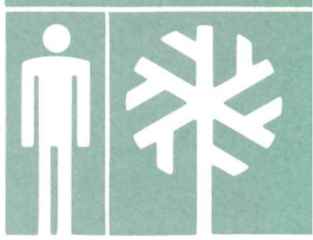
feral burro management plan and environmental assessment

november 1976



GRAND CANYON

NATIONAL PARK / ARIZONA

FERAL BURRO MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT

Grand Canyon National Park

Prepared by
Grand Canyon National Park
National Park Service
Department of the Interior
November 1976

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I. ENVIRONMENTAL SUMMARY AND NEGATIVE DECLARATION

The Feral Burro Management Plan for Grand Canyon National Park aims to prevent further wildlife competition and habitat destruction by these animals and to return impacted areas to a natural level. A 5-year program of direct control by shooting and exclusion by fencing are the means by which these goals will be achieved. An accompanying Environmental Assessment documents environmental impacts and alternatives to the proposed actions.

Proposed studies will provide the necessary information base for these actions. Specific management actions are designed to restore and maintain the natural environment in favor of native biota. Adverse environmental effects include the aesthetic imposition of burro carcasses and fencing on the park scene.

A 'no action' alternative was considered for the proposed actions, in which case overgrazing of park vegetation would continue with increasing environmental damage. Competition with bighorn sheep would continue with a resultant decline of this native species in the park. Archaeological sites would continue to be destroyed and the parks legislative mandates for preserving the natural scene would be ignored.

Additional alternatives considered and subsequently rejected include: trapping and relocation; trapping and euthanasia; mechanical and chemical sterilants; retention of a managed herd; and establishing a burro viewing area.

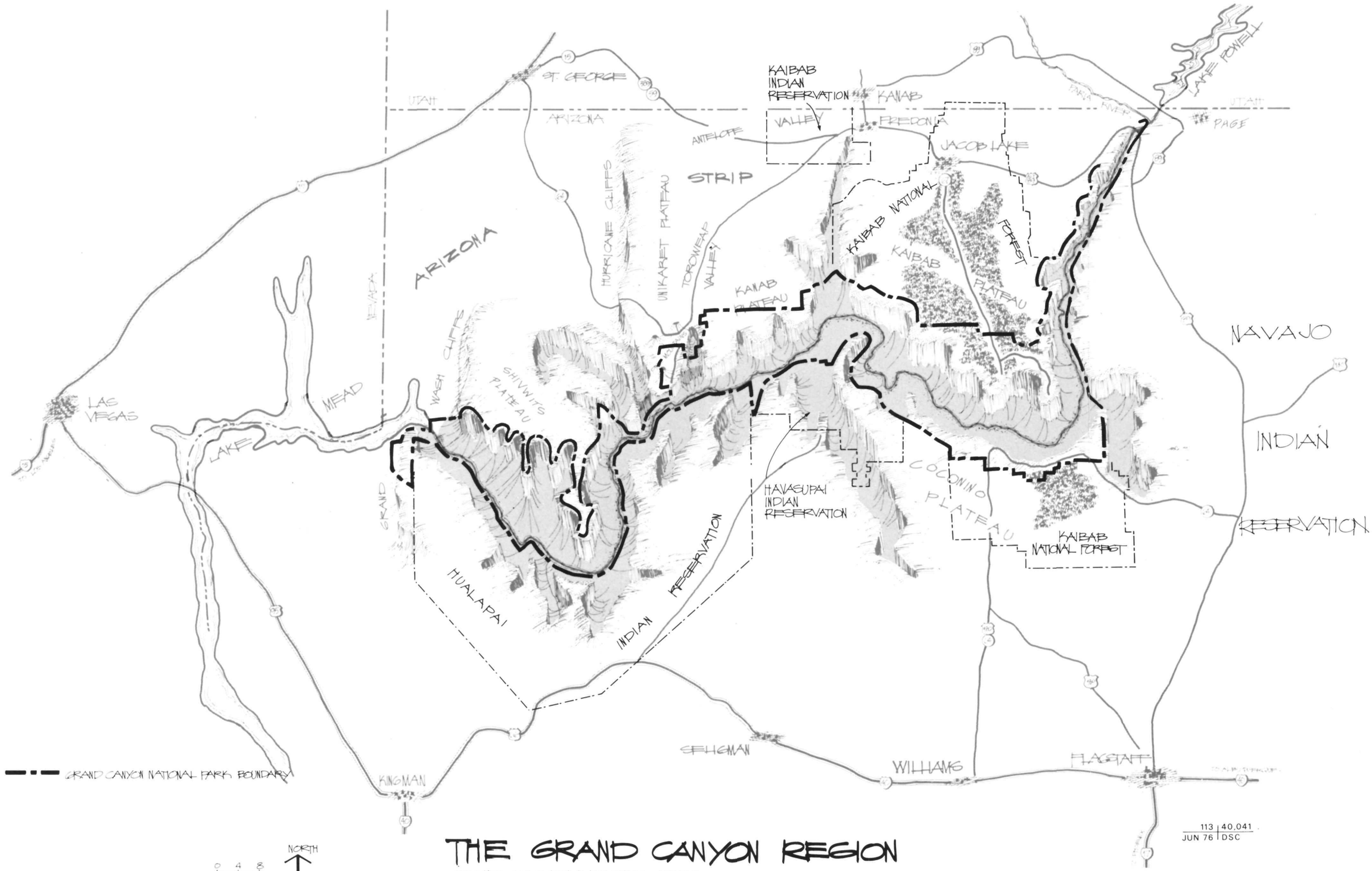
Because none of the proposed actions entail significant environmental impact, it is recommended that the Grand Canyon Feral Burro Management Plan be assigned a negative declaration. Unless significant controversy develops during public review, a full Environmental Impact Statement will not be prepared. This action plan will be translated into a field exercise when the 30-day public review period has expired.

10-12-76
Date

Superintendent, Grand Canyon National Park

11-5-76
Date

Regional Director, Western Region



THE GRAND CANYON REGION

GRAND CANYON NATIONAL PARK

II. BURRO MANAGEMENT PLAN

A. INTRODUCTION

Grand Canyon National Park encompasses nearly 1-1/2 million acres containing physical and natural resources representative of life zones ranging from Alpine meadows to Lower Sonoran deserts. The entire general area is referred to as the Colorado Plateau which, in turn, is divided into several subordinate plateaus. Responsible management of this diverse resource requires a multi-disciplinary, publicly informed approach. This resource management environmental assessment contains management action plans and research proposals which focus on identified resource problems specific to Grand Canyon National Park. Perpetuation of natural conditions and processes requires active measure because of the presence of introduced, non-native species.

