the park refer to the 217,000 acres acquired prior to the Kahuku addition. Current management of the “old” section of the park would continue under all alternatives. This area includes the Kīlauea, ‘Ōla‘a, and Mauna Loa units of the park that extends from the coast to the Mauna Loa summit. With the exception of feral pigs, management actions have essentially eliminated non-native ungulates below 9,000 feet (2,743 meters) in elevation. Above 9,000 feet (2,743 meters) are occasional mouflon sheep, hybrid mouflon sheep, and possibly goats. Feral pigs are excluded from interior fenced units protecting approximately 40,000 acres of subalpine, montane, and selected lowland communities. In remaining areas, feral pigs are typically at low densities in dry to arid environments, and reach higher densities in seasonally dry to wet environments in the Kīlauea and ‘Ōla‘a units.

## **MANAGEMENT TOOLS**

### **Direct Reduction with Firearms—Ground Shooting**

This tool involves using firearms from the ground for the lethal removal of non-native ungulates. Personnel involved, which would include NPS staff, would have the appropriate skills and proficiencies in the use of firearms and protecting public safety, including experience in the use of firearms for the removal of wildlife. In the past, university cooperators have assisted the park with direct reduction efforts; however, they are not being used currently.

Individuals, as necessary, would be involved with direct reduction activities, including the field activities directly related to reduction efforts (shooting, field dressing, data collection, carcass handling). Individuals could work simultaneously in different areas of the park, depending on the target species. Each member's role would be identified during a pre-reduction meeting and could include any of the actions noted above. Individuals would generally access an area on foot or by vehicle. The individuals would locate groups of non-native ungulates to facilitate reduction activities for a targeted species, although non-native ungulates located by chance would also be considered for removal as long as it would not adversely affect the removal of the target species. Consideration would be given to the choice of firearm, ammunition, and shot placement to ensure the humaneness of the action. Non-native ungulates injured during the operation would be dispatched as quickly as possible to minimize suffering.

As part of direct reduction activities, trained dogs could be used to locate and flush sheep, goats, or mouflon sheep to facilitate direct reduction from the ground. These dogs could also be used to locate and immobilize non-native ungulates, such as feral pigs, during implementation of direct reduction with firearms. They would not be used in known breeding/molting areas of the nēnē to minimize the potential for unintended impacts on this federally listed species. This method could also be used in combination with tools such as telemetry (described below).

To increase the efficiency of removal activities, park staff would also make use of the tendency for some non-native ungulates, such as feral cattle, feral sheep, feral goats, and mouflon sheep, to form larger social groups. Staff would capture an individual non-native ungulate, place a telemetry collar on it, release it, and track it back to the larger group. Once the larger group is identified, ground shooting would be implemented.

### **Direct Reduction with Firearms—Aerial Shooting**

Direct reduction with firearms would also occur from helicopters. As with ground shooting, personnel involved would have the appropriate training, certifications, skills, and proficiencies in helicopter operations, firearms, and safety.

This method is most effective in open areas where skilled shooters are able to take animals in vegetation openings. Trained dogs and/or ground crews would be used in combination with aerial shooters to help spot non-native ungulates and/or flush them into open areas. This method could also be used in combination with telemetry, as described for ground shooting.

**TABLE 3: SUMMARY OF ALTERNATIVE ELEMENTS**

<b>Management Activity</b>	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
General description of the alternative	Under alternative A, the NPS would continue current non-native ungulate practices, which are informed by the 1974 resources management plan/EIS and subsequent amendments (NPS 1974, 1986, 1999a), and other management decisions. Management techniques would be lethal. Qualified volunteers would continue to be used to assist with certain ground shooting activities, and could be used for certain other non-native ungulate management activities.	Under alternative B, the NPS would implement a comprehensive, systematic management plan that would use lethal techniques. Alternative B would include a systematic progression of management phases, monitoring, and considerations for the use of management tools. Qualified volunteers would be used to assist with ground shooting operations, and could be used for certain other non-native ungulate management activities.	Under alternative C, the NPS would implement a comprehensive, systematic management plan utilizing the most efficient and cost-effective methods of non-native ungulate management. Management techniques would be lethal. Alternative C would include a systematic progression of management phases, monitoring, and considerations for the use of management tools. Volunteers would not be used in any capacity associated with non-native ungulate management.	Under alternative D, the NPS would implement a comprehensive, systematic management plan providing maximum management flexibility. Management tools would be primarily lethal, but non-lethal techniques could be considered, such as relocation. Alternative D would include a systematic progression of management phases, monitoring, and considerations for the use of management tools. Qualified volunteers would be used to assist with ground shooting operations, and could be used for certain other non-native ungulate management activities.	Under alternative E, the NPS would implement a comprehensive, systematic management plan that relies primarily on lethal techniques, but non-lethal techniques could be considered such as relocation. Alternative E would include a systematic progression of management phases, monitoring, and considerations for the use of management tools. To provide a full range of alternatives, qualified volunteers would not be used for ground shooting activities. Volunteers could be used for certain other non-native ungulate management activities.
Population-level objective	Has been described in different ways for the older section of the park, but for practical purposes is zero non-native ungulates (or as low as practicable). No established population-level objective for Kahuku, but past experience and current scientific knowledge suggest a practical goal of zero non-native ungulates (or as low as practicable).	Zero non-native ungulates, or as low as practicable in managed areas, recognizing the possibility of remnant populations and ingress animals.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Direct reduction with firearms—ground shooting	Lethal removal of non-native ungulates using firearms from the ground. All actions related to direct reduction with firearms from the ground would be included, such as shooting, data collection, and carcass handling. Direct reduction with firearms—ground shooting—could also include the following elements: <ul style="list-style-type: none"> <li>• Could be used in combination with dogs; however, dogs would not be used in nēnē habitat until trained to avoid the nēnē.</li> <li>• Could be used in combination with telemetry.</li> </ul>	Same as alternative A.	Same as alternative A, plus: <ul style="list-style-type: none"> <li>• Ground-shooting activities could be expanded by use of bait stations to attract larger groups of non-native ungulates for removal.</li> <li>• Consider inducing estrus in captive female non-native ungulates to lure other non-native ungulates.</li> <li>• Consider use of cracker shells (shotgun shells that when discharged make a loud noise to startle animals) to flush animals into open areas.</li> <li>• Consider use of infrared technologies to locate non-native ungulates, which could also facilitate lethal removal by aerial shooting.</li> </ul>	Same as alternative C.	Same as alternative C.

Management Activity	Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)	Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques	Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers	Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques	Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers
Direct reduction with firearms—aerial shooting	<p>Lethal removal of non-native ungulates using firearms from the air.</p> <p>This activity would occur in open-canopy areas where skilled shooters are able to take animals that appear in vegetation openings. Choice of firearm, ammunition, and shot placement are all factors in the humaneness and success of using aerial shooting that would be considered. Personnel would have the appropriate skills, proficiencies, training, and certifications in helicopter operation and in the use of firearms for the removal of wildlife.</p> <p>Direct reduction with firearms—aerial shooting—could also include the following elements:</p> <ul style="list-style-type: none"> <li>• Could be used in combination with dogs; however, dogs would not be used in nēnē habitat until trained to avoid the nēnē.</li> <li>• Could be used in combination with telemetry.</li> </ul>	Same as alternative A.	<p>Same as alternative A, plus:</p> <ul style="list-style-type: none"> <li>• Aerial shooting activities could be expanded by use of bait stations to attract larger groups of non-native ungulates for removal.</li> <li>• Consider inducing estrus in captive female non-native ungulates to lure other non-native ungulates.</li> <li>• Consider use of cracker shells (shotgun shells that when discharged make a loud noise to startle animals) to flush animals into open areas.</li> <li>• Consider use of infrared technologies to locate non-native ungulates, which could also facilitate lethal removal by aerial shooting.</li> </ul>	Same as alternative C.	Same as alternative C.
Snaring	<p>Snaring would be used exclusively for the removal of feral pigs under one or more of the following conditions:</p> <ul style="list-style-type: none"> <li>• Populations are at remnant levels.</li> <li>• Densities are low.</li> <li>• Terrain is rugged.</li> <li>• Location is remote.</li> <li>• Pigs have become accustomed to other removal techniques.</li> </ul> <p>Using this method, a cable snare would be placed in areas where pigs are most likely to travel, or approximately one snare per acre. Snares would be mapped and marked with global positioning system (GPS) technology. Units with snares would be well signed to limit potential safety issues.</p>	Same as alternative A.	<p>Same as alternative A, plus:</p> <ul style="list-style-type: none"> <li>• Explore the use of snares for other non-native ungulates in addition to feral pigs.</li> <li>• Explore the use of snares in combination with telemetry devices that would alert park staff when snares have been tripped.</li> </ul>	Same as alternative C.	Same as alternative C.
Baiting and trapping	Baiting and trapping would include trapping pigs, mouflon sheep, and feral cattle and dispatching the animals in or near the traps. This tool would be used wherever feasible.	Same as alternative A.	Same as alternative A, plus: Explore expanding the use of this method for lethal removal of other non-native ungulates as well.	Same as alternative C.	Same as alternative C.

Management Activity	Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)	Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques	Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers	Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques	Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers
Relocation	Relocation would not be used.	Same as alternative A.	Same as alternative A.	<p>Park staff would investigate the possibility of capturing non-native ungulates and relocating them to other lands by either:</p> <ul style="list-style-type: none"> <li>• Driving the non-native ungulates onto adjacent lands where they could be hunted; or</li> <li>• Capturing non-native ungulates, using radio-collaring and traps or non-lethal snares, and transporting them to another location.</li> </ul> <p>All relocation activities would require willing recipients and would be carried out in close cooperation with the state. When considering areas to relocate animals, the NPS would avoid sites where undesirable impacts to the environment could occur. All necessary permits would be obtained. Prior to transporting animals to other locations, any necessary disease testing would be conducted.</p>	Same as alternative D.
Fencing	<p>The NPS would continue retrofitting boundary fences from 4-foot fences to 6-foot fences in areas vulnerable to mouflon sheep ingress in the older section of the park.</p> <p>The NPS would continue to use interior fencing to delineate managed non-native ungulate removal areas and exclude non-native ungulates from sensitive resource areas, including restoration plots, in the older section of the park.</p> <p>Past experience and consideration of current scientific knowledge indicate that boundary fencing would be necessary in Kahuku. However, under alternative A implementation of a comprehensive boundary fence would be uncertain.</p>	<p>Same as alternative A, plus:</p> <ul style="list-style-type: none"> <li>• complete a boundary fence for the Kahuku Unit,</li> <li>• establish a boundary fence for unmanaged portions of the 'Ōla'a rainforest,</li> </ul> <p>In addition, localized internal fencing could be constructed to assist in the control of non-native ungulates as needed. Boundary fences could be established on the east end of Kīlauea if active lava flow ceased and ingress occurred. The actual sequence of fencing would be based on conditions on the ground as the implementation of other parts of the plan occurs. Design of fencing could be modified based on new information and future experimentation to exclude multiple non-native ungulate species.</p>	Same as alternative B.	Same as alternative B.	Same as alternative B.

Management Activity	Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)	Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques	Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers	Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques	Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers
Use of qualified volunteers	<p>Qualified volunteers would be used for direct reduction with firearms during the reduction phase in more accessible areas of Kahuku (e.g., areas below 5,000 ft in elevation). The following would be required of potential qualified volunteers:</p> <ul style="list-style-type: none"> <li>• Completing a registration form</li> <li>• Obtaining a Hunter Education Certificate or card</li> <li>• Presenting registration of the firearm to be used and a Hawai'i hunting license</li> <li>• Providing their own transportation</li> <li>• Being able to spend a minimum of 8 hours hiking over rough terrain</li> </ul> <p>A minimum of one NPS staff member would directly supervise and escort every two volunteers and these staff members would direct volunteers as to which animals should be removed.</p> <p>Volunteers would be allowed to keep the meat or other parts from any animal they kill (inconsistent with current NPS practice).</p> <p>Qualified volunteers could also be used for other non-native ungulate management activities, including fence construction and maintenance, monitoring, baiting, trapping, and relocation. These qualified volunteers would need to demonstrate proficiency appropriate to their proposed involvement.</p>	<p>Same as alternative A, except:</p> <ul style="list-style-type: none"> <li>• For consistency with current NPS practice, volunteers would not be allowed to keep any part of the animal, including the meat.</li> <li>• The NPS would work to promote increased volunteer engagement in the full spectrum of non-native ungulate management activities open to volunteer participation (e.g., fence construction and maintenance, monitoring, etc.).</li> </ul>	<p>Volunteers would not be used in any capacity associated with non-native ungulate management.</p>	<p>Same as alternative B, plus:</p> <ul style="list-style-type: none"> <li>• Volunteers could be used for ground shooting activities in additional management phases and areas where safe and practicable.</li> </ul>	<p>Same as alternative B, except:</p> <ul style="list-style-type: none"> <li>• Volunteers would not be used for any ground shooting activities.</li> </ul>
Carcass disposal	<p>Carcasses of animals would generally be left in place, unless volunteers choose to keep the meat or other parts of the animal. Carcasses may be relocated from kill sites if they are located in sensitive areas, such as next to a road, trail, or cultural site.</p>	<p>Same as alternative A. However, volunteers would not be able to keep the meat. The NPS would investigate opportunities to salvage and donate meat when practicable, following all applicable NPS guidelines.</p>	<p>Carcasses of animals would generally be left in place. Carcasses may be relocated from kill sites if they are located in sensitive areas, such as next to a road, trail, or cultural site.</p>	<p>Same as alternative B.</p>	<p>Same as alternative B.</p>

Helicopter and firearms use would comply with all relevant regulations, policies, and plans (see the “Employee and Visitor Health and Safety” section in “Chapter 4: Environmental Consequences”), and would be consistent with the Interagency Aviation Management Council’s (IAMC) *Interagency Helicopter Operations Guide* (IAMC 2006) and the *Aerial Capture, Eradication, and Tagging of Animals Handbook* (Department of the Interior Departmental Manual 351 [DM 2–351 DM 3]). Only qualified personnel would participate in helicopter operations. Compliance with all relevant NPS directives related to firearms use in parks, as well as federal firearm laws administered by the Bureau of Alcohol, Tobacco, and Firearms, would be required. The NPS would continue to pursue safe and effective non-toxic alternatives to the use of lead bullets. Firearm noise suppressors would be considered at the discretion of the NPS.

