



RECORD OF DECISION

Plan / Environmental Impact Statement Protecting and Restoring Native Ecosystems by Managing Non-native Ungulates

Hawai'i Volcanoes National Park

INTRODUCTION

The Department of the Interior, National Park Service (NPS), has prepared this Record of Decision (ROD) for the Hawai'i Volcanoes National Park (the park) Plan and Environmental Impact Statement for Protecting and Restoring Native Ecosystems by Managing Non-native Ungulates (plan/EIS). This ROD states what the decision is, identifies the other alternatives considered and the environmentally preferable alternative, discusses the basis for the decision, lists measures to minimize environmental harm, and briefly describes public and agency involvement in the decision-making process. The non-impairment determination for the selected action, which is required by NPS *Management Policies 2006* (NPS 2006b), is attached to this ROD. References for citations used in the ROD and non-impairment determination are available in the final plan/EIS.

PURPOSE AND NEED FOR THE PLAN/EIS

Non-native ungulates (mammals with hooves) are an issue of concern in Hawai'i because of their detrimental effects on native plant and animal diversity and ecosystems. The unique ecosystems of the Hawaiian Islands evolved without large mammalian herbivores and are particularly vulnerable to the impacts of non-native ungulates. Goats (*Capra hircus*), pigs (*Sus scrofa*), sheep (*Ovis aries*), mouflon sheep (*Ovis montanus*), axis deer (*Axis axis*), and feral cattle (*Bos Taurus*) (all of which are non-native ungulates) destroy habitat, inhibit native forest regeneration, and cause local extinctions of vulnerable species. Non-native ungulates detract from the natural conditions that contribute to the wilderness character of the park through the loss of native species and damage to the ecological integrity of the area. Non-native ungulates also have the potential to damage cultural resources at the park, including archeological sites, cultural landscapes, and ethnographic resources.

The purpose of the plan/EIS is to develop a comprehensive and systematic framework for managing non-native ungulates that supports long-term ecosystem protection, supports natural ecosystem recovery and provides desirable conditions for active ecosystem restoration, and supports protection and preservation of cultural resources. The park's most recent plan for non-native ungulate control was written over 30 years ago. A plan/EIS is needed to address the impacts of non-native ungulates, which include loss of native ecosystems, especially native plant and animal communities; loss of sensitive native species, including state- and federally listed species; deterioration of wilderness character; and loss of irreplaceable cultural resources. The new plan considers the Kahuku Unit, acquired in 2003, new invasive species challenges, and current NPS policy and guidance.

The following are the objectives of the plan/EIS.

Management Methodology

- Develop or refine informed, scientifically based methods for management of non-native ungulate populations to allow for the protection and recovery of park resources.

Vegetation

- Protect native plant communities and assist with their natural recovery from impacts of non-native ungulates.
- Provide desirable conditions for active restoration of native plant communities degraded by non-native ungulate activity to a native state.

Native Wildlife and Wildlife Habitat

- Protect native wildlife and wildlife habitat and assist with their natural recovery from impacts of non-native ungulates.

Rare, Unique, Threatened, or Endangered Species

- Protect endangered, threatened, and rare plant and animal species and assist with their natural recovery from impacts of non-native ungulates.

Cultural/Historic Resources

- Prevent impacts on archeological resources, historic structures, cultural landscapes, and ethnographic resources from non-native ungulate activity.

Wilderness

- Using the minimum tools necessary to meet minimum requirements per the Wilderness Act, limit the impacts of non-native ungulates, as well as management actions, on wilderness areas located within the park.
- Assist in the recovery of natural conditions that have been impacted, or may be impacted, by non-native ungulates.
- Determine the minimum requirements to restore wilderness character in areas impacted by non-native ungulates.

Soils

- Minimize the impacts of non-native ungulates on soil erosion and disturbance.

Visitor Use and Experience

- Provide visitors with the opportunity to experience native ecosystems and cultural landscapes that have not been impacted by non-native ungulate activity.
- Enhance visitor awareness and understanding of non-native ungulate management actions and why they are necessary for the protection of park resources.
- Minimize limitations to visitor access as a result of non-native ungulate management activities.

Park Management and Operations

- Minimize long-term impacts (in terms of reduced staff time and resources) to programs at the park incurred by continued monitoring and management of non-native ungulates.

Coordination and Outreach

- Coordinate with neighboring land managers implementing non-native ungulate management actions beneficial to the protection of park resources.

- Coordinate with other stakeholders regarding non-native ungulate management and the protection of park resources.
- Enhance public awareness and understanding of the impacts of non-native ungulates and the need for management to protect and restore park resources.

BACKGROUND

Non-native ungulate management measures at the park were first implemented in a concentrated manner beginning in 1927, when the Territorial Government conducted goat removal as part of a regional effort to protect Hawai'i's watershed. Between 1927 and 1931, these efforts resulted in the removal of 17,389 goats from the park. Efforts by the Territorial Government ceased after 1931. The NPS took over control efforts and relied on private hunters to remove non-native ungulates in the park on a permit basis between 1932 and 1934. These efforts proved to be ineffective in reducing animal numbers and were subsequently discontinued. After 1934, virtually no control of non-native goats or other non-native species occurred at the park until 1938, when the Civilian Conservation Corps used organized drives to remove the animals from the park. These drives were supplemented with boundary and internal fencing. Although successful in removing large numbers of non-native ungulates from the park, Civilian Conservation Corps efforts were suspended in 1941 due to World War II, and fences deteriorated (NPS 1972).

Starting in 1944, the NPS hired private companies for goat control. These companies rounded up goats from the park and then sold them at a profit. This method continued until 1955, when it was discontinued due to lack of effectiveness. Starting in 1955 and lasting until 1970, the NPS relied exclusively on park staff to eliminate non-native ungulates within the park. During this time, more than 30,000 goats were removed from the park through a variety of techniques such as organized culls and drives. However, a lack of steady funding and adequate fencing precluded the level of sustained management that could reduce the population. In 1970, the park had over 14,000 goats residing within its boundary (NPS 1972).

Along with feral goat eradication efforts, attempts to control feral pigs were also carried out in the park. Approximately 7,000 pigs were eliminated from the older part of the park from 1930 to 1971 (Katahira et al. 1993). These efforts were not successful in eliminating pigs, largely due to the inability of NPS employees to sustain reduction efforts and prevent reentry of pigs into non-native ungulate-control areas.

During this period of feral ungulate control, domestic cattle from the adjoining ranches would graze within the park. The most impacted areas included Mauna Loa and portions of Kilauea. Although authorized grazing was discontinued in 1948, a small number of stray cattle (both domestic and feral) remained until the early 1970s (Tunison et al. 1995).

In the 1970s, the NPS changed management strategies to a systematic approach of lethal removal (direct reduction) and fencing, including the use of volunteers in management efforts. The strategy included the use of boundary and internal fences to isolate populations, removal of animals at greater rates than they could be replenished by reproduction and ingress, boundary fence inspection and maintenance, and monitoring and removal to prevent population increases (NPS 1974, 1986, 1993, 1997a, 1997b, 1999b, 2001b). Since the NPS adopted this approach, staff members have eliminated nearly all goats below 9,000 feet in elevation (excluding the Kahuku Unit) and have eliminated pigs from approximately 40,000 acres of interior fenced units, or pig control units. Ingress of feral ungulates (goats, mouflon sheep, pigs, and cattle) into managed units has occurred at very low, manageable rates since the 1970s. In Kahuku, large numbers of mouflon sheep are present along with feral pigs and a few feral goats and cattle. Several hundred feral sheep live in the remote north corner of Kahuku. Between 2004 and 2006, approximately 1,900 mouflon sheep were removed from Kahuku and fence segments were constructed along the park boundary; however, populations remain high in many areas (estimated at 1,797, \pm 688 in December 2006) due to an annual increase estimated between 21.1 and 33.1 percent (Stephens et al. 2008; USGS 2006).

DECISION (SELECTED ACTION)

The NPS will implement alternative D, as described in the final plan/EIS, as the selected action. This alternative is the same as the preferred alternative presented in the final plan/EIS, which was released to the public for the required 30-day no-action period beginning January 25, 2013, and ending February 25, 2013. The selected action was developed with input from the NPS, a science team convened specifically to provide input into this planning process, and public comments received on the draft plan/EIS.

Under the selected action, the NPS will implement a comprehensive, systematic management plan that will provide maximum management flexibility. The selected action includes a systematic progression of management phases, monitoring, and the considered use of management tools, with a defined population objective of zero non-native ungulates (or as low as practicable, recognizing the possibility of remnant populations and ingress animals) in managed areas. In addition to fencing, management tools will rely primarily on lethal techniques, but the NPS could also use non-lethal techniques such as relocation. The NPS will 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. Qualified volunteers will be used to assist with ground shooting operations, and could be used for certain other non-native ungulate management activities. The NPS will implement the selected action, including the measures to minimize harm and minimum tools discussed later, to manage non-native ungulates known to occur in the park and any other non-native ungulates that the NPS may find in the park during the life of the plan.