Desert ecosystems are fragile, surviving under stringent natural conditions, and are vulnerable to human use and other imposed factors. The presence of feral burros and their impacts upon the park's natural and physical environment requires prudent action. Indigenous fauna, such as the desert bighorn and mule deer, require herd management to avoid diminishment of either population numbers or well-being.

The resource management planning process began with problem identification, determination of a number of management options or alternatives designed to solve those problems, and assessment of impacts incurred by each alternative course of action. A course of action has been selected and the environmental assessment will be made available for public review, at which time Federal, State, and local governmental bodies, organizations and special interest groups, and concerned individuals may comment on proposed action plans. Subsequent analysis of comments received will be weighed, those found infeasible will be eliminated, and those found feasible which were not thought of in the assessment will be considered. Synthesis follows analysis, with the final outcome resulting in a plan which identifies the park's resource management problems and corresponding solutions to these problems. By considering a wide range of comments in the planning process, it will be possible to achieve a document which serves the public at large and fulfills the responsibilities and requirements of the managing agency.

The Burro Management Plan for Grand Canyon National Park is an integral part of the park's forthcoming Resource Management Plan.

B. PLANNING CONSIDERATIONS

1. Legislation Affecting Resource Management

Bringing national park status to all of Grand Canyon has long been the goal of those whose primary concern is in assuring that the canyon will always retain its natural integrity. Over the years, various sections of the canyon have been preserved by their placement within various units of the National Park System.

Public Law 93-620, dated January 3, 1975, incorporated Marble Canyon National Monument, Grand Canyon National Monument, portions of the Lake Mead National Recreation Area, and portions of the Kaibab National Forest into the enlarged 1,218,375-acre national park as shown on the map, page 1a. This legislation has accomplished much of the National Park Service proposal.

Public Law 93-620 removed 83,809 acres of land from the park in the Manakacha-Topocoba and Tenderfoot Plateau areas and placed it in Bureau of Indian Affairs Trust as part of the Havasupai Reservation. The Enlargement Act also provided for traditional uses, including grazing, to the Havasupai on approximately 95,300 acres of park land.

Additional legislation influencing planning activities in the park includes the National Park Service Organic Act of 1916, the National Historic Preservation Act of 1966 and Executive Order 11593, the Wilderness Act of 1964, and the Endangered Species Act of 1973. The Organic Act of 1916 directs the National Park Service to regulate park use and promote enjoyment of parklands in a manner consistent with the conservation of park scenery, natural and historic objects, and wildlife. In order to fulfill these mandates, all resource planning activities must ensure that public-use facilities do not disrupt or damage resources to a degree whereby their ability to serve future visitors is reduced; that appropriate nondestructive public use and enjoyment of resources is made possible; and that conscious care and protection is provided to conserve natural and cultural parkland resources.

Executive Order 11593 directs Federal agencies to survey and nominate to the Secretary of the Interior all properties under their administration that might qualify for listing in the National Register of Historic Places, and to take measures which would result in the "protection and enhancement of the cultural environment." This law has a pertinence in that feral burros do have a recognized adverse impact on the parks archaeological sites in the form of trampling and site destruction. The exact extent of this destruction is, as yet, unknown.

The Wilderness Act of 1964 required all Federal land-managing agencies to reexamine their resources for possible wilderness classification.

The lands within the former boundaries of the park and the two monuments have been studied and evaluated for placement in the National Wilderness Preservation System. A draft proposal based on these evaluations has been prepared, as has an environmental impact statement (DES-76-28, dated July 19, 1975). Potential wilderness areas in those lands recently added to the national park have also been evaluated and recommendations made as to their suitability or nonsuitability for preservation under the Wilderness Act.

The Endangered Species Act of 1973 requires all Federal agencies to consult with the Secretary of the Interior on all projects and programs having potential impact on endangered flora and fauna. The legislation further requires Federal agencies to take ". . . such action necessary to insure that action authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered species and threatened species or result in the destruction or modification of habitat of such species which is determined . . . to be critical."

Another bill, House of Representatives 2935, proposes to amend the existing Wild Free-Roaming Horse and Burro Act of 1971 to provide authority to properly manage wild horses and burros in harmony with wildlife and other uses of national resource lands. It would then be authorized for the Secretaries of Agriculture and the Interior to use aircraft and motorized vehicles in the protection, management, and control of wild, free-roaming horses and burros, as well as to sell or donate without restriction, excess horses or burros to individuals or organizations.

The 1971 Wild Free-Roaming Horse and Burro Act pertains only to Bureau of Land Management and the U.S. Forest Service administered lands. The National Park Service is excluded from the specific restrictions imposed by this law.

2. Management Objectives

Management Policies for the National Park System (1975) form the basis for planning activities and administration of Grand Canyon National Park. Resource management planning is also based on management objectives--a listing of desired conditions or states to be achieved within the park--which provide the manager a context for evaluation of preservation and use, and a framework that enables management to satisfy the specific purposes for which the park was established. Management objectives specific to resource management approved by the Regional Director, Western Region are listed as follows:

> To maintain, preserve, and perpetuate the aesthetic setting and the natural/cultural resources of Grand Canyon National Park.
>
> To restore conditions conducive to the perpetuation of the natural processes as they functioned before disruption by technological man or competition from nonnative plants and animals.
>
> To restore native plants and animals to their original range.
>
> To restore to natural appearance the land surfaces disturbed by man, recognizing that significant cultural values must be preserved.
>
> To ensure perpetuation of rare and endangered plants and animals and those species endemic to Grand Canyon National Park.
>
> To develop and execute continuing research programs for natural and cultural resources.

In addition, the 1975 "Management Policies" for the National Park Service states:

> "Control or eradication of noxious or exotic plant and animal species will be undertaken when they are undesirable in terms of public health, recreational use and enjoyment, or when their presence threatens the faithful presentation of the historic scene or the perpetuation of significant scientific features, ecological communities, and native species, or where they are significantly harmful to the interests of adjacent landowners."

C. STATEMENT OF THE PROBLEM

The most significant problem associated with feral burros in Grand Canyon National Park today involves competition with other animals for food and water. Burros are relatively large animals and consume a considerable amount of herbage, an important consideration in arid and semiarid environments where forage resources are limited. The crux of the problem is that the burro is an introduced exotic, and prospers more or less at the expense of native fauna. A virtual absence of predators and relatively prolific breeding habits result in rapid population increases. Predation, other than by man, can be a significant factor in determining wild burro populations (McKnight, 1958). The only predators capable of taking a mature burro are cougars (Felis concolor), wolves (Canis lupus), and jaguars (Felis onca), and all three are largely extripated in the areas where burros now exist in the United States. It is possible that coyotes (Canis latrans), bobcats (Lynx rufus), and eagles (Aquila chrysaetos) occasionally take a young or weakened burro.