### **Snaring**

Snaring would be used for the removal of feral pigs. This technique would be used primarily to remove remnant pigs, when densities are low, in rugged terrain or remote sites, and/or to remove pigs that have become accustomed to other removal techniques and learned to avoid them. This technique involves placing a cable snare in areas where pigs are most likely to travel, including trails, ridgetops, and fence lines. Cable snares consist of a loop of steel cable fastened to a secured or heavy object and situated to catch an animal it passes through the narrow opening, ultimately killing the animal. The snares would be well marked, mapped with GPS coordinates, heavily flagged, and sometimes baited. Prior consultation with NPS subject experts and the park botanist would be conducted to determine the type of snare, placement, and bait selection to avoid potential impacts to nēnē and other native sensitive species in the area. Fenced management units with snares would be well signposted, which would limit potential safety issues.

### **Baiting and Trapping**

Baiting and trapping would be used for lethal removal of feral pigs, mouflon sheep, and feral cattle. Traps would be used to capture the animals, which would then be dispatched in or near the trap. This method would be used in fenced and unfenced areas; the latter typically during the breeding and nesting season of the endangered nēnē where nests or goslings need to be protected from predatory pigs. Prior consultation with NPS subject experts and the park botanist is conducted to determine the type of trap, placement and bait selection to avoid potential impacts to nēnē and other native sensitive species in the area.

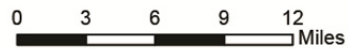
### **Fencing**

In the older section of the park, the NPS would continue to repair boundary fences (see figure 5). In areas where there is potential for mouflon sheep to breach fences, the NPS would continue to retrofit boundary fences from 4-foot to 6-foot fences. The NPS would also continue to use interior fencing (39 to 72 inches in height, depending on the non-native ungulates in the area) to delineate managed non-native pig removal areas and exclude non-native ungulates from sensitive resource areas, including restoration plots. Fenced management units typically range from several hundred acres in size to several thousand acres. Smaller fenced units (e.g., several acres) are typically constructed for the protection of highly sensitive resources (e.g., endangered silverswords and nēnē) or to evaluate recovery as a prelude to establishment of larger, fenced managed units.



- NPS Boundary
- Roads and Streets
- Towns
- Volcanoes
- Wilderness Area
- Fenceline

**FIGURE 5:**  
Existing Fence Boundaries



For Illustration Purposes Only.



Although fencing for the Kahuku Unit would be part of any alternative, the type, amount, location, and priority of fencing would vary between the no-action and the action alternatives (see discussion in “Elements Common to All Action Alternatives” and “Alternative A”). Based on past experience and research, any fencing would be at least 6 feet (2 meters) high and would be designed to keep multiple non-native ungulate species outside the park boundary. Any fencing would be modified, as necessary, to minimize impacts on other wildlife (e.g., using white vinyl strips or flagging to make the fence more visible to petrels) and address any changes in fencing technology (e.g., fence design, remote cameras to monitor breaches, etc.).

### **Carcass Handling and Disposal**

Carcasses of animals would generally be left in place. Carcasses may be relocated from kill sites if they are located in sensitive areas, such as next to a road, trail, or cultural site.

### **HUMANE MANAGEMENT ACTIONS**

The NPS would adhere to guidelines from the American Society of Mammalogists (ASM n.d.) and the American Veterinary Medical Association (AVMA 2007) to ensure that management actions are conducted as humanely as possible to minimize non-native ungulate suffering. When using direct reduction with firearms, consideration would be given to the choice of firearm, ammunition, and shot placement to ensure the humaneness of the action.

### **WEED AND FIRE MANAGEMENT PROGRAMS**

The NPS would continue to implement the weed control program (NPS 1999a) and the fire management plan that are already in use at the park (NPS 2005a). For information regarding weed control in the park, refer to the “Vegetation” section in chapter 3. The fire management plan is described in detail in chapter 1.

### **THREATENED OR ENDANGERED PLANT AND ANIMAL SPECIES**

The NPS would continue to coordinate with the USFWS to ensure that potential environmental impacts on listed species are adequately considered and, as needed, identify appropriate mitigation measures to avoid impacts on listed species in the area. See appendix A for letters detailing consultation efforts conducted to date for this plan/EIS.

### **CULTURAL RESOURCES**

The NPS would continue to coordinate with the State Historic Preservation Officer to ensure compliance with all pertinent laws and regulations, and, if necessary, will seek a Memorandum of Agreement to cover the management actions of the preferred alternative. Archeological surveys would be conducted prior to the construction of fences, and fences would be realigned, if necessary, to avoid impacts to archeological resources and to minimize disturbance to the cultural viewshed. See appendix A for letters detailing consultation efforts conducted to date for this plan/EIS.

### **MINIMUM REQUIREMENTS AND MINIMUM TOOLS FOR MANAGEMENT ACTIONS IN WILDERNESS AREAS**

Pursuant to the *Wilderness Act*, the park’s manager must apply the “minimum requirement” concept to all management activities that affect the wilderness resource and character at the park. Minimum requirement is a documented process the NPS uses to determine the appropriateness of all actions affecting wilderness. This concept is intended to minimize impacts on wilderness values and resources. Using this process,

managers may authorize the generally prohibited activities or uses listed in section 4(c) of the *Wilderness Act* if deemed necessary to meet the minimum requirements for the administration of the area as wilderness, and where those methods are determined to be the “minimum tool” for the project.

In accordance with NPS policy, a minimum requirements analysis must be completed before a management action can be taken in designated wilderness areas. *NPS Management Policies 2006* states that the purpose of a minimum requirements analysis is to determine (1) whether the proposed management action is appropriate or necessary for administration of the area as wilderness and does not cause a significant impact on wilderness resources and character; and (2) the techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized (NPS 2006b, section 6.3.5).

In addition, Director’s Order 41: *Wilderness Preservation and Management* sets forth guidance for applying the minimum requirement concept to protect wilderness and for the overall management, interpretation, and uses of wilderness. With regard to natural resource management in wilderness, it reaffirms management policies and states, “Management intervention should only be undertaken to the extent necessary to correct past mistakes, the impacts of human use, and the influences originating outside of wilderness boundaries” (NPS 1999c).

Management intervention to ensure the survival of endemic communities of plants and animals at risk from human introduced non-native ungulates was determined to be a minimum requirement for the administration of wilderness areas in the Final Environmental Statement for the Proposed Wilderness Areas at Hawai‘i Volcanoes National Park (NPS 1975b). Specific actions identified were construction of fences, use of power tools to assist with fence construction, and the use of helicopters to exclude non-native goats and pigs for the protection of park resources. Subsequent environmental assessments (NPS 1997a, 1997b, 1999b) re-affirmed the need to construct fences and conduct non-native ungulate control measures in wilderness units.

The current minimum requirements decision guide template (see appendix B) is used by each of the agencies to assist wilderness managers in making appropriate decisions for wilderness management. The minimum requirements analysis provides a method of determining the necessity of an action in wilderness areas and how to minimize impacts, but does not bind an agency to take a particular action.

Under all alternatives, the NPS would implement management activities to remove non-native ungulates from areas that include designated wilderness and areas currently being evaluated for wilderness eligibility (e.g., upper elevation portions of the Kahuku Unit). Although the *Wilderness Act* implies that management actions that manipulate natural processes in wilderness conflict with wilderness values, managing populations of non-native ungulates is not expressly prohibited in the act. As noted previously, section 4(c) of the *Wilderness Act* notes that agencies may engage in management actions that may otherwise be prohibited in wilderness provided they are necessary “to meet the minimum requirements for the administration of the area.”

The results of the minimum requirements analysis determined that management of non-native ungulate populations in wilderness is necessary to meet the minimum requirements for the administration of wilderness areas in the park (see appendix B). Managing populations of non-native ungulates, as proposed under all alternatives, would perpetuate or assist recovery of the natural conditions that contribute to the character of the wilderness at Hawai‘i Volcanoes National Park. Specific actions (fence construction, the use of power tools and helicopter) identified in the alternatives are considered the minimum tools necessary to meet these requirements (see appendix B).

## MINIMIZATION OF DISTURBANCE TO PUBLIC

To the extent feasible, efforts would be made to minimize safety concerns and disturbances to the public, such as scheduling non-native ungulate management activities during periods of lower visitor use (e.g., early morning). However, the NPS would determine if specific areas of the park would also need to be temporarily closed during non-native ungulate management activities. The public would be appropriately notified of these closures.

At the time of this writing (summer 2011), Kahuku is open to the public on weekends. Because areas currently open to the public overlap with the areas where volunteers conduct animal reduction activities, the park closes these areas the first Saturday of every month to safely conduct the reduction activities. Closures are not typically needed in the ‘Ōla‘a, Kīlauea, and Mauna Loa sections of the park, which are primarily in the maintenance phase and require minimal removal efforts (see discussion of “Frequency and Duration of Management Actions” under “Elements Common to All Action Alternatives” for more details). Although these sections of the park are open to the public, visitation is typically rare away from roads and trails. As a result, closures in these areas typically involve notifying the front desk, dispatchers, researchers, and other park staff of plans to conduct removal activities in these areas, in addition to placing signs on fences and/or gates to notify visitors. Removal activities are also generally conducted in the early morning to minimize impacts on visitors.

## EDUCATION

Under all alternatives, NPS staff would continue to provide information in the visitor center, on nature walks, and in evening programs about NPS efforts to perpetuate endemic plants and animals and about issues related to non-native ungulates. Programs in local communities would be conducted as opportunities arise.

## FORMAL PARTNERSHIPS

As described in “Chapter 1: Purpose of and Need for Action,” the NPS is part of the TMA (formerly the ‘Ōla‘a-Kīlauea Partnership), a cooperative land management effort for over 1 million acres of land on the Island of Hawai‘i (see the “Non-native Ungulate Management by Other Federal, State, and Local Agencies in the Region” section). Under all alternatives, the NPS would continue to collaborate with existing partners as well as increase participation in partnerships with neighboring landowners to implement non-native ungulate management actions beneficial to the protection of park resources.

## USE OF BEST AVAILABLE SCIENCE

As described in chapter 1, “Research Summary,” the NPS has relied on scientific research to develop and implement effective strategies for non-native ungulate management in the park. Under all alternatives, the NPS would continue to rely on the best available science to implement non-native ungulate management. This includes working with scientists and technical experts with a background in non-native ungulates to evaluate and refine current control methods, and develop new methods to address multiple non-native ungulate species.

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*Under all alternatives, the NPS would continue to rely on the best available science to implement non-native ungulate management. This includes working with scientists and technical experts with a background in non-native ungulates to evaluate and refine current control methods, and develop new methods to address multiple non-native ungulate species.*

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## ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

The following elements would be common to all action alternatives. Some of the actions listed under “Elements Common to All Action Alternatives” may be implemented under alternative A, the no-action alternative. However, they would not be part of a comprehensive, systematic management plan under alternative A and therefore would not be considered common to all alternatives.

### NON-NATIVE UNGULATE POPULATION-LEVEL OBJECTIVE

The *Organic Act* of 1916 and *NPS Management Policies 2006* (NPS 2006b) require that the NPS manage resources in natural conditions (described as the condition of resources that would be present in the absence of human dominance over the landscape) to prevent the need for restoration and leave them unimpaired for the enjoyment of future generations. The *NPS Management Policies 2006* acknowledges that park units are parts of much larger ecosystems and that management of resources should occur within this context. In addition, *NPS Management Policies 2006* states that non-native species will not be allowed to displace native species if this displacement can be prevented (NPS 2006b).

To meet these requirements and to attain objectives for protecting natural resources and supporting their natural recovery, the NPS concluded that the population-level objective for all action alternatives would be zero non-native ungulates, or as low as practicable in managed areas, recognizing the possibility of remnant populations and ingress animals. Although removal of non-native ungulates alone would not result in comprehensive ecosystem protection and restoration, it would not be possible to achieve success with non-native ungulates on the landscape.

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*To meet these requirements and to attain objectives for protecting natural resources and supporting their natural recovery, the NPS concluded that the population-level objective for all action alternatives would be zero non-native ungulates, or as low as practicable in managed areas, recognizing the possibility of remnant populations and ingress animals.*

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### MANAGEMENT PHASES

Non-native ungulate management under a comprehensive, systematic plan would be divided into four phases:

1. **Initial assessment.** This phase occurs prior to initiation of control work, and includes monitoring to estimate initial abundance levels and distribution and to determine the amount of resources that will be necessary to manage non-native ungulates in prescribed areas.
2. **Reduction.** This first phase of control work typically begins at or near maximum population density, and usually after ingress has been controlled by fences. The goal of this phase is to reduce the population as much as possible in a short period of time, thereby reducing population recruitment and curtailing excessive ecosystem damage.
3. **Post-reduction.** This phase occurs when remnant levels of non-native ungulates have been achieved and the animals often become more difficult to detect, monitor, and manage.
4. **Maintenance.** The goal of this phase is to prevent ingress to management units in which non-native ungulates targeted for control have been fully removed and to carry out follow-up removal of ingress animals.