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 the NPS will not allow non-native species 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 (including the selected action) will 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 will not be possible to achieve success with non-native ungulates existing on the landscape.

Management Phases

Non-native ungulate management under the selected action will 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 nonnative ungulates targeted for control have been fully removed and to carry out follow-up removal of ingress animals.

Considerations for Implementing Management Tools

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 selected action (see table 4 of the final plan/EIS). These considerations include target species for particular management techniques and conditions under which management tools are most warranted. Each of these management tools is further described below.

Management Tools

Direct Reduction with Firearms—Ground Shooting

This tool involves using firearms from the ground for the lethal removal of non-native ungulates. NPS staff, and personnel directed by them, will have the appropriate skills and proficiencies in the use of firearms and ensuring public safety, including experience in the use of firearms for the removal of wildlife. When conducting ground shooting activities, the NPS will comply with all relevant policies, and plans related to firearms use.

Participants involved with direct reduction activities will assist with 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 will be identified during a pre-reduction meeting and could include any of the actions noted above. Participants will generally access an area on foot or by vehicle. The participants will locate groups of non-native ungulates to facilitate reduction activities for a targeted species, although non-native ungulates located by chance will also be considered for removal as long as it will not adversely affect the removal of the target species. Participants will consider the choice of firearm, ammunition, and shot placement to ensure the humaneness of the action. Non-native ungulates injured during the operation will 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 trained dogs could also be used to locate and immobilize non-native ungulates, such as feral pigs, during implementation of direct reduction with firearms. They will not be used in known breeding/molting areas of the nēnē or Hawaiian goose (*Branta sandvicensis*) 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 will 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 will capture an animal, place a telemetry collar on it, release it, and track it back to the larger group. Once the larger group is identified, ground shooting will be implemented.

In addition to the methods described above, activities associated with ground shooting could include using bait stations to attract larger groups of non-native ungulates for removal. The park will 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 will 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 will be collared, held in an approximately 1-acre enclosure, sedated, and given estrogen implants. The implant will be injected in the area of the non-native ungulate's ear using a specially designed implantation device. The treated ungulate will 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 will continuously be in estrus, which will be used as a lure for the male non-native ungulates. When lured, the male non-native ungulates will be lethally removed and the injected females will be collected and used for other removal operations. Each dose of the estrogen implants will last approximately 200 days, after which time the female non-native ungulates will need to be re-injected (Elanco Animal Health 2002).

Direct Reduction with Firearms—Aerial Shooting

Direct reduction with firearms will also occur from helicopters. As with ground shooting, personnel involved will have the appropriate training, certifications, skills, and proficiencies in helicopter operations, firearms, and safety. When conducting aerial shooting activities, the NPS will comply with all relevant regulations, policies, and plans related to helicopter and firearms use.

This method is most effective in open areas where skilled shooters are able to take animals in vegetation openings. Trained dogs and ground crews will be used in combination with aerial shooters to help spot non-native ungulates and flush them into open areas. This method could also be used in combination with telemetry, as described for ground shooting. Furthermore, aerial shooting activities could include use of bait stations to attract larger groups of non-native ungulates for removal, and the park could consider inducing estrus in captive female non-native ungulates to lure other non-native ungulates (as described for ground shooting).

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 will 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 begins to confuse the infrared signals.

Snaring

The NPS will use snaring primarily for the removal of feral pigs, particularly when they are at remnant levels, when densities are low; in rugged terrain or remote sites; or to remove pigs that have become accustomed to other removal techniques and learned to avoid them. Snaring 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 as it passes through the narrow opening, ultimately resulting in the death of the animal. Other types of snares for additional non-native ungulate species may also be used wherever effective and safe. The NPS will also explore using snares in combination with telemetry devices that will alert park staff when snares have been tripped. The snares will be well marked, mapped with GPS coordinates, heavily flagged, and sometimes baited. NPS subject experts and the park botanist will be consulted before snaring activities to avoid potential impacts to non-target species and visitor safety.

Baiting and Trapping

Baiting and trapping will be used primarily for lethal removal of feral pigs, mouflon sheep, and feral cattle, although the NPS will also explore using this tool for sheep and axis deer (if found in the park). The NPS use traps to capture the animals, which will then be dispatched in or near the trap. This method will 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. In mid-elevation, seasonally dry nēnē habitat on Kīlauea, baiting and live trapping will be the primary tool for removing feral pigs from the vicinity of nests and goslings. The NPS will conduct these localized activities annually and during the breeding season (October through March). NPS subject experts and the park botanist will be consulted before these activities to avoid potential impacts to non-target species.

Fencing

Existing and proposed fence boundaries under the selected alternative are shown in figure 1. In existing fenced units, the NPS will continue to repair boundary fences. In areas where there is potential for mouflon sheep to breach fences, the NPS will continue to retrofit boundary fences from 4-foot to 6-foot fences. The NPS will also continue to use interior fencing (approximately 3 to 6 feet 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 to several thousand acres. Smaller fenced units (e.g., several acres) are typically constructed to protect highly sensitive resources (e.g., endangered Mauna Loa silverswords (*Argyroxiphium kauense*) and nēnē) or to evaluate recovery as a prelude to the establishment of larger fenced management units.

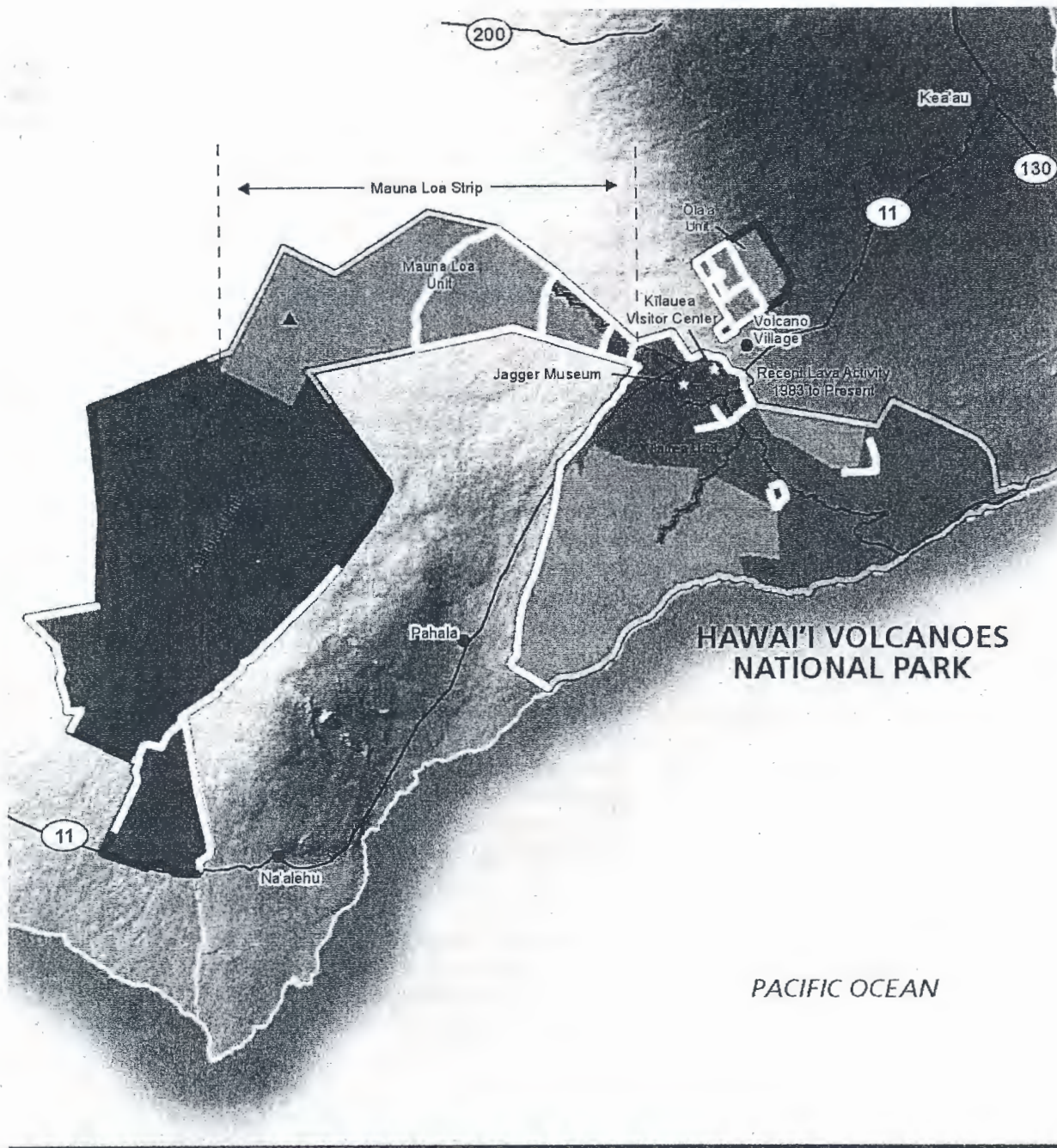
In the Kahuku Unit, the NPS will complete the boundary fence that will extend upslope for several miles into sparsely vegetated lava fields before terminating at the 11,000-foot elevation where potential for animal ingress will be low. In addition, the NPS could construct localized internal fencing to assist in the control of non-native ungulates, if needed. The NPS could establish boundary fences on the east end of Kīlauea if active lava flow ceased and ingress of feral goats or other ungulates occurred in significant numbers. A boundary fence for unmanaged portions of the 'Ōla'a rainforest will also be constructed (see figure 1).