Large mammals, including desert bighorn (Ovis canadensis nelsoni), mountain lion (Felis concolor), and mule deer (Odocoileus hemionus), are less numerous in the park than smaller mammals. The exception is the large number of exotic and feral burros that roam the park from Tanner Creek to the park's western boundary adjoining Lake Mead National Recreation Area.

Mule deer are present in the pinyon-juniper and Boreal forest associations of the South and North Rims, respectively. The total deer population of the park is estimated to be 2,500 individuals. A recent analysis of the problem in New Mexico (Koeler 1974) found evidence that the feral ass directly competes with native mule deer on certain ranges.

Desert bighorn occupy the remote Inner Canyon areas where their habitat requirements for food, water, escape terrain, and living space are fulfilled (Hansen 1968, 1971, 1972, 1973). Preliminary population surveys within the park indicate a decline in the desert bighorn population. Two factors have contributed to this decline: human use has encroached upon desert bighorn habitat; and feral burros have invaded large areas of the park wherein they compete with native bighorn, all resulting in a loss of habitat. See map on page 7 for burro distribution in the park. The precise distribution of bighorn sheep in the park is not known at this time.

The desert mountain ranges of southeastern California, southern Nevada, and Arizona (plus small portions of neighboring states) constitutes the last strongholds of bighorn in the Southwest. Much has been written about these animals (Russo 1956). In point of fact, burros and bighorns frequently compete on the same range, usually to the detriment of the bighorn. Theoretically, the bighorn is perhaps hardier than the burro, as it can inhabit rougher terrain and presumably

LEES FERRY

FISHTAIL

FOSSIL BAY

SWAMP PT.

LAKE MEAD N.R.A.

PARASHANT CANYON

WHITMORE CANYON

ANDRUS CANYON

PIERCE FERRY

APACHE PT.

PASTURE WASH

COLORADO RIVER

TANNER CANYON

HERMITS REST

GRAND CANYON VILLAGE

DESERT VIEW

BIG SPRING CANYON

GRANITE CANYON

SHANLEY SPRING

SANUP PLATEAU

SPENCER CANYON

DIAMOND

PEACH SPRINGS

DISTRIBUTION of FERAL ASSES

AREA of HEAVIEST CONCENTRATION

N

5 0 5 10 Miles

5 0 5 10 15 K.M.

DISTRIBUTION of FERAL BURRO in GRAND CANYON NATIONAL PARK

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has fewer watering needs. However, where there is competition between the two, it is the bighorn that yields (Dixon and Sumner, Ferry, Jaeger, McKnight, Sumner 1952, Dodge 1951). There seems to be four principal reasons for this. (1) Dietary limits of the burro are more flexible than those of the bighorn. It has been pointed out burros eat almost any edible vegetation. Bighorn sheep cannot subsist on some of the foods that sustain burros. (2) Bighorns have a higher mortality rate from parasites and diseases than burros. (3) Burros are probably more successful than bighorn in raising their young to maturity. Infant mortality is usually high among bighorn sheep, partially from predation, partially from climatic causes (bighorn lambing grounds are usually at higher altitudes than the places burro colts are born), and partially from diseases. Burro colts, on the other hand are more likely to escape infant mortality, although this generalization is based largely on speculation. (4) Perhaps most important of all is the "social attitude" of the two animals involved. The bighorn is shy, flighty, nervous and intolerant. It is inclined to vacate a competitive situation. Burro concentrations around water holes are avoided by bighorn. Rather than tolerate such conditions, the bighorn frequently will move to another area. The burro, on the other hand, is stolid, patient, relatively insensitive, and seems to thrive on competition (Moehlman 1974). Thus, the dilemma.

Competition between desert bighorn and feral burros for forage, water, and living space has been suggested as being the most serious wildlife management problem within Grand Canyon National Park. Occasional wild horses and trespass cattle compound this problem. All has led to the classification of the desert bighorn as a vulnerable species by the International Union for the Conservation of Nature and Natural Resources (1972).

Burros became established in Grand Canyon in the 1900's as prospectors and miners released these beasts of burden, either on purpose or accidentally. From 1924 to 1931, "burro hunts" were conducted in Grand Canyon National Park (Carothers, et al. 1975). The animals were shot with high powered rifles and left to decompose. During this 7-year period, 1,467 feral asses were killed. It was believed that the burro population in Grand Canyon National Park had been reduced to possibly 50 to 75 head, thus park biologists were confident that no more "burro hunts" would be necessary. Yet, between 1932 and 1956, an additional 370 animals were removed. Between 1956 and 1968, 771 more were destroyed with an additional 252 having been captured and taken out of the park. This represents a total removal of 2,800 feral asses from the park in the 45 year period from 1924 to 1969. No control has been attempted since 1969. One of the main reasons for the lack of control efforts has been the negative public sentiment engendered by the "burro hunts" of mid and late 1960's.

Discontinued reduction efforts led to today's feral burro population estimates of 2,000 to 3,000 animals. One response to this population increase and high population density has been territory expansion and subsequent usurpation of bighorn habitats (Douglas 1976). Today in Grand Canyon National Park, feral burros expand their range in direct response to curtailed control measures and the high rate of survival within burro populations (Weaver, 1972; Hansen, 1972 and 1973; and Ohmart, 1974).

A burro carrying capacity for Grand Canyon National Park of one animal per 15 square miles (Hansen 1972) was derived by considering forage and water requirements on optimum-quality burro habitat. In this case, carrying capacity is the maximum animal numbers which can be supported on an area over time without environmental deterioration, and optimum-quality burro habitat are those park lands adequately watered, of rolling brush-covered topography, and between 4,000 and 6,000 feet above sea level. Grand Canyon's inner canyon environs fit the above description very well. But even if all other acreage in the park, except stands of douglas fir, ponderosa pine, and spruce, were considered as optimum burro habitat (an area of approximately 1785 square miles) an even broader carrying capacity of one animal per 10 square miles would yield only 178 burros as maximum for Grand Canyon. This is compared to the estimated 2,000 burros now found in the plateau and Inner Gorge portions of the park.

Competition of the burro with native wildlife is only one of the severe ramifications of an excessive burro population within the park. Burros have devoured, nearly to root-collar level, the "candy" grasses such as Oryzopsis hymenoides within the heavier concentrated areas. Severe overgrazing by burros in this same area is punctuated by upsetting the normal population and distribution of other native mammal and plant species. Tables 1 and 2 show the result of comparative field studies sponsored by the National Park Service in 1974 and 1975. (Carothers, et al. 1975). Dramatic differences are shown regarding the number and composition of small mammal populations on the effect grazing has on vegetation. See Appendix C for a summary of those studies.

Heavy browsing activity by burros in the park is significantly affecting the structure of the riparian community. Burro trampling and pawing cause accelerated erosion; trailing and wallowing cause soil compaction. Such environmental damage is subject to slow recovery rates or irreversible consequences (Hansen, 1968 and 1973).