## **FREQUENCY AND DURATION OF MANAGEMENT ACTIONS**

Information regarding the frequency and duration of management actions in this plan/EIS is based on ungulate management actions conducted between fiscal year (FY) 2003 and FY 2009 (NPS 2005b, 2006c, 2007c, 2010b). Actual frequency and/or duration during the implementation of any action alternative would depend on conditions at the time of implementation.

### **Reduction and Post-reduction Phases**

Frequency and duration of the reduction/post-reduction phases for mouflon sheep, pigs, and goats in Kahuku have been estimated based on reduction efforts in the west (approximately 12,600 acres) and mauka (approximately 8,900 acres) Kahuku units (FY 2003–FY 2009). During this phase, the annual number of full-day removal efforts using ground shooting averaged 20 and varied between 8 and 28. The annual number of helicopter-assisted (herding and/or aerial shooting) reduction/post-reduction efforts for mouflon sheep and goats averaged 7 and varied between 0 and 19, typically increasing to 2 to 3 times a month as animals became more wary of ground-pursuit methods. Aerial shooting generally lasts 1.5 to 2 hours, while ground shooting can last up to 10 hours per day. The reduction phase would typically take place over a period of 6 to 36 months, depending on the size of the unit, whether the unit is expanded, and availability of funding. For the purposes of the analysis, it is assumed that reduction/post-reduction would continue at a similar pace for the foreseeable future, resulting in about 20 removal efforts per year within a unit. Up to one-third of the removal efforts would include helicopter assistance. Frequency and duration of the reduction/post-reduction phases in remaining unmanaged areas in ‘Ōla‘a have been based on feral pig control efforts in the new unit of the ‘Ōla‘a area from FY 2005 to FY 2007. Staff conducted an average of 24 full-day removal efforts using ground shooting with dogs and snaring during this period. A similar intensity of effort per acre would be assumed for remaining unmanaged areas. The number of removal efforts would decrease over the life of the plan as non-native ungulates are removed and excluded from an area and the NPS moves into the maintenance phase.

### **Maintenance Phase**

Information on the frequency and duration of management actions during the maintenance phase is based on efforts conducted in non-native ungulate control units in the Kīlauea, Mauna Loa, and ‘Ōla‘a sections of the park. Because non-native ungulate populations targeted for control have generally been excluded and removed in these areas, management actions are focused on removing ingress animals. The frequency of maintenance activities varies based on the number of non-native ungulates that breach an area in any given year. Between October 2004 and September 2009, the average annual number of animals removed from all management units in the maintenance phase was one goat, one mouflon sheep, zero cattle, and twelve pigs. This resulted in the park conducting an average of approximately fifteen removal efforts per year. During that period, four efforts (three involving goats and one involving mouflon sheep) were helicopter assisted (i.e., aerial shooting). Aerial operations last no more than a couple of hours. The remaining removal efforts were conducted using snaring, trapping, and/or ground shooting. These operations generally last 6 to 8 hours. Removal efforts typically begin at first light to minimize impacts on visitors and to maximize effectiveness. For the purposes of this analysis, it is assumed that maintenance efforts would continue at a similar level for the foreseeable future, resulting in about 5 to 25 removal efforts per year across all units in the maintenance phase. Approximately one-third of these efforts per year would require helicopter assistance. As the NPS shifts from reduction to maintenance in the Kahuku section of the park, the number of maintenance efforts parkwide would likely increase.

In mid-elevation, seasonally dry nēnē habitat on Kīlauea, baiting and live trapping would be the primary tool for removing feral pigs from the vicinity of nests and goslings. These localized activities would be conducted annually and limited to the breeding season (October through March).

## MONITORING

A formalized monitoring system, as described in appendix C, would be part of all action alternatives. The information gained through monitoring would inform the use of management tools and the progression through the four management phases described above.

When ungulates such as mouflon sheep are abundant and inhabit relatively open environments, particularly during the initial assessment phase, systematic aerial surveys are an effective means of assessing population levels. However, although feral pigs inhabit a wide range of sparse, open, and dense vegetation communities, they are the most problematic ungulate to assess during all management phases, especially in dense vegetation. Therefore, ground-based systematic monitoring techniques are often used when feral pigs are at high population levels. Monthly perimeter inspections of fences are the primary means of assessing the integrity of management units during the maintenance phase.

Systematic monitoring techniques are less effective for all species at low population levels because ungulates may congregate in small numbers away from original monitoring locations. Adaptive strategies and combinations of multiple techniques may be necessary to monitor small numbers of non-native ungulates remaining in management units. Occasionally, some monitoring techniques may be used out of sequence or during other phases of non-native ungulate management as needed.

## CONDITIONS OF USE FOR MANAGEMENT TOOLS

Due to the harsh environment and remoteness of some areas in Hawai'i Volcanoes, there are challenges to managing non-native ungulates. For example, in parts of the park where fences are exposed to substantial rainfall and washouts, volcanic fumes, or sea spray, they can deteriorate quickly, requiring more frequent maintenance to help prevent ingress. Management must be adapted to address densely vegetated forests, difficult terrain, or remote areas of the park. Some methods used in these areas include aerial shooting of animals such as mouflon sheep in remote and difficult terrain, using snares that trap and kill pigs, and using dogs to seek out and flush mouflon sheep in the dense forests. Natural barriers, primarily earth cracks, can preclude the use of certain management techniques and block access to animals such as pigs, because of the possibility that park staff or dogs would fall into the cracks (NPS 1999a, 2006b). Areas that are hard to access require intensive efforts that consume valuable staff time, and control of remnant individual animals is difficult in these locations.

Several studies to test efficacy of control methods and evaluate recovery of the vegetation following animal removal have been conducted in the park (Baldwin and Fagerlund 1943; Cuddihy 1984; Hone and Stone 1989; Katahira 1980; Katahira et al. 1993; Loh and Tunison 1999; Pratt et al. 1999; Spatz and Mueller-Dombois 1975; Stone et al. 1992; Tunison et al. 1994; Tunison et al. 1995). Current studies are focused on evaluating the population growth and developing control techniques for mouflon sheep (Stephens et al. 2008; USGS 2006a.) and monitoring recovery of koa forest following mouflon sheep reduction in Kahuku (Loh et al. 2005). Also, the park has established several small experimental exclosures to evaluate vegetation changes and develop methods to facilitate koa-‘ōhi’a forest recovery in former cattle-grazed pasture in Kahuku (NPS 2006i). Similar studies have taken place at Haleakalā National Park (Anderson and Stone 1993; Diong 1981, 1982; Stone et al. 1991) and in Hakalau Forest National Wildlife Refuge (Hess et al. 2006). A study by Loope et al. (1991) documented the recovery of a bog disturbed by feral pig damage after a fence was constructed around it. Throughout the next 6 years, the area's vegetation was assessed annually to evaluate progress as recovery occurred.

Based on past research and experience, and in consideration of input from the public and the science team, the NPS has identified considerations for implementing the management tools under the action alternatives. These considerations include target species for particular management techniques and conditions under which management tools are most warranted (see table 4).

**TABLE 4: CONSIDERATIONS FOR IMPLEMENTING MANAGEMENT TOOLS**

	Management Tools							
	Direct Reduction with Firearms—Ground Shooting	Direct Reduction with Firearms—Aerial Shooting	Snaring		Baiting and Trapping		Relocation	
	All Action Alternatives	All Action Alternatives and Other Non-Native Ungulates	Alternative B	Alternatives C-E	Alternative B	Alternatives C-E	Alternatives B, C	Alternatives D, E
Species	Sheep, goats, pigs, mouflon sheep, deer, and feral cattle	Sheep, goats, mouflon sheep, pigs, deer and feral cattle	Pigs	Pigs and other non-native ungulates	Pigs, mouflon sheep, and feral cattle	Pigs, mouflon sheep, feral cattle, and other non-native ungulates	Domestic cattle (returned to ranchers); not used for feral animals	Sheep, mouflon sheep, pigs, deer, domestic cattle (returned to ranchers), and other non-native ungulates
Population levels	All	All	Generally low density	Same as alternative B	All	Same as alternative B	Low density (ingress domestic cattle)	All
Environment	Wherever effective and safe	Wherever effective and safe; in general, beneficial in open-canopy areas, remote areas	In general, rugged terrain (cracks, lava tubes that present safety risks to dogs and staff); remote sites; also along trails that lead to traps (used if baiting not successful)	Wherever effective and safe	Wherever effective and safe	Wherever effective and safe	Wherever effective and safe	Wherever effective and safe
Other factors	Could be used in combination with dogs	Could be used in combination with dogs	Would be used when pigs have become accustomed to other techniques	Same as alternative B, plus: Could be used for other non-native ungulates	Would include use in nēnē habitat for pigs; can be used at any time during removals when effective	Same as alternative B	Park would work with ranchers to relocate domestic cattle back to their ranches	Same as alternatives B and C, plus: Would require willing recipients for other ungulates; and all necessary permissions, environmental review, and permits; would avoid relocating animals to sites where undesirable impacts to the environment could occur

Notes: Use of any tool is subject to available funding. Relocation could involve either driving to adjacent lands or capturing animals and transporting them to other areas; both require willing recipients and close coordination with pertinent agencies.





## FENCING

As described in “Elements Common to All Alternatives,” the NPS would continue to repair and retrofit boundary fences around the older section of the park and construct localized interior fences to manage and exclude non-native ungulates.

Under all action alternatives, the NPS would

- complete a boundary fence for the Kahuku Unit;
- construct a boundary fence for unmanaged portions of the ‘Ōla‘a rainforest (figure 6).

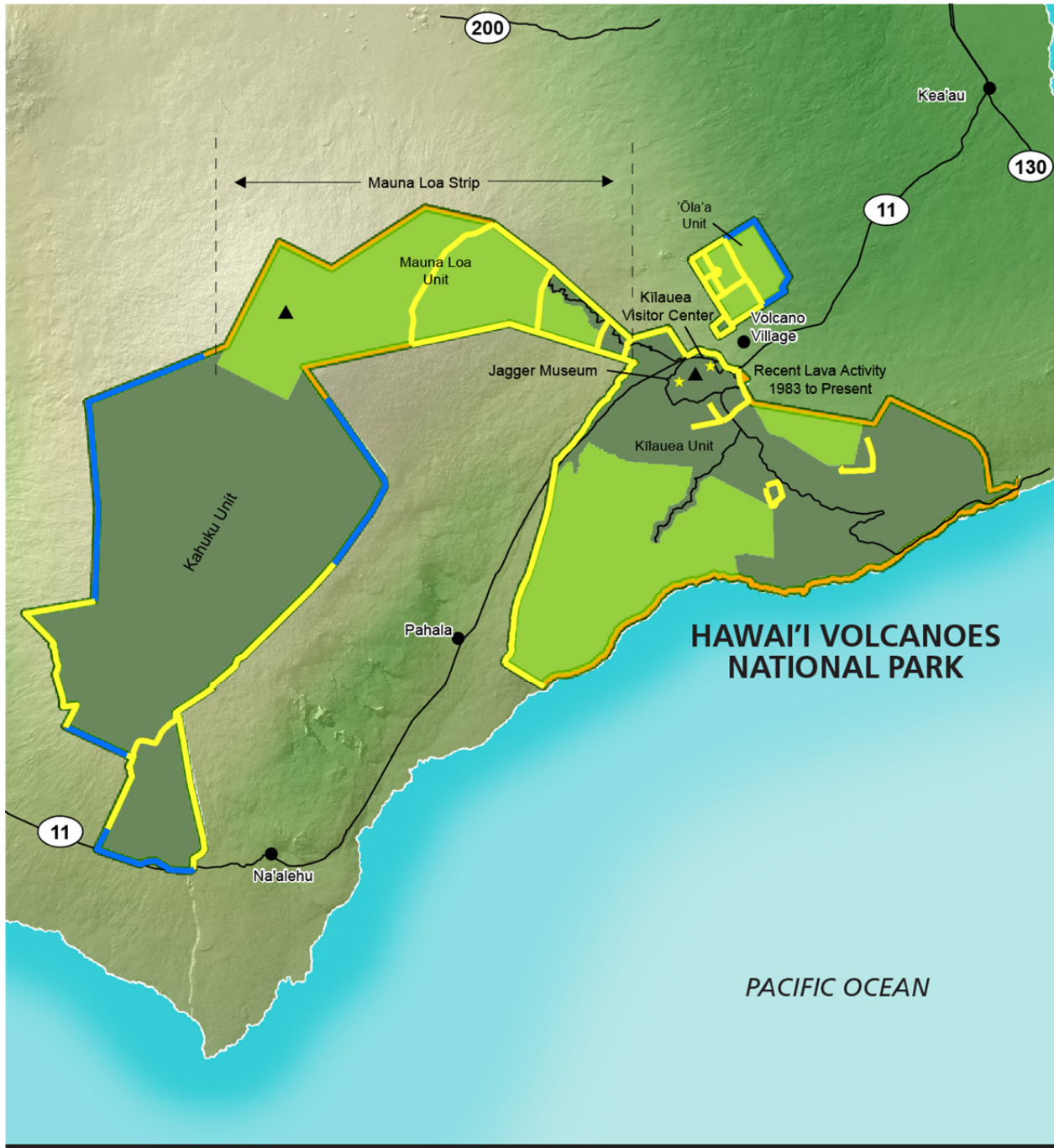
In the Kahuku Unit, the boundary fence would extend upslope for several miles into sparsely vegetated lava fields before terminating at the 11,000 foot elevation where potential for animal ingress would be low. In addition, localized internal fencing could be constructed to assist in the control of non-native ungulates, if needed. Also, boundary fences could be established on the east end of Kīlauea if active lava flow ceased and ingress of feral goats or other ungulates occurred in significant numbers.

The actual sequence of fencing would be based on conditions on the ground while other parts of the plan are being implemented. Design of fencing would be as described in “Elements Common to All Alternatives,” but could be modified based on new information and future experimentation to exclude multiple non-native ungulate species.

