

**Goats in Hawai'i Volcanoes
National Park:
A Story to be Remembered**

W. Edwin (Ed) Bonsey,
Volunteer, National Park Service

An absolutely excellent job in covering the history, controversy and outcome.

Don Reeser

The goat tale looks great and is a worthy addition to the long saga.

Bryan Harry

Contents

Introduction	1
Early History	1
Goat Control in the Park	3
Goat Related Studies	8
A Crisis Develops	11
Darkness	16
Protest	17
Hope	23
Formation of the Resources Management Division	28
Eliminating the Remnants—"Judas Goats"	31
Appendix	33
Acknowledgements	35
References	35

Figures

Figure 1. Map of Hawai'i Volcanoes National Park, showing locations mentioned in the text.	2
Figure 2. Trees barked by goats.	4
Figure 3. Dilapidated 'Āinahou Ranch fence line.	6
Figure 4. Yearly numbers of goats taken through 1970.	8
Figure 5. Growth in Kūkalau'ula enclosure after two years.	9
Figure 6. Kipuka Ki enclosure, before and after two goats were enclosed.	10
Figure 7. Goat herd at Hilina Pali.	13
Figure 8. Goat herd in forest, 'Āinahou Ranch .	13
Figure 9. Notice in Hawaii Tribune Herald, October 15, 1970 and days following.	15
Figure 10. Numbers of Deputy hunters participating and numbers of goats taken in the Kalapana Goat Control Area in a six month period, April through September, 1971.	21
Figure 11. Feral goat range and goat-control fencing units proposed by Baker and Reeser.	24
Figure 12. Youth Conservation Corps fence crew.	27
Figure 13. Fence building camp.	28
Figure 14. Goat drive team at Halapē	29
Figure 15. Goat sale at 'Āinahou Ranch.	30
Figure 16. Numbers of goats removed, 1970-1984.	31
Figure 17. Judas goat.	32

All illustrations are NPS photos, courtesy of Hawai'i Volcanoes National Park (HAVO).

Figure 1 courtesy of Jay Robinson, HAVO, Division of Interpretation.

Figures 4, 10 and 11 from Baker and Reeser, 1972.

Figure 9 from Hawaii Tribune Herald, October 15, 1970 and days following.

Figure 16 from Reeser, 1993A.

Goats in Hawai‘i Volcanoes National Park: A Story to Be Remembered

Introduction: Growing up on Maui from the mid 1930s to the late ‘40s, I was a frequent hiker in Haleakalā,¹ with my family as a youngster and, later, with my older brother and friends as a high schooler. In those days, we encountered large herds of goats, often numbering in the hundreds. I recall that, returning in the late 80s with my grown children we had glimpses of hog wire and steel post fences along the borders of the park, and at the same time, were aware that we saw no goats. I surmised that there was a connection between the two, but it was only on my retirement in 1992, and the beginning of my “second career” as a Park Service volunteer at Hawai‘i Volcanoes National Park (HAVO²), that I learned the amazing story of the removal of goats from both parks. It is to my friends in the Resources Management Divisions of both parks, current and retired, that I dedicate this paper, with deep respect, in hopes that someday someone with greater research skills than mine will tell the whole story—one that deserves to be remembered in Hawai‘i’s parks and throughout the National Park System.

Early History:³ The earliest record of the introduction of goats to the Hawaiian Islands comes from Captain James Cook’s journal. He noted that, on February 1, 1778, while meeting crew members who had landed earlier on Ni‘ihau in search of water, “I went myself with the Pinnace and Launch...taking with me a Ram goat and two Ewes...”⁴ In January 1779, he released an undisclosed number of goats at Kealahou Bay on Hawai‘i Island. Other introductions followed, including that by Captain George Vancouver who released a pair of goats on Kaua‘i on March 13, 1792. Goat introduction was initially intended to provide a ready source of fresh meat for British sailors. Goats were quickly adopted for such use by the Hawaiian people. Soon, residents of Hawai‘i also realized the value of goat hides as an export commodity.⁵

Goats are highly adaptive animals that can survive in a variety of terrains. Though preferring open semi-arid areas they often venture into rocky highlands or wet forests, such as those found in HAVO. When more preferred food sources are not available, they turn to plants spurned by cattle and sheep, including the bark of many trees. Though one of the oldest domesticated animals, goats have changed little genetically from their wild ancestors. Those that escape from domestication soon revert to the wild, and their high reproductive rate quickly results in large, ever-growing herds. A young nanny grows to maturity in nine months and, on the average, can drop two sets of twins per year.⁶

¹ Diacritical marks are used in the spelling of Hawaiian names, except when quoting documents in which they were not used.

² The National Park Service abbreviation for Hawai‘i Volcanoes National Park.

³ Except where noted otherwise, material for this section has been derived primarily from Baker and Reeser, 1972.

⁴ Beaglehole, 1955:276.

⁵ By 1850, less than 75 years after the introduction of goats to the islands, over 26,000 hides had been exported.

⁶ Geerdes, 1964:13

Such was the early history of goats on Hawai‘i Island. As early as 1850 herds of feral goats had appeared in such numbers on lowlands, ranchlands, in valleys and uplands, that they were seen as a menace to forests and cultivated fields, and as competitors for ranch pasturage. In particular, the presence of large goat herds in future national park lands had caused the destruction of verdant lowlands and upland forests resulting in the drastic reduction, and sometimes extinction, of native plant and animal species.

The destructiveness of goat herds in what is now Hawai‘i Volcanoes National Park was the result of several factors:

- Native plants in goat habitats had never before encountered mammal predators. They were unaccustomed to frequent browsing and trampling. Further, they had either lost, or never developed, adequate defenses such as thorns or an unpalatable taste. They were, largely, primary sources of food for the herds.
- The size of the herds increased so rapidly that over-grazing soon became a problem. Large areas were denuded, and erosion, stripping topsoil essential to the growth of native plant species, was rampant.
- Palatable native plants began to disappear, and were often replaced by non-native grasses and woody non-native brush, such as lantana and Christmas berry.
- With the growing scarcity of vegetation in the lower regions, goats began to move into the forests above. Bark was chewed from trees, killing them, and tree seedlings were eaten or trampled, resulting in the reduction of the canopy. The understory was eaten, or its growth impaired when shade-loving plants were exposed to direct sunlight. Sections of forest were converted into grasslands with scattered trees, such as are common today in ranchlands adjoining forests in the park. With their habitats destroyed, populations of native birds and insects dependent on forests have been depleted.

Goat Control in the park:⁷ Over the years large destructive feral herds roamed what is now much of the lower wilderness area of the park. Early on, the size and destructiveness of the goat population had grown to present a problem both to ranchers and to Territorial foresters alike, resulting in the establishment of a formal goat eradication program by the Territory of Hawaii. Large hunting parties were common. At the formation of Hawaii National Park⁸ in 1916, Territorial efforts on park lands temporarily ceased.

In the early years of the park, staff members were largely engaged in the development of facilities and programs. There being neither the inclination nor the funding for goat control, goats thrived on the southern flank of Kīlauea showing a preference for the *pali* areas, and often venturing into the forests above. Eleven years after the establishment of the park, the Territory of Hawaii offered assistance and resumed its goat eradication program on park lands under the direction of Charles S. Judd, Superintendent of Forestry. In 1922 Judd had written,

[W]ild goats...today constitute a real and serious menace....Not only are thousands

⁷ Material for this section is derived primarily from Geerdes, 1964.

⁸ The park's name was changed to Hawai‘i Volcanoes National Park in 1961.

of acres robbed of valuable forage grasses, but also the undergrowth of bushes, ferns, and herbaceous plants which form valuable ground cover is being entirely consumed or destroyed by goats. The trees which form the complement in the scheme of water conservation are being barked and killed by this voracious pest.⁹



Figure 2. Trees barked by goats

Between 1927 and 1931 a total of 17,389 goats were removed from park lands. Such success was attributed to the formation of frequent hunting parties and the appropriation of funds by the Territory specifically for their support.

Following the end of efforts by the Territory of Hawaii in the early '30s, goat eradication efforts by the park became haphazard and sporadic. Soon the problem became so acute that private individuals were allowed to hunt by special permit granted by either oral or written request. This continued until November 12, 1934, when Arno B. Cammerer, Director of the National Park Service, issued Office Order No. 288, directing that hunting was to be allowed by park staff only. The following April, the order was appealed by Park Superintendent Edward G. Wingate, who wrote, "I have too few men and they cannot spare the time often enough to make any impression on the rapidly multiplying goats."¹⁰ In June 1935, Associate Director Arthur E. Demaray modified the order, stating that legally all private hunting was prohibited, but that hunting by park rangers and deputized hunters hired and acting under the direction and control of the Park Service was permitted.

⁹ Quoted in Baker and Reeser, 1972:2.

¹⁰ Quoted in Geerdes, 1964:3.

Demaray wrote Wingate further in October, saying, “We hope that the successful solution of this problem will be one of your outstanding accomplishments as Superintendent of Hawaii National Park”.¹¹ There is, however, no record of any follow-up to the modified order over a period of about three years.

For a few years, between 1938 and 1941, Civilian Conservation Corps (CCC) personnel, brought to the park primarily for major construction work, were utilized by Superintendent Wingate in a goat control program. Among the CCC’s projects was the construction of boundary and internal fences intended to aid in goat control. Much of the fencing, however, was ineffective, due to the use of improper mesh or single strand wire. The lack of funding for an effective maintenance program soon rendered the fences useless. Large gaps formed where high rainfall and volcanic fumes caused the fences to rust. In addition, fallen trees over fences provided bridges easily utilized by goats. Where park lands lay adjacent to ranch lands, maintenance was left to the ranches, which provided fencing sufficient for cattle only. The net result was that areas thought to be protected by fencing were easily re-infested with goats.¹²

Multiple goat drives were conducted during the above years by rangers and CCC workers. Large sections of the Hilina Pali area were combed on foot over rough, broken and often steep ground in strenuous efforts to round up goats. In May 1940 Wingate informed Director Cammerer that drives had resulted in the removal of over 7,000 goats, and he estimated that there were a mere 500 remaining in the park, which he said were “very difficult to eliminate.” Wingate continued his letter, prophetically stating, “The goats multiply rapidly and if we do not bend every effort to destroy the remaining 500 odd goats, their increase in number will result in almost the same situation confronting this park as existed before the fencing project was undertaken.”¹³ Wingate realized that if the remnant were not destroyed, “the number in the park would be increased by half or doubled within a year.” Unfortunately goat drives and park-sponsored fencing both halted abruptly when World War II put an end to the CCC program.

During the first two years of the war, with fewer than 600 having been eliminated by park personnel, goat control efforts were all but neglected. Concerned with the subsequent increase in goat population, and the loss of previous gains in goat control, Superintendent Wingate began a new program that overlooked former park policy, including Order 288. Under his direction, the park advertised for individual private “goat control companies” to remove goats to be sold for profit. The public announcement began, “For sale to the highest bidder for pickup at the Great Cracks area, Kipuka Pepeiau, Kipuka Nene, Kaone regions, and Mauna Loa, Hawaii National Park, Hawaii, goats—live, domestic.” Stipulations, among others, were that the bidder must offer a unit price per goat removed, payable on the date of removal, regardless of age or condition, construct necessary corrals and wing fences (to remain the property of the U.S. Government), and conduct at least two drives a month.

¹¹ Quoted in Geerdes, 1964:4.

¹² CCC fencing notes from Baker and Reeser, 1972:5, 7.

¹³ Quoted in Geerdes, 1964:15.