The NPS will sequence actual fencing based on conditions on the ground while other parts of the plan are being implemented. Based on experience and research, the NPS will design fencing to keep multiple non-native ungulate species outside the park boundary. The NPS will modify any fencing, as necessary, to minimize impacts on other wildlife and incorporate changes in fencing technology (e.g., fence design, remote cameras to monitor breaches, etc.).

Relocation

The NPS will investigate the possibility of relocating non-native ungulates, such as feral sheep, mouflon sheep and pigs, to other lands (in addition to returning domestic cattle to ranchers). This will occur by driving non-native ungulates onto adjacent lands.

All potential relocation activities will require willing recipients and the NPS will carry them out in close cooperation with the state. When considering areas to relocate animals, the NPS will only relocate nonnative ungulates to areas where populations have already been established in large numbers, and will avoid sites where undesirable impacts to the environment could occur (e.g., rare native plants and animals, critical habitat, soils, cultural resources etc.). The NPS will obtain any necessary permissions and permits prior to relocation activities.



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

FIGURE 1:
Proposed Fence Boundaries



0 3 6 9 12 Miles

For Illustration Purposes Only.

Relocation to adjacent lands could 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 will open and lead the animals into a holding pen. From the holding pen, the NPS will transfer non-native ungulates to adjacent lands. These operations would last less than a day, usually only a few hours at a time.

Qualified Volunteers

Under the selected action, the park will retain a volunteer program for the following reasons:

- It assists in removal of non-native ungulates in support of the plan.
- It furthers the purposes of the Volunteers in Parks Act and NPS Management Policies 2006 related to the use of volunteers by engaging the surrounding community and general public in stewardship of park resources as authorized agents of the NPS.
- It provides an opportunity to increase awareness of non-native ungulate adverse impacts and build support for the ungulate management program.

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 continues to be in participation with ground shooting efforts.

To be eligible, qualified volunteers will be required to fill out a registration form and meet specific criteria, including the following:

- 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.

NPS staff will 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. Volunteers will be escorted in the field by park staff who will directly supervise 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 will collect data consisting of names of volunteers; date, area, and time of removal activities; and species, sex, age, and herd size of animals removed.

Any qualified volunteer who meets the requirements for participation will become part of a pool of available personnel who may supplement NPS management teams.

The NPS could make adjustments to the volunteer program to improve the effectiveness of the program (e.g., adjusting the staff/volunteer ratio, skills requirements, etc.). Current NPS practice dictates that the use of qualified volunteers for lethal removal of wildlife in accordance with an approved management plan is not a recreational activity, does not involve the principles of fair chase, and does not allow volunteers to keep any part of the animal, including the meat. Should this change in the future, the park will ultimately be responsible for adhering to new or revised practices. Additionally, the NPS will 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).

Furthermore, the NPS could use qualified volunteers for ground shooting activities in additional management phases and areas where safe and practicable. The NPS has the discretion to discontinue the volunteer program depending on its effectiveness in helping the park meet its non-native ungulate management objectives.

Carcass Handling and Disposal

The NPS will salvage and donate meat when possible, following all applicable public health and government property guidelines. However, the NPS may leave animal carcasses in place as necessary (e.g., if removing the carcass is too difficult). The NPS may also relocate carcasses from kill sites if they are in sensitive areas, such as next to a road, trail, or cultural site.

Education

Park staff will continue to provide information in the visitor center, in interpretive programs, and in evening programs about NPS efforts to perpetuate endemic plants and animals and about issues related to non-native ungulates. The NPS will conduct programs in local communities as opportunities arise.

Formal Partnerships

Under the selected action, the NPS will 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. As part of this, a framework for communication, coordination and collaboration among park partners and community stakeholders will be developed.

Use of Best Available Science

The NPS will 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. The NPS will also explore the potential to expand existing management actions as new information becomes available regarding their effectiveness.

Minimum Requirements and Minimum Tools for Management Actions in Wilderness Areas

Pursuant to the Wilderness Act of 1964, the park's manager must apply the "minimum requirement" concept to all proposed management activities that may 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, when management intervention is deemed to be necessary. Using this process, managers may authorize the generally prohibited activities or uses listed in Section 4(c) of the Wilderness Act if deemed necessary for the administration of the area as wilderness, and where those methods are determined to be the "minimum tool" for the project.

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, 1999a), and the park's general management planning process (ongoing; NPS 2011¹), reaffirmed the need to construct fences and conduct non-native ungulate control measures in wilderness units.

The results of the minimum requirements analysis conducted for this plan/EIS also 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 of the final plan/EIS). Managing populations of non-native ungulates will perpetuate or assist recovery of the natural conditions that contribute to the character of the wilderness at Hawai'i Volcanoes National Park. The NPS has determined the specific actions described as part of the selected action (e.g., fence construction, the use of power tools and helicopter) to be the minimum tools necessary to meet these requirements. This determination applies to Congressionally designated Wilderness areas of the park, as well as certain tracts which have been determined to be eligible for designation.

Monitoring

A formalized monitoring system will be part of the selected action. The information gained through monitoring will inform the use of management tools and the progression through the four management phases described previously.

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 non-native ungulate to assess during all management phases, especially in dense vegetation. Therefore, the NPS often uses ground-based systematic monitoring techniques 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 non-native-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.

Measures to Minimize Harm

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

Natural Resources

- The NPS will continue to pursue safe and effective non-toxic alternatives to the use of lead bullets to minimize harmful impacts of lead in the environment.

¹ NPS 2011. Hawai'i Volcanoes National Park General Management Plan /Wilderness Study /Environmental Impact Statement, Newsletter #3 Preliminary Alternatives, Summer 2011.

- The NPS will not use trained dogs (used to locate and flush sheep, goats, or mouflon sheep to facilitate direct reduction from the ground) in known breeding/molting areas of the nēnē to minimize the potential for unintended impacts on this federally listed species.
- The NPS will minimize low-flying helicopter work in sensitive wildlife habitat during critical periods.
- Prior to using snares or traps, consultation with NPS subject experts and the park botanist will be conducted to determine the type of snare or trap, placement, and bait selection to avoid potential impacts to nēnē and other native sensitive species in the area. The NPS will continue to implement the weed control program (NPS 1999a) and the fire management plan that are already in use at the park (NPS 2005a), to minimize the potential for increased non-native plant infestations or fire danger after the removal of non-native ungulates.
- The NPS will continue to coordinate with the U.S. Fish and Wildlife Service (USFWS) to ensure that potential environmental impacts on listed species are adequately considered and, as needed, to identify appropriate mitigation measures to avoid impacts on listed species in the area.
- Botanical surveys conducted prior to fence corridor clearing will mark all listed and rare plant species in the area, including helicopter staging areas. The NPS will adjust fence alignment and helicopter staging areas so that endangered or rare species observed in the vicinity of the fence line will not be affected by the proposed project (at least 15 feet away from listed plants per comments received from the USFWS).
- To protect potential host plants and habitat for the picture-wing fly (*Drosophila heteroneura*, *Drosophila mulli*), the NPS will limit impacts on native vegetation associated with fence corridor clearing to a 4-foot corridor. Plant removal will 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., *Trematolobelia* spp., *Pritchardia* spp.).
- Vehicles will stay on existing roads and trails. If off-road use is needed, the NPS will survey routes and listed plants will be clearly marked with flagging or tape.
- Park staff familiar with the native plants in the area will supervise workers within fenced units.
- The NPS will be clearly mark, with flagging or tape, all listed plant species along fence construction corridors.
- The NPS will modify fencing, as necessary, to minimize impacts on other wildlife. For example, to reduce the risk of fence strikes in areas where Hawaiian petrel and Newell's shearwater (*Puffinus auricularis newelli*) occur or fly over, the NPS will attach white vinyl strips, flagging, or similar material to the top strand of the fence that protrudes above the canopy. In addition to strips on the top strand of the fence, the NPS will attach strips along the middle of the fence where the fence is found on open or sparsely vegetated lava flows. The NPS will adjust fence alignment to at least 30 feet away from seabird colonies. If improved marking strategies emerge, the NPS could use them in place of the current practice. The NPS will also adjust fence alignment to avoid impacts on seabird colonies.
- The NPS will follow all park sanitation protocols for inspecting and cleaning personnel clothing, boots, and gear, project equipment, vehicles, and construction material 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, the NPS will inspect and treat worksites to remove non-native species that may have entered the area.
- In endangered forest bird habitat, the NPS will adjust fence alignment to avoid cutting large trees. The proposed specifications for vegetation clearing limits removal to trees less than 6 inches in

diameter. This will protect 'ōhi'a (*Metrosideros polymorpha*) or koa trees (*Acacia koa*), with a diameter of 3 feet or greater, which are preferred nesting habitat for 'ākepa (*Loxops coccineus*). To the extent practical, construction activities and helicopter transport of fence materials will 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 will halt construction activity and not resume until coordination with the USFWS has occurred.