## MINIMIZING IMPACTS TO SPECIAL STATUS PLANT AND ANIMAL SPECIES

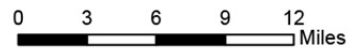
After informal consultation with the USFWS, the following measures were identified to minimize potential impacts to endangered species and habitat associated with ungulate removal, fence repair, replacement and construction:

- Ungulate removal efforts could take place year round depending on where and when animals are detected and may include actions conducted during critical periods for sensitive species. Trap placement and bait selection is done in consultation with NPS subject experts and the park botanist to avoid potential impacts to nēnē and other sensitive native plant and animal species in the area. The use of dogs to assist with locating animals would be avoided in known areas where nēnē or other ground nesting sensitive native species occur. Low-flying helicopter work would be minimized in sensitive wildlife habitat during critical periods. However, if control actions are required (e.g., due to animal ingress), park staff will confer with the appropriate wildlife biologist to determine if sensitive species are in the area, and depending on the determination, consult with USFWS prior to implementation of control actions. Personnel involved in removal efforts will follow sanitation protocols for inspecting and cleaning equipment, personal gear, and vehicles to reduce the risk of bringing non-native plants and animals into an area.



- NPS Boundary
- Roads and Streets
- Towns
- Volcanoes
- Wilderness Area
- Existing Fenceline
- Proposed Fenceline

**FIGURE 6:**  
Proposed Fence Boundaries



For Illustration Purposes Only.

- Botanical surveys conducted prior to fence corridor clearing would mark all listed and rare plant species in the area, including helicopter staging areas. Fence alignment and helicopter staging areas would be adjusted so that no endangered or rare species observed in the vicinity of the fence line would be affected by the proposed project (at least 15 feet (4.6 meters) away from listed plants per comments received from USFWS). Impacts to native vegetation associated with fence corridor clearing would be limited to a 4-foot corridor. Plant removal would be limited to common understory vegetation, brush, and small trees less than 6 inches in diameter. Vehicles would stay on existing roads and trails. If off-road use is needed, routes would be surveyed and listed plants would be clearly marked with flagging or tape. Park staff familiar with the native plants in the area would supervise workers within fenced units. All listed species along fence construction corridors would be clearly marked with flagging or tape.
- In areas where Hawaiian petrel and Newell's shearwater occur or fly over, to reduce the risk of fence strikes, white vinyl strips, flagging, or similar material would be attached to the top strand of the fence that protrudes above the canopy. In addition to strips on the top strand of the fence, strips would be attached along the middle of the fence where the fence is found on open or sparsely vegetated lava flows. Fence alignment would be adjusted to at least 30 feet (9.1 meters) away from seabird colonies. If improved marking strategies emerge they could be used in place of the current practice. Fence alignment would be adjusted to avoid impacts on seabird colonies.
- All park sanitation protocols for inspecting and cleaning personnel clothing, boots, and gear; project equipment; vehicles; and construction material would be followed to reduce the risk of bringing non-native plants, insects and coqui frogs into the area. For a minimum of 1 year after completion of the project, worksites would be inspected and treated to remove non-native species that may have entered the area.
- In endangered forest bird habitat, fence alignment would be adjusted to avoid cutting large trees. The proposed specifications for vegetation clearing (described above) limits removal to trees less than 6 inches in diameter. This would protect 'ōhi'a (*Metrosideros polymorpha*) or koa trees with a diameter of 3 feet (1 meter) or greater, which are preferred nesting habitat for 'ākepa. To the extent practical, construction activities and helicopter transport of fence materials would be scheduled before or after the peak breeding season for endangered forest birds (February through July). If an endangered forest bird or active nest is detected in or near the project area during construction, the NPS would halt construction activity and not resume until coordination with the USFWS has occurred.
- In Hawaiian hawk habitat, to the extent practical, helicopter transport of fence materials and construction activities would be scheduled before or after the breeding and nesting seasons (March through September). For construction during the breeding season, a nest search of the area proposed for fence corridor construction and surrounding environs would be conducted by the park biologist or a qualified alternate immediately prior to the onset of construction to ensure that no nests are in the vicinity. If an active nest is detected during construction, construction activity would be halted and will not resume until coordination with the USFWS has occurred.
- Trained NPS staff would evaluate helicopter staging areas prior to transport of material to drop sites, and sites may be relocated, if needed, to reduce impacts to nēnē. If nēnē are observed during construction activity along the fence line, appropriate NPS staff would be contacted to evaluate the situation, and the construction would be suspended until the birds move on of their own accord or coordination with the USFWS occurs.
- In order to reduce potential disturbance to Hawaiian hoary bats, no tree (>15-feet tall) removal or trimming would occur when lactating or non-volant bats are present (May through August, ≤5,000-feet in elevation). Additionally, no barbed wire would be used in new fence construction

in order to minimize potential bat entanglement. Where potential entanglement may occur (e.g., in open areas), barbed wire would be removed from existing fences.

- To protect potential host plants and habitat for the picture-wing fly (*Drosophila heteroneura*, *Drosophila mulli*), impacts on native vegetation associated with fence corridor clearing would be limited to a 4-foot corridor. Plant removal would be limited to common understory vegetation, brush, and small trees less than 6 inches in diameter, and avoid removal of important host plants (e.g., *Clermontia* spp., *Cyanea* spp. *Trematobelvia* spp., *Pritchardia* spp.).

In addition, the proposed project would incorporate the following measures to avoid impacts from humans and vehicles when construction or eradication efforts take place in the vicinity of listed plants:

- Vehicles would stay on existing roads and trails. If off-road use is needed, routes would be surveyed and listed plants would be clearly marked with flagging or tape.
- Park staff familiar with the native plants in the area would supervise workers within fenced units.
- All listed species along fence construction corridors would be clearly marked with flagging or tape.

## USE OF BEST AVAILABLE SCIENCE

As described in “Elements Common to All Alternatives,” the NPS would continue to rely on scientific research to develop and implement effective strategies for non-native ungulate management in the park. As described in the State of Hawai‘i DLNR technical report entitled *Review of Methods and Approach for Control of Non-native Ungulates in Hawai‘i*, non-native ungulate control programs require “an up-to-date evaluation of the full range of tools available, management flexibility in the choice of methods and approach deployed, and an integrated approach that uses multiple methods and approaches” (HDLNR 2007). The Department of Interior Secretarial Order 3305 underscores the need for peer review to ensure the validity of the science used in decision making. Recognizing these needs, the NPS convened a science team, consisting of scientists and technical experts with a background in non-native ungulates that reviewed the efficacy of available management methods including, but not limited to, those considered by the state (“Chapter 5: Consultation and Coordination”). These discussions were considered by the NPS planning team when formulating the action alternatives. In addition, management actions would generally be used as described later in this chapter, but the NPS could explore the potential to expand their use as new information becomes available regarding their effectiveness.

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*The Department of Interior Secretarial Order 3305 underscores the need for peer review to ensure the validity of the science used in decision making. Recognizing these needs, the NPS convened a science team, consisting of scientists and technical experts with a background in non-native ungulates that reviewed the efficacy of available management methods including, but not limited to, those considered by the state.*

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## FORMAL PARTNERSHIPS

As described in “Elements Common to All Alternatives,” the NPS would continue to collaborate with existing partners as well as increase participation in partnerships with neighboring landowners to implement non-native ungulate management actions beneficial to the protection of park resources. Under all action alternatives, the comprehensive plan would provide a framework for communication, coordination and collaborations among park partners and community stakeholders.

## **ALTERNATIVE A: NO ACTION (CONTINUE EXISTING NON-NATIVE UNGULATE MANAGEMENT ACTIVITIES)**

The Council on Environmental Quality (CEQ) requires that the alternatives analyzed in an EIS “include the alternative of no action” (40 CFR 1502.14[d]). The no-action alternative “sets a baseline of existing impact continued into the future against which to compare impacts of action alternatives” (NPS 2001a, Section 2.7). Under alternative A, the NPS would continue current non-native ungulate management practices and not implement any new activities beyond those used when the non-native ungulate management planning process started.

In the older section of the park, the NPS has managed non-native ungulates for decades pursuant to a variety of plans and other management decisions (See “History of Non-native Ungulate Management at Hawai‘i Volcanoes National Park” in chapter 1). Although described in different ways, the NPS has for all practical purposes operated with a population-level objective of zero non-native ungulates (or as low as practicable) in the older section of the park. As described under “Elements Common to All Alternatives,” with the exception of feral pigs, management actions have essentially eliminated non-native ungulates below 9,000 feet (2,743 meters) in elevation. Feral pigs are excluded from interior fenced units protecting approximately 40,000 acres of subalpine, montane, and selected lowland communities. Under alternative A, the NPS would continue to use lethal management techniques in the older section of the park as described in “Elements Common to All Alternatives” and would conduct monitoring activities similar to those described in appendix C to inform management tool selection. The NPS would continue to repair, retrofit, and install fencing in the older section of the park as described in “Elements Common to All Alternatives.”

In the Kahuku Unit, interim actions taken since the acquisition of the unit would continue under alternative A. However, unlike the older section of the park, there would not be an established population-level objective for the unit, although past experience and consideration of current scientific knowledge suggest a practical goal of eliminating non-native ungulates. Under alternative A, the NPS would continue to use lethal management techniques in Kahuku as described in “Elements Common to All Alternatives” and would conduct monitoring activities similar to those described in appendix C to inform management tool selection. Past experience and consideration of current scientific knowledge indicate that boundary fencing would be necessary in the Kahuku Unit to support non-native ungulate management efforts. However, because it is not currently part of any approved management plan for the park, implementation of a comprehensive boundary fence in Kahuku would be uncertain under alternative A.

Under alternative A, the implementation of non-native ungulate management would depend largely on the professional judgment, past experience, and scientific knowledge of NPS staff responsible for conducting management activities. Because alternative A does not incorporate the comprehensive, systematic approach described in “Elements Common to All Action Alternatives,” it would be uncertain whether the NPS would progress through management phases, monitor, and apply management tools consistently as staff and institutional knowledge change over time. The greatest uncertainty would be for Kahuku and areas currently unmanaged (e.g., portions of ‘Ōla‘a), for which no established population-level objective and fencing strategy has been identified.

### **MANAGEMENT TOOLS**

Under alternative A, available management tools and use would be as described be in “Elements Common to All Alternatives.”

## **QUALIFIED VOLUNTEERS**

Under alternative A, qualified volunteers could be used to assist with ground shooting in more accessible areas of Kahuku where animal densities are high. Volunteers would not be used in less accessible areas where individuals are at remnant levels, or if other safety concerns are present.

To be eligible, qualified volunteers would be required to fill out a registration form and meet specific criteria, including

- obtaining a Hunter Education Certificate or card;
- presenting registration of the firearm to be used and a Hawai'i hunting license;
- providing their own transportation; and
- being able to spend a minimum of 8 hours hiking over rough terrain.

Qualified volunteers would be used to assist with ground shooting approximately once or twice a month. NPS staff would formulate a plan for each removal effort to ensure that control work is done in priority areas and that potential safety concerns and conflicts with other park visitors are addressed. A minimum of one park staff member would be present to directly supervise and escort every two volunteers. Once in the field, park staff would direct volunteers as to which animals should be removed, ensuring that each individual understands the effort is for the purposes of resource management, and not for the experience of a "fair chase." Volunteers could also assist with spotting and handling the carcasses. NPS staff would collect data consisting of names of volunteers; date, area, and time, of removal activities; and species, sex, age, and herd size of animals removed. Volunteers would be allowed to keep the meat and other parts from any animal they kill (which is inconsistent with current NPS practice).

The primary purpose of volunteer participation would be to increase awareness of non-native ungulate issues and engage the surrounding community and general public in stewardship of park resources. Although volunteers have been used in other activities related to ungulate management (e.g., fence building, monitoring, baiting), based on past volunteer involvement, the majority of volunteer interest would continue to be in participation with ground shooting efforts. Any qualified volunteer who meets the requirements for participation would become part of a pool of available personnel who may supplement NPS management teams. In addition, all qualified volunteers would be directly supervised in the field by NPS personnel during any non-native ungulate management actions.

## **CARCASS HANDLING AND DISPOSAL**

Carcasses would generally be left in place, unless volunteers choose to keep the meat or other parts of the animal. Carcasses may be relocated from kill sites if they are in sensitive areas, such as next to a road, trail or cultural site.

## **ALTERNATIVE B: COMPREHENSIVE MANAGEMENT PLAN THAT USES LETHAL REMOVAL TECHNIQUES**

Under alternative B, the NPS would implement a comprehensive, systematic management plan that would use lethal removal techniques. The population-level objective would be zero, or as low as practicable in managed areas, recognizing the possibility of remnant populations and ingress animals. Management phases, monitoring, conditions of use for management tools, and fencing priorities would be as described in "Elements Common to All Action Alternatives." Qualified volunteers could be used for certain ground shooting activities and other non-native ungulate management activities.

## **MANAGEMENT TOOLS**

Under alternative B, the NPS would use the management tools described in “Elements Common to All Alternatives.” The use of management tools would be as described in that section and in “Considerations for Implementing Management Tools” (table 4).

### **QUALIFIED VOLUNTEERS**

The use of qualified volunteers would be as described for alternative A. However, for consistency with current NPS practice concerning the use of qualified volunteers, they would not be allowed to keep any part of the animal, including the meat. Additionally, the NPS would work to promote increased volunteer engagement in the full spectrum of non-native ungulate management activities open to volunteer participation (e.g., fence construction and maintenance, monitoring, etc.). The primary purpose of the NPS’s use of qualified volunteers would be to increase awareness of non-native ungulate issues and engage the surrounding community and general public in stewardship of park resources.