Figure 3. Dilapidated 'Āinahou Ranch fence line.

Contracts were issued every 90 days to the highest bidder from 1944 through August 1947. Park Superintendent Frank R. Oberhansley then wrote Western Regional Director Tomlinson that the 90-day contract arrangement was not satisfactory, due to “low bids from undesirable people....” He continued that when the September 1 quarterly contract just awarded to Mr. Gordon D. Mackenzie of Hilo expired, yearly contracts would be awarded thereafter. Mackenzie’s contract was renewed yearly through 1951. Thereafter, yearly contracts were awarded, with varying degrees of satisfaction to the park, through 1955.

During the period of the yearly contract program, park employees continued occasional efforts to eliminate goats. At the same time privileged individuals and private groups were also allowed to hunt for sport, in clear opposition to established Park Service regulations. Contractors were also found to practice favoritism in the selection of their hunters. These practices generated great dissatisfaction among the general ranks of Island hunters, and became a major factor in future hunter-park relations.

On the whole, the initial results of the contract program were encouraging. Soon, however, it became evident that the annual numbers of goats eliminated were never satisfactory, and actually had steadily declined after reaching a high of 2,890 in 1948.

Furthermore, the contractors were limiting the take in order not to flood the market, as well as to insure a continuing supply.¹⁴ Clearly, goat elimination was not their intent.

For-profit hunting, obviously not a viable solution, was terminated by Park Superintendent John B. Wosky in 1955. For the next 15 years, the park maintained organized hunting drives conducted by uniformed employees, occasionally supplemented by deputized temporary employees. Based on estimates of the number of goats remaining in the park in 1955, and their reproductive rate, it was determined that the elimination of an average of 300 goats per year would keep the herds under reasonable control.¹⁵ For the next five years, goat reduction averaged 244 per year. However in 1960 the 300 per year reduction figure was seen to be too low, as the herds were obviously increasing. The yearly average reduction figure was then doubled to 600. With added efforts the annual kill between 1960 and 1963 increased rapidly, reaching a high of over 2,300 in 1963. Within the next two years the annual kill doubled again to 4,688 in 1965. These increases were due largely to the organizational skills and training efforts of Chief Ranger DeLyle R. Stevens (November 1958 to May 1963). A high of 5,402 goats eliminated was reached in 1966, after which the numbers showed a rapid decline.¹⁶

In addition to hunting, goat drives were conducted periodically. Examples of two drives conducted during 1970 provide some details. A February 24-25 two-day drive covering eight square miles between Hilina Pali and the sea on the west side of 'Āinahou Ranch netted 253 goats, 199 of which were sold at \$3.50 each for a total of \$696.50. Free helicopter support was given by a U.S. Army helicopter training detachment in Hilo, keeping overall costs low at \$862.98. After sales, the net cost of the drive was \$166.48, or \$0.66 per goat captured, the lowest per goat cost of any drive. A drive conducted on October 28 along the upper portion of the Mauna Loa Strip Road covering seven square miles between 6,800 and 5,500 feet elevation netted 98 goats, with 27 killed during the drive and 71 sold at \$10.11 per goat. The operation entailed eight men on horseback and two on foot, with hired helicopter support. Helicopter observation confirmed that only a small number of goats escaped in the drive. The small number of goats captured indicated successful efforts at goat eradication in that area in preceding years.¹⁷

Although more than 31,000 goats were removed during the 15-year period 1955-1970, the efforts which evidently slacked after 1966 were not enough to keep up with the reproductive rate of the herds. A census in 1970 showed that there were then more than 14,000 goats in the park—a figure somewhat larger than in 1927 when organized control efforts, with Territorial aid, had begun. The intervening 40 years or more had only seen the denuding and serious erosion of *pali* and lowlands, the destruction of large tracts of forest, and the reduction or extinction of several native plants and animals. The goat problem was beginning to be seen as insolvable, as some put it, “An impossible task!”

¹⁴ Baker and Reeser, 1972:5.

¹⁵ Note that former Superintendent Wingate's determination to eliminate the goats appears to have been lost.

¹⁶ The 1965 high was exceeded only in 1931, when 5,736 goats were eliminated (numbers eliminated 1932-37 are unknown).

¹⁷ Hawai'i Volcanoes National Park, 1970.

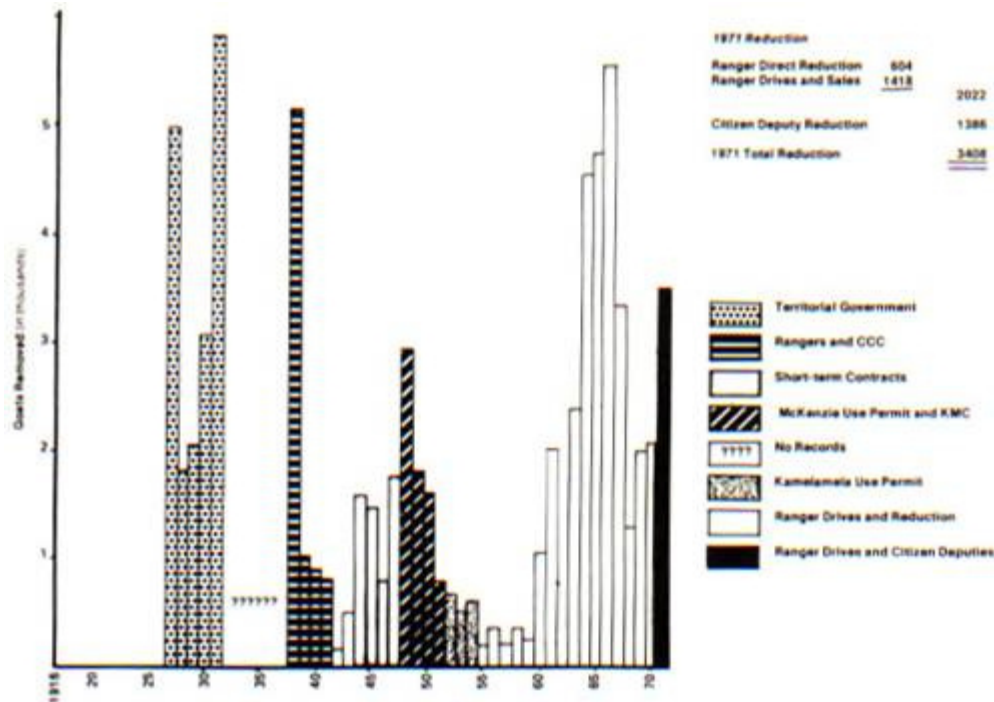


Figure 4. Yearly numbers of goats taken through 1970.

Goat-related studies:¹⁸ A controversy had begun to grow around the goat problem over whether or not the removal of goats from the park was, in fact, desirable. On the one hand there was the large volume of evidence—beginning with that compiled by Territorial foresters early in the century—leading to the conclusion that goats were “a real and serious menace” in HAVO. Added to this was the long-standing policy of the Park Service to remove destructive non-native animals from park sites. On the other hand, those who questioned goat removal from the park argued that, perhaps, the damage was irreversible and that goats might be useful, by their voracious appetites, in controlling the rapid spread of exotic plants.

In response, newly appointed Park Research Biologist, James K. (Ken) Baker, in 1970, continued studies begun by Wildlife Ranger David K. Morris a year earlier, which were designed to understand goats and their relationship to exotic plants. Analyses of goat stomach content shed light on the kinds and relative amounts of vegetation eaten. In the *pali* regions, 89% of food eaten was grass, with smaller amounts of various leafy plants and shrubs. Of the species eaten, 99% were non-native and only 1% native. These results were explainable by the fact that in the *pali* regions the vegetation was almost exclusively exotic grass, native species being all but non-existent.

Stomach content analysis of goats in the lower Mauna Loa Strip region was revealing. There, native vegetation is dominant, but non-native species are also abundant. Goat diets were 98% native plants and only 2% non-native. The conclusions were that, where available, native plants were preferred by goats, and that, by that preference goats were

¹⁸ Material derived primarily from Baker and Reeser, 1972.

major factors in the reduction of native species and could not be relied on to control exotics among natives.

A second study begun by Morris in August 1969 and continued by Donald W. Reeser, who succeeded him in early 1970 as Wildlife Ranger, was aimed at determining the make-up of native flora before the introduction of goats. The study included the construction of several 1,000-square-meter exclosures (about 150 feet by 30 feet) to determine the possibility of the recovery of native flora in the absence of goats. That at the crest of Kūkalau‘ula Pali, on the Ka‘u side of the Pepeiau-Ka‘aha trail, at 800 feet elevation, where goat concentrations were heaviest, produced the most dramatic results. When first enclosed, the area contained no native plants. The plants present were primarily two exotic grasses that were cropped so closely that there were few shoots visible. After one year, a good plant cover had grown, which, within two years, was almost continuous. Several native species had re-appeared, along with an equal number, plus one, of exotic species. The natives, however constituted the greater bulk of the plants, illustrating their ability to crowd out exotics. Their presence gave hope that other natives would reappear in the absence of goats.



Figure 5. Growth in Kūkalau‘ula exclosure after two years. Clumps of *pili* (grass) in foreground; *āwikiwiki* (jackbean) in background. Note barren ground outside exclosure.

Most surprising was the appearance of a species of native Hawaiian jackbean¹⁹ not yet known to botanists. The plant, then found nowhere else, dominated the fenced area, its vine piling up on itself, creating a mat some 16 inches thick.²⁰ It is conjectured that several seeds inside the exclosure may have lain on the ground for, perhaps, as long as 150 years and that the new ground cover provided shade and wind protection for sufficient retained moisture to cause them to sprout. Inspection of the ground outside the exclosure revealed other seeds. In later years, following goat removal, the plant became common in the Pu‘u Kaone area, inland, and a little east of Ka‘aha. The jackbean had evidently been among the favorites of the earliest goats in the park and had quickly been browsed to extinction—except for its remnant seeds.

Perhaps the more practical discovery from the exclosure study was made by former superintendent G. Bryan Harry, who said, “‘Ice cream’ plants grow inside the fence. But goats don’t jump over fences. We didn’t know that. So if it was possible to keep goats from a half acre of delicious browse, why not from 5000 acres?”²¹ The fencing imperative was born.

At the same time, and as a variation of the above study, a 1,000-square-meter area was fenced in Kipuka Ki on the Mauna Loa Strip Road, and two goats were placed in it. There, the progressive destruction of vegetation was monitored by Baker, first of the understory, and then of many trees. On the removal of the goats, both understory and forest canopy were able to recover.



Figure 6. Kipuka Ki enclosure, before and after two goats were enclosed.

¹⁹ *Canavalia kauensis*. The species was named by Dr. Harold St. John, University of Hawai‘i, Mānoa botanist. Wagner, Herbst and Sohmer, *Manual of the Flowering Plants of Hawai‘i*, later included it in the more common species *C. hawaiiensis*, endemic to Hawai‘i Island. Baker and Reeser, 1972:20, and Stone and Pratt, 2002:297, give the Hawaiian name ‘āwikiwiki.

²⁰ St. John, 1972:414.

²¹ Harry, 1990:1.

The two fencing studies showed clearly that, when given a choice, goats prefer native species because of their greater palatability. This explained the rapid decline and near disappearance of native species where goats were present. Most encouraging was the discovery that seeds of native species lay on the ground, and under proper conditions, could sprout and compete favorably with exotics in the absence of goats, whether in the forests, on the *pali*, or on the lowlands.