The following are additional adverse effects on the environment caused by the presence of burros within the park: spring and waterhole disturbance, contamination, or destruction; threats to fragile archaeological sites and trails; manure and flies on river campsites; and the aesthetic impact of viewing destroyed or damaged habitat.

The burro is thus a hardy competitor, capable of assuming a role of dominance in determining the fate of the natural vegetation and most herbivorous animals in a given area. Under present and foreseeable conditions, burro competition can only be controlled by man.

TABLE [1].--The line-intercept vegetation data summary for the control and impact study areas.

SPECIES		CONTROL				IMPACT			
		Relative Density	Relative Frequency	Relative Dominance	Importance Value	Relative Density	Relative Frequency	Relative Dominance	Importance Value
SHRUBS									
Acacia greggii [1] [2]	a.	01.40	8.24	22.02	31.66	14.98	22.31	23.92	61.21
	b.	15.69	16.28	26.73	58.70	35.22	32.93	26.00	94.15
Baccharis Sergilloides	a.	---	---	---	---	00.96	01.65	03.00	05.61
	b.	---	---	---	---	02.27	02.44	03.26	07.97
Brickellia Longifolia	a.	---	---	---	---	02.90	04.96	01.68	09.54
	b.	---	---	---	---	06.81	07.32	01.83	15.97
Larrea tridentata	a.	01.40	09.41	13.41	23.95	03.89	03.30	02.47	09.66
	b.	15.69	18.61	15.94	50.24	04.54	04.87	02.68	12.09
Lycium pallidum	a.	---	---	---	---	00.48	00.83	00.24	01.55
	b.	---	---	---	---	01.14	01.22	00.26	02.62
Prosopis juliflora	a.	05.43	32.94	44.15	82.51	21.26	34.70	60.65	116.62
	b.	60.78	61.63	53.59	176.00	50.50	51.22	65.95	167.17
Sueda torreyana	a.	00.70	01.76	03.07	05.53	---	---	---	---
	b.	07.84	03.49	03.73	15.06	---	---	---	---
SUB-SHRUBS									
Chaenactis fremontii	a.	00.52	02.35	00.18	03.05	---	---	---	---
	b.	26.09	26.65	08.28	61.02	---	---	---	---
Cyrptantha spp.	a.	00.79	02.35	00.18	03.32	---	---	---	---
	b.	39.13	26.50	08.28	74.06	---	---	---	---
Dynnodia pentachaeta	a.	---	---	---	---	00.96	01.65	00.15	02.86
	b.	---	---	---	---	11.76	13.32	03.47	28.55
Encelia farinosa	a.	00.00	00.59	00.25	00.93	03.86	04.96	03.33	12.15
	b.	04.35	06.68	11.59	22.62	47.06	40.03	78.87	165.96

Table 1.-- cont.

Ephedra spp.	a.	---	---	---	---	00.96	01.65	00.12	02.73
	b.	---	---	---	---	11.76	13.32	02.84	27.92
Lepidium montana	a.	00.44	02.35	00.48	03.27	---	---	---	---
	b.	21.74	26.65	21.85	70.24	---	---	---	---
Opuntia spp.	a.	---	---	---	---	00.48	00.83	00.29	01.60
	b.	---	---	---	---	05.88	06.69	06.94	19.51
Porphyllum gracile	a.	00.09	00.59	01.07	01.75	01.93	00.33	03.30	05.56
	b.	04.35	06.68	49.34	60.37	23.53	07.89	26.63	58.05
Sphaeralcea fendleri	a.	00.09	00.59	00.01	00.69	---	---	---	---
	b.	04.35	06.68	00.66	11.69	---	---	---	---
GRASSES									
Bromus [3] rubens	a.	43.13	28.24	07.85	79.22	45.41	20.35	00.85	66.61
	b.	48.22	72.73	52.89	173.84	95.92	85.00	90.14	271.06
Festuca spp.	a.	00.87	00.59	00.09	01.55	01.98	00.48	00.09	04.50
	b.	00.99	01.52	00.58	03.09	04.08	15.00	09.86	28.94
Plantago spp.	a.	20.56	04.71	04.01	29.28	---	---	---	---
	b.	23.18	12.12	22.95	58.25	---	---	---	---
Sporobolus contractus	a.	24.50	05.29	03.50	33.29	---	---	---	---
	b.	27.61	13.63	23.58	64.82	---	---	---	---

[1] Data summary comparing density, frequency and dominance of all species in cat-claw/mesquite area.

[2] Data summary comparing density, frequency and dominance only between species of similar strata, i.e., shrubs, sub-shrubs and graminoids.

[3] Exotic weed speices.

Table 2. Small mammal population densities on the two study areas.

209 MILE CANYON (IMPACT)

Species	Absolute Density (per hectare)						Relative Density (percent)						
	Mar	May	Jun	Aug	Nov	Jan	Mar	May	Jun	Aug	Nov	Jan	$\bar{x}$
Peromyscus eremicus	30.4	9.4	8.2	9.1	7.7	2.9	97	94	76	66	85	67	80.0
Peromyscus crinitus	0.0	0.3	2.3	4.4	1.4	1.4	0	3	23	32	15	33	17.5
Peromyscus boyleii	0.3	0.0	0.0	0.0	0.0	0.0	1	0	0	0	0	0	0.2
Perognathus formosus	0.3	0.3	0.3	0.3	0.0	0.0	1	3	2	2	0	0	1.3
Neotoma lepida	31.3	10.0	10.8	13.8	9.1	4.3	100	100	100	100	100	100	100.0

Average total Absolute Density, March 1974 to January 1975 = 13.2 mammals per hectare.

GRANITE PARK (CONTROL)

Species	Absolute Density (per hectare)						Relative Density (percent)						
	Mar	May	Jun	Aug	Nov	Jan	Mar	May	Jun	Aug	Nov	Jan	$\bar{x}$
Peromyscus eremicus	53.5	35.3	43.2	27.7	11.4	11.4	60.0	65.0	64.0	45.0	56.0	65.0	59.2
Peromyscus boylii	0.3	0.0	0.3	0.3	0.0	0.0	0.3	0.0	0.3		0.0	0.0	0.1
Perognathus intermedius	34.3	18.7	23.5	31.3	8.6	6.0	39.0	34.0	35.0	51.0	42.0	34.0	39.2
Neotoma albigula	0.8	0.5	0.8	2.5	0.3	0.2	0.7	1.0	0.7	4.0	2.0	1.0	1.5
TOTAL	88.9	54.5	67.8	61.8	20.3	17.6	100.0	100.0	100.0		100.0	100.0	100.0

Average total Absolute Density, March 1974 to January 1975 = 51.8 mammals per hectare.