### **CARCASS HANDLING AND DISPOSAL**

As described in “Elements Common to All Alternatives,” carcasses of animals would generally be left in place. In addition, the NPS would investigate opportunities to salvage and donate meat when practicable, following all applicable NPS guidelines.

## **ALTERNATIVE C: COMPREHENSIVE MANAGEMENT PLAN THAT MAXIMIZES EFFICIENCY BY EXPANDING LETHAL REMOVAL TECHNIQUES AND DISCONTINUING THE USE OF VOLUNTEERS**

Under alternative C, the NPS would implement a comprehensive, systematic management plan utilizing the most efficient and cost-effective methods of non-native ungulate management. Management techniques would be lethal. The population-level objective would be zero, or as low as practicable in managed areas, recognizing the possibility of remnant populations and ingress animals. Management phases, monitoring, conditions of use for management tools, and fencing priorities would be as described in “Elements Common to All Action Alternatives.” Volunteers would not be used in any capacity associated with non-native ungulate management.

## **MANAGEMENT TOOLS**

Under alternative C, the NPS would use the management tools described in “Elements Common to All Alternatives.” Alternative C would also expand the application of management tools as described below. Table 4, “Considerations for Implementing Management Tools,” summarizes the general conditions that the NPS would consider when determining which tools to use in implementing management actions.

### **Direct Reduction with Firearms—Ground and Aerial Shooting**

Under alternative C, activities associated with ground shooting could be expanded by using bait stations to attract larger groups of non-native ungulates for removal. The park would also consider luring non-native ungulates into larger groups by inducing estrus in captive females. Studies have shown that inducing estrus may increase the efficiency of telemetry devices, as more males would seek out these animals than they would non-estrus females (Campbell et al. 2006). This process would involve trapping a limited number (for example, two) of female animals. Under the guidance of the NPS veterinarian and conducted by the certified park practitioner, these animals would be collared, held in an approximately 1-acre enclosure, sedated, and given estrogen implants. The implant would be injected in the area of the

non-native ungulate's ear using a specially designed implantation device. The treated ungulate would be ear tagged or collared to identify the treated animal as a precautionary measure in the event that the ungulate escapes from the enclosure. Once implanted, the females would continuously be in estrus, which would be used as a lure for the male non-native ungulates. When lured, the male non-native ungulates would be lethally removed and the injected females would be collected and used for other removal operations. Each dose of the estrogen implants would last approximately 200 days, after which time the female non-native ungulates would need to be re-injected (Elanco Animal Health 2002). To potentially facilitate removals during aerial shooting, the use of cracker shells (shotgun shells that when discharged make a loud noise to startle animals) to flush animals into open areas, as well as infrared technologies to locate non-native ungulates, could be investigated. Infrared technology could be used with aerial shooting to locate non-native ungulates for lethal removal using devices that remotely detect body heat emitted from the animals. Use of infrared technology would be limited to daybreak because of safety issues associated with night helicopter operations and because there is a very narrow window before the ground heats up and heat from other sources (e.g., warm rocks) begins to confuse the infrared signals.

### **Snaring**

Snaring could be expanded by using other types of snares for additional non-native ungulate species wherever effective and safe. The NPS would also explore using snares in combination with telemetry devices that would alert park staff when snares have been tripped.

### **Baiting and Trapping**

The NPS would investigate the expanded use of baiting and trapping for lethal removal of sheep and axis deer (if they are discovered in the park) in addition to pigs, mouflon sheep, and feral cattle.

## **QUALIFIED VOLUNTEERS**

Under alternative C, qualified volunteers would not be used for any non-native ungulate management activities, including but not limited to, non-native ungulate monitoring, lethal and non-lethal removal actions, and fencing. Elimination of the use of qualified volunteers would be aimed at increasing efficiency of management actions. NPS use of volunteers for non-native ungulate management activities requires additional NPS staff time for program administration, recruitment, training, and directing field efforts. Additionally, data indicate that NPS staff are more efficient at conducting lethal removal activities than volunteers. For example, data from the NPS and USGS (Stephens et al. 2008) show that NPS staff participants in the closely directed volunteer program at Kahuku were more efficient at removing mouflon sheep (5.2 per day) than qualified volunteers (4.6 per day) between March 2004 and February 2007, despite the fact that the volunteers had the advantage of taking the first shot. The greater efficiency of NPS staff is further demonstrated by a comparison of a staff-only removal effort in July 2009 (70 non-native ungulates removed in 1 day) versus a staff/volunteer effort conducted in September 2009 (47 non-native ungulates removed in 1 day). Based on past participation, discontinuing the use of volunteers in other activities related to ungulate management (fence building, monitoring, baiting) would not noticeably affect the ungulate program, as volunteer interest in these activities has been infrequent and focused on the more accessible areas of the park, which limits the efficiency gained by using volunteers.

## **CARCASS HANDLING AND DISPOSAL**

As described in "Elements Common to All Alternatives," carcasses of animals would generally be left in place.



## **ALTERNATIVE D: COMPREHENSIVE MANAGEMENT PLAN THAT MAXIMIZES FLEXIBILITY OF MANAGEMENT TECHNIQUES**

Under alternative D, the NPS would implement a comprehensive, systematic management plan providing maximum management flexibility. Management tools would rely primarily on lethal techniques, but non-lethal techniques such as relocation could also be considered. The population-level objective would be zero, or as low as practicable in managed areas, recognizing the possibility of remnant populations and ingress animals. Management phases, monitoring, conditions of use for management tools, and fencing priorities would be as described in “Elements Common to All Action Alternatives.” Qualified volunteers could be used for ground shooting and other non-native ungulate management activities.

### **MANAGEMENT TOOLS**

Under alternative D, the NPS would rely primarily on management tools as described for alternative C. Additionally, the NPS could use non-lethal management tools as described below. “Table 4: Considerations for Implementing Management Tools,” summarizes the general conditions that the NPS would consider when determining which tools to use in implementing management actions.

#### **Relocation**

The NPS would investigate the possibility of relocating non-native ungulates, such as feral sheep, mouflon sheep and pigs, to other lands (in addition to domestic cattle being returned to ranchers). This could occur through one of two ways:

- Driving the non-native ungulates onto adjacent lands
- Capturing non-native ungulates using telemetry and traps, or non-lethal snares, and transporting them to another location

All potential relocation activities would require willing recipients and would be carried out in close cooperation with the state. When considering areas to relocate animals, the NPS would avoid sites where undesirable impacts to the environment could occur (e.g., rare native plants and animals, critical habitat, soils, cultural resources etc.). Any necessary permissions and permits would be obtained prior to relocation activities. Prior to transporting animals to other locations, any necessary disease testing required by the state would be conducted.

Relocation to adjacent lands would include the use of a helicopter, with a few staff on the ground, to drive the non-native ungulates along the boundary fence line to a temporary “wing” fence. The wing fence would open and lead the animals into a holding pen. From the holding pen, the non-native ungulates would be transferred to adjacent lands. These operations would last less than a day, usually only a few hours at a time. Where caught close to roads, animals could also be transported by vehicle to nearby locations.

### **QUALIFIED VOLUNTEERS**

The use of qualified volunteers would be as described for alternative B. In addition, qualified volunteers could be used for ground shooting activities in additional management phases and areas where safe and practicable.

## **CARCASS HANDLING AND DISPOSAL**

Carcass handling and disposal would be as described for alternative B.

## **ALTERNATIVE E: COMPREHENSIVE MANAGEMENT PLAN THAT INCREASES OF MANAGEMENT TECHNIQUES WHILE LIMITING THE USE OF VOLUNTEERS**

Under alternative E, the NPS would implement a comprehensive, systematic management plan that relies primarily on lethal techniques, but also considers non-lethal techniques such as relocation as described under alternative D. The population-level objective would be zero, or as low as practicable in managed areas, recognizing the possibility of remnant populations and ingress animals. Management phases, monitoring, conditions of use for management tools, and fencing priorities would be as described in “Elements Common to All Action Alternatives.” To provide a full range of alternatives, qualified volunteers would not be used for ground shooting activities. Volunteers could be used for other non-native ungulate management activities.

## **MANAGEMENT TOOLS**

Under alternative E, the NPS would use management tools as described for alternative D. “Table 4: Considerations for Implementing Management Tools,” summarizes the general conditions that the NPS would consider when determining which tools to use in implementing management actions.

## **QUALIFIED VOLUNTEERS**

The use of qualified volunteers would be as described for alternative B, except that volunteers would not be used for any ground shooting activities.

## **CARCASS HANDLING AND DISPOSAL**

Carcass handling and disposal would be as described for alternative B.

## **HOW ALTERNATIVES MEET OBJECTIVES**

As stated in chapter 1, all action alternatives (B–E) selected for analysis must meet all objectives to a large degree. The action alternatives must also address the stated purpose of taking action and resolve the need for action; therefore, the alternatives were individually assessed in light of how well they would meet the objectives of this plan/EIS, which are stated in “Chapter 1: Purpose of and Need for Action.” This process is the foundation for determining the agency-preferred alternative. Alternatives that did not meet the objectives were not analyzed further (see the “Alternatives Eliminated from Further Consideration” section in this chapter).

Table 5 compares how each of the alternatives described in this chapter would meet the plan objectives. Table 6 summarizes the effects of each alternative on each impact topic, as described in “Chapter 4: Environmental Consequences.”

TABLE 5: HOW ALTERNATIVES MEET OBJECTIVES

Objective	Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)	Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques	Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers	Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques	Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers
<b>Management Methodology</b>					
Develop informed, scientifically based methods for management of non-native ungulate populations to allow for the protection and recovery of park resources.	There would be no comprehensive parkwide plan to guide management over the next 25 years in a way that would ensure that informed, science-based methods would continue to be implemented.	Management actions were developed considering input from a science team. A comprehensive, systematic plan provides for continuous monitoring of the results of management actions and adjustments of management actions as needed, ensuring implementation of informed, science-based methods over time.	Same as alternative B.	Same as alternative B.	Same as alternative B.
<b>Vegetation</b>					
Protect native plant communities and assist with their natural recovery from impacts of non-native ungulates.	In existing fenced units, desired conditions for vegetation would result from the continuation of animal exclusion. Potential for reaching desired conditions would be unlikely for areas currently unmanaged (e.g., portions of 'Ōla'a and Kahuku), where no established population-level objective or fencing strategy has been identified in a comprehensive and systematic plan. Also there would be less likelihood that the NPS would progress through management phases, monitor, and apply management tools consistently as staff and institutional knowledge change over time.	Population objectives and fencing strategy identified in a comprehensive, systematic management plan would provide greater certainty that desired conditions would be achieved and that non-native ungulate management would protect and assist with the natural recovery of native plant communities.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.
Provide desirable conditions for active restoration of native plant communities degraded by non-native ungulate activity to a native state.	In existing fenced units, management actions would continue to help provide opportunities for active restoration of native plant communities. However, lack of a comprehensive, systematic plan would reduce the likelihood that actions would be applied consistently and achieve the conditions necessary to support such efforts parkwide over time.	Population objectives and fencing strategy identified in a comprehensive, systematic management plan would provide greater certainty that desired conditions would be achieved and that non-native ungulate management would provide opportunities for active restoration of native plant communities.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.
<b>Native Wildlife and Wildlife Habitat</b>					
Protect native wildlife and wildlife habitat and assist with their natural recovery from impacts of non-native ungulates.	In existing fenced units, management actions would continue to help protect native wildlife and wildlife habitat and provide opportunities for natural recovery. Potential for reaching desired conditions would be unlikely for areas currently unmanaged (e.g., portions of 'Ōla'a and Kahuku), where no established population-level objective or fencing strategy has been identified. The lack of a comprehensive, systematic plan would reduce the likelihood that actions would be applied consistently and support natural recovery parkwide over time.	Population objectives and fencing strategy identified in a comprehensive, systematic management plan would provide greater certainty that desired conditions would be achieved and that non-native ungulate management would protect and assist with the natural recovery of native wildlife and wildlife habitat.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.

Objective	Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)	Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques	Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers	Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques	Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers
<b>Rare, Unique, Threatened, or Endangered Species</b>					
Protect endangered, threatened, and rare plant and animal species and assist with their recovery from impacts of non-native ungulates.	In existing fenced units, management actions would continue to help protect endangered, threatened, and rare plant and animal species, while providing opportunities for both natural and active recovery. Potential for reaching desired conditions would be unlikely for areas currently unmanaged (e.g., portions of 'Ōla'a and Kahuku), where no established population-level objective or fencing strategy has been identified. The lack of a comprehensive, systematic plan would reduce the likelihood that actions would be applied consistently and support recovery parkwide over time.	Population objectives and fencing strategy identified in a comprehensive, systematic management plan would provide greater certainty that desired conditions would be achieved and that non-native ungulate management would protect and assist with the recovery of endangered, threatened, and rare plant and animal species.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.
<b>Cultural/Historic Resources</b>					
Prevent impacts on archeological resources, historic structures, cultural landscapes, and ethnographic resources from non-native ungulate activity and management.	In existing fenced units, management actions would continue to help prevent impacts on cultural resources from non-native ungulate activity. However, lack of a comprehensive, systematic plan would reduce the likelihood that actions would be applied consistently and prevent impacts parkwide over time.	Population objectives and fencing strategy identified in a comprehensive, systematic management plan would provide greater certainty that actions would continue to be implemented in a manner that would reduce the potential for adverse impacts on cultural resources and that desired conditions necessary to protect these resources would be achieved.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.
<b>Wilderness</b>					
Restore natural conditions and perpetuate natural processes in wilderness (including areas managed for wilderness values).	In existing fenced units, management actions would continue to help restore natural conditions and perpetuate natural processes in wilderness. However, lack of a comprehensive, systematic plan would reduce the likelihood that actions would be applied consistently and support restoration over time.	Population objectives and fencing strategy identified in a comprehensive, systematic management plan would provide greater certainty that desired conditions would be achieved and that non-native ungulate management would help restore natural conditions and perpetuate natural processes in wilderness.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.
Limit the impacts of non-native ungulate management actions needed to protect wilderness resources and values through the use of the minimum requirements/tools decision process.	Existing analysis of minimum tools would continue to be done on a case-by-case basis (primarily for fencing), but not as part of a comprehensive, systematic plan.	A comprehensive, systematic evaluation for all non-native ungulate management actions would ensure that minimum tools are used to meet the minimum requirements for managing wilderness at the park.	Same as alternative B.	Same as alternative B.	Same as alternative B.
<b>Soils</b>					
Minimize impacts on soils through increased soil erosion and disturbance caused by non-native ungulates	In existing fenced units, management actions would continue to help minimize soil erosion and disturbance. However, lack of a comprehensive, systematic plan would reduce the likelihood that actions would be applied consistently and minimize impacts parkwide over time.	Population objectives and fencing strategy identified in a comprehensive, systematic management plan would provide greater certainty that desired conditions would be achieved and that soil erosion and disturbance would be minimized.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.