- In Hawaiian hawk (*Buteo solitaries*) habitat, to the extent practical, helicopter transport of fence materials and construction activities will be scheduled before or after the breeding and nesting seasons (March through September). For construction during the breeding season, the park biologist or a qualified alternate will conduct a nest search of the area proposed for fence corridor construction and surrounding environs 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 will be halted and will not resume until coordination with the USFWS has occurred.
- Trained NPS staff will evaluate helicopter staging areas prior to transport of material to drop sites, and may relocate sites, if needed, to reduce impacts to nēnē. If nēnē are observed during construction activity along the fence line, appropriate NPS staff will be contacted to evaluate the situation, and the construction will be suspended until the birds move on of their own accord or after coordination with the USFWS.
- In order to reduce potential disturbance to Hawaiian hoary bats (*Lasiurus cinereus* ssp. *semotus*), no tree (>15-foot tall) removal or trimming will occur when lactating or non-volant bats are present (May through August, ≤5,000-feet in elevation). Additionally, the NPS will not use barbed wire in new fence construction in order to minimize potential bat entanglement. Where potential entanglement may occur (e.g., in open areas), barbed wire will be removed from existing fences.

Cultural Resources

- The NPS will continue to coordinate with the State Historic Preservation Officer (SHPO) 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 will be conducted prior to the construction of fences, and fences will be realigned, if necessary, to avoid impacts to archeological resources and to minimize disturbance to the cultural viewshed.

Visitor Use and Experience

- The NPS will consider the use of firearm noise suppressors at their discretion, in order to reduce impacts on the natural soundscape.
- To the extent feasible, the NPS will make efforts 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 will determine if specific areas of the park will need to be temporarily closed during non-native ungulate management activities. The NPS will notify park visitors and the surrounding communities of these closures, as appropriate. Closures will typically involve notifying the front desk, dispatchers, researchers, and other park staff of plans to conduct removal activities in a specific area, in addition to placing signs on fences or gates to notify visitors. The NPS will also conduct removal activities in the early morning to minimize impacts on visitors.

Visitor and Employee Safety

- Personnel involved in ground shooting activities, which will include NPS staff and qualified volunteers, will 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.
- Personnel involved in aerial shooting will have the appropriate training, certifications, skills, and proficiencies in helicopter operations, firearms, and safety.
- The NPS will comply with all relevant policies, and plans related to helicopter and firearms use, including:
 - the Interagency Aviation Management Council's *Interagency Helicopter Operations Guide* (IAMC 2006);
 - the *Aerial Capture, Eradication, and Tagging of Animals Handbook* (Department of the Interior Departmental Manual 351 (351 DM 2–351 DM 3));
 - NPS directives related to firearms use in parks; and
 - Federal firearm laws administered by the Bureau of Alcohol, Tobacco, and Firearms.
- Fenced management units with snares will be well signposted, which will limit potential safety issues. The location of snares will also be mapped with GPS coordinates and heavily flagged for identification.
- The NPS will limit the use of infrared technology for management actions 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 infrared signals.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

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. Of all the alternatives considered, alternative C provides for the most expedient and efficient management of non-native ungulates by relying exclusively on lethal removal techniques and 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 reduce the continued impacts of non-native ungulates on natural and cultural resources in the park most quickly. 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 other alternatives.

ALTERNATIVES CONSIDERED BUT NOT SELECTED

Alternative A: No Action

Under alternative A (no action), 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, 1999b), and other management decisions. Management techniques would be lethal and would include the use of fencing. The NPS would continue to use qualified volunteers to be used to assist with certain ground shooting activities, and could be used for certain other non-native ungulate management activities.

The population-level objective would continue to be zero (or as low as practicable) in existing management units located on Kīlauea, Mauna Loa and 'Ōla'a in the park. However, no population objective and fencing strategy would be defined for Kahuku and for other areas currently unmanaged (e.g. portions of 'Ōla'a) in a comprehensive parkwide plan.

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 techniques and would include the use of fencing. Alternative B would include a systematic progression of management phases, monitoring, and the considered use of management tools, with a defined population objective of zero non-native ungulates (or as low as practicable) in managed areas. Qualified volunteers would be used to assist with ground shooting operations, and could be used for certain other non-native ungulate management activities.

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 using the most efficient and cost-effective methods of non-native ungulate management. Management techniques would be lethal and would include the use of fencing. Alternative C would include a systematic progression of management phases, monitoring, and the considered use of management tools, with a defined population objective of zero non-native ungulates (or as low as practicable) in managed areas. Volunteers would not be used in any capacity associated with non-native ungulate management.

Alternative E: Comprehensive Management Plan That Increases Flexibility of Management Techniques While Limiting the Use of Volunteers

Under alternative E, the NPS would implement a comprehensive systematic management plan that includes fencing and relies primarily on lethal techniques, but also considers non-lethal techniques such as relocation. Alternative E would include a systematic progression of management phases, monitoring, and the considered use of management tools, with a defined population objective of zero non-native ungulates (or as low as practicable) in managed areas. To provide the full range of alternatives, alternative E would involve the same management techniques as alternative D, and although qualified volunteers would be used, they would not participate in ground shooting.

BASIS FOR DECISION

In selecting alternative D (Comprehensive Management Plan That Maximizes Flexibility of Management Techniques) for implementation, the NPS considered factors such as the extent to which alternatives meet plan objectives, environmental consequences, efficacy in restoring wilderness character, anticipated effort associated with implementation, degree of management flexibility, and costs. Of all the alternatives evaluated, alternative D provides the greatest flexibility of management techniques, including options for use of non-lethal actions, while incorporating the use of qualified volunteers, 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

- engage the volunteers in removal of non-native ungulates in support of the park's resource management program
- further the purposes of the Volunteers in Parks Act and NPS *Management Policies 2006* (NPS 2006b) related to the use of volunteers by engaging the surrounding community and general public in stewardship of park resources as authorized agents of the NPS

- provide an opportunity to increase awareness of non-native ungulate adverse impacts, which furthers the NPS's objectives related to coordination and outreach described previously, and builds support for the ungulate management program

Any expected increase in the time, cost, and administrative oversight needed to achieve the population-level objective by implementing alternative D when compared with the other alternatives, including the environmentally-preferred alternative, will not prevent the NPS from fully meeting the non-native ungulate management objectives of protecting and restoring park resources. In addition, the NPS can make additional adjustments to the current volunteer program as needed to improve its effectiveness (e.g., adjusting the staff/volunteer ratio, skills requirements, etc.). The NPS also has the discretion to discontinue the volunteer program depending on its effectiveness in helping the NPS meet its non-native ungulate management objectives.

PUBLIC AND AGENCY INVOLVEMENT IN THE PLANNING PROCESS

Public Scoping

Public scoping for the plan/EIS began with the NPS publishing a Notice of Intent in the *Federal Register* on February 13, 2008, which indicated this would be a delegated EIS process. The NPS invited the public to submit comments on the scope of the planning process and potential alternatives through May 19, 2008. During the public scoping period, three public scoping meetings were held throughout the Island of Hawai'i in Hilo, Nā'ālehu, and Kona. A total of 79 attendees signed in during the three meetings. Park press releases were sent to various news outlets on Hawai'i island. Articles were subsequently published in *West Hawaii Today* (Mar 17, 2008), *Hawai'i Tribune Herald* (April 26, 2008), *Ka'ū Calendar* (May 2008), and *National Parks Traveler* (May 14, 2008). An article covering the public meeting in Hilo was published in the *Hawai'i Tribune Herald* (April 30, 2008).

Each of the public workshops included presentations on non-native ungulate issues at the park and on the planning process, a listening session, and open house. Park staff and other NPS specialists were on hand to record public comments, answer questions, and provide additional information to meeting attendees. The NPS received 112 pieces of correspondence during the scoping period, including a total of 458 comments.

Of the 458 comments received, 331 were related to the alternative concepts; 79 comments were related to the affected environment at the park; two comments were related to the impact analysis; and 14 comments were concerned with the purpose and need of the plan/EIS.

Public Review of the Draft Plan/EIS

The U.S. Environmental Protection Agency (EPA) and NPS published Notices of Availability for the draft plan/EIS in the *Federal Register* on November 18 and November 23, 2011, respectively. Following the release of the draft plan/EIS, a public comment period was open between November 18, 2011, and January 20, 2012. The NPS announced the public comment period on the park's website (www.nps.gov/havo) and by press releases. The NPS also sent notification of the plan/EIS availability and public comment period to the park's mailing list of nearly 600 interested parties, elected officials, and appropriate local and state agencies. This included the distribution of approximately 100 hardcopies of the document. The NPS also made the draft plan/EIS available through several outlets, including the NPS PEPC website at <http://parkplanning.nps.gov/havo>, and was available at the park visitor center, in local libraries, at the public meetings, and by contacting the park superintendent. After reviewing the draft plan/EIS, the public was encouraged to submit comments regarding the draft plan/EIS through the NPS PEPC website, at the public meetings, or by postal mail sent directly to the park.