As for goat removal in general, scrutiny of records of goat hunting programs in the park, and of studies of goat removal programs in New Zealand, showed park staff that, in spite of impressive tallies of goats eliminated, remaining herds could, and generally did, quickly rebound to their former size. It was even joked that after a successful hunt eliminated 1,000 goats, 500 surviving nannies could each drop two kids to replenish the herd before news of the hunt had time to wend its way, via official reports, to Washington. Park staff came to two realizations: first, that periodic hunting alleviated goat-caused destruction somewhat, but at the same time, it simply culled the weaker members of the herds, leaving healthy, vigorous survivors capable of producing strong offspring; and second, that given their high reproductive rates, short of total elimination, the goat problem would persist. Practical conclusions were (1) that no hunting program would ever succeed until goat-infested areas were fenced adequately and fences properly maintained to prevent re-infestation and (2) that sustained and persistent hunting, aided by the use of dogs and helicopters, was required, concentrating sequentially on specific fenced portions of goat range until the last goat was removed. As early as 1969, David Morris, in the park's Resource Management Plan, had proposed boundary and internal fencing as the only workable approach to goat control. That approach, however, had been set aside for lack of funding.

A Crisis Develops:²² Local hunting groups, largely excluded from hunting activities within the park by Park Service regulations, began to agitate for greater participation. Older hunters recalled the days when selected individuals had been included in programs contracted with the Park or were hired on a temporary basis as deputies. In the late 1960s there was criticism by the local hunting community over the fact that rangers were engaged in shooting goats but local citizens were not allowed to participate. More pointedly, local hunters complained that park maintenance employees were allowed to hunt on weekends and were permitted to invite friends to join them.²³ Increasing frustration among hunters lead to increased pressure by some means to circumvent the Park Service's ban on sport hunting.

As it happened, leaders among the hunters also held leadership positions in the local unit of the labor union that represented plantation and dockworkers throughout Hawai'i. These persons, in turn, had political connections with those members of the State Legislature and of the Hawai'i delegation in the U.S. Congress, who had been heavily supported by union members. The hunters appealed to delegation members. Representative Patsy Mink then pressured Park Service Director George B. Hartzog, Jr., to allow local hunter participation,

²² Unless otherwise noted, material for this and the following three sections is largely from Reeser, 1993A.

²³ Reeser, 2008.

stating that they knew how to, and could, control the goats.²⁴ Senator Hiram L. Fong also wrote to Hartzog, “to urge that herd control hunting by local Hawaii hunters be allowed within the boundaries of Hawaii Volcanoes.”²⁵ Hartzog responded by ordering the park to implement a deputy ranger goat-control program.

Hartzog based his order on the 1963 Leopold Report (named for the Chairman of the Advisory Board on Wildlife Management appointed by Interior Secretary Stewart L. Udall), which had been adopted as Park Service policy. The report stated, in part,

Most game reduction programs can best be accomplished by regular park employees. But as removal programs increase in size and scope...the National Park Service may find it advantageous to engage additional shooters from the general public. No objection to this procedure is foreseen so long as the selection, training, and supervision of shooting crews is under ridged control of the Service and the culling operation is made to conform with primary park goals.²⁶

In a 1967 memorandum to all superintendents relative to the above report, Hartzog had directed that, should additional shooters be needed, they must be recruited and appointed locally as Deputy Park Rangers without compensation. He ordered further that all such deputies shall be “highly skilled in firearms safety, animal identification and marksmanship,” and that they shall “operate as part of a crew under the supervision of a permanent, full-time Park Ranger of the Service.” His memo also made it clear that “no part of the [game] reduction program will have any aspect of sport or recreational public hunting.”²⁷

The Director’s order to begin a deputy ranger goat control program at HAVO was received with dismay by park personnel. The program was seen as a repeat of “sustained-yield recreation” characteristic of previous goat-control programs, which had done little, either to reduce the goat population or to enhance the restoration of damaged areas. However, convinced that the first step to success in any control program was proper and adequate fencing, Don Reeser hoped to revive Morris’ proposed program. In June 1970, he wrote to Superintendent Gene Balaz regarding the up coming deputy ranger program, suggesting, “[I]t would be best if such a program were initiated with clear-cut wildlife management objectives in mind rather than a program that merely satisfies politically influential hunting groups.” He then proposed a program of “fencing goat infested areas into management units” as the first of a three-step process that would also include goat removal with citizen assistance, and, finally, reintroduction of native trees. He had hoped to have fencing of the first unit completed by October or November 1970.²⁸ In actuality the plan was not carried out in the sequence suggested. Fencing did not begin until June 1971. The park, however, had announced that the deputy ranger goat-control program would open in early October 1970--at the same time, making known its commitment to a comprehensive fencing program in the near future.

²⁴ Harry, 2009A.

²⁵ Fong, 1970.

²⁶ Leopold, et al, 1963:14.

²⁷ Hartzog, 1967: 3,4.

²⁸ Reeser, 1970.



Figure 7. Goat herd at Hilina Pali.



Figure 8. Goat herd in forest, 'Āinahou Ranch .

Local hunters became alarmed by the intended fencing program, seeing in it the eventual extermination of goats, resulting in the loss of prime hunting opportunities. Immediately following the park's announcements of the goat-control and fencing programs, the Island of Hawaii Fish and Game Association (IHFGA) began a campaign that surprisingly encouraged non-participation by local hunters. The Honolulu Advertiser reported that the Association "protested plans by the National Park Service to eliminate goats in Hawaii Volcanoes National Park." It went on to state that Earl Pacheco, President of the Association, had indicated "his organization would support any plan to 'control' the goat population, but did not approve of wiping them out altogether." It quoted Pacheco as saying; "We have too little game available as it is."²⁹

The newspaper campaign against the goat-control program was ineffective; hundreds of hunters appeared on opening day.

The initial area for citizen participation in goat-control was opened on Saturday, October 10, 1970. Named the Holei Pali unit, it ran roughly from the Chain of Craters Road west to the 'Āinahou Ranch fence line in the *pali* area. Days before opening, however, lava from Mauna Ulu was streaming down the *pali* and had covered a little more than half the area. Participants were so concentrated that a recently returned veteran declared it was more dangerous there than in Viet Nam.³⁰

Two other units followed: the Kalapana unit, extending from the Chain of Craters Road eastward to the Kalapana boundary fence, primarily on the costal flat, and including the remnant of the Holei unit, opened on April 3, 1971, and the Hilina Pali unit, west of 'Āinahou Ranch, on October 2, 1971. Between them, the three units included some 13,500 of the then-estimated 15,000 goats in the park.

Information given to prospective deputy rangers listed four simple qualifications. In short, applicants were required to:

- Possess a valid Hawai'i hunting license;
- Be at least 18 years of age;
- Accept temporary, volunteer assignment as a park ranger;
- Sign a liability waiver absolving the Park Service from liability for injury or loss.

Assuming the above, applicants were to be deputized before entering goat-control areas. Finally, various regulations were listed, but notably missing was any mention of desired skill, or of training or supervision by Park personnel.³¹

Funds were diverted from Interpretive and Protection programs to support the goat-control program. Detailed records of the numbers of deputized rangers, of program days, and of goats eliminated were kept. Duly deputized citizens were allowed to participate on weekends and holidays. As each unit was opened for citizen participation, interest and consequently, goat elimination, were relatively high, but as the number of goats was

²⁹ Anonymous, 1970A.

³⁰ Reeser, 2008.

³¹ Hawaii Volcanoes National Park, 1971:1-3.

reduced and many of those remaining were forced into more inaccessible areas, citizen interest declined.

Two months after the Kalapana unit was opened Wildlife Ranger Reeser wrote to Superintendent Balaz in a positive manner, saying, "I'm enthusiastic about the prospects for approaching our objectives in the present citizen goat management unit." He went on to explain that accessibility of the unit led to a high level of goat reduction, and hence to the beginning of "a moderate planting program," which he found "particularly gratifying." However, his enthusiasm was dampened by the long-term prospects that the remaining goats in the unit would quickly multiply and that eventually, "all the trees we shall have spent thousands of dollars on will be destroyed."³²

Appearing on October 15 and running until at least the 23rd, a notice in the *Hawaii Tribune Herald* ordered hunter non-participation in the goat "eradication" program."³³

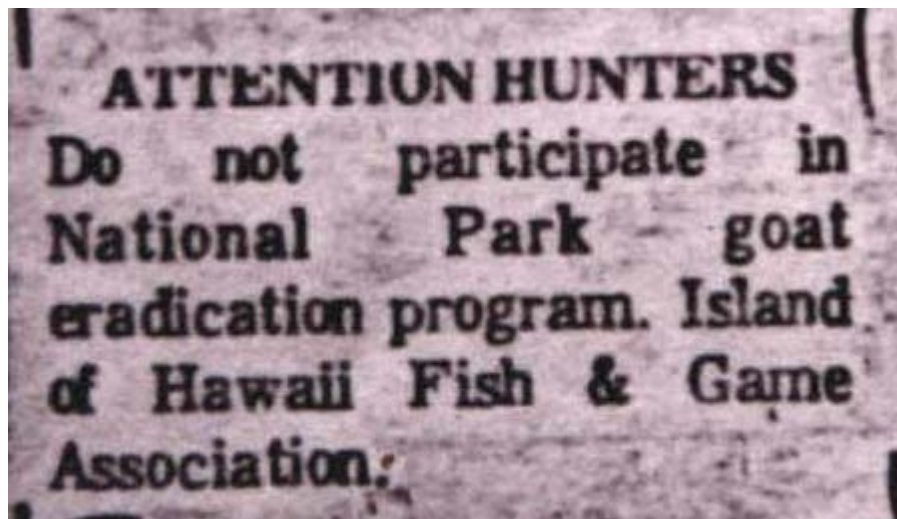


Figure 9. Notice in the Hawaii Tribune Herald, October 15, 1970 and days following.

In the meantime, Park Service Director Hartzog, with U.S. Representative Patsy T. Mink, had flown to Hawai'i "to get the feral goat reduction program underway."³⁴ While there, again bowing to hunter pressure, he publicly announced on October 16, 1970, at the First Annual State of Hawai'i Recreation and Park Conference held at Kīlauea Military Camp in the park, "I have no intention of exterminating goats from Hawai'i Volcanoes National Park." He had a few days earlier made the statement verbally to IHFGA President Earl Pacheco and selected colleagues and confirmed the same in a letter to Pacheco dated October 20, with a copy to Mink.

³² Reeser, 1971.

³³ Anonymous, 1970C.

³⁴ Hartzog, 1988:105.

Hartzog's letter to Pacheco continued with lengthy quotes from Park Service policies by which he established the purpose, necessity, and the legality of citizen participation in goat control, normally prohibited by Congressional statutes. He ended with the emphasis, "As I explained to you and your colleagues, 'direct reduction by shooting' is employed as a management tool and not as a recreational sports hunting program."³⁵

Evidently, Hartzog's promise not to exterminate goats from the park was less than convincing to Pacheco and his association. Their campaign against the goat-control program was renewed with vigor. Scarcely more than a week after receiving Hartzog's letter, Pacheco wrote to the entire Hawai'i Congressional delegation in Washington, to Hawai'i Island's State senators and representatives, persons close to the Governor of Hawai'i, the Hawai'i State Department of Land and Natural Resources, the Hawai'i County Council and to local papers and radio stations, stating,

The Island of Hawaii Fish and Game Assn. strongly object to the goat management program now in progress (in actuality a goat eradication program) in the Hawaii Volcanoes National Park....The odor of death and rotting flesh in the park hunting area today is overwhelming as any hunter who has participated, would verify.³⁶

Enclosed with the letter was a picture of five of 15 goats, shot by a single deputized participant. Two weeks after Pacheco's letter was written, the *Hawaii Tribune Herald* published the picture, along with quotes from the letter.³⁷

Darkness: Hartzog's announcement avowing the non-extermination of goats from Hawai'i Volcanoes hit the park like a bombshell! As Reeser put it, the announcement "plunged us into deep depression.... The words 'eradication,' 'elimination,' and 'extermination' were ordered stricken from the staff's vocabulary....The park's goat program lay emasculated and a goat ranching operation loomed on the horizon as our new goal."³⁸

Park Research Scientist Ken Baker complained to his superior in Washington,

[T]he Director solicited views and opinions primarily from the local hunting enthusiasts and politicians while ignoring the expertise of the researchers, managers, and Hawaiian conservationists who are intimately involved with the ecological problems caused by goats.