Objective	Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)	Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques	Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers	Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques	Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers
<b>Visitor Use and Experience</b>					
Provide visitors with the opportunity to experience native ecosystems and cultural resources that are protected from the impacts of non-native ungulates.	In existing fenced units, management actions would continue to help provide visitors with the opportunity to experience native ecosystems and cultural resources that are protected from the impacts of non-native ungulates. However, lack of a comprehensive, systematic plan would reduce the likelihood that actions would be applied consistently and support the objective parkwide over time.	Population objectives and fencing strategy identified in a comprehensive, systematic management plan would provide greater certainty that visitors would experience native ecosystems and cultural resources that are protected from the impacts of non-native ungulates.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.
Enhance visitor awareness and understanding of non-native ungulate management actions and why they are necessary for the protection of park resources.	Existing interpretive programs would enhance visitor awareness and understanding of non-native ungulate management actions and why they are necessary for the protection of park resources, but not as part of a comprehensive, systematic plan.	A comprehensive, systematic management plan would provide a framework for the development of interpretive programs aimed at enhancing visitor awareness and understanding of non-native ungulate management actions and why they are necessary for the protection of park resources.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Minimize limitations to visitor access as a result of non-native ungulate management activities.	Management actions as currently implemented would minimize impacts on visitor access, but not as part of comprehensive, systematic plan.	A comprehensive, systematic management plan would provide greater certainty that the reduction phase would be completed sooner, which would minimize closures that affect visitor access.	Same as alternative B, plus: Potential for completing the reduction phase sooner by relying exclusively on lethal removals conducted by NPS and other professionals, which would minimize closures that affect visitor access.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and prolong the reduction phase, requiring more closures.	Same as alternative B, except: Use of relocation could reduce efficiency and prolong reduction actions, requiring more closures.
<b>Park Management and Operations</b>					
Minimize long-term impacts, in terms of reduced staff time and resources, to programs at the park caused by continued monitoring and management of non-native ungulates.	There would be no comprehensive, systematic plan to guide non-native ungulate management parkwide over the next 25 years in a way that would minimize impacts on park management and operations.	A comprehensive, systematic management plan would provide greater certainty that the more intensive reduction phase would be completed sooner, minimizing long-term impacts on park management and operations. Administration of the volunteer program would require additional oversight, which would contribute to long-term impacts on park management and operations.	Same as alternative B, plus: Potential for completing the reduction phase sooner by relying exclusively on lethal removals conducted by NPS and other professionals, which would minimize long-term impacts on park management and operations.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and prolong long-term impacts on park management and operations.	Same as alternative B, except: Use of relocation could reduce efficiency and prolong long-term impacts on park management and operations.
<b>Coordination and Outreach</b>					
Coordinate with neighboring land managers implementing non-native ungulate management actions beneficial to the protection of park resources.	Existing communication, coordination efforts, and partnerships would enhance protection of park resources, but not as part of a comprehensive, systematic plan.	A comprehensive, systematic management plan would provide a framework for communication, coordination, and collaboration among partners that would benefit protection of park resources.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Coordinate with other stakeholders regarding non-native ungulate management and the protection of park resources.	Existing communication and coordination efforts with other stakeholders would continue, but not as part of a comprehensive, systematic plan.	A comprehensive, systematic management plan would provide a framework for communication and coordination with other stakeholders.	Same as alternative B, except: Eliminating the use of volunteers for non-native ungulate management would decrease opportunities for stakeholder participation.	Same as alternative B.	Same as alternative B, except: Eliminating the use of volunteers for ground shooting activities would decrease opportunities for stakeholder participation.

<b>Objective</b>	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
<p>Enhance public awareness and understanding of the impacts of non-native ungulates and the need for management to protect and restore park resources.</p>	<p>Existing interpretive and outreach programs would continue to enhance public awareness and understanding of non-native ungulate management actions and why they are necessary for the protection of park resources. Use of volunteers would also provide additional opportunities for enhancing public awareness. However, these efforts would not be part of a comprehensive, systematic plan.</p>	<p>A comprehensive, systematic management plan would provide the framework for interpretive and outreach programs that would enhance public awareness and understanding of non-native ungulate management actions and why they are necessary for the protection of park resources. Use of volunteers would provide additional opportunities for enhancing public awareness.</p>	<p>Same as alternative B, except: Eliminating the use of volunteers would decrease opportunities for enhancing public awareness through participation in non-native ungulate management.</p>	<p>Same as alternative B.</p>	<p>Same as alternative B, except: Eliminating the use of volunteers for ground shooting activities would decrease opportunities for stakeholder participation.</p>

TABLE 6: SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
Vegetation	<p>Under alternative A, short- and long-term negligible to minor adverse impacts would result from the implementation of ground-based management actions. In areas of the park already considered ungulate free, alternative A would produce negligible adverse impacts because the frequency and duration of management actions in these areas would be minimal; and long-term beneficial impacts on vegetation would result from the continuation of animal exclusion. Long-term beneficial impacts would be unlikely for Kahuku and areas currently unmanaged (e.g., portions of 'Ōla'a), where no established population-level objective or fencing strategy has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on vegetation, would have short- and long-term minor to moderate adverse cumulative impacts on vegetation. Long-term beneficial cumulative impacts would be less certain under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, short- and long-term negligible to minor adverse impacts on vegetation would result from the implementation of ground-based management actions. In areas of the park already managed for ungulates, alternative B would produce negligible adverse impacts because the frequency and duration of management actions in these areas would be minimal. Long-term beneficial impacts to vegetation would be fully realized under this alternative because the comprehensive, systematic approach described in chapter 2, "Elements Common to All Action Alternatives," would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on vegetation, would have short- and long-term minor to moderate adverse and long-term beneficial cumulative impacts.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>
Native Wildlife and Wildlife Habitat	<p>Under alternative A, short-term minor to moderate adverse impacts would result from the implementation of monitoring and management actions. In the older section of the park, long-term beneficial impacts to native wildlife and wildlife habitat would result from the continuation of animal exclusion in managed units. However, long-term beneficial impacts to native wildlife and wildlife habitat would be unlikely for areas currently unmanaged (e.g., portions of Kahuku and 'Ōla'a), for which no established population-level objective and fencing strategy has been identified.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on native wildlife and wildlife habitat, would have short- and long-term minor to moderate adverse cumulative impacts on vegetation. Long-term beneficial cumulative impacts would be less likely under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, short-term minor to moderate adverse impacts would result from the implementation of monitoring and management actions. Long-term beneficial impacts to native wildlife and wildlife habitat would be fully realized under this alternative because the comprehensive, systematic approach described in chapter 2, "Elements Common to All Action Alternatives," would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on wildlife and wildlife habitat, would have short- and long-term minor to moderate adverse and long-term beneficial cumulative impacts.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>

	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
Rare, Unique, Threatened, or Endangered Species	<p>Under alternative A, short-term minor to moderate, and long-term minor adverse impacts on rare, unique, threatened, or endangered species and their habitat would result from the implementation of non-native ungulate management actions. In the older section of the park, long-term beneficial impacts would result from the continuation of animal exclusion in managed units, with moderate to major beneficial impacts on federally listed species. However, long-term beneficial impacts would be unlikely for Kahuku and areas currently unmanaged (e.g., portions of 'Ōla'a), for which no established population-level objective and fencing strategy has been identified.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on rare, unique, threatened, or endangered species, would have short- and long-term minor to moderate adverse cumulative impacts on vegetation. Long-term beneficial cumulative impacts, including moderate to major beneficial impacts on federally listed species, would be less likely under alternative A, because management would depend largely on the professional judgment, past experience, and scientific knowledge of NPS staff responsible for conducting management activities and implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, short-term minor to moderate, and long-term minor adverse impacts on rare, unique, threatened, or endangered species and their habitat would result from the implementation of monitoring and management actions. Long-term beneficial impacts would be fully realized under this alternative, with moderate to major beneficial impacts on federally listed species because the comprehensive, systematic approach described in chapter 2, "Elements Common to All Action Alternatives," would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions, would have short- to long-term minor to moderate adverse and long-term beneficial and cumulative impacts, with moderate to major beneficial cumulative impacts on federally listed species.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>
Cultural/Historic Resources: Archeological Resources	<p>Under alternative A, long-term negligible to minor adverse impacts on archeological sites and associated viewsheds would result from the implementation of management actions. In the older section of the park, long-term minor to moderate beneficial impacts would result from the continuation of animal exclusion in managed units. However, long-term benefits would be unlikely for Kahuku and areas currently unmanaged (e.g., portions of 'Ōla'a), for which no established population-level objective and fencing strategy has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on archeological resources, would have long-term minor to moderate adverse cumulative impacts on archeological resources. Long-term beneficial cumulative impacts would be less likely under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, long-term negligible to minor adverse impacts on archeological sites and associated viewsheds would result from the implementation of management actions. Long-term minor to moderate beneficial impacts to archeological resources would be fully realized under this alternative because the comprehensive, systematic approach described in chapter 2, "Elements Common to All Action Alternatives," would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on archeological resources, would have long-term minor to moderate adverse and long-term moderate beneficial cumulative impacts.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>



	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
Cultural/Historic Resources: Cultural Landscapes	<p>Under alternative A, long-term minor adverse impacts on cultural landscapes would result from implementation of management actions. Designed landscapes would be less impacted than either historic vernacular landscapes or ethnographic landscapes. In the older section of the park, long-term minor beneficial impacts on cultural landscapes would result from the continuation of animal exclusion in managed units. However, long-term benefits would be unlikely for cultural landscapes still inhabited by non-native ungulates, for which no established population-level objective and fencing strategy has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on cultural landscapes, would have long-term minor adverse cumulative impacts on cultural resources. Long-term beneficial cumulative impacts would be less certain under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, long-term minor adverse impacts to cultural landscapes would result from the implementation of management actions. Designed landscapes would be less impacted than either historic vernacular landscapes or ethnographic landscapes. Long-term minor beneficial impacts to cultural landscapes would be fully realized under this alternative because the comprehensive, systematic approach described in chapter 2, "Elements Common to All Action Alternatives," would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on cultural landscapes, would have long-term minor adverse and long-term minor beneficial cumulative impacts.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>
Cultural/Historic Resources: Ethnographic Resources	<p>Under alternative A, short-term minor adverse impacts on ethnographic resources would result from the implementation of management actions. In the older section of the park, long-term moderate to major beneficial impacts would result from the continuation of animal exclusion in managed units. However, long-term beneficial impacts would be unlikely for Kahuku and areas currently unmanaged (e.g., portions of 'Ōla'a), for which no established population-level objective and fencing strategy has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on ethnographic resources, would have short- and long-term minor adverse cumulative impacts. Long-term beneficial cumulative impacts would be less likely under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, short-term minor adverse impacts on ethnographic resources would result from the implementation of management actions. Long-term moderate to major beneficial impacts would be fully realized under this alternative because the comprehensive, systematic approach described in chapter 2, "Elements Common to All Action Alternatives," would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on ethnographic resources, would have short- and long-term minor adverse and long-term moderate to major beneficial cumulative impacts.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>

	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
Wilderness	<p>Under alternative A, short- and long-term minor to moderate adverse impacts to wilderness would result from fences, helicopter work and ground activities related to removal efforts and fence construction and maintenance. In the older section of the park, long-term beneficial impacts on wilderness through the recovery of natural conditions would result from the continuation of animal exclusion in managed units. Long-term beneficial impacts would be unlikely for the Kahuku unit and areas currently unmanaged (e.g., portions of 'Ōla'a), where no established population-level objective or fencing strategy has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on wilderness, would have short- and long-term minor to moderate adverse cumulative impacts. Long-term beneficial cumulative impacts would be less likely under alternative A, because non-native ungulate management would depend largely on the professional judgment, past experience, and scientific knowledge of NPS staff responsible for conducting management activities and implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, short- and long-term minor to moderate impacts on wilderness would result from fences, helicopter work and ground activities related to removal efforts and fence construction and maintenance. Long-term beneficial impacts to wilderness would be fully realized under this alternative because the comprehensive, systematic approach described in "Elements Common to All Action Alternatives" would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on wilderness, would have short- and long-term minor to moderate adverse and long-term beneficial cumulative impacts.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>
Soils	<p>Under alternative A, short-term, localized negligible adverse impacts to soils would result from ground-based management actions. In the older section of the park, long-term beneficial impacts on soil would result from the continuation of animal exclusion in current management units. Long-term beneficial impacts would be unlikely for Kahuku and portions of 'Ōla'a, where no established population-level objective or fencing strategy has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on soil, would have short- and long-term minor to moderate adverse cumulative impacts. Long-term beneficial cumulative impacts would be less likely under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, short-term, localized negligible adverse impacts to soils would result from ground-based management actions. Long-term beneficial impacts to soils would be fully realized under this alternative because the comprehensive, systematic approach described in "Elements Common to All Action Alternatives" would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on soil, would have short- and long-term minor to moderate adverse and long-term beneficial cumulative impacts.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>