D. PROPOSED ACTION PLAN

The effectiveness of the proposed resource management action is based upon the close relationship of field activities with research needs. High priority items in each of these fields should be considered as a single management package.

1. Management Actions

The numbers and densities of burros in Grand Canyon National Park exceed the environmental capability to sustain feral populations without significant, possibly irreparable, damage. Two management actions are available that address the park's estimated burro population of 2,500 animals and its effects on the environment:

a. Immediate Action: Elimination of all feral burros by direct reduction - Shooting.

Methods: Direct reduction by shooting with high-powered rifles and leaving carcasses in situ is the main method to be used in the park's burro elimination program. Mechanical silencers will be used as necessary. Shooting activities would be conducted in the more remote portions of the park, and/or during the winter when visitation is low in order to minimize visitor disturbance. Areas where shooting would be conducted would be temporarily closed to backcountry travel for visitor safety. Shooting would be accomplished by qualified Park Service personnel under the following plan.

This project will include the combined use of park resources including aircraft, river rafts, horse patrols, and foot patrols maintained over a 5-year period. Table 3, following page, shows a cost breakdown. Motorized vehicles, such as aircraft and rafts, will be used only for the transporting of management personnel to areas of burro habitation. Present federal laws prohibit animals from being shot from mechanized vehicles.

That part of the Tonto Plateau lying south of the Colorado River from Tanner Creek to Hermit Creek will be cleared of burros using foot and horse patrolmen. Remnant populations in the Pasture Wash area will be cleared in this manner also. An estimated 60 man/days will be needed for the first year's operation. Fourteen man/days per year will be needed for the 4 remaining years. Total man/days needed include, 115 at an estimated cost of $11,810. This money will buy, at least, two foot or horse patrolmen which will cover the plateau eliminating burros as they are encountered. High visitor use areas will be treated with emphasis on aesthetic impact. This means removing carcasses when necessary.

TABLE 3. Action Plan Cost - Shooting
(5-Year Program)

METHOD	Needed Staff	x	Needed Days	=	Man Days	Salaries (GS-9)	Supplies & Equip.	Helicopter Hours	Helicopter Costs	Total Costs
1st year										
Foot & Horse	3		20		60	3,730	1,520	2	480	5,730
River Patrol	3		40		120	7,460	2,000	---	---	9,460
Helicopter	2		13		26	1,665	1,000	100	24,000	26,665
										41,855
2nd year										
Foot & Horse	2		7		14	870	410	1	240	1,520
River Patrol	3		20		60	3,730	1,000	---	---	4,730
Helicopter	2		5		10	622	200	40	9,600	10,422
										16,672
3rd year										
Foot & Horse	2		7		14	870	410	1	240	1,520
River Patrol	3		20		60	3,730	1,000	---	---	4,730
Helicopter	2		5		10	622	200	40	9,600	10,422
										16,672
4th year										
Foot & Horse	2		7		14	870	410	1	240	1,520
River Patrol	3		20		60	3,730	1,000	---	---	4,730
Helicopter	2		5		10	622	200	40	9,600	10,422
										16,672
5th year										
Foot Patrol	2		7		14	870	410	1	240	1,520
River Patrol	3		20		60	3,730	1,000	---	---	4,730
Helicopter	2		5		10	622	200	40	9,600	10,422
										16,672
									TOTAL	108,543

The Inner Canyon population of burros will be controlled through combination river raft/foot patrols. 120 man/days for the first year will be needed to effectively eliminate the river population. The following 4 years will require 60 man/days per year for a total of 360 man/days needed. Estimated costs include $28,380.

This phase of the elimination program involves managers floating the river and collecting all animals within reasonable hiking distance. Generally, this means covering the shore up to the Tapeats Formation and approximately 1 mile into the mouths of canyons. This phase of the project will be most effective from Whitmore Canyon to the headwaters of Lake Mead.

The most costly, but paradoxically the most efficient, reduction technique will involve the use of a helicopter. This aircraft will be used to transport managers to remote areas of the park. This includes: all areas of the Tonto Plateau not covered by foot and horse patrols; Big Spring and Fossil Bay Canyons; the terraces on both sides of the river in proximity to the Great Thumb; and the total area between the north park boundary and the Colorado River from Andrus Canyon to Pierce Canyon. This area is generally described as the Sanup Plateau area. It includes known concentrations of animals in Andrus, Two Hundred and Nine Mile Canyon and the area around Shanley Spring.

Based upon helicopter time needed in research projects involving locating and collecting burros, it is estimated the 5-year program will require 264 hours of flight time. This translates to $68,353.

Grand total for the 5-year program is $108,543.

In addition to the above program, the park will encourage giving away animals to individuals willing to care for them and willing to collect them in the field. This tactic is not considered to have any resource management benefits beyond public relations.

b. Preventative Action - Exclusion of feral burros. A second aspect of Grand Canyon's burro control plan is exclusion... fencing designed to prevent entry onto park lands.

1. Fencing of parts of the park boundary to preclude feral burro entry into the park from adjacent non-NPS lands is required to facilitate an effective burro population control program. Exact locations and extent of needed fencing must be determined through a

concerted program of locating burro range and ingress points. This project is identified in this document as a research need. Otherwise, direct reduction activities might result in unintentional regional population reductions as burros inhabiting neighboring lands move onto the park. Such activities would at a minimum necessitate the installation of sections of boundary or drift fence across routes of burro ingress. To reduce the cost of fencing, initially it would block only traditional routes of entry, and would be tied into natural barriers in sections as determined by field survey.

2. Internal drift fencing may also be required to define each management area where direct reduction or other control measures take place to allow systematic removal of feral occupants, to prevent scattering of feral animals, and to prevent their re-entry into areas already cleared. At the present time, it is not possible to quantify the number of miles of drift fence that would be required for a control program. The amount of fencing will be determined after a field survey is completed, a time schedule established, and personnel requirements fully identified.

3. Barrier fencing may be needed in some areas of the park to protect natural springs critical to the native park fauna. Fence design will exclude burros and allow bighorn and deer access to springs. Such a barrier fence has been installed after a design suggested by Helvie (1971). Such fences would be required for the duration of the control program. In order not to place undue stress on burros frequenting these springs, such exclosures will be constructed during the cooler, winter months when burros are more widely dispersed and not so dependent on one or two sources of water. In this manner, traumatic curtailment of access to water will be avoided, and affected animals will be able to move to areas where water is available.

4. In addition to barrier, drift, and boundary fence installations, continued long-term inspection and maintenance will be required to keep the fences in repair. Principal threats to park fencing include destructive flash floods and burros riding down fences to gain park access or access to lands adjacent to the park. Fenceline disrepair would permit continued burro movement onto and from adjacent lands, or burro re-entry into sections of the park already cleared of feral burros, thereby necessitating the duplication of control measures.