Superintendent Balaz and his staff have shown diligent planning and management of one of the most critical problems in the park. There must be a solution to what I feel has been an unfortunate decision on the part of the Director.³⁹

³⁵ Hartzog, 1970, 2; emphasis Hartzog's.

³⁶ Pacheco, 1970. The statement regarding "rotting flesh" is puzzling as participants were required to remove goat carcasses from the park (Hawaii Volcanoes National Park, 1971:2).

³⁷ Anonymous, 1970B.

³⁸ Reeser, 1993A: 432.

³⁹ Baker, 1970, 2.

Hartzog's ignoring the opinions of biological scientists would be in contradiction to a 1965 memorandum in which he "cautioned his superintendents that research was not a 'fringe activity' but a 'real and practical requirement' that needed recognition."⁴⁰

Summer 1971 marked the lowest ebb in the morale of those who were convinced that they had finally come upon a viable solution to the heretofore-insolvable problem of eliminating goats from the park. Park staff felt betrayed that in bowing to the demands of local hunters the Park Service had reversed its long-standing policy of removing destructive non-native species where possible and had turned its back on more than 40 years of struggle at HAVO.

Adding to the dejection of the park staff, their superintendent, Gene Balaz, had suddenly been removed by order of Hartzog in June. It has been assumed that this was Hartzog's response to Balaz's statement to the National Parks and Conservation Association in early May that "the aim of this program is to reduce the number of goats—any goats."⁴¹ Reeser, aware of the assumption, had reservations: "Superintendent Balaz's transfer we surmised was due to frictions about the goat program but I don't think that we can say that for sure."⁴² Harry has added a different perspective: "I believe Hartzog moved Balaz not because of Gene's stand on goats, but rather because he had publicly criticized Patsy Mink and alienated her."⁴³

Protest: Though not immediate in coming, Hartzog's "non-elimination" declaration raised a furor of protest throughout the environmental community in Hawai'i and across the nation. Criticism rose from environmentalists in the form of resolutions, letters and the wide circulation of photos from the park—the most persuasive of which was that of the Kūkalau'ula goat enclosure mentioned above, showing the re-appearance of native species. The cry of the environmentalists was in defense of native flora being destroyed by the goats, and of the native fauna—primarily birds—dependent on it for habitat and food.

The Hawaiian Botanical Society, on April 5, 1971, sent a resolution to Hartzog and to Hawai'i's entire congressional delegation, calling on the Park Service to "institute an effective program of goat eradication" in the National Parks in Hawai'i. Representative Patsy Mink's response revealed that, "It was at my urging that the deputized hunter program was established, but" she clearly stated, "it was intended only as a supplemental program and not to reduce our efforts at management and control of the goat problem."⁴⁴ Senator Hiram L. Fong responded guardedly, saying that his interest in the goat problem had led him to ask the Park Service to request increased funding for goat control in their fiscal 1973 budget request.⁴⁵

⁴⁰ Sellars, 1997:224; quoting Hartzog to all field offices, March 29, 1965.

⁴¹ Sellars, 1997:261.

⁴² Reeser, 2008.

⁴³ Harry, 2009B.

⁴⁴ Mink, 1971.

⁴⁵ Fong, 1971A.

The Hawaii Audubon Society and the Wildlife Society, Hawaii Chapter, each sent a resolution of protest in late 1971. In response to the former Representative Mink stated that she generally agreed with their position, except for the elimination of goats from the Hawai'i parks, a goal she believed to be "not realistic."⁴⁶ At this time, Senator Fong strengthened his stance, asking the National Park Service "to look into the problem and to implement the goat eradication program."⁴⁷

The most stinging criticism of Hartzog's position came from a personal acquaintance, Dr. F. Raymond Fosberg, formerly of Bishop Museum in Honolulu and later, Special Assistant on Tropical Biology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Fosberg found it disturbing that Hartzog had ordered that "attempts to eliminate the goats were to be stopped, and that the goats were to be managed on a sustained-yield basis for the benefit of the small, but politically effective, group of local hunters in Hawaii."

He then asked,

How can you expect to retain the respect and support of the public, which it seems to me that the National Park Service desperately needs, if you do things like this?...I would like very much to have your side of this story before taking any measures to direct the conservationists' attention outside Hawaii to this matter.⁴⁸

Fosberg waited over a month for Hartzog's reply. It began with the assurance that "it is our [i.e., the NPS'] objective to restore and maintain the diversity...and abundance of native plants and animals." Hartzog continued that this had been made "extremely complex and difficult" in the Hawaiian national parks because of the introduction of numerous exotics, thus calling for an appropriate management plan "based on solid ecological studies." "Unfortunately," he wrote, "this principle has not always been followed, and the goat control programs in Hawaii Volcanoes are a good case in point." His assertion was that, "the Service objective [in Hawai'i] had gradually drifted from one of natural ecosystem restoration to one of goat eradication." "We are now back on the track," he said, with the two-fold explanation that "a Service biologist has been assigned to Hawaii Volcanoes to evaluate the impact of goats," and that "we have supplemented our limited manpower through the use of deputy park rangers." He ended with the observation that "the deputy park ranger program has been working out quite well."⁴⁹ In his memoirs he later contradicted this evaluation.

Hartzog's response to Fosberg was equivocal. On the one hand, he claimed that previous goat-control programs had been problematic because they had not been "based on solid ecological studies," and on the other hand he ordered his program of non-elimination, having ignored the research then in progress by the very National Park Service biologist that he had appointed.

⁴⁶ Mink, 1972.

⁴⁷ Fong, 1971B.

⁴⁸ F. Raymond Fosberg, 1971.

⁴⁹ Hartzog, 1971A, 1-2.

The most continual criticism of Hartzog's position came from Anthony Wayne Smith, President and General Counsel of the National Parks and Conservation Association (NPCA)⁵⁰ in Washington, D.C., and another personal acquaintance of Hartzog. In an editorial in the June 1971 issue of the NPCA Magazine, Smith raised the question as to whether the switch in Hawai'i's parks from the long-term goal of goat eradication to goat management represented a switch in NPS policy. In his view it had, particularly because "Park Service regulations governing part-time deputized hunters stress that...all deputized hunters will be selected for their marksmanship, be trained for the specific job at hand, and operate under the direct supervision of full-time park employees."⁵¹ The editorial charged, "[E]vidence that the parks are being used for recreational hunting lies in the fact that hunters entering the park are required to have valid Hawaiian hunting licenses...and that they receive no instruction or supervision in their shooting." Smith therefore concluded, "It now seems that the removal effort may have evolved into a public hunt, with some effort being made to maintain a breeding stock of goats...so as to insure a future supply of game."⁵²

Not satisfied with responses from lower level officials of the Park Service to his concerns Smith published an August editorial that included a letter from himself (letter dated May 12, 1971) written directly to George Hartzog. In it he charged: (1.) "There is no justification for maintaining a residual population of [goats] for the accommodation of people who desire to hunt them, under whatever pretext," and (2.) "There is no justification for permitting sports hunting in the guise of necessary deputy operations to assist ranger control."⁵³

Hartzog waited over a month to make his reply. Acknowledging that the degree of goat damage to native plants and animals was critical, he explained that he intended to give the use of deputized personnel a fair trial as a control method. Also, he emphasized that the program was for goat-control only and not sports hunting, "nor will [it] ever be responsive to any...demand to open parks to recreational sports hunting."⁵⁴

Hartzog continued his letter to Smith, saying, "I suspect that the majority of our differences concerning this issue could be resolved if I were willing to retract my statement that it is not our intention to eliminate goats from the Hawaiian national parks. This...I cannot do." Hartzog went on to say, "The question I have asked my Chief Scientist is this: 'Will the elimination of goats bring us nearer to attaining our ultimate objective of restoring and maintaining the natural ecosystems of the Hawaiian national parks?'" He insisted that until this question was answered in all of its ramifications, that is, the interrelations between goats, exotic plants and native flora and fauna, "we have no basis for making an ecologically sound judgment concerning the goat population." And yet,

⁵⁰ The name of the association has since been amended to "The National Park Conservation Association."

⁵¹ Here the editorial is referring to Hartzog's memo of September 22, 1967. See p. 8 above.

⁵² Smith, 1971A, 32.

⁵³ Smith, 1971B, 28.

⁵⁴ Hartzog, 1971B.

eight months earlier, he had already delivered a judgment—"I have no intent...." In that statement to the hunters the question was not open, pending the results of research.

Further, Hartzog, in his letter to Smith, made the statement that, "[I]t is conceivable, that some [non-native plants] may be held in a state of equilibrium by the pressure of the exotic goat." Ken Baker's response to Hartzog's conclusion was, "This tack is poor thinking."⁵⁵ Nor was it new. The same reasoning had led to allowing cattle to remain on former ranchlands in the early days of the park to enhance the spread of native plants by controlling exotic grasses. Ultimately cattle were expelled because of the rate at which they trampled seedlings of native trees. In 1967, it had been suggested that goats, in limited numbers, might control exotic grasses. Testing this hypothesis was a major incentive, leading to studies in the park begun in 1969 by David Morris and continued by Baker and Reeser, of the interrelationships between goats and exotic plants.⁵⁶

As for Hartzog's question to Robert Linn, his Chief Scientist, the answer was readily available, for as Quentin Tomich, president of the Hawaii Chapter of The Wildlife Society, pointed out, "[E]nough is understood by professional wildlife biologists in Hawaii about interrelationships of goats and endemic plants to strongly favor total removal of goats from Park areas."⁵⁷ Indeed, Ken Baker himself was prepared to answer. As he wrote Linn, his superior, "What [Hartzog] wants from me, it seems, is how many goats we can maintain and still have native plants. But there is no equilibrium between goats and native Hawaiiana...."⁵⁸

Frustrated with the refusal of the National Park Service to respond openly to repeated inquiries by himself and his colleagues, Anthony Smith wrote a third editorial in the NPCA Magazine. In it, he outlined again the objection of the Association to the evident switch in long-standing Park Service policy of the elimination of goats to one of control, brought about by pressure from Island hunters. He argued, as in his previous editorial, that the very nature of the deputy program amounted to a sports hunting program simply because any hunter licensed by the State of Hawai'i was allowed to shoot goats individually, without training or supervision by park staff. This, he charged, was a violation, not only of National Park Service policy, but also of the Congressional act by which the park had been established.⁵⁹

The goat control program that Hartzog had ordered, though somewhat encouraging at first, proved ultimately to be ineffective. At the end of 16 months (October 1970-February 1972), the deputy ranger-hunter program, involving 665 citizen participants, had eliminated only 2,158 goats (less than three goats per hunter per year). That was not a significant portion of the estimated 14,000-15,000 goats in the park. Conclusions were that, even though the hunting population, generally, was delighted at the possibility of "hunting" in the park, and that continuing pressure on the goat population (in more

⁵⁵ Baker, 1971, 1.