	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
Soundscapes	<p>Under alternative A, there would be short-term moderate adverse impacts to soundscapes would result from ground-based and aerial management actions. In the older section of the park, long-term beneficial impacts on soundscapes would result through the continuation of ungulate exclusion in current management units. Long-term beneficial impacts would be unlikely for the Kahuku unit and areas currently unmanaged (e.g., portions of 'Ōla'a), where no established population-level objective or fencing strategy has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable actions on soundscapes, would have short-term moderate adverse cumulative impacts. Long-term beneficial cumulative impacts would be less likely under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, short-term moderate adverse impacts to soundscapes would result from the use of firearms, vehicles, helicopters, and fence maintenance equipment. Long-term beneficial impacts to soundscapes would be fully realized under this alternative because the comprehensive, systematic approach described in "Elements Common to All Action Alternatives" would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable actions on soundscapes, would have short-term moderate adverse and long-term beneficial cumulative impacts.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>
Land Management Adjacent to the Park	<p>Alternative A would result in short- and long-term negligible to moderate adverse and beneficial impacts on land management adjacent to current park management units. Where existing boundary fences occur, impacts of removal efforts on non-native ungulate populations outside the park would be negligible. However, impacts of any future removal efforts would be uncertain in areas currently unmanaged and for which no population objective or fencing strategy has been identified (e.g., portions of 'Ōla'a and Kahuku).</p> <p>The long-term minor to moderate adverse and beneficial impacts of past, present, and reasonably foreseeable future actions on land management adjacent to the park, when combined with the impacts of implementing alternative A, would have long-term minor to moderate adverse and beneficial cumulative impacts on land management adjacent to the park.</p>	<p>Alternative B would result in short- and long-term negligible to minor adverse and beneficial impacts on land management adjacent to the park. Proposed new boundary fences, would minimize impacts of removal efforts conducted inside the park on populations outside the park.</p> <p>The long-term minor to moderate adverse and beneficial impacts of past, present, and reasonably foreseeable future actions on land management adjacent to the park, when combined with the impacts of implementing alternative B, would have long-term, minor to moderate adverse and beneficial cumulative impacts on land management adjacent to the park.</p>	<p>Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.</p>

	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
Socioeconomics	<p>Under alternative A, non-native ungulate management program would have beneficial impacts on local communities as a result of park payroll and spending on non-native ungulate control, fencing, and related supplies. Impacts to non-market social values would be minor, short-term, and adverse during control activities. There would be no measurable effect on park visitation and recreation spending. Long-term beneficial impacts to non-market social values through the restoration of native species and communities would be less likely for the Kahuku unit and areas currently unmanaged (e.g., portions of 'Ōla'a), where no established population-level objective, or fencing strategy, or management implementation has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with the impacts of past, present, and reasonably foreseeable future actions on socioeconomic resources, would have short- and long-term minor adverse impacts and long-term beneficial impacts on socioeconomic resources. Long-term beneficial cumulative impacts would be less likely under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, non-native ungulate management program would have beneficial impacts on local communities as a result of park payroll and spending on non-native ungulate control, fencing, and related supplies. Impacts to non-market social values would be minor, short-term, and adverse during control activities. There would be no measurable effect on park visitation and recreation spending. Long-term beneficial impacts to non-market social values through the restoration of native species and communities would be fully realized under alternative B because the comprehensive, systematic approach described in "Elements Common to All Action Alternatives" would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The impacts of past, present, and reasonably foreseeable future actions on socioeconomic resources, when combined with the impacts of implementing alternative B, would have short- and long- term minor adverse and long-term beneficial cumulative impacts.</p>	<p>Same as alternative B, plus:</p> <p>Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p> <p>Impacts on participants in the volunteer program are expected to be minor, as substitute hunting opportunities are available.</p>	<p>Same as alternative B, except:</p> <p>Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p> <p>Some beneficial impacts to social values would be gained among individuals who prefer non-lethal relocation approaches over lethal methods. Conversely, the additional resources needed to implement non-lethal methods (e.g., capture and relocation of animals) may delay the NPS in reaching desired conditions and result in more reduction efforts, which would contribute to adverse impacts to social values.</p>	<p>Same as alternative D, except:</p> <p>Impacts on participants in the volunteer program are expected to be minor, as substitute hunting opportunities are available.</p>
Visitor Use and Experience	<p>Under alternative A, short- and long-term minor adverse affects on visitor use and experience would result from temporary closures and disruptions caused by ungulate control measures and fence construction and repair, and the long-term presence of fences. In the older section of the park, long-term beneficial impacts to the visitor experience resulting from the recovery of native vegetation and wildlife habitat would continue in managed units. Long-term beneficial impacts would be less likely for the Kahuku unit and areas currently unmanaged (e.g., portions of 'Ōla'a), where no established population-level objective, or fencing strategy, or management implementation has been identified in a comprehensive and systematic plan.</p> <p>The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on visitor use and experience, would have short- and long-term minor adverse cumulative impacts. Long-term beneficial cumulative impacts would be less likely under alternative A, because implementation of management tools could become increasingly inconsistent as staff and institutional knowledge change over time.</p>	<p>Under alternative B, short- and long-term minor adverse affects on visitor use and experience would result from temporary closures and disruptions caused by ungulate control measures and fence construction and repair, and the long-term presence of fences. Long-term beneficial impacts to visitor use and experience would be fully realized under this alternative because the comprehensive, systematic approach described in "Elements Common to All Action Alternatives" would ensure that the NPS would progress through ungulate management phases, monitor, and apply management tools consistently over time.</p> <p>The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on visitor use and experience, would have short- and long-term minor adverse cumulative and long-term beneficial impacts.</p>	<p>Same as alternative B, plus:</p> <p>Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.</p>	<p>Same as alternative B, except:</p> <p>Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.</p>	<p>Same as alternative B, except:</p> <p>Use of relocation could reduce efficiency and delay achieving desired conditions.</p>

	<b>Alternative A: No Action (Continue Existing Non-native Ungulate Management Activities)</b>	<b>Alternative B: Comprehensive Management Plan that Uses Lethal Removal Techniques</b>	<b>Alternative C: Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers</b>	<b>Alternative D: Comprehensive Management Plan that Maximizes Flexibility of Management Techniques</b>	<b>Alternative E: Comprehensive Management Plan that Increases Flexibility of Management Techniques While Limiting the Use of Volunteers</b>
Visitor and Employee Safety	Under alternative A, short- and long-term minor to moderate adverse impacts on visitor and employee safety would result from implementation of management actions. In the older section of the park, long-term beneficial impacts to visitor and employee safety would continue in managed units. Long-term beneficial impacts would be unlikely for the Kahuku unit and areas currently unmanaged (e.g., portions of 'Ōla'a), where no established population-level objective or fencing strategy has been identified in a comprehensive and systematic plan. In these areas, animals could potentially remain on the landscape indefinitely, increasing exposure of employees and visitors to safety risks associated with ungulate management activities. The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on visitor and employee safety, would have short- and long-term minor to moderate adverse cumulative impacts.	Under alternative B, short- and long-term minor to moderate adverse impacts on visitor and employee safety would result from implementation of management actions. Long-term beneficial impacts to visitor and employee safety would be fully realized under this alternative. The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on visitor and employee safety, would have short- and long-term minor to moderate adverse and long-term beneficial cumulative impacts.	Same as alternative B, plus: Potential for reaching desired conditions sooner by relying exclusively on lethal removals conducted by NPS and other professionals.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.
Park Management and Operations	Alternative A would result in long-term moderate adverse impacts on the Natural Resources Division and short- and long-term negligible to minor adverse impacts on other divisions. There could be increased costs associated with alternative A, because management would not have a comprehensive plan to guide implementation. There would be less likelihood that the NPS would progress through management phases, monitor, and apply management tools consistently (and effectively) as staff and institutional knowledge change over time. The greatest uncertainty would be for Kahuku and areas currently unmanaged (e.g., portions of 'Ōla'a), for which no established population-level objective and fencing strategy has been identified. The effects of alternative A, when combined with impacts of past, present, and reasonably foreseeable future actions on park management and operations, would have long-term moderate adverse cumulative impacts.	Alternative B would result in long-term moderate adverse impacts to the Natural Resources Division and short- and long-term negligible to minor adverse impacts to other park divisions. Compared to alternative A, there would be increased cost efficiency associated with alternative B, because ungulate management would be guided by the fencing strategy, population objective, and comprehensive and systematic approach described in chapter 2, "Elements Common to All Action Alternatives." The effects of alternative B, when combined with impacts of past, present, and reasonably foreseeable future actions on park management and operations, would have long-term moderate adverse cumulative impacts.	Same as alternative B, plus: There would be cost efficiency gained through the discontinuation of volunteers in ground shooting efforts.	Same as alternative B, except: Use of volunteers for ground shooting in additional areas and use of relocation could reduce efficiency and delay achieving desired conditions.	Same as alternative B, except: Use of relocation could reduce efficiency and delay achieving desired conditions.



## **PREFERRED ALTERNATIVE**

The CEQ regulations for implementing NEPA (40 CFR 1502.14[e]) require that an agency identify its preferred alternative or alternatives in draft and final EIS documents. The preferred alternative is that alternative “which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors” (46 FR 18026, Q4a).

The NPS has identified alternative D, Comprehensive Management Plan that Maximizes Flexibility of Management Techniques, as its preferred alternative. In identifying its preferred alternative, the NPS considered factors such as the extent to which alternatives meet plan objectives (see table 5), environmental consequences, anticipated effort associated with implementation, degree of management flexibility, and costs.

Among all alternatives evaluated, alternative D provides the greatest flexibility of management techniques, including options for use of non-lethal actions, within the context of a comprehensive, systematic management plan. By incorporating the use of qualified volunteers to assist in management activities, alternative D provides the NPS with opportunities to increase awareness of non-native ungulate issues and engage the surrounding community and general public in stewardship of park resources. Although alternative D would be expected to involve some increase over other alternatives in the time needed to achieve the population-level objective, this would not prevent the NPS from fully meeting its non-native ungulate management objectives. Although alternative D would likely include some additional costs and administrative oversight over other alternatives, these factors would likewise not be expected to prevent the NPS from fully meeting its non-native ungulate management objectives.

The NPS will consider comments on this draft plan/EIS and may modify or adjust the preferred alternative accordingly. Any modifications or adjustments will be disclosed in the published final plan/EIS. A Record of Decision will follow the final plan/EIS and will be made available to the public.

## **ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION**

A number of additional alternatives addressing non-native ungulate management in the park were developed based on the results of internal and external scoping, including public and agency scoping. The following section discusses those alternatives considered and dismissed, and explains why each was eliminated from further study.

### **HUNTING IN THE PARK**

A management action using unsupervised, licensed sportsmen was proposed repeatedly during park-sponsored public scoping efforts. It was not carried forward for further analysis because it would essentially be a public hunt, which would be inconsistent with existing laws, policies, regulations, and case law regarding public hunts in units of the national park system and with long-standing basic policy objectives for national park system units where hunting is not authorized. Because public hunting was not carried forward, all elements suggested related to public hunting, such as creating a licensing system or concession service for hunting, were also not considered.

The likelihood that the NPS would change its long-standing servicewide policies and regulations regarding hunting in parks is remote and speculative. Throughout the years, the NPS has taken differing approaches to wildlife management, but has maintained a strict policy of not allowing hunting in park units of the national park system where it is not congressionally authorized. In 1970, Congress passed the *General Authorities Act* and in 1978 the “Redwood Amendment,” which clarified and reiterated that the

single purpose of the NPS *Organic Act* is conservation. While the *Organic Act* gives the Secretary of the Interior the authority to destroy plants or animals for the purposes of preventing detriment to park resources, it does not give the Secretary authority to permit the destruction of animals for recreational purposes. In 1984, after careful consideration of congressional intent with respect to hunting in national parks, the NPS promulgated a rule that allows public hunting in national park areas only where “specifically mandated by Federal statutory law” (36 CFR 2.2). The NPS reaffirmed this approach in the *NPS Management Policies 2006* (NPS 2006b). At this time, the agency intends to exhaust all other possible alternatives before it attempts to change its governing laws, regulations, or policies, due to concerns that such actions may have negative impacts on the visitors and resources of this and other parks in the national park system.

Although the use of private individuals as qualified volunteers to assist with lethal removals was retained in some alternatives (see details under the alternatives), the use of qualified volunteers does not constitute hunting because the lethal removal of non-native ungulates described in the alternatives is an administrative activity that would be conducted in accordance with an approved resource management plan and under the direct supervision of NPS staff. In contrast to hunting, removal activities that would involve qualified volunteers would not be recreational in nature, would not involve personal taking of meat or other portions of the animal, and would not be bound by the principles of fair chase.

### **SINGLE LETHAL METHOD AS A STAND-ALONE ALTERNATIVE**

Because multiple non-native ungulate species occur at the park, a variety of tools are needed based on target species, the stage of the removal process, and other factors, such as terrain, which can influence the effectiveness of certain techniques. This is affirmed by the state’s review of available management methods (HDLNR 2007). As a result, the NPS planning team felt that multiple management methods would be needed to meet the purpose, need, and objectives of the plan/EIS. Having multiple lethal removal methods available would allow management in remote areas of the park, and would allow the park staff to adjust selected actions as population numbers decrease or as animals become more accustomed to management activities. For these reasons, a single lethal method alternative was dismissed from the plan/EIS.