2. Research Needs

Natural resources research is a prerequisite to all phases of planning and resource management. Four kinds of knowledge are needed: (1) the current condition of the park's natural resources; (2) the primeval condition of these resources; (3) the most feasible methods of restoring the resources and associated environmental influences to the natural ecological state required for their continuing natural evolution, and (4) what ecological successional processes are operative. Trends in resource deterioration must be identified in order to stop or minimize detrimental influences.

There has been significant research conducted with feral burros in several National Park Service areas including Grand Canyon National Park. Ongoing research projects within Grand Canyon include investigations of population dynamics and vegetative recovery rate surveys. These projects are being conducted by the Museum of Northern Arizona under contract with the N.P.S.

Following are research projects proposed as park staff or contracted undertakings. The research program is ongoing and changes may take place in priority or subject, depending on the state of resource management.

a. Determine exact fencing needs to eliminate burro ingress from surrounding areas.

   Exact parameters concerning burro dispersal and ingress points are not known. A survey of these accesses and recommendations for specific fencing requirements must be undertaken to make reduction efforts effective and insure the permanence of the management action plan. This research and resultant recommendations must be carried out in close chronological proximity to the reduction program. An estimated $10,000 will be needed to survey the park for fence recommendations. This money is identified and included in the Natural Resource Project Statement entitled: "Sanup Plateau Boundary Survey (GRCA-RM-2)."

b. Pre-Construction Archaeological Survey on Fence Right-of-Way

   Executive Order 11593 requires a survey of archaeological resources be conducted prior to any construction work. This law will pertain to all fence proposals stemming from the burro control program.

E. RELATIONSHIP TO OTHER PROJECTS

The proposed action plan has been coordinated with other park planning documents. These include: the wilderness proposal and a forthcoming Resource Management Plan. In addition, the proposal is synchronized with the recently completed Colorado River Study (a contracted National Park Service research project).

The Arizona Game and Fish Department has been kept abreast of the park's intent and time schedule for burro control.

The Natural Resource Management Plan for Lake Mead National Recreation Area has identified feral burros as a resource problem. Initially, the plan proposes a study to document and assess burro impact. This study will form the basis of possible management plans.

The burro management policy for Lake Mead National Recreation Area is as follows:

> "In wilderness areas, where burros are determined to be competing directly with desert bighorn and in those areas where burros are seriously damaging the environment, control measures will be undertaken. In the non-wilderness areas (all prime bighorn habitat in the Recreation Area has been proposed as wilderness) and in areas where burros are not creating environmental damage, they will be retained as part of the recreational scene for the enjoyment of park visitors. Burro numbers throughout the Recreation Area will be maintained at levels which are not detrimental to the environment."

Since most of the lands adjoining the park and recreation area are proposed as wilderness zones, the control measures for both areas can be coordinated to minimize costs and achieve maximum results towards maintaining an optimum habitat for native biota.

III. ENVIRONMENTAL ASSESSMENT

A. DESCRIPTION OF THE ENVIRONMENT

1. General

The 1,218,375 acres of the Grand Canyon National Park lie adjacent to the Colorado River in northern Arizona. The park extends for 277 miles along the Arizona portions of the Colorado River, from Glen Canyon National Recreation Area at Lees Ferry to Grand Wash Cliffs. The park, thus, extends east-west across the southern portion of the Colorado Plateau; a vast, semi-arid land of raised plains and basins. Dividing the park into north and south portions is the 277-mile-long Grand Canyon, which ranges from 1 to 20 miles in width and is up to 1 mile in depth. Elevation within the park ranges from 1,200 feet at the western portion where the Colorado River enters Lake Mead, to 9,165 feet on the North Rim. Lake Mead National Recreation Area adjoins the complex along its western boundary. P.L. 93-620, dated January 3, 1975, incorporated Marble Canyon National Monument; Grand Canyon National Monument; portions of Lake Mead National Recreation Area, the Kaibab National Forest, national resource lands (Bureau of Land Management); and other lands into the present park.

2. Cultural Resources

The archaeological resources within the park are of a primary scientific and historic value. The initial occupation of the canyon began about 4000 years ago by people of the Pinto Basin Complex. After this occupation, an apparent lapse of several thousand years occurred before the canyon was once again occupied by culture groups representing Coconino, Kayenta Anasazi, Virgin Anasazi and Cerbat Tradition as evidenced by pottery, structures, fire pits and lithic material. This phase of occupation occurred approximately between A.D. 700 and 1200.

Today's Hualapai and Havasupai Indians are descendents of these earlier culture groups and their reservations bound the southwest section of the park. The Navajo Reservation adjoins the eastern boundary of the park and they likewise have traditionally used portions of the canyon for religious purposes.

The park may well contain clues to solutions for many unresolved archaeological research problems encountered in other areas of the southwest. Present burro damage to these sites include trampling and wall destruction by rubbing and wallowing. The management proposal will have the effect of eliminating this situation.

In accordance to Executive Order 11593, archaeological surveys will be conducted prior to fence construction. The need for further investigation into burro impact on this resource has been identified as a research need.

3. Human Use and Influence

The proposed resource management action plan will have an influence on human use in respect to backcountry, hiking along the Inner Canyon trails and river use access to the Inner Canyon below the rim is by foot, horse or mule, and by raft from Lees Ferry, Arizona. In 1975, more than 200,000 visitors entered the Inner Canyon by foot or mule-back and 14,305 users entered the canyon by boat. An aspect of all these visits is the viewing of burros and burro impacted areas. Burro viewing may be considered as part of the visitor experience. Burro impact on the environment is readily apparent i.e., dung, wallows, flies, and damaged vegetative cover.

Because park visitors and feral burros share common ranges, the influence of management activities must be closely addressed. The plan recognizes the adverse effects of having armed managers and helicopters circulating throughout the park in relation to the typical backcountry visitor. It is also recognized the short-term effects of burro carcasses lying about the park as an adverse influence. Measures addressing this influence are listed in the section of this report entitled Mitigating Measures included in the proposed action plan (page 24).

4. Probable Future Environment Without the Proposal

The future environment of Grand Canyon National Park without the proposed plan will continue to deteriorate. Impact will include the following adversities:

Competition will continue between burro and bighorn sheep within the park. Though the exact parameters of this competition are not now known, it can be inferred from similar situations in other areas that the sheep will be adversely affected.

Obvious soil disturbance, erosion and landscape scarring generated by feral burros will increase in present impact areas and spread to new areas as burros spread.

Change in the structure of park vegetation communities and the possible elimination of endemic, threatened, or endangered plants and animals will continue and the effectiveness of future management proposals regarding bighorn sheep will be reduced or nullified.

The sociological impacts of viewing burros and burro damage in Grand Canyon National Park will continue.