The draft plan/EIS received considerable publicity through various news outlets in Hawai'i. The *West Hawai'i Today*, the *Hawai'i Tribune Herald*, *Ka'ū Calendar*, *Big Island Weekly*, and the *National Parks Traveler* published articles in November and December 2011 describing the efforts of the park to restore native ecosystems through the management of non-native ungulates. These articles described the proposed actions and referenced the desire of residents to be able to hunt the non-native ungulates inside the park.

During the public review and comment period, three public meetings were held in December 2011 to present the plan, provide an opportunity to ask questions, and facilitate public involvement and community feedback on the draft plan/EIS for management of non-native ungulates in Hawai'i Volcanoes National Park. The public meetings were held at the park's Visitor Center, at the Nā'ālehu Community Center, and at the Kona Outdoor Circle. A total of 54 meeting attendees signed in during the three meetings.

The NPS received 28 pieces of correspondence during the comment period, including a total of 274 comments. The NPS analyzed all comments received to identify common concerns or issues for response from the NPS. A majority of comments received were related to meat handling and donation of meat, comments in support of removing non-native ungulates from the park, and the relocation of non-native ungulates. Members of the NPS planning team responded to the substantive concerns in appendix E of the final plan/EIS. As necessary, responses describe where the NPS made changes to the final plan/EIS based on public comments received. Generally, changes made because of public comments were factual in nature and did not result in changes to the NPS-preferred alternative or the outcome of the impact analysis for any of the management alternatives considered.

Following the public meetings on the draft plan/EIS, the *West Hawai'i Today* (December 2011) and *The Ka'ū Calendar* (January 2012) published articles describing the public meetings, the draft plan/EIS, and the general sentiment that the attendees displayed during the public meetings.

Final Plan/EIS

The final plan/EIS was available for public inspection for a 30-day no-action period, which began with the publication of the EPA *Federal Register* Notice of Availability of the final plan/EIS on January 25, 2013, and ended on February 25, 2013. As with the draft plan/EIS, the NPS issued its own *Federal Register* Notice of Availability of the final plan/EIS on February 1, 2013. The NPS also announced the availability of the final plan/EIS on the park's website (www.nps.gov/havo) and by press releases. As with the draft plan/EIS, notification of the availability of the final plan/EIS was sent directly to the park's mailing list of nearly 600 interested parties, elected officials, and appropriate local and state agencies. This included distribution of approximately 100 hardcopies of the document. The final plan/EIS was also made available through several outlets, including the PEPC website at <http://parkplanning.nps.gov/havo> and local libraries, and was available on CD or hardcopy by contacting the park superintendent.

In January 2013, the *West Hawai'i Today*, the *Hawai'i Tribune Herald*, and the *Big Island Now* news outlets published articles describing the final plan/EIS.

Agency Consultation

Endangered Species Act

In accordance with Section 7 of the Endangered Species Act of 1973, as amended, the NPS initiated informal consultation with the USFWS concerning impacts to threatened and endangered species in 2008. The NPS sent a letter during initial scoping requesting early USFWS input on the plan/EIS, and information about the presence of federally listed species in or near the park. The USFWS sent a

response, which helped guide preparation of the plan/EIS. In 2011, the NPS sent a request for USFWS concurrence with the determination that the plan may affect, but is not likely to adversely affect, listed species. The USFWS responded with its concurrence on July 18, 2011. The NPS also sent the USFWS copies of the draft and final versions of the plan/EIS.

National Historic Preservation Act

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, the NPS initiated consultation with several groups in 2008 (please see chapter 5 of the final plan/EIS for details on groups contacted). As part of the distribution of the draft plan/EIS, the NPS sent copies of the documents to these groups, and specifically requested SHPO concurrence with the determination under Section 106 that the plan will have no adverse effects on listed cultural resources. In addition, the NPS sent a copy of the final plan/EIS and notification of its availability to the SHPO and the other groups consulted under Section 106. The SHPO did not respond within 30 days of receiving the NPS request for concurrence, and still have not responded, so the Section 106 consultation process is considered complete, and NPS may proceed with implementation per 36 CFR 800.5(c)(1).

Native Hawaiian Consultation

Over the course of the planning, development, and writing of the plan/EIS, the NPS met with the Kupuna Consultation Group to discuss the proposed plan to remove non-native ungulates from park lands. The Kupuna Consultation Group is made up of individuals and representatives of Native Hawaiian Organizations (see 36 CFR 800.2(c)) who have knowledge of the lands that encompass Hawai'i Volcanoes National Park. This group has been meeting in the park since the early 1990s specifically for consultation as defined by the National Historic Preservation Act (36 CFR 800.16(f)). Six meetings were held that related to the plan and ungulate control in general; the first meeting was in February 2008 and the last meeting was in September 2011. All meetings were held at the park, and each meeting is summarized in chapter 5 of the plan/EIS. Overall, the Kupuna Consultation Group felt the removal of non-native ungulates will be positive, but that grass and weed growth could be an issue with regard to fire hazard and fuel load; meat from sheep removed by volunteers should be made available to them; and volunteers chosen to participate in non-native ungulate management should be from the local community. The NPS also provided copies and notification to the Kupuna Consultation Group when the draft and final plan/EIS were released.

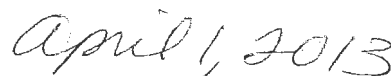
CONCLUSION

Overall, of the five alternatives considered, the selected action best meets the purpose, need, and objectives of the plan/EIS and is expected to support the long-term protection, preservation, and restoration of natural and cultural resources at Hawai'i Volcanoes National Park. It incorporates all practical means to avoid or minimize environmental harm and will not result in the impairment of park resources and values or violate the NPS Organic Act. The official responsible for implementing the selected action is the Superintendent of Hawai'i Volcanoes National Park.

Approved:



Patricia L. Neubacher
Acting Regional Director, Pacific West Region



Date

ATTACHMENT A: NON-IMPAIRMENT DETERMINATION
PROTECTING AND RESTORING NATIVE ECOSYSTEMS
BY MANAGING NON-NATIVE UNGULATES

Pursuant to the NPS Guidance for Non-Impairment Determinations and the NPS NEPA Process¹, a non-impairment determination for the selected alternative is included here as an attachment to the ROD.

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

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

According to NPS *Management Policies 2006*, an action constitutes an impairment when its impact “would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values” (NPS 2006b, section 1.4.5). To determine impairment, the NPS must evaluate “the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts” (NPS 2006b, section 1.4.5).

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

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

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or

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

- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance (NPS 2006b, section 1.4.5)

The resource impact topics carried forward and analyzed for the NPS-selected alternative, which is the same as the preferred alternative (alternative D) in the final plan/EIS, and for which a non-impairment determination was completed, include: vegetation; native wildlife and wildlife habitat; rare, unique, threatened, or endangered species; cultural/historic resources; wilderness; soils; and soundscapes. Non-resource topics considered in the final plan/EIS, including park operations, visitor use, and socioeconomics, are not subject to the determination of impairment.

Vegetation

Vegetation in the park varies with the climate, elevation, and topographic exposure (exposed or sheltered from trade wind showers). The fire management plan (NPS 2005a) for Hawai'i Volcanoes National Park identifies seven environmental zones, adapted from vegetation maps created by Mueller-Dombois and Fosberg (1974), each with different plant communities: alpine/aeolian, subalpine, mesic/wet forest, montane seasonal, mid-elevation seasonal, coastal lowland, and Kahuku pasture/mesic forest. The plant communities supported in these zones are home to more than 400 native species of vascular plants, as well as 600 non-native vascular plant species.

The park's vegetation quality is necessary to fulfill the purposes for which the park was established and is critical to the natural and cultural integrity of the park. The park is home to a wide variety of vegetation types including rain forests, subalpine shrublands, dryland forests, and sparsely vegetated lava flow communities (among others), which are specifically identified in the park's enabling legislation and planning documents.

Healthy, native terrestrial vegetation is necessary to fulfill the purposes for which the park was established and is critical to the natural integrity and enjoyment of the park. Removal of non-native ungulates will result in long-term beneficial impacts on vegetation due to reductions in browsing pressure, rooting, and trampling, as well as ecosystem restoration and recovery. Long-term beneficial impacts on vegetation will be fully realized under the selected alternative because the comprehensive, systematic approach will ensure that the NPS will progress through ungulate management phases, monitor, and apply management tools consistently over time. Additionally, removal of non-native ungulates and restoration of native vegetation cover helps to counteract potential pressures of global climate change on vegetation by removing a key stressor on native ecosystems, helping reduce habitat fragmentation, and lessening disturbance-facilitated establishment and dispersal of non-native weeds.