### **FERTILITY CONTROL**

Park staff considered the role fertility control could play in the range of alternatives, including as a stand-alone alternative to meet the park’s desired conditions for zero non-native ungulates. Based on science team discussions, this option would result in a slow, nominal population decline that would not remove non-native ungulates from the ecosystem within the lifetime of this plan. As a result, impacts from non-native ungulates would continue and this option would not meet the purpose, need, and objectives of this plan/EIS. Therefore, fertility control was dismissed from further consideration as a stand-alone alternative.

This method was considered in combination with relocation or driving non-native ungulates to adjacent lands, but concerns over driving chemically treated animals to adjacent lands where they could be hunted and consumed made it impractical. The NPS planning team also considered the use of fertility control to slow non-native ungulate population growth so fewer animals would need to be removed by other means over the life of this plan/EIS. There are several obstacles to administering such an agent. Delivery by injection would require non-native ungulates to be captured, injected, marked, released, and recaptured for a booster shot (HDLNR 2007). Both the NPS planning team and the science team noted that the level of effort required to implement this option would be better spent removing the non-native ungulates to eliminate the impacts associated with their presence on the landscape.



As a result, the NPS planning team discussed the potential for delivering a fertility-control agent orally, as recommended by the state (HDLNR 2007). Originally, this was considered a feasible option, so the NPS planning team outlined other criteria that the fertility-control agent would have to meet, as follows:

1. **Oral delivery.** The agent would have to be delivered remotely through bait that would be unpalatable to nontarget animals. This would minimize the dangers and stress for the animals and people involved, unintended impacts on native wildlife, and associated costs.
2. **Multiyear effectiveness.** Given the expense of treating animals, a chemical agent would need to be effective (at least 85 percent) for at least 3 to 5 years, which is also consistent with the time frame for removing non-native ungulates from control units.
3. **Single-treatment effectiveness.** The agent must effectively control fertility for the life of the animal with a single dose, and must not require a booster. A single-dose treatment would minimize the effort to treat large numbers of non-native ungulates.
4. **At least 85 percent effectiveness.** Considering the variability in biological response and the difficulty and expense of applying chemical contraceptives to a free-roaming wildlife population, the lowest acceptable level of effectiveness would be 85 percent.
5. **Use limited to fenced control units.** Because of concerns about their being hunted and consumed, a population of non-native ungulates would be fenced away from sensitive resources and fertility-control agents would be administered to them. Over time, as animals in the fenced population die, they would not be replaced by new births, reducing the population. The availability of resources within the fenced area would also contribute to a decline in the population, as the resources become more limited. This method was deemed impractical in combination with relocation or driving non-native ungulates to adjacent lands, as there are concerns about the human consumption of chemically treated animals.
6. **Appropriate approvals and certifications.** Ideally, the agent should have regulatory approval for use in the specific non-native ungulate being targeted. Alternatively, the agent could be a drug approved for use in other ungulate species and available for those in the park. Finally, an agent could be used experimentally if the responsible regulatory agency (U.S. Food and Drug Administration or EPA) approved an investigational new animal drug exemption or experimental use permit. This exemption requires specialized authorizations under a drug research project. All agents would need to be certified as safe for use in the specific ungulate species by the prescribing veterinarian.
7. **Withdrawal period.** Any fertility-control agent used must have a zero-day withdrawal period (the amount of time following treatment after which an ungulate would be considered drug free and fit for consumption) to allow consumption of the meat if the animal is killed by a hunter immediately after being treated.
8. **Safety for treated animals.** The agent must have no long-term effects on treated non-native ungulates other than effective fertility control. This would include the absence of toxic short-term reactions or debilitating long-term effects that would increase morbidity or mortality in the population. The agent must not affect pregnant animals or their fetuses, or result in any genetic mutations that would be passed on to subsequent generations of non-native ungulates if the fertility control is not successful.
9. **No substantial behavioral effects.** The fertility-control agent must not result in substantial behavioral effects, such as changes in breeding behavior. It is the park's goal to avoid substantial changes that would adversely affect wildlife behavior, visitor experience, and/or the health and safety of the public.

- 10. Safety for nontarget animals.** A fertility-control agent should have no adverse effects (e.g., toxicity, changes in fertility, genetic mutations) on nontarget animals.

Consultation with NPS experts in wildlife fertility control indicated that an agent that meets these criteria is currently unavailable, and it is highly unlikely such an agent would be developed during the life of this plan/EIS. It is possible that an agent that meets some of these criteria would be developed, but even that is not expected. There is not a lot of research on oral delivery of reproductive-control agents, and none has dealt with applications in free-ranging ungulate populations. This research is being conducted with steroid hormones (progesterone) that must be mixed with palatable bait and fed to animals on a daily basis. In other words, if one treatment is missed, the non-native ungulate could be impregnated. While this approach might be feasible in feedlots for domestic livestock, the NPS would have serious difficulty ensuring adequate uptake to maintain infertility in the free-ranging non-native ungulate populations at the park. Even if used in fenced control units, these areas could encompass thousands of acres, and the same difficulties would exist. There are also concerns in the scientific community about putting such steroids into the environment and the potential for impacts on nontarget species. Research has been conducted since 2000 to formulate a nonsteroid alternative for oral delivery, but the lack of success makes it a remote possibility that such an agent would be available during the life of this plan/EIS.

Because fertility control administered by injection would result in environmental impacts that could be avoided using other methods, and because oral delivery of fertility-control agents is not technically feasible and could not be implemented if chosen, the use of this technology in combination with other management techniques was dismissed from further consideration.

## **TOXINS AND POISONS**

Under this alternative, poison would be mixed with food sources such as grains to kill non-native ungulates. Death from poisoning is not immediate, and health concerns resulting from people potentially hunting and eating poisoned non-native ungulates that have wandered out of the park could be an issue. In addition, nontarget native wildlife, including native birds of prey, domestic wildlife, or roaming pets could eat a tainted carcass or the poison itself. Further, there are no toxicants that are currently registered for use on ungulates in the United States (HDLNR 2007), and such a toxicant is not expected to become available during the life of this plan/EIS. Therefore, this alternative was dismissed.

## **BIOLOGICAL CONTROL**

Under this alternative, parasites or disease could be introduced to reduce the non-native ungulate population. Infecting a population of animals with a disease-causing organism has the potential to be highly effective in reducing the number of animals. However, as noted by the science team and the state of Hawai'i's technical report (HDLNR 2007), even the low likelihood of infecting domestic livestock or humans makes this technique impractical in most locations. It is not currently practiced or recommended for any of Hawai'i's feral non-native ungulate species and appears to hold little promise for safe use in the near future. There are presently no known disease organisms that could be safely introduced without threat to domestic livestock and animals managed for hunting. In addition, death from such methods would not be immediate or humane (HDLNR 2007). Health concerns about people potentially hunting and eating diseased animals that have wandered out of the park could be an issue. Introducing a large predator capable of taking non-native ungulates would require introduction of another non-native species (such an animal does not occur in Hawai'i), which would not be consistent with NPS policies. Thus, the use of biological control as a management method was not considered further in this plan/EIS.

## **BOUNTIES**

This was not considered a viable option based on issues cited in the state's technical report on non-native ungulate management in Hawai'i, which states: "Bounties have been found to be generally ineffective in animal management, and have actually resulted in increases in the target species in many cases. Problems include fraud (such as bringing in evidence of kills from animals outside the target area), deliberate release of breeding animals, or purposely leaving some animals behind to provide future income" (HDLNR 2007). Further, the prohibition on public hunting in the park would make offering bounties an infeasible way to achieve population reduction in the park. Because this method is not recommended by the state and has proven ineffective in the past, it was not carried forward for analysis in this plan/EIS.

## **NO CONTROL**

Under this concept, the park would not take any further control measures for non-native ungulates. This lack of action would not meet the purpose, need, and objectives for the plan/EIS, as impacts from non-native ungulates on park resources, such as removal of native vegetation, destruction of habitat for native species, and damage to cultural resources, would continue. Therefore, this alternative was dismissed from further consideration.

## **RAISING GOATS FOR FOOD**

The concept of raising goats for food was raised during public scoping. This concept was dismissed from analysis because it equates to maintaining a managed herd, which would not meet the purpose, need, and objectives for the plan/EIS. Although providing food sources for goats could decrease browsing pressure on vegetation resources at the park, increasing food sources would increase goat health and reproduction, leading to a growing goat population. In the long term this would compound problems associated with high goat numbers (see "Chapter 1: Purpose of and Need for Action"). For these reasons, this alternative was dismissed from the plan/EIS.

## **PROVIDING ACCESS THROUGH KAHUKU FOR HUNTING OR OTHER RECREATIONAL ACTIVITIES**

During scoping, the public raised questions regarding the park's ability to provide access through Kahuku to reach state lands for hunting. Access was also requested for other recreational activities, such as bicycling, hiking, and bird-watching. Questions related to access in various areas of the park are outside the scope of this plan/EIS and will be revisited in the ongoing process to develop a GMP for Hawai'i Volcanoes National Park. Therefore, this alternative was dismissed from further consideration in this plan/EIS.

## **CONSISTENCY WITH SECTION 101(B) OF THE NATIONAL ENVIRONMENTAL POLICY ACT**

NEPA requires an analysis of how each alternative meets or achieves the purposes of the act, as stated in section 101(b). Each alternative analyzed in a NEPA document must be assessed as to how it meets the following purposes:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

2. assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources (42 USC 4331).

### **ALTERNATIVE A: NO ACTION (CONTINUE EXISTING NON-NATIVE UNGULATE MANAGEMENT ACTIVITIES)**

Alternative A would meet the purpose of NEPA in that the NPS would continue current management of non-native ungulates, thereby supporting the protection and recovery of native plant and animal species, and the protection of cultural resources, for the enjoyment of current and future generations. However, under alternative A, the implementation of non-native ungulate management would depend largely on the professional judgment, past experience, and scientific knowledge of NPS staff responsible for conducting management activities. As a result, consistent application of management tools over time would be uncertain, meaning that the extent to which alternative A meets the purposes of NEPA would be considered less than under the action alternatives.

### **ALTERNATIVE B: COMPREHENSIVE MANAGEMENT PLAN THAT USES LETHAL REMOVAL TECHNIQUES**

Alternative B would meet the purpose in NEPA in that the NPS would implement a comprehensive, systematic plan to manage non-native ungulates, thereby supporting the protection and recovery of native plant and animal species, and the protection of cultural resources, for the enjoyment of current and future generations. The comprehensive, systematic approach to management would help to ensure consistent and successful application of management tools over time, meaning that alternative B would meet the purposes of NEPA to a greater extent than alternative A.

### **ALTERNATIVE C: COMPREHENSIVE MANAGEMENT PLAN THAT MAXIMIZES EFFICIENCY BY EXPANDING LETHAL REMOVAL TECHNIQUES AND DISCONTINUING THE USE OF VOLUNTEERS**

Alternative C would meet the purpose in NEPA in that the NPS would implement a comprehensive, systematic plan to manage non-native ungulates, thereby supporting the protection and recovery of native plant and animal species, and the protection of cultural resources, for the enjoyment of current and future generations. The comprehensive, systematic approach to management would help to ensure consistent and successful application of management tools over time, meaning that alternative C would meet the purposes of NEPA to a greater extent than alternative A and to a similar extent as alternative B.

### **ALTERNATIVE D: COMPREHENSIVE MANAGEMENT PLAN THAT MAXIMIZES FLEXIBILITY OF MANAGEMENT TECHNIQUES**

Alternative D would meet the purpose in NEPA in that the NPS would implement a comprehensive, systematic plan to manage non-native ungulates, thereby supporting the protection and recovery of native plant and animal species, and the protection of cultural resources, for the enjoyment of current and future generations. The comprehensive, systematic approach to management would help to ensure consistent and successful application of management tools over time, meaning that alternative D would meet the purposes of NEPA to a greater extent than alternative A and to a similar extent as alternatives B and C.

### **ALTERNATIVE E: COMPREHENSIVE MANAGEMENT PLAN THAT INCREASES FLEXIBILITY OF MANAGEMENT TECHNIQUES WHILE LIMITING THE USE OF VOLUNTEERS**

Alternative E would meet the purpose in NEPA in that the NPS would implement a comprehensive, systematic plan to manage non-native ungulates, thereby supporting the protection and recovery of native plant and animal species, and the protection of cultural resources, for the enjoyment of current and future generations. The comprehensive, systematic approach to management would help to ensure consistent and successful application of management tools over time, meaning that alternative E would meet the purposes of NEPA to a greater extent than alternative A and to a similar extent as alternatives B, C, and D.

## **ENVIRONMENTALLY PREFERRED ALTERNATIVE**

The NPS is required to identify the environmentally preferred alternative in its NEPA documents for public review and comment. Guidance from the CEQ states that the environmentally preferred alternative is “the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources” (40 CFR 1500–1508). The CEQ NEPA regulations also indicate that the environmentally preferable alternative is the one that “will promote the national environmental policy as expressed in NEPA’s Section 101” (46 FR 18026, Q6a).

The NPS has identified alternative C (Comprehensive Management Plan that Maximizes Efficiency by Expanding Lethal Removal Techniques and Discontinuing the Use of Volunteers) as the environmentally preferred alternative. Among all alternatives considered, alternative C provides for the most expedient and efficient management of non-native ungulates by relying exclusively on lethal removal techniques and through eliminating the use of volunteers in non-native ungulate management activities. As a result, the NPS would be expected to achieve its population-level objective more quickly under alternative C than under any other alternative. As such, alternative C would most quickly reduce the continued impacts of non-native ungulates on natural and cultural resources in the park. Furthermore, the focus of alternative C on expedient and efficient management would be expected to result in fewer management actions over the life of the plan, resulting in fewer management-related environmental impacts than under other alternatives.