⁵⁶ See p. 5 above.

⁵⁷ Tomich, 1972, 1.

⁵⁸ Baker, 1971, 1.

⁵⁹ Smith, 1971C, 2, 35.

accessible areas) allowed some plant recovery to take place, the cost and the low effectiveness of the program as a whole made its continuation unacceptable.

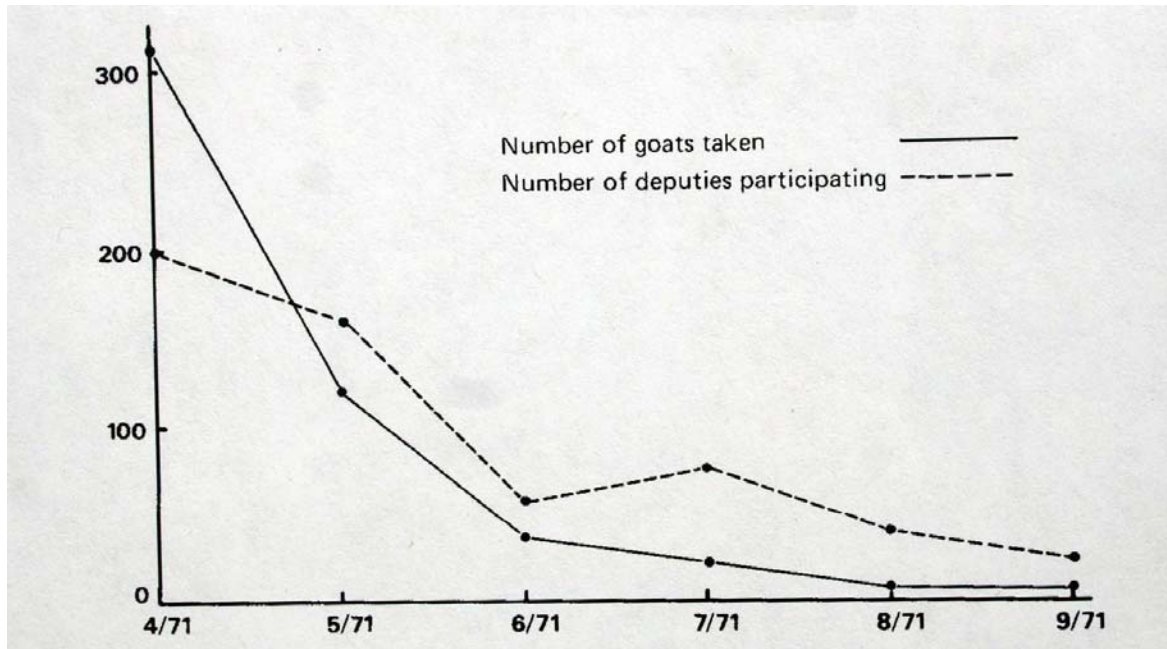


Figure 10. Numbers of Deputy hunters participating and numbers of goats taken in the Kalapana Goat Control Area in a six month period, April through September, 1971.

Searching Hartzog's memoirs in hopes of finding some significant thoughts in retrospect regarding HAVO's goat problem is disappointing in that he devotes to the subject no more than a simple but enigmatic paragraph. Citing a program he had ordered in Yellowstone to control elk, he wrote,

I had less success with the Park Service employees in Hawaii, where in accordance with Leopold's recommendation,⁶⁰ I approved deputizing local hunters as park rangers to kill off the feral goats....With Congresswoman Patsy Mink I went to Hawaii to get the feral goat reduction program underway. When I left the program fizzled. Out of sight, out of mind.⁶¹

The paragraph is a complete puzzle. None of the questions that had been pressed upon him by his former critics are addressed: Why the switch in Park Service policy from extermination of goats to control? Why the concessions to the Island hunters? Why did he seem to overlook the on going research of his biologist in the park? One might also ask why he had felt compelled to help "get the feral goat reduction program underway", and why Representative Patsy Mink also found it necessary to go to Hawai'i at that time? Above all, publishing in the late 1980s, how could he have been so forgetful of the success of the goat eradication program in HAVO—an "impossible task" so outstanding in Park

⁶⁰ See p. 8 above.

⁶¹ Hartzog, 1988:105.

Service history—as to give it no mention, and even to suggest that goat control efforts had “fizzled”?

The latter question, perhaps, we can never answer⁶². Clues to understanding the former questions are apparent, beginning with Secretary of the Interior Stewart L. Udall’s call of George Hartzog to the Office of Director of the National Park Service in January 1964. Together, their primary goal was to continue the expansion of the National Park System supported by President Lyndon B. Johnson’s Great Society program. During Hartzog’s nine-year tenure (1964-72), 69 new park units were added to the System.⁶³ Udall and Hartzog, however, were not so successful in Hawai‘i.

Congressional bills in 1965 had proposed the establishment of Kaua‘i National Park, to comprise the Na Pali Coast, Alaka‘i Swamp and Waimea Canyon. “The proposal was pushed on the people of Kaua‘i, who prize ownership of the land to an extent unparalleled elsewhere in the nation, in an aggressive manner; ensuing repercussions forced the National Park Service to drop its plans for the park.”⁶⁴

The Congressional Record shows that, at the time of Hartzog and Mink’s visit to HAVO in October 1970, new legislation for the park’s expansion had already been introduced into both houses of Congress. Senate Bill S. 3642, introduced by Hiram Fong on May 19, 1970, called for the addition of 198,000 acres, linking the summit area of Mauna Loa to the summit area of Hualalai, and continuing through the Honaunau State Forest to Pu‘u Honua o Hōnaunau on the Kona coast. Patsy Mink introduced a similar bill, H.R. 18234, into the House of Representatives on June 25.

Mink, co-sponsor of the above legislation, did not want a repeat performance of the Kaua‘i experience at HAVO. Her appeals to environmentalists reveal her deep concern. To the President of the Hawaiian Botanical Society, she wrote, “It would be most helpful if, in any way, you could meet with the hunters on this subject [of goats in the park]. Conflicts with this group have jeopardized proposed expansion of the park system.”⁶⁵ Several months later in a letter to the Secretary of the Hawaii Audubon Society she expressed similar feelings:

[M]embers of the Hawaii congressional delegation introduced legislation in the last congress to greatly expand Volcanoes Park....The proposal foundered, however, because of the vehement opposition of local hunters who...fear the loss of hunting grounds. Unless a mutually agreeable solution between the hunters and those concerned with the preservation of the endemic flora is found, the chances for expanding the Volcanoes Park are slim.⁶⁶

While the above-quoted letters were written, respectively, before and after her October, 1970 visit to HAVO, they illustrate clearly the concerns that compelled her to go to the

⁶² George B. Hartzog, Jr., died on June 27, 2008.

⁶³ Mackintosh, 1991: 62-63.

⁶⁴ King, 1971:11

⁶⁵ Mink, 1971. The last sentence may be a reference to the failure of the Kauai National Park proposal.

⁶⁶ Mink, 1972.

park at that time, where she saw her role as a peace maker in order to enhance the possibility of the passage of pending legislation to expand the park.⁶⁷

Mink also made it clear that “It was at my urging that the deputy hunter program was established....”⁶⁸ Hence, Hartzog, under pressure from Mink, ordered the program, applying the Leopold Report as its justification. Together with his “no intent” declaration, he offered the deputy hunter program as a politically acceptable solution that at the same time conceded something to the hunters and, allowed him to claim serious efforts toward a goat solution, in hopes of fostering public support. The pain of that action was borne by the park staff, and the environmental community.

It is interesting to note that both Hartzog (and staff) and Mink were convinced that the elimination of goats from the park was not possible. Robert M. Utley, Hartzog’s Acting Associate Director, wrote, “[W]e believe that it may not be possible to totally eliminate goats from all portions of the two parks [i.e. HAVO and Haleakalā].”⁶⁹ Likewise, Mink stated “I sympathize with your goal of preserving the endemic flora of Hawaii, but I feel that the apparently simple solution of exterminating all goats to achieve this goal is not realistic in view of the complexity of the problem.”⁷⁰ Relative to this, Bryan Harry, biologist, noted, “I never believed Hartzog had the faintest idea of alien ungulates’ effect on island native ecosystems....”⁷¹ Perhaps the above notations shed light on Hartzog’s concessions to the hunters, and on the degree to which he appeared to ignore the appeals of the Hawaiian environmental community, as well as the research of his biologist at HAVO. In short, his political intuitions outweighed his biological interests.

Hope: In the latter months of 1971, and in early 1972, events began to unfold that eased the pain and pressure of Hartzog’s “non-elimination” stance and, ultimately dispelled the former gloom, providing a path toward reinvigorated and enthusiastic action among park personnel.

While the deputy ranger program was at its mid-point, a single natural resources worker, Shokie Hirayama, a hard worker skilled in fence building, was assigned to the task of fencing a goat-control unit of 3,000 acres in June 1971. This was the so-called “Unit 4,” lying in the Poliokeawe Pali area east of ‘Āinahou Ranch. The work itself provided a sense of significant accomplishment toward a future hope of goat eradication.

A major sense of hope was felt at about this time in the request by Nathaniel P. Reed, Assistant Secretary of the Interior for Fish and Wildlife and Parks, for a full report on the goat problem at HAVO. This was a prime opportunity for park personnel to compile all of their learnings from history, research and practical experience in a single paper, culminating in a concrete plan for future action. Baker and Reeser gladly took up the task.

⁶⁷ The bills proposing the expansion of the park never received the support necessary for passage.

⁶⁸ Mink, 1971.

⁶⁹ Utley, Utley, 1972

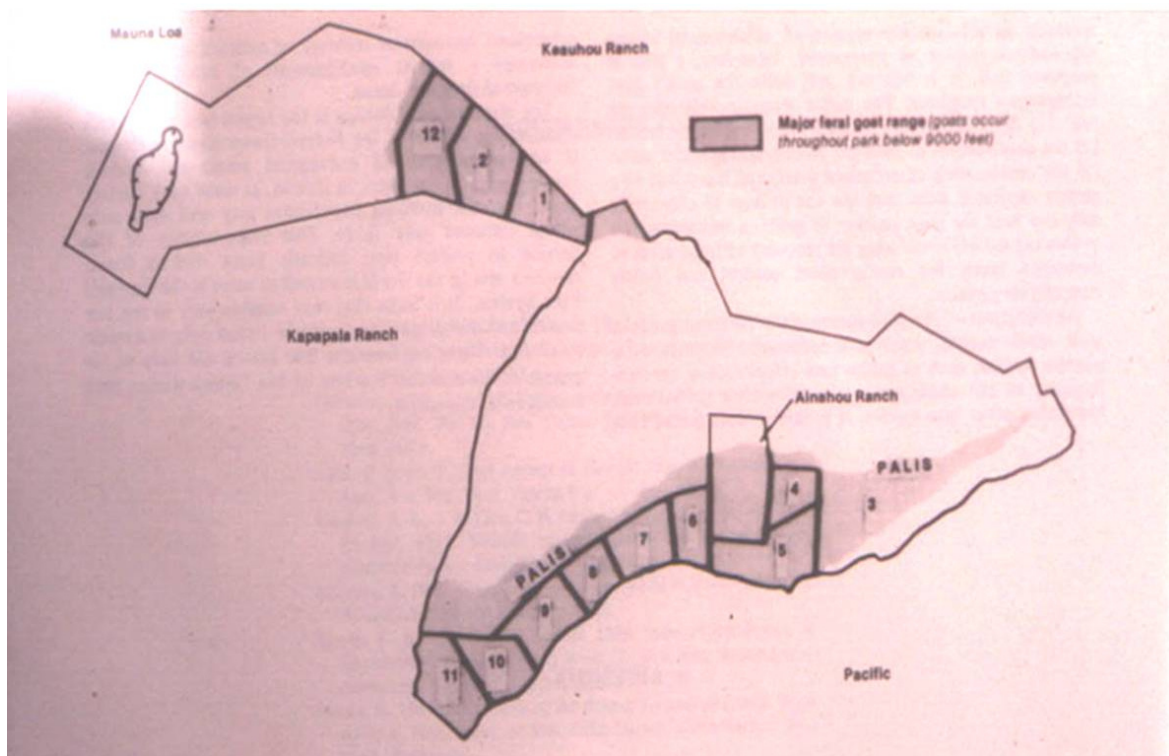
⁷⁰ Mink, 1972.