The removal of ungulates could cause an increase in some non-native weeds, resulting in long-term adverse impacts on native plants and plant communities, depending on a variety of factors. In addition, fire risk could increase in certain areas when grazers and browsers are removed, while for other areas fire risk could decrease or remain unchanged. However, the implementation of weed, native plant restoration, and fire management programs (through existing plans) and weed sanitation protocols to prevent establishment of invasive species will limit the potential

adverse effects of non-native weeds and an altered fire regime on vegetation. It is possible that increased human and vehicular traffic associated with potential relocation activities could cause additional disturbance to vegetation during the process of driving non-native ungulates to adjacent lands. However, these impacts will be short term, localized, and similar to impacts of other management actions.

Overall, adverse impacts on vegetation will be relatively limited, given appropriate mitigation, and will be offset by the expected recovery of vegetation associated with the removal of non-native ungulates under selected action. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, implementation of the selected alternative will not impair vegetation because of the low magnitude of adverse effects from management actions and the benefits that will result from removal of the non-native ungulate population.

Native Wildlife and Wildlife Habitat

One of the reasons the park was legislated was to conserve and interpret the unique wildlife of the island. A wide variety of habitats is found in the park, along with a correspondingly wide variety of terrestrial and aquatic wildlife species. The majority of the native wildlife in Hawai'i is endemic (found nowhere else on earth) (NPCA 2008). A total of 14 mammalian species (two of which are native), 87 bird species (46 of which are native), more than 1,100 species of invertebrates (over 350 of which are native, of which approximately 98 percent are endemic), and two reptile species inhabit the terrestrial and shoreline acreage of the park. Freshwater aquatic species include a diverse assemblage of fishes and aquatic invertebrates, including several mussel and crayfish species.

Viable wildlife populations and wildlife habitat are necessary to fulfill the purposes for which the park was established and are critical to the natural and cultural integrity of the park. The actions in the selected alternative will have mainly beneficial impacts. Reduction of non-native ungulate browsing will enhance forest regeneration, increasing the availability of food and cover for wildlife species that depend on ground-layer and understory vegetation for survival. Thus, reduction of ungulate browsing will help support the population viability of native wildlife and native invertebrates in the park. Non-native mosquito habitat created by feral pigs will also be reduced, which will help protect native forest birds from mosquito-borne avian malaria and avian pox (NPS 1999a; USGS 2005a). The number of wildlife species that will benefit from these changes will increase as the vegetation becomes more diverse and abundant with reduced browsing pressure. Long-term beneficial impacts on native wildlife and wildlife habitat will be fully realized under the selected alternative because the comprehensive, systematic approach will ensure that the NPS will progress through ungulate management phases, monitor, and apply management tools consistently over time. Additionally, removal of non-native ungulates and restoration of native wildlife habitat helps to counteract potential pressures of global climate change on wildlife and wildlife habitat by removing a key stressor on native ecosystems, thereby increasing the capacity of native species to adapt to changes in climate. Restoration of fragmented plant communities would assist the local migration of species in response to climate change. Also removing ungulates would reduce disturbance-facilitated establishment and dispersal of non-native weeds.

Native wildlife and wildlife habitat will be temporarily disturbed during implementation of management actions, fence construction and maintenance, non-native ungulate removal efforts, and monitoring. Low-flying aircraft used to support management actions may temporarily affect the behavior and ecology of wildlife. Increased human and vehicular traffic associated with potential relocation activities could also disturb native wildlife and wildlife habitat during the process of driving non-native ungulates to adjacent lands. However, these impacts will be short term, localized, and similar to impacts of other management actions. The use of firearms, the presence of people associated with management actions, and the use of trained dogs will contribute to localized disturbance of wildlife during management actions. However, non-native ungulate management actions will be infrequent, temporary, and any disruption will end once a management action is complete. Although implementation could temporarily displace native wildlife, they will return after management actions are completed, and population stability and viability will not be negatively affected by management actions. Any trampling of plants during management actions will have similar impacts to other routine fieldwork, and will not affect the integrity of wildlife habitat. In addition, the NPS will take steps to minimize adverse effects associated with the selected alternative. For example, firearm noise suppressors, which could reduce the disturbance to native wildlife, will be considered at the discretion of the park. Fence corridors will be surveyed for sensitive plant and animal species prior to construction, repair, or replacement, and fence work will be minimized or avoided in areas identified as sensitive bird or bat habitat during critical breeding seasons. The potential long-term adverse impacts of fencing will be mitigated by modifying fencing, as necessary, to minimize impacts on native wildlife (e.g., the use of vinyl strips or flagging to make fencing more visible to petrels and the removal of barbed wire in areas where impacts on Hawaiian hoary bats (*Lasiurus cinereus semotus*) are a concern) and to address any changes in technology (to ensure effectiveness and avoid fence breaching).

Overall, adverse impacts on native wildlife and wildlife habitat will be relatively limited, given appropriate mitigation, and will be offset by the ecosystem restoration and recovery of native wildlife and wildlife habitat under the selected action. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, implementation of the selected alternative will not impair wildlife or wildlife habitat because of the low magnitude of adverse effects from management actions and the benefits that will result from reduced non-native ungulate browsing pressure. In 2011, following consultation between the NPS and the USFWS, the USFWS agreed that the disturbance from non-native ungulates suppresses the regeneration of native species, which could eventually lead to a total loss of native forests. The USFWS stated that the removal of non-native ungulates under the selected action will be beneficial to native flora and fauna, and the park's ecosystems in general.

Rare, Unique, Threatened, or Endangered Species

The Endangered Species Act requires federal agencies to ensure that their activities will not jeopardize the existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. As of 2010, 437 plant and animal taxa in Hawai'i were listed as endangered or threatened by the USFWS, or approximately 30 percent of all such plants and animals listed for the entire United States (USFWS 2010). At the time of writing the plan/EIS, the NPS reviewed lists of species provided by the USFWS (Leonard 2009) and additional information on species in the park (NPS 2009j), and identified 35 plants and 18

animals listed as threatened, endangered, or candidate species which could be impacted as a result of non-native ungulate management actions (NPS 2009e).

Viable populations of special-status species are necessary to fulfill the purposes for which the park was established and are critical to the natural and cultural integrity of the park. Under the selected alternative, the reduced non-native ungulate density will minimize potential impacts on the habitat for special-status species in the park, resulting in long-term beneficial effects. The removal and exclusion of non-native ungulates will substantially reduce the threats they pose to rare, unique, threatened, or endangered species, and will support ecosystem protection, including recovery and restoration of native plants and animals. Reduction of non-native ungulate browsing will enhance forest regeneration, increasing the availability of food and cover for wildlife species that depend on ground-layer and understory vegetation for survival. Thus, reduction of ungulate browsing will help support the population viability of these species and native invertebrates in the park. When feral pigs browse in the park, they create habitat for non-native mosquitoes, which can carry disease. Because pigs and the effects of pig browsing will be removed from the park, habitat for non-native mosquitoes will be eliminated. As a result, impacts on vulnerable bird species will be reduced because they will be less likely to contract avian malaria and avian pox in the absence of non-native mosquitos. The number of wildlife species that will benefit from these changes will increase as the vegetation becomes more diverse and abundant with reduced browsing pressure. Additionally, removal of non-native ungulates and restoration of habitat that is critical to the survival of rare, unique, threatened or endangered species helps to counteract potential pressures of global climate change by removing a key stressor on native ecosystems, thereby increasing the capacity of native species to adapt to changes in climate. Restoration of fragmented plant communities would assist the local migration of species in response to climate change. Also removing ungulates would reduce disturbance-facilitated establishment and dispersal of non-native weeds.

Rare, unique, threatened, or endangered species will be temporarily disturbed during implementation of management actions, fence construction and maintenance, non-native ungulate removal efforts, and monitoring. Low-flying aircraft used to support management actions may temporarily affect the behavior and ecology of rare, unique, threatened, or endangered species. Increased human and vehicular traffic associated with potential relocation activities could also disturb rare, unique, threatened, or endangered species during the process of driving non-native ungulates to adjacent lands. However, these impacts will be short term, localized, and similar to impacts of other management actions. The use of firearms, the presence of people associated with management actions, and the use of trained dogs will contribute to localized disturbance of rare, unique, threatened, or endangered species during management actions. However, non-native ungulate management actions will be infrequent, temporary, and any disruption will end once a management action is complete. Although implementation could temporarily displace native wildlife, they will return after management actions are completed, and population stability and viability will not be negatively affected by management actions. In addition, the NPS will take steps to minimize adverse effects associated with the selected alternative. For example, firearm noise suppressors, which could reduce the disturbance to rare, unique, threatened, or endangered species, will be considered at the discretion of the park. Fence corridors will be surveyed for sensitive plant and animal species prior to construction, repair, or replacement, and fence work will be minimized or avoided in areas identified as sensitive bird or bat habitat during critical breeding seasons. The potential long-term adverse impacts of fencing

will be mitigated by modifying fencing, as necessary, to minimize impacts on rare, unique, threatened, or endangered species, and to address any changes in technology (to ensure effectiveness and avoid fence breaching).