The change currently undergoing native rodent and reptile species as a result of burro impact will continue.

B. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION
(See Also Appendix A for Tabular Summary)

One of the most obvious results of the burro management program would be the presence of burro carcasses scattered in reduction areas, their number dependent on program length and intensity, and whether or not burro ingress was restricted. This number of carcasses would temporarily support desert scavengers such as the turkey vulture, fox, and coyote. The carcasses would be aesthetically objectionable to some visitors frequenting control areas following direct reduction activities.

Although substantial evidence points toward increasing environmental damage to Grand Canyon as long as feral animals remain at excessive population levels, some individuals feel the removal of any animals is objectionable in any form. Other individuals believe that burros belong in the park as a complement to its historic scene. Conversely, the presence of feral animals in an area designated as natural is as objectionable to others. (See Management Objectives page 5.)

Shooting large numbers of burros may result in selection of wary individuals that learn to avoid hunters by hiding among rocks, or that blend in better with their background. Individuals then may be driven to the park's roughest terrain where they will have the best chance of survival, and the greatest likelihood of competing with desert bighorn. This might also significantly bias possible research of unmanaged feral burros in the park. However, opportunity to study unmanaged herds outside the park is available.

Shooting of burros with rifles would exchange stress of trapping for the stress of pursuit, with the possibility that an inaccurate shot might result in a less than instantaneous death.

The greatest impact of direct reduction and other management activites will be the onset of environmental restoration. Wallows will stabilize through establishment of vegetation responding to relief from overgrazing. Gully erosion will begin to heal in response to vegetation establishment and recovery, and to elimination of trampling and trailing, especially in the vicinity of select feeding locations, watering places, and where physical barriers such as narrow canyons and passes channel animal movements. Vast areas subjected to mechanical surface disturbance and compaction and subsequent sheet erosion will begin to stabilize through establishment of annual vegetation and mycelia (a network of threadlike tubes similar to roots but produced by fungi). Plants extirpated from overgrazed areas may return, thereby restoring integrity to adversely affected communities. Relief of grazing pressures may allow plants, as well as plants identified in the future as threatened, endangered, or endemic to regain vigor and a chance for continued existence.

Continued spring contamination due to large concentrations of burros will be eliminated, ensuring the survival of some of the small springs vulnerable to compaction and excessive use. Dependent aquatic and terrestrial fauna will also survive. Competition between burros and bighorn which prompted bighorn to vacate sections of the park will not occur elsewhere, and may permit the native bighorn to reoccupy historical range. Small mammals and reptiles, such as rodents, will respond favorably to increased vegetation establishment and vigor brought by removal of burro overgrazing pressures.

The current unknown number of archaeological sites occurring within feral burro range within the park would no longer be jeopardized by trampling and trailing. Archaeological sites in Shinumo Creek, Tuna Canyon, White Creek, Turquoise Canyon and many other areas have been severely disturbed by burros according to surveys conducted by the staff park Anthropologist. Generally, Indian trails which lead from sites to springs, as well as those sites in the immediate vicinity of springs, will receive the greatest relief through burro control.

The most convenient and economically feasible method available to dispose burro carcasses is to leave them in situ to decompose naturally. Despite the potential value of burro carcasses as a source of protein and as study subjects, field recovery and transport would prove impractical. At China Lake Naval Weapons Station, California, a mid-1960 sampling of 125 burros was conducted over a 2-year period. Carcasses were left in place to decompose and recycle naturally, and were scavenged by indigenous fauna, including turkey vultures, raptors, coyotes, foxes, small rodents and insects. Subsequent decay in the hot, arid environment then obliterated all signs of killing except for scattered, dry bones.

In areas of heavy visitor use every effort will be made to drive the animals to more remote areas before they are destroyed. If this cannot be done practically, the carcasses will be removed with the aid of helicopters. Areas of the park related to this problem include: Indian Gardens; the Bright Angel, Kaibab, Hermit, and Tanner Trails. No animals will be killed and left on any beach of the Colorado River or near springs or other water sources.

One major effect that boundary fencing will have is the blocking and then the movement along the fencelines by burros seeking a way through or around the fence. Trails adjacent to the fence, in addition to that created by fence construction, will result. Soils will be compacted, nearby vegetation will be removed, possibly to the extent that typical fenceline contrasts will result as outside vegetation is hedged and inside vegetation begins to recover. Where these fenceline trails diagonally transect mountain slopes, runoff during periods of heavy rainfall will be intercepted and concentrated. Changes in soil moisture regimes then may result in significant changes in total vegetative cover and reproduction on the downhill side of these newly formed trails, again accentuating fence construction scars.

The construction of fences may also have impact on archaeological sites occurring along fence routes. To mitigate this, a pre-construction survey of all proposed fence routes will be made by qualified archaeologists. Should any sites be located along proposed fence right-of-ways, the fence will be re-routed.

Traditional movement of indigenous fauna may be occasionally interrupted. However, proper fence design employing smooth bottom wires, properly spaced, in conjunction with barbed wire, will make it possible for bighorn sheep to pass unscathed through the boundary fence, continue to allow deer to jump over the fence, while dissuading burros from trying to push the fences over or ride them down in order to gain park access.

This action alone will not eliminate population increases. As control measures are taken, biological compensators such as increased survival of offspring will occur. Even though tied to natural barriers, burros may persist in entering the park over the more difficult terrain between each of the proposed sections of fence. Even fencing of the boundary is no guarantee that feral burros would be permanently excluded from the park.

During fence installation the noise, dust, and other distractions associated with fence construction would result in disturbances to native wildlife and park visitors frequenting areas within earshot or sight of such activities.

Environmental impacts of internal drift fencing, however temporary, would be identical with those of the boundary fence. If a wilderness area is created within Grand Canyon National Park, internal drift fencing would intrude upon the intended natural scene. Following removal of these fences after control programs are completed, scarring caused by burros trailing alongside the temporary, internal drift fences would persist for years, according to the length of time the fences are in place.

Fence repair activities will continue intermittently, generating vegetation disturbance and temporary wildlife disruptions within sight and hearing distance along a 1-mile corridor. Periodic inspection and maintenance will be required for the life of all boundary fencing. As long as neighboring lands harbor feral burros, there will be a need for boundary fencing to exclude them from the park.

Currently, eight permittees hold cattle grazing allotments within Grand Canyon National Park. Four of these permits will have to be considered in terms of fencing proposals. These permits are to be terminated by 1984. A careful analysis of this situation in terms of: whether or not the permit is actually being used; adjoining land use; critical water needs; possible overlapping bighorn sheep/burro/cattle range; and possible cattle access methods and routes will be undertaken as part of the fencing program.

C. MITIGATING MEASURES

The following measures are included in the proposal to lessen adverse impacts:

A research study, as part of this proposal, will reveal the most efficient method of fence installation and, therefore, promote minimal visual impact.