⁷¹ Harry, 2009B. At the same time Harry wrote, “Frankly, I admire Stu Udall and George Hartzog for their focus, decisions, and determination. They served us well, goats notwithstanding.”

Their work resulted in the publication in January 1972 of USNPS Natural Resources Report No. 2, *Goat Management Problems; Hawaii Volcanoes National Park: A History, Analysis, and Management Plan*.

Baker and Reeser's report presented a comprehensive goat management plan that contained four major emphases requiring "faithful, unwavering adherence."⁷² In summary, they were:

- Rebuild the decrepit boundary fences, using galvanized steel posts and 48-inch hog wire, to prevent re-invasion of goats, and schedule proper maintenance on an annual basis for inspection and repair of all fences;
- Within the park boundaries fence off a number of smaller goat management units of several thousand acres each;
- As management units are completed, organize hunts and drives, supplemented by the use of dogs and helicopters, sufficient to reduce goats and to maintain numbers at manageable levels consistent with the natural restoration of native growth;⁷³
- Monitor and aid the recovery of native flora by exotic plant control and revegetation, as needed.



⁷² Adapted from Baker and Reeser, 1972:36.

⁷³ Soon the only "manageable number" came to be zero, based on the principle that "success is not to be measured in numbers of animals killed but in how few, if any, are left to start all over again." Baker and Reeser, 1972:31. Reeser tells the story that "when talking to a friendly audience that asked how many goats [a manageable number] represented, I'd hold up a zero with my thumb and index finger and they would all laugh." Reeser, 2008.

Figure 11. Feral goat range and goat-control fencing units proposed by Baker and Reeser.

The arrival of Bryan Harry in August of 1971 as the new superintendent of HAVO was a major event in restoring hope among park staff members. Harry, a biologist by training, on reading Sherwin Carlquist's newly published *Hawaii: A Natural History*,⁷⁴ was deeply moved by the beauty and diversity of Hawaii's biota, and its struggle for survival. Immediately he knew "the goal is to preserve these natural ecosystems; quit emphasizing 'exterminate goats'."⁷⁵

Harry's memorandum to NPS Chief Scientist Robert Linn summarizes his insightful grasp of the task before him. In it, he wrote,

In my mind, rather than a goal of either 'control' or 'eradicate' goats, our goal should be simply to perpetuate, restore—and appreciate—the native Hawaiian biota. The latter is natural and easily defended. Goat eradication per se is difficult to explain to a local populace who not only like goats, but sometimes whose parents (on incredibly slim wages) relied on wild goats and pigs to feed their families.... The word 'eradicate' has bugged local residents and made acceptance of our program difficult to impossible.... I sense that we'll progress more surely if we develop easier and more responsive attitudes regarding citizen participation and control vs. eradication, and if we present goat management as a part of a whole biologic plan rather than as a single all or nothing objective.

He ended his memo with, "I'd appreciate your thoughts—and help. This is a long haul."⁷⁶

Harry was able to help park staff to see that, although a weighty and difficult task, goat eradication⁷⁷ was one of several objectives toward the greater goal of restoring the park as closely as possible to its pristine condition. Instead of "eradication, elimination, and extermination" the new key words became "replant, renew, restore." A new and positive outlook grew among the staff. While they continued to labor at goat eradication, park workers looked beyond it to focus also on such tasks as restoring native plants on the *pali* and lowlands and restoring habitats for native birds in the forests—non-controversial objectives more readily accepted by the public. Park staff had been enabled to gain a new perspective of themselves as the guardians and protectors of the invaluable natural resources of HAVO. A more positive public attitude followed.

One of Harry's early tasks was to prepare a new Environmental Impact Statement (EIS) for the park listing the major environmental issues and evaluating the impact of possible approaches to resolving them. Wisely, he invited leaders from among the hunting community to participate in the preparation of the EIS. As work progressed and the hunters began to grasp the nature of the goat problem, realizing that the park was committed to restoring native plants and bird habitats, they became less and less opposed

⁷⁴ The American Museum of Natural History, Natural History Press, Garden City, NY.

⁷⁵ Harry, 2009B.

⁷⁶ Harry, 1971B: 1,3.

⁷⁷ Publicly referred to as "goat control" to appease the hunting community.

to the eventual elimination of goats. They began to feel a sense of satisfaction that they were allowed to participate in park restoration, as well as necessary goat reduction.⁷⁸

Superintendent Harry left no doubt of his commitment to building miles of expensive fencing in goat-infested areas as the first step toward the goal of restoring native plants, and animal habitats. In October 1971, he submitted to Robert Barrel, General Superintendent of the Hawai‘i Group, a request for \$16,400 for fencing to complete Unit 4, then 25 per cent complete. He backed his request with the outline of a five-year fencing plan, in which the addition of the equivalent of 1.8 full-time workers to build and maintain fences would be a top priority. Harry then said, “If we don’t get the money for Unit 4, we plan to work as we can to complete it.”⁷⁹ This would mean the diversion of funds and personnel from the park’s normal budgeting and operations.

Two-and-a-half months after Harry’s request for fencing funds was submitted, a memo dated January 12, 1972 from Neal G. Guse, Acting Director of the Western Region, to Director Hartzog (copy to Superintendent Harry) contained some encouraging words. Guse wrote, “Our complete agreement in recognizing the extreme destruction of this park’s ecosystems led us to pursue potential funding sources....” He explained that while the funding search was unsuccessful, the happy news from Superintendent Harry was that the fencing of Unit 4 would be completed using locally available manpower and funding. Guse concluded, “We strongly commend him for his resourcefulness in taking an active stance in this critical matter.”⁸⁰

On the same day that Neal Guse wrote his memo to Director Hartzog, Assistant Secretary Nathaniel Reed wrote a memo to Guse, with a copy to Hartzog, that opened new paths to efforts at restoring native ecosystems in HAVO, including the elimination of goats. He noted that he had read, with pleasure, Baker and Reeser’s report,⁸¹ adding, “There has obviously been considerable thought and effort given to the problem for some time and the report successfully comes to grips with the reality of the situation.”⁸² Reed’s acceptance of the report brought a great sense of relief to the park. Not only did it mean that no longer would the park labor under the Hartzog dictum of non-intent to eliminate goats, but even more that now, at last, scientific research in the park would be given due recognition.

Reed gave his recommendations for continuing, and eventually completing, the fencing program at HAVO, suggesting that it be completed over three years. These were conveyed to the park via the Western Regional Office with directions to place fencing at the top of its priority list, with plans to complete the ‘Āinahou boundary in 1973, the Mauna Loa Strip boundary and the Hilina Pali drift and enclosure fences in 1974, and the Ka‘u boundary in 1975. The ‘Āinahou boundary had already been designated as the Western Region’s top

⁷⁸ Reeser, 1993B: 2.

⁷⁹ Harry, 1971A: 2.

⁸⁰ Guse, 1972.

⁸¹ i.e. Baker and Reeser, 1972.

⁸² Reed, 1972.

priority for 1973, and the Park Service Washington office had assured that it would be funded.⁸³

While Unit 4 fencing was in progress, a notable goat drive was held in March 1972 in 35 square miles of forested area along the fence line at the crest of Poliokeawe Pali west of the 1969 lava flows. Nine horsemen and seven footmen were able to herd 139 goats into a corral within 'Āinahou Ranch that were sold for \$11.77 each, the highest price to that date. During the drive only 12 goats were destroyed while attempting to escape. After covering costs of the drive, including manpower, the government gained a net profit of \$706.03⁸⁴

Fencing of the 3,000-acre Unit 4, begun in summer 1971, was completed in July 1972. Goat drives and concentrated hunting efforts over the next several months resulted in Unit 4 being the first large area to be made essentially goat-free. This was a joyful accomplishment for the park. Fencing of a second goat-control unit, of 3,600 acres, was begun in August 1972.



Figure 12. Youth Conservation Corps fence crew.

During several summers, Youth Conservation Corps (YCC) students assisted park personnel engaged in fencing and native plant restoration. The young people, several of them children of prominent Island citizens, coined the motto “Save da trees”, expressing

⁸³ Tobin, 1972.

⁸⁴ Hewitt, 1972.

their understanding of the nature and significance of their work. They became major carriers of that understanding to the general populace.⁸⁵

Fewer than the 12 multi-thousand-acre units, originally proposed, were fenced. Each successive unit was larger than the former, as fencing and hunting techniques improved.⁸⁶ Ultimately, fencing enclosed the entire 80,000 acres of goat range, primarily in the *pali* and coastal areas, but also in the forested portions of the Mauna Loa Strip.

Formation of the Resources Management Division: When T. Arthur Hewitt, Chief of Interpretation and Resources Management, transferred out of HAVO in 1974, Superintendent Harry saw the opportunity to form a separate Resources Management (R.M.) Division—an innovation in Park Service management organization. Don Reeser was named the first chief, with a locally hired staff of nine technicians and laborers. Together these 10 men concentrated on completing the multi-thousand-acre fencing units, systematically eliminating goats from each unit, monitoring the re-emergence of native plants, and removing exotics.

Fences were built of four-foot-high woven hog wire with steel posts and made to conform to the terrain without bulldozing so as to leave the landscape as unaltered as possible.⁸⁷



Figure 13. Fence building camp.

⁸⁵ Haey, 2009A.

⁸⁶ Harry, 1990:1.

⁸⁷ Reeser, 1976:14.

Chris Zimmer, one of the workers in the new R.M. division recalled his early experiences:

At first, we built fence five days a week. We had to camp out in the field the whole week. I was newly married and camping wasn't much fun. When each of the goat-control units was completed we would begin the drives—rounding up goats by the hundreds. There were usually 12 to 14 men on horseback plus a few on foot—R.M. personnel, and some rangers. At times we used dogs as well, but the goats outran them. Also the dogs had difficulty running on the rough lava; their paws soon were bleeding.⁸⁸



Figure 14. Goat drive team at Halapē. From left to right: Bryan Harry, Fred Galante, John Hauanio, Don Reeser, Doug Olivera, Hiroshi Nozawa, Ken Baker, Bill Larson.
Photo by Ron Bachman, Hawai'i State Biologist, a member of the team.