Overall, adverse impacts on rare, unique, threatened, or endangered species will be relatively limited, given appropriate mitigation, and will be offset by the expected recovery of vegetation associated with the selected action, which will result in ecosystem restoration and recovery of rare, unique, threatened, or endangered species. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, implementation of the selected alternative will not impair rare, unique, threatened, or endangered species because of the low magnitude of adverse effects from management actions and the benefits that will result from reduced non-native ungulate browsing pressure.

Cultural/Historic Resources

Cultural resources at the park document nearly 600 years of human activity and include a range of resources from indigenous island cultural adaptations to a unique lava landscape (Tuggle and Tomonari-Tuggle 2008). Cultural resources in the park include archeological resources, cultural landscapes, ethnographic resources, and historic structures. The NPS has been the steward of the lands in the park for nearly 100 years. For centuries prior to European contact, the Native Hawaiian people cared for and occupied this land. The physical remnants of those who lived and thrived in this setting can still be seen today in the archeological resources that are spread across this vast landscape. The NPS has identified 19 individual cultural landscapes in the park, which include trails, ranches, roads, historic districts, landing strips, and a military camp. However, only three historic properties with certified cultural landscapes have been thoroughly documented: Crater Rim Historic District, Kīlauea Historic District (formally the Kīlauea Administration and Employee Housing Historic District), and 'Āinahou Ranch and Gardens. These have been documented through cultural landscape inventories (NPS 2004c, 2006d, 2006e) and have been determined eligible for listing on the National Register of Historic Places (national register). 'Āinahou Ranch House and Gardens was listed on the national register in 1994 as significant under national register criteria B (associated with the lives of persons significant in our past) and C (embodies distinctive characteristics of a type, period, or method of construction). Ethnographic resources abound in the park. The ethnography program at the park is one of the park's most visible cultural resource programs. The park has a strong commitment to integrating native voices in interpretive materials, acknowledges the "living culture," and embraces the sacredness of the landscape. Traditional uses by native populations still occur today, including ceremonial activities. The volcanic landscape, the space above, and the endemic flora and fauna, connect the Hawaiian people to the park. These same resources have value for non-Hawaiians for a variety of reasons.

Preservation of cultural/historic resources is necessary to fulfill the purposes for which the park was established and is critical to the cultural integrity of the park.

Archeological Resources

In the long term, there will be beneficial impacts on archeological resources from the removal and exclusion of non-native ungulates, which will protect archeological sites by preventing the trampling of features and artifacts by animals and preventing the destabilization of the soil

surrounding cultural deposits and human remains. Beneficial impacts will be fully realized under this alternative because the comprehensive, systematic approach will ensure that the NPS will progress through ungulate management phases, monitor, and apply management tools consistently over time. Under the selected alternative, construction of fences for boundaries and internal exclosures could result in long-term adverse impacts. However, impacts will be mitigated by conducting surveys and rerouting fence alignments to avoid impacts on archeological resources and to minimize disturbance to the cultural viewshed. Under the selected alternative, it is possible that increased human and vehicular traffic associated with potential relocation activities could cause additional trampling and damage to archeological resources during the process of driving non-native ungulates to adjacent lands. However, surveys will be conducted and driving routes will be located away from sensitive resources to minimize the potential for impacts.

Overall, adverse impacts on archeological resources will be limited, given appropriate mitigation, and will be offset by the expected elimination of non-native ungulates that can trample archeological features and artifacts and destabilize soils surrounding cultural deposits and human remains. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, implementation of the selected alternative will not impair archeological resources because adverse effects from management actions will not have a measurable effect on these resources, and benefits will result from reduced non-native ungulate trampling and browsing pressure.

Cultural Landscapes

Implementation of the selected alternative will result in noticeable but relatively slight impacts on cultural landscapes. The woven-wire, 6-foot fences will introduce new structural elements into the park's overall landscape. Existing fence corridors have been surveyed for sensitive cultural areas and will be resurveyed prior to fence repair or replacement as needed. Where there are historic and existing pasture fences, the park will use these existing alignments for non-native ungulate fences as much as feasible in order to minimize the introduction of new fence lines. In addition, placing fences behind vegetation or taking advantage of topography will help to conceal them from sight. Although construction of fencing will cause relatively limited impacts on cultural landscapes, there will be long-term beneficial impacts from the preservation of the remaining plant species and cultural plantings that have existed historically in the park and the reestablishment or reintroduction of historical species. Beneficial impacts will be fully realized under this alternative because the comprehensive, systematic approach will ensure that the NPS will progress through ungulate management phases, monitor, and apply management tools consistently over time.

Overall, adverse impacts on cultural landscapes will be limited, given appropriate mitigation, and will be offset by the preservation of the remaining plant species and cultural plantings that have existed historically in the park and the reestablishment of historical species. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, implementation of the selected alternative will not impair cultural landscapes because adverse effects on these resources from management actions will be slight, and benefits will result from reduced non-native ungulate impacts.

Ethnographic Resources

Non-native ungulate control under the selected alternative will support the protection and restoration of the native flora and fauna regarded as ethnographic resources to Native Hawaiians. Although Polynesian pigs were held in regard in Native Hawaiian legends, the European and other domestic strains of pigs have become the dominant type in the wild. These animals became feral and ventured into native forest, where they proved destructive to the native flora. In the Hawaiian culture, everything has a degree of sacredness, including the native plants, birds, insects, and the communities they form. In particular, upland plant communities are valued for supplying aquifers and providing the seed sources for forest regeneration. Long-term beneficial impacts resulting from the protection and recovery of native plants and animals valued as ethnographic resources will be fully realized under this alternative because the comprehensive, systematic approach will ensure that the NPS will progress through ungulate management phases, monitor, and apply management tools consistently over time.

Implementation of the selected alternative will result in short-term limited adverse impacts on ethnographic resources. Monitoring, direct reduction with firearms, and fencing will temporarily cause noise from the use of helicopters and firearms, which could affect cultural practitioners in the area. Temporary closures due to control efforts could also interfere with cultural practitioners. However, closures will usually only last a few hours, rarely lasting more than a day. In addition, management actions will typically be confined to specific areas. Similarly, monitoring activities and fence construction involving the use of helicopters will be intermittent.

Overall, adverse impacts on ethnographic resources will be limited, given appropriate mitigation, and will be offset by the protection and recovery of native plants and animals valued as ethnographic resources. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, implementation of the selected alternative will not impair ethnographic resources because adverse effects on these resources from management actions will be slight, and benefits will result from reduced non-native ungulate browsing pressure.

Wilderness

In 1978, under Public Law 95-625, *National Parks and Recreation Act of 1978*, the U.S. Congress designated 123,100 acres of wilderness at the park. There are 7,850 acres of land outside the park that were identified as potential wilderness, which could become designated wilderness should the park acquire those lands in the future (for a total of 130,950 acres). There are four disjunct wilderness units at the park: the Mauna Loa Unit, which includes the Mauna Loa Strip (above 5,000 feet in elevation) and the summit; the 'Ōla'a Unit, which includes the 'Ōla'a Forest; the East Rift Unit in the upper east rift zone; and the Ka'ū Desert Unit, encompassing the Ka'ū Desert (below 3,000 feet in elevation). The upper elevations of Kahuku Unit meet the criteria for wilderness and are eligible for further wilderness study and potential designation.

Under the selected alternative, the exclusion and removal of non-native ungulates will support recovery of natural conditions in wilderness, including the recovery of native plants and animals. Removal of non-native ungulates will eliminate a source of mortality for sensitive native plants and remove a vector for non-native species dispersal.

For management units in the reduction and post-reduction phases (e.g., portions of 'Ōla'a and the upper elevations of Kahuku), removal activities will initially be frequent, but will decrease once animals are excluded. For management units in the maintenance phase, disruptions to solitude by removal efforts will not occur frequently. Monitoring will be done on foot or by helicopter. During monitoring, helicopters will be used in open vegetation areas 3 to 4 times per year. These actions will typically be conducted in the early morning, both to minimize impacts on visitors and because the early morning is the optimal time for locating feral animals. In dense vegetation, monitoring will be conducted on the ground on foot, typically at two-month intervals, during fence inspection activities. If non-native ungulates are identified in these maintenance areas, removal actions (which could include trapping, snaring, and direct reduction with firearms) will be initiated. Aerial shooting is most effective in open areas where skilled shooters are able to take animals in vegetation openings. Trained dogs and ground crews will be used in combination with aerial shooters to help spot non-native ungulates and flush them into open areas. This method could also be used in combination with telemetry, as described for ground shooting. In forest, dense vegetation obscures and attenuates sound from these intrusions. It is assumed that removals associated with the maintenance phase of management, including those outside wilderness, will occur approximately 5 to 20 times per year (spread out across the various units) when ingress of non-native ungulates is detected, and that some of these will require helicopter assistance. The human control or manipulation of non-native ungulate populations will affect the untrammelled nature of the wilderness areas in the short term. The use of helicopters will temporarily affect the undeveloped quality of the wilderness areas. The noise and presence of people will introduce sounds that are not part of the natural environment, and could disturb wildlife during implementation.