Fencing will be of such construction it will not interfere with the movement of native wildlife.

In compliance with E.O. 11593, archaeological surveys will be made prior to the installation of any fence.

Carcasses will be removed from high visitor use areas such as Indian Gardens and along heavily used hiking trails. No killing will be conducted within view of the public and elimination of animals in these immediate areas will be conducted by foot and horse patrolmen only. No carcasses will be left around any spring or water source.

If it is possible to purchase or otherwise obtain them from another government agency, the weapons used in the elimination will be mechanically silenced to minimize report. Shooters will be screened to obtain maximum accuracy to minimize the chance of wounds and lingering death.

Helicopter use will be restricted around heavy visitor use areas to minimize noise impact.

Wherever shooting is occurring, the appropriate canyon or drainage will be closed to visitor use. All efforts will be made to insure public safety.

D. ANY ADVERSE EFFECTS THAT CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

The proposed actions are designed to restore and maintain the natural environment flora and fauna. Should the elimination and fencing plans be implemented, it will involve the following adverse effects:

Aircraft noise will increase with the use of the park's helicopter for personnel movement.

Temporary anxiety in animals sought, and disturbance to native wildlife in the vicinity of direct reduction activities.

Artificial selection of individuals that are wary, protectively colored, or living in remote sections of the park where burro/bighorn competition may be relatively critical.

Likelihood that occasional individuals will not experience immediate death because of personnel and equipment limitation.

Scattered burro carcasses in areas subjected to direct reduction activities. Short-term aesthetic displeasure to backcountry visitors encountering carcasses.

Short-term scavenger increases in sections of the park where direct reduction activities take place.

Eventual elimination of research opportunities to study wild, free-roaming burros in the park.

Implementation of a continuing direct reduction program to preclude future population recovery.

Temporary inconvenience to park visitors wanting to visit backcountry areas closed during direct reduction activities.

Short-term disturbances to native wildlife and park visitors during fence construction and maintenance activities.

Disturbance of an intermittent strip of land of a presently unknown dimension surrounding the park.

Fenceline contrasts of varying magnitude generated by burros trailing along fence, use of outside habitat, and recovery of inside habitat.

Intrusions upon the wilderness setting of park backcountry adjacent to or within sight of boundary fencing.

Concentration of feral burros at alternate areas unprotected by barrier fencing.

E. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed management plan will involve the short-term use of park lands for purposes other than legislative intent. These temporary uses will be compensated by the achievement of desired long-term productivity associated with a burro free habitat and natural environment. These relationships are:

The short-term need for fence construction to achieve the desired state of a non-burro impacted park and long-term productivity of a natural habitat.

The recognized need to temporarily maintain armed patrolmen in the park environment is compensated by long-term benefits of eliminating burro impact and the resultant recovery of disturbed areas.

The short-term effects of aircraft visual and noise pollution will be compensated by the achievement of park management objectives regarding maintenance of a natural scene and control of exotic species.

The elimination of short-term aesthetic benefits of burro viewing within the park will be substituted by increased opportunities to view native wildlife and experiencing undisturbed desert habitat in present impacted areas of the park.

F. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES THAT WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

No nonrenewable resources such as critical wildlife habitat, threatened species, or paleo-archaeological remains will be lost due to any of the proposed resource management action plans.

G. MANAGEMENT ALTERNATIVES CONSIDERED

The following alternatives were considered as possible action plans for the feral burro problem. A summary of effects is listed in Appendix B. These alternatives have been eliminated from consideration for reasons of their being: impractical, too costly, inefficient, or against the concepts of management for Grand Canyon National Park. They are:

1. No Action

   This alternative would result in the conscious neglect of identified resources management problems facing Grand Canyon National Park. Springs and seeps adversely affected by large animals will continue to limit the ability of park habitat to support park fauna. The park's feral burro population would increase and expand its range, causing accelerated soil erosion to such degree that aesthetics, natural drainage patterns, and nutrient regimes are permanently scarred or altered; increased contamination or destruction of water sources critical to the survival of indigenous fauna; increased damage to park cultural resources, especially sites vulnerable to trampling or other forms of surface disturbance, possibly to the extent that even professional study and interpretation would not be possible; substantial alteration of park's habitat, as exemplified by elimination of key forage species and component changes within portions of the area's blackbrush and Sonoran communities; and possible extirpation of native animals such as the desert bighorn.

2. Manage the Feral Burro Population

   a. Elimination of feral burros. This alternative would entail any combination of trapping and euthanasia (the act of inducing painless death) of approximately 2,500 or more feral burros.

      (1) Trapping and subsequent relocation of captured animals is one option available for the elimination of burros from Grand Canyon National Park. As an interim measure in controlling the burro population, the park has, in the past, allowed permittees to live-trap feral burros from overpopulated areas for sale to slaughter houses and other commercial outlets. This was accomplished in cooperation with the Arizona Sanitary Livestock Board which issues ownership and transfer permits.

      This practice was followed for several years during the late 1950's and early 1960's. Approximately 250 animals were disposed of in this manner. But because of the roughness of the terrain and the logistics involved it was determined, by permittees, this was not a money-making proposition. The Wild Horse and Burro Protection Act of 1971 (P.L. 92-195) subsequently outlawed commercial exploitation of these animals.

Trapping of feral burros for relocation to other areas outside the park might be possible if those areas were capable of supporting the additional load. Throughout the western and southwestern United States there are between 8,000 and 10,000 feral burros (National Advisory Board for Wild, Free-Roaming Horses and Burros, 1975)--approximately 2,500 of which are found in the park--in numbers exceeding many area carrying capacities, even on nearby Bureau of Land Management, Indian reservations, and U.S. Forest Service lands. Relocation of burros to lands outside the park would require agreement between the National Park Service and other land-managing agencies. Relocation would result in increased, often times concentrated, impacts elsewhere, and continual ingress to reach equilibrium states would probably occur. The larger question of burro management under various land-management policies and the appropriate place for the wild, free-roaming burro on desert lands would remain untreated.

The construction of traps and required holding corrals will cause local vegetation, soil, and wildlife disturbances for the duration of the trapping program. In order to be most effective, traps and holding corral facilities must be located at points of burro congregation, such as at springs, readily accessible to truck traffic for ease of animal relocation. Few areas in the park offer these conditions. As these areas are cleared of animals, additional traffic sites in the vicinity of population concentrations would be required. Maintenance and use of traps and holding corrals would result in the temporary intrusion of structures, handling facilities, and local truck traffic in the vicinity of those facilities for the duration of the project. Impacts such as the following would continue and possibly intensify at least in the vicinity of trap sites: soil disturbance and compaction and resultant small mammal and reptile population declines; increased erosion and scarring caused by trampling; wallowing and trailing