The drives often lasted two to three days. One main drive fence ran upslope from the east side of Halapē to the west boundary of 'Āinahou Ranch. Wing fences, on either side of the main fence, funneled goats to a large corral between Pu'u Kapukapu and Makahanu Pali above it, where they were held over night, while the drive team camped at Halapē. In the morning, riflemen using tracer bullets would drive the goats up the pali along the drive fence and, horsemen at the top would continue the drive to a holding corral in the upper portion of 'Āinahou Ranch. There the goats were sold at auction. When trucking was available the goats were driven up a narrow, mile-long lane, with four-foot hog wire on each side, to a third corral near the Hilina Pali Road, where they were loaded and trucked away, for shipment to Honolulu, or elsewhere.⁸⁹

⁸⁸ Zimmer, 2009.

⁸⁹ Zimmer, 2009; Reeser, 2010.

Drives removed up to 95 per cent of the goats from each unit. Eliminating the remainder took “dogged persistence.” Remnant goats became more and more wary and elusive, making them difficult to locate. As Reeser put it, “We had to continually remind ourselves that removing only a few or no goats during a hard day’s effort was not failure but a sign



Figure 15. Goat sale in the ‘Āinahou Ranch holding corral, at the crest of Poliokeawe Pali. Pu‘u Kapukapu the high point on the coast, upper right. Halapē inland of the tiny islet in the surf, right of top center.

of success.”⁹⁰ When traditional hunting methods had reached their limits, the use of helicopters was begun. To prevent public opposition, only two of his staff, John Kaiewe and Sampson Kaawaloa, natives of Kalapana, were permitted to join Reeser in this work. Helicopters were used to locate remaining small herds. The hunters would then disembark and attempt to engage the goats on foot, while the pilot did his best to drive the fleeing goats within rifle range.

Shooting from helicopters was forbidden, until, for safety’s sake, Superintendent Harry allowed it when learning that the three hunters had been leaping onto rocky crags on the *pali* from the helicopter skids—it being impossible to climb the cliffs in hopes of finding goats. Reeser recounts that, before shooting from helicopters, “I would check closely on who was in the back country and kept this activity quiet...because [it] was so controversial.”⁹¹

⁹⁰ Reeser, 1993A:434.

⁹¹ Reeser, 2008.

As goats were reduced to minimal numbers, unit by unit, more time was given to the tasks of restoration, such as raising and planting rare and endangered native plants, and re-introducing *nēnē*, the native Hawaiian goose. By the early 1980s the park was declared virtually goat-free. Only small, scattered clusters remained.

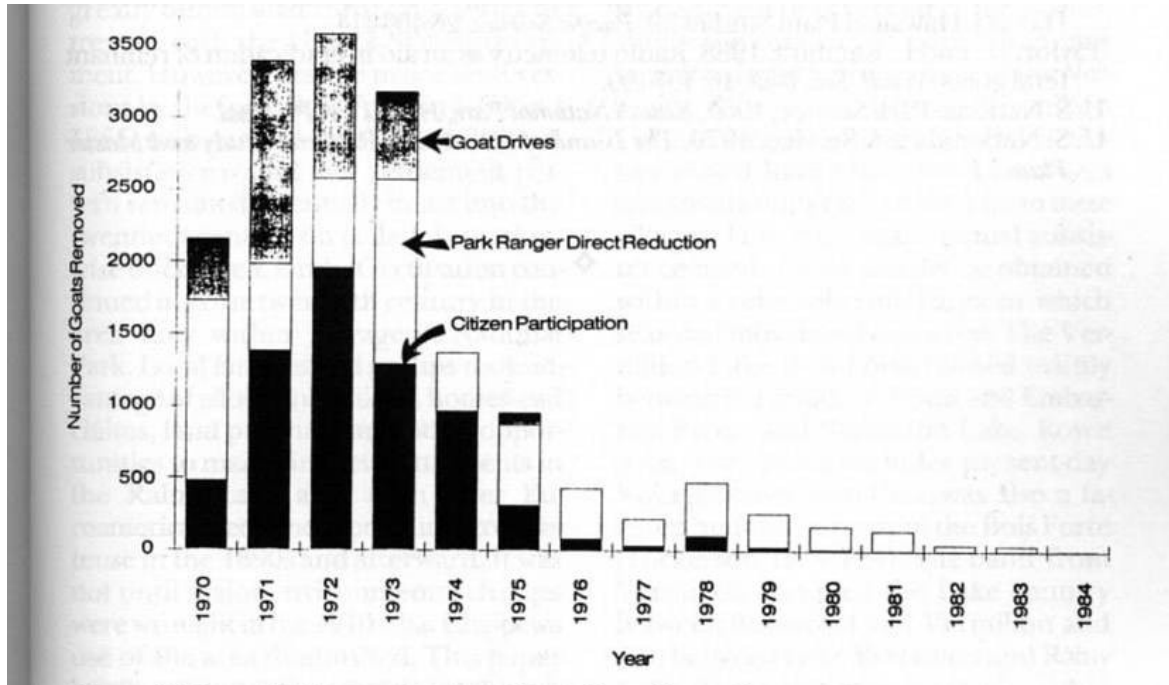


Figure 16. Numbers of goats removed, 1970-1984. Fencing units were operative from 1972 onward.

Eliminating the remnants—“Judas Goats”:⁹² Locating the remaining few goats was an extreme challenge. Monitoring indicated that there were perhaps 250 remaining, in groups of 20 or so, in an area of 80,000 acres of forest, grasslands, and mesic shrubland. These hardy survivors of previous hunting attempts presented a long and costly eradication problem, having become acutely sensitive to the sound and smell of humans, gun shots, and approaching helicopters, were greatly adept at hiding themselves. Resources Management personnel in the early 1980s found that remnant goats maintained clusters and roamed somewhat fixed grazing ranges.⁹³ However, continued monitoring of small, scattered groups over a wide range of territory was costly, and traditional methods were less than effective.

Looking for a more useful method of monitoring, Dan Taylor, Resources Management Chief and Larry Katahira, Wildlife Specialist, discussed using radio-collared goats. They had read about animal tracking by this method in other fields, but they were the first to apply it to tracking feral goats for purposes of removing remnant groups. As Taylor tells

⁹² Material in this section is derived primarily from Taylor and Katahira, 1998.

⁹³ At this point, Don Reeser had transferred to Redwoods National Park. Dan Taylor succeeded him as Division Chief in fall 1979.

it, “We got the idea from a casual suggestion made by one of the rangers, that, ‘We should wire the hell out of a tame goat, then let ‘er loose in the grasslands to find a boyfriend.’”⁹⁴ In April 1981, a captured female goat was collared and released, at which time she was dabbed with orange paint. Named “Agent Orange,” she discovered a group of remnants in a matter of days and was easily distinguished from the others. That the plan had worked, said Taylor was, “very exciting,” adding that Agent Orange was faithfully tracked by two dedicated volunteers. “Had it not been for their persistence and faith that the method would work,” Taylor recalls, “we would never have gone forward.”⁹⁵



Figure 17. Judas goat. Note radio under goat's throat.

⁹⁴ Taylor, 2008.

⁹⁵ Taylor, 2008.

In July 1982, a male goat was captured, collared and released. He and Agent Orange wore dog collars with small radios attached. They could be tracked for a limited time only, as the whip antennae on their radios soon broke off. Later, 12 more goats were captured and equipped with specially designed collars and radios that would transmit for two years. These goats were released between February 1983 and July 1986 in two areas of the Mauna Loa Strip and four in the *pali* and lowland areas. While methods of tracking the collared goats were being developed, concentrated hunting, as practiced earlier by Reeser and his staff was continued, resulting in the elimination of 226 goats. Only a few tens remained in the park.

To the delight of Resources Management personnel, all of the latter 12 collard goats could easily be located and observed. This was done on a bimonthly basis. In time, eight of the collard goats found, and were accepted by, groups of remnant goats, betraying the locations of those groups, and thus earning for themselves the epithet “Judas goats.” Those that never connected with others were, presumably, in fenced areas that were goat-free.

The transmitters attached to the collars of the Judas goats had a range of a little over nine miles. They and their accompanying groups were located, using directional antennae and hand-held receivers. This was done from selected spots on park roads or trails. Often, a second “fix” was taken to verify locations. Cross-country hikes were then made to track the Judas goats and to observe them and their respective groups. On observations of individual groups, detailed notes were made of the number of goats seen, descriptions of each, and their movements. Observers were cautious to remain down wind and to tread softly so as not to reveal their presence to the goats. Helicopter use was avoided for observations, because goats scattered and/or hid on detecting their sound.

When a decision was made to eliminate a particular group of goats, a combined ground-air approach was used. A team of up to three tracker-hunters set out on foot, equipped with .30 caliber rifles. After the group had been located and details of their number and individual descriptions, etc., recorded, a waiting helicopter, with a few hunters aboard was radioed, on which it proceeded to the scene. As the helicopter drew near, the ground observers radioed movements of the scattering goats, as well as their own locations, to the hunters on board, thus advising the pilot as to the preferred approach in an attempt to keep the goats in a group. By this method, the final 33 goats in the park were eliminated.

The Judas goats were spared to continue monitoring the fenced areas within the park. Since June 1984, no uncollared goats have been seen in HAVO.

Soon after, the successful methods developed at HAVO were applied at Haleakalā under the leadership of Ron Nagata, its Chief of Resources Management. By 1990 Haleakalā also was goat-free. Goat eradication in Hawai‘i’s two largest parks, seen as “an impossible task”, marked one of the most notable conservation successes in National Park Service history. A story truly to be remembered.

Appendix:

From “Biographical Vignettes,” in *National Park Service: The First 75 Years*.

George Hartzog accomplished much toward three major goals as director: to expand the system to save important areas before they were lost, to make the system relevant to an urban society, and to open positions to people who had not previously had much access to them, especially minorities and women. During his directorship, the Park Service added 69 areas. In 1968 he appointed Grant Wright to head the U.S. Park Police, the first black man to head a major police force in the United States, and selected several women to be park superintendents, including Lorraine Mintzmyer at Herbert Hoover NHS. The first major urban recreation areas, Gateway (New York) and Golden Gate (San Francisco) National Recreation areas, were acquired in 1972. The “Summer in the Parks” urban program was started at Richmond National Battlefield Park and in Washington, D.C., and living history interpretation was advanced. Hartzog operated in the style of first NPS Director Stephen Mather in gaining the cooperation of members of Congress. He was instrumental in getting Congressional approval for the 1971 Alaska Native Claims Settlement Act, allowing 80 million acres of Alaska wildlands to be withdrawn for new national parks, wildlife refuges, and wilderness. Former Interior Secretary Stewart L. Udall said, “[Hartzog]...was a consummate negotiator, he enjoyed entering political thickets; he had the self-confidence and savvy to be his own lobbyist and to win most of his arguments with members of Congress, Governors and Presidents”.⁹⁶

Bryan Harry and Don Reeser have each received the Distinguished Service Award from the Hawai‘i Conservation Alliance, with the following citations:⁹⁷

“1998: Don Reeser Superintendent of Haleakalā National Park

Don Reeser has been an aggressive leader inventing and demonstrating hands-on resource management techniques to preserve and restore native ecosystems in Pacific islands for more than three decades. In the late 60s and early 70s, as a young ranger/naturalist at Hawai‘i Volcanoes National Park, Don was dissatisfied that the annual elimination of thousands of goats had no effect upon the park’s goat populations. He began small fenced exclosure experiments to determine how to control goat populations. At the time, this was a novel concept. Don discovered that it was possible to construct barrier fences to prevent ‘outside’ goats from re-entering areas where he had removed entire goat populations. Initially he kept marauding goats (and later pigs) from only a few acres—but the concept was born. From what then were merely a few goat-free acres, now are 50,000 or more such ungulate-free acres at both Hawai‘i Volcanoes and Haleakalā National Parks.