Maintaining a fence in wilderness will create a visual intrusion and affect the undeveloped nature of the area. In open habitat, the presence of a fence will create a hazard for some species, such as native birds (petrels) and bats. The installation of fence posts in lava substrates may require using a motorized rock drill. The use of remote cameras may also introduce a modern element into the wilderness.

The lack of suitable roads and terrain for stock animals in wilderness necessitates the use of helicopters for the transport of fence material, equipment, tools, and camp supplies to fenced areas. Old fence material will be dismantled and hauled out by helicopter. For fence segments in more remote areas, a temporary administrative camp will be established for the duration of the repair work. All landings, drop sites, and temporary camps will be surveyed and placed to minimize impacts on the surroundings. The use of the helicopter will minimize damage that will otherwise be caused by vehicles and pack animals traveling across lava surfaces and through dense vegetation. As determined by a Minimum Requirements Analysis completed for this plan/EIS (see appendix B of the final plan/EIS), the use of pack animals is not practical, considering the large loads of fence material and equipment and the difficulty of traversing earth cracks and the highly uneven, fragile lava surfaces and dense vegetation off trail. Such management activities will require vegetation clearing and leveling of surfaces along the travel routes, which will result in more long-term adverse impacts than helicopter use.

Mitigation measures will be used to minimize impacts in wilderness areas. For example, fences are generally located away from visitor campsites and most trails are obscured by dense vegetation, so that these intrusions are minimized. The areas affected visually by the fence will

also be small relative to the large protected areas. Placing remote cameras in inconspicuous locations could mitigate their effects. The NPS will constantly evaluate fence design to minimize impacts, and will mitigate bird or bat fence strikes by using vinyl strips or flagging, by avoiding the use of barbed wire, and by placing fence in areas least likely to affect the petrels and bats. To minimize impacts on natural resources, fence alignments will be surveyed and rerouted to avoid sensitive plant and animal species and to avoid the removal of large trees and rare plants. Fence work will be minimized or avoided in habitats of sensitive wildlife during the breeding seasons for these species.

Under the selected alternative, it is possible that increased human and helicopter traffic associated with potential relocation activities could cause additional disturbance to wilderness during the process of driving non-native ungulates to adjacent lands. However, these impacts will be short term, localized, and similar to impacts of other management actions. Overall, adverse impacts on wilderness will be relatively limited, given appropriate mitigation, and will be offset through the exclusion of non-native ungulates and the resultant recovery of natural wilderness conditions. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, the implementation of the selected alternative will not impair wilderness because adverse effects from management actions will be localized, and long-term benefits will result from recovery of natural wilderness conditions.

Soils

Because the geology of the area is a result of the volcanic history of the island, soils at the park are generally shallow, although deeper soils occur on older substrates on Mauna Loa. Soils found in the geological region consist mostly of lava, cinder, and rubble, which form organic matter through decomposition. The range in soil conditions reflects the geologic parent material; accumulations of organic matter in the soil and ground litter are the most important factors in soil development on these relatively young substrates. Pāhoehoe, 'a'ā, cinders, and weathered ash provide differing contributions of minerals and drainage characteristics, and soil age and composition have considerable influence over plant community composition and hydrology (TMA 2007). Throughout the park, sparsely vegetated, homogeneous soil substrates of volcanic origin are typical and include volcanic ash-based soils and well-draining, fertile soils. These newly formed soils originate from historic lava flows. Young ash deposits, for instance, are evident in the Devastation Trail area, where early successional vegetation has recently become established, as well as in other areas of the park that have undergone relatively recent geologic changes due to volcanic eruptions (Matson 1990). The USDA-NRCS has identified approximately 39 soil map units in the park. However, for analysis purposes, this analysis focuses on soil associations found in the park, as identified by the USDA-NRCS (2009a) and listed in table 9 of the final plan/EIS.

Removal of non-native ungulates will limit the threats they pose and will support the recovery and restoration of soils. Soil disturbance results from digging by feral pigs or general disturbance related to non-native ungulates, such as the removal of vegetation through grazing by large numbers of goats, sheep, and mouflon sheep. Heavy, sustained use by ungulates can weaken or kill vegetation and reduce soil cover, thereby contributing to and accelerating surface erosion (USFWS n.d.). This is especially true in areas with steep slopes, along water flow paths, and in areas exposed to wind. Increased erosion also has the potential to decrease soil fertility.

Consequently, the reduction of ungulates will eliminate a source of soil compaction and erosion. Improvements in native vegetation, including ground cover, will further reduce soil erosion potential. It is possible that increased human and vehicular traffic associated with potential relocation activities could cause additional disturbance to soils during the process of driving non-native ungulates to adjacent lands. However, these impacts will be short term, localized, and similar to impacts of other management actions.

Impacts on soils under the selected alternative will be limited to those associated with temporary ground-based management actions (including increased foot traffic, placing bait stations, shooting ungulates, setting traps and snares, monitoring and collecting data, constructing and repairing fences and relocation). Impacts will include those associated with any routine field activity, including temporary increases in soil compaction and possible erosion. Fencing will involve minor soil disturbances and trampling of vegetation in the removal areas. The NPS will continue to pursue safe and effective non-toxic alternatives to the use of lead bullets to minimize impacts to the environment. As part of direct reduction activities, trained dogs could be used to locate and flush or immobilize non-native ungulates to facilitate direct reduction from the ground (or from the air). Impacts on soils from these activities will be similar to those associated with routine field activities and will not have noticeable effects on soils. The duration and frequency of these actions will also decrease as the park moves from reduction into less intensive management phases. As a result, there will be short-term localized negligible adverse impacts on soils during management actions.

Overall, adverse impacts on soils will be limited, given appropriate mitigation, and will be offset through the removal of non-native ungulates, which supports the recovery and restoration of soils. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, the implementation of the selected alternative will not impair soils because adverse effects from management actions will be slight, and benefits will result from reduced non-native ungulate browsing and digging pressures.

Soundscapes

One of the natural resources of the park is the natural soundscape, which includes all of the naturally occurring sounds of the park. The “natural quiet” that occurs in the absence of human sound sources is also defined as the “natural ambient” sound level of a park. These natural ambient sound conditions exist in the absence of any human-produced noises. Common natural ambient sounds at the park include wind, thunder, rain, the rustle of vegetation, ocean surf, birds, and insects, as well as the crackling, clinking, and rockfall sounds associated with new lava flows and eroding volcanic features. These sounds may be heard as a composite of sound, not individually.

The removal and exclusion of non-native ungulates will support the restoration of vegetation, which in turn will help attenuate human-caused sounds. It will also improve wildlife habitat, which could lead to an increase in natural sounds as populations of insects and birds increase.

The implementation of the selected alternative will result in noticeable short-term adverse impacts caused by the use of firearms, vehicles, helicopters, and fence maintenance equipment, which will create low to medium noise levels over brief intervals or high noise levels over very

brief intervals. Some aerial assistance may also be required during monitoring for non-native ungulates prior to reduction, and will be needed for fence repairs. The use of helicopters for these efforts will be intermittent and will last up to several hours each time. Currently, aerial capture, eradication, and tagging of animal flights will last from one to two hours, during which the helicopter will be flying at approximately 300 feet above ground level searching for ungulates. When target animals are sighted, the helicopter will descend to between 30 and 60 feet above ground level, depending on the surrounding vegetation. Due to the height of helicopter flights, noise levels generated at ground level will be well above the natural ambient sound level; however, such increases will be short term, only lasting for the duration of the management event. Depending on where they are located, the use of firearms (either from the air or ground) will cause temporary increases in noise levels above the natural ambient levels to levels that could be considered high, for very brief periods of time. The use of noise suppressors for ground shooting, which will reduce impacts on the natural soundscape, will be considered. However, noise associated with management actions will still temporarily mask natural sounds while management actions are being executed, and some noise (e.g., helicopters) could be audible at a distance, affecting the overall soundscape. As part of non-native ungulate management, fence maintenance could require the use of a gasoline generator, pneumatic post driver, and rock drill. Noise levels generated by these pieces of equipment will be high in the immediate vicinity of the fence construction and will attenuate to medium levels at greater distances from the source. Generally, fences are located away from visitor campsites and most trails or they are obscured by dense vegetation so that noise is attenuated and intrusions are minimized.

Overall, adverse impacts on soundscapes will be noticeable, given appropriate mitigation, and will be offset through the removal of non-native ungulates, which supports the recovery and restoration of vegetation, which in turn will help attenuate human-caused sounds. Additionally, the contribution to overall adverse cumulative impacts will be limited. As a result, the implementation of the selected alternative will not impair soundscapes because adverse effects from management actions will be noticeable but insignificant due to the short time during which impacts will be noticeable, and the generally limited areas affected by ground sources of noise. In addition, benefits will result from the restoration of vegetation, which in turn will help attenuate human-caused sounds.

Summary

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