Don not only invented the “barrier-fence technique of keeping goats/pigs out of areas to protect native ecosystems, but he also changed the National Park

⁹⁶ Cahn, 2000

⁹⁷ Hawai‘i Conservation Alliance, 2008.

Service measure of success from the number of alien animals killed in a park to the number of acres free of alien animal populations in a park. The restoration of native ecosystems and the protection of the park's biodiversity is the true worthy goal of resource management in these parks.

Don's innovative philosophy is now the standard in the National Park Service nationwide. Professional Resource Management units within national parks, pioneered by Don, are now standard throughout the nation's parks. Don's inventive resource management techniques and philosophy have been copied worldwide.

**2004: Bryan Harry
Director of the National Park Service Pacific West Region⁹⁸**

Bryan has had a long and distinguished career with the National Park Service that includes Yellowstone, Yosemite and Hawai'i Volcanoes National Parks. In 1975 Bryan was appointed Alaska Area Director. In addition to his strong advocacy for natural resource management, Bryan has demonstrated an equally strong interest in cultural conservation. In Alaska he headed the Alaska Task Force that assisted native Alaskans in identifying historic places, which led to an increase in NPS units in Alaska from four to 16 units protecting over 54.6 million acres of land.

In 1980 Bryan was appointed to his current position as Director of the National Park Service Pacific West Region and oversees the 11 national parks in this Region. He has continued his strong efforts to protect natural and cultural resources. He has demonstrated time and again a creative and enduring talent for acquiring and managing important natural and cultural landscapes that might otherwise have not received the protection given by National Park status. In the early 1970s, Bryan led the way in planning and implementing landscape management of Hawaiian ecosystems, including the control and removal of invasive alien species. This was the beginning of the modern era of resource management in Hawai'i. Bryan continues to work on critical conservation issues in Hawai'i, including the U.S. Coral Reef initiative, which again demonstrates the far reach of his conservation interests.

Acknowledgements: I want to thank Nancy Hori, Supervising Librarian, National Park Service Pacific West Region—Seattle, and Karen Lee, Volunteer Librarian at the Pacific West Regional Office—Oakland for their assistance in securing library resources. I am grateful to Laura Carter Schuster, Chief of Cultural Resources Management and her archival staff, Keola Awong, Tracy Laqua and Deb Sheppard, and to Rhonda Loh, Chief of Resources Management, and Ruth Levin of the Division of Interpretation, all of Hawai'i Volcanoes National Park, for their gracious assistance in locating references and providing photos. From Cindy Orlando, Superintendent of Hawai'i Volcanoes, I received the warmest of welcomes back to the park for research on two occasions. In particular I thank, Jim Gale, Chief of Interpretation at Hawai'i Volcanoes for encouragement in writing this

⁹⁸ Bryan Harry's title was General Superintendent, Hawai'i Group.

paper, and Jane Takahashi, Librarian at USGS-Hawaiian Volcano Observatory, for graciously consenting to edit the manuscript. Special thanks go to Don Reeser and Dan Taylor, both retired former Chiefs, successively, of Resources Management at Hawai‘i Volcanoes, for consenting to read my manuscript and to add helpful comments. I am also grateful to Bryan Harry, former Superintendent of Hawai‘i Volcanoes and retired General Superintendent, Hawaii Group, for commenting on the manuscript and for a helpful interview. Not the least, I thank Chris Zimmer, one of the original Resources Management staff members at Hawai‘i Volcanoes, now retired, for his personal reminiscences.

References: *

- Anonymous, 1970A, “Sportsmen protest plan to slay goats”: Honolulu Advertiser, October 7.
- Anonymous, 1970B, “F&G Group Angry Over Goat Killing”: Hawaii Tribune Herald, November 20.
- Anonymous, 1970C, “Attention Hunters”: Hawaii Tribune Herald, October 23.
- Baker, James K., 1970, Memo to Chief Scientist, Office of Natural Science Studies, Washington Support Office, November 6: Archives, Hawai‘i Volcanoes National Park.
- Baker, James K., 1971: Personal letter to Bob Linn, July 2: Archives, Hawai‘i Volcanoes National Park.
- Baker, James K., and Donald W. Reeser, 1972, Goat Management Problems, Hawaii Volcanoes National Park; a History, Analysis, and Management Plan: National Park Service, Natural Resources Report No. 2.
- Beaglehole, J.C., ed., 1995, The Journals of Captain James Cook on His Voyages of Discovery, vol III, part 1: The Hakluyt Society, Cambridge University Press.
- Cahn, Robert, 2000, National Park Service: The First 75 Years (Table of Contents): www.nps.gov/history/history/online_books/sontag/hartzog.htm.
- Fong, Hiram L., 1970, Letter to George Hartzog, May 19: Archives, Hawai‘i Volcanoes National Park.
- _____, 1971A, Letter to Mr. Ronald Hurov, President: Hawaiian Botanical Society, June 16: Archives, Hawai‘i Volcanoes National Park.
- _____, 1971B, Letter to Mr. P. Quentin Tomich, President, The Wildlife Society, Hawaii Chapter, December 23: Archives, Hawai‘i Volcanoes National Park.
- Fosberg, F. Raymond, 1971, Letter to George B. Hartzog, Jr., April 25: Archives, Hawai‘i Volcanoes National Park.
- Geerdes, Raymond J., 1964, History of the Feral Goat Control Program of Hawaii Volcanoes National Park: Hawai‘i Volcanoes National Park, unpublished paper.
- Guse, Neal G., 1972, Memorandum to Director, National Park Service, January 12: Archives, Hawai‘i Volcanoes National Park.
- Harry, G. Bryan, 1971A, Memorandum to General Superintendent, Hawaii Group, October 27: Archives, Hawai‘i Volcanoes National Park.
- _____, 1971B, Memorandum to Chief Scientist, Office of Natural Science Studies, Washington Support Office, December 2: Archives, Hawai‘i Volcanoes National Park.
- _____, 1990, From “The Snake and the Goat, a Manager’s View of Two Science,

- Inventory and Monitoring Cases":
<http://www.botany.hawaii.edu/basch/uhnpscesu/casestudy.pdf>.
- _____, 2009A, After Dark in the Park, May 5: Hawai'i Volcanoes National Park.
- _____, 2009B, Written communication, September 3, 2009: Archives, Hawai'i Volcanoes National Park.
- _____, 2009C, Personal communication, September 8, 2009.
- Hartzog, George B., Jr., 1967, Memorandum to all Field Offices, September 22: Archives, Hawai'i Volcanoes National Park.
- _____, 1970, Letter to Earl Pacheco, October 20: Archives, Hawai'i Volcanoes National Park.
- _____, 1971A, Letter to Dr. F. Raymond Fosberg, June 3: Archives, Hawai'i Volcanoes National Park.
- _____, 1971B, Letter to Mr. Anthony Wayne Smith, President and General Counsel, National Parks and Conservation Association, June 17: Archives, Hawai'i Volcanoes National Park.
- _____, 1988, Battling for the National Parks: Moyer Bell, Ltd.
- Hawaii Conservation Alliance, 2008: <http://hawaiiconservation.org/awards.asp>.
- Hawai'i Volcanoes National Park Natural Resources Division, 1970, Feral Goat Control Project records: Archives, Hawai'i Volcanoes National Park.
- _____, 1971, Goat Management Information and Regulations, April: Archives, Hawai'i Volcanoes National Park.
- Hewitt, Arthur H., Jr., 1972; Memo to Director, Western Region, National Park Service, March 31: Archives, Hawai'i Volcanoes National Park.
- King. Warren, 1971, "Haven for Endangered Species?": National Parks and Conservation Magazine, October, p.11.
- Leopold, A.S., S.A. Cain, C.M. Cottam, I.N. Gabrielson, T.L. Kimball, 1963, Wildlife Management in the National Parks: National Park Service.
- Mackintosh, Barry, 1991, The National Parks: Shaping the System: National Park Service.
- Mink, Patsy T., 1971, Letter to Mr. Ronald Hurov, President, Hawaiian Botanical Society, June, 2: Archives, Hawai'i Volcanoes National Park.
- _____, 1972, Letter to Mrs. Mae E. Mull, Secretary, Hawaii Audubon Society, January 3: Archives, Hawai'i Volcanoes National Park.
- Pacheco, Earl, 1970, Letter to Mr. Wm. Y. Thompson, Dept of Land and Natural Resources, State of Hawaii, November 6: Archives, Hawai'i Volcanoes National Park.
- Pratt, Linda W., 2008, written communication: Archives, Hawai'i Volcanoes National Park.
- Reed, Nathaniel P., 1972; Memo to Director, Western Region, National Park Service, January 12: Archives, Hawai'i Volcanoes National Park..
- Reeser, Donald W., 1970, Memo to Superintendent, Hawai'i Volcanoes National Park, June 8: Archives, Hawai'i Volcanoes National Park
- _____, 1971, Memo to Superintendent, Hawai'i Volcanoes National Park, June 2: Archives, Hawai'i Volcanoes National Park.
- _____, 1976, Successful Goat Control at Hawaii Volcanoes: Parks, Vol. 1, no. 2, pp. 14-15.
- _____, 1993A, Establishment of the Resources Management Division, Hawai'i

- Volcanoes National Park: Proceedings of the 7th Conference on Research and Resource Management in Parks and Public Lands, George Wright Society, pp. 431-436.
- _____, 1993B, Memorandum to Chief, Division of Natural Resources and Research, Western Regional Office, National Park Service, August 23: Archives, Hawai‘i Volcanoes National Park.
- _____, 2008, Written communication, June: Archives, Hawai‘i Volcanoes National Park.
- _____, 2010, Written communication, February 2: Archives, Hawai‘i Volcanoes National Park.
- Sellers, Richard West, 1997, Preserving Nature in the National Parks; Yale University Press.
- Smith, Anthony Wayne, 1971A, “Do Hawaiian Parks Double as Goat Hunting Preserves?”: National Parks and Conservation Magazine, June, pp.32-33.
- _____, 1971B, “Further on the Feral Goat Problem in the Hawaiian Parks”: National Parks and Conservation Magazine, August, p. 28.
- _____, 1971C, “Goats in the Parks”: National Parks and Conservation Magazine, November, 1971, pp. 2, 35.
- St. John, Harold, 1972, Hawaiian Plant Studies 39: Pacific Science, Vol. 26, no. 4.
- Stone, Charles P., and Linda W. Pratt, 2002, Hawai‘i’s Plants and Animals: Hawaii Natural History Association, Hawai‘i Volcanoes National Park.
- Taylor, Dan, 2008, Written communication, June: Archives, Hawai‘i Volcanoes National Park.
- Taylor, Dan, and Larry Katahira, 1998, Radio Telemetry as an Aid in Eradicating Feral Goats: JSTOR: Wildlife Society Bulletin, Vol. 16, no. 3, pp. 297-299.
- Tobin, Daniel J., Jr., 1972, Memo to Superintendent, Hawaii Volcanoes, January 14: Archives, Hawai‘i Volcanoes National Park.
- Tomich, P. Quentin, 1972, Letter to Hon. Patsy T. Mink, for the Wildlife Society, Hawaii Chapter, January 18: Archives, Hawai‘i Volcanoes National Park.
- Utey, Robert M., 1972, Letter to Senator Daniel K. Inouye, April 11: Archives, Hawai‘i Volcanoes National Park.
- Zimmer, Chris, 2010, Written communication, January 9: Archives, Hawai‘i Volcanoes National Park

**Copies of references are stored under “Bonsey Papers” in the archives of Hawai‘i Volcanoes National Park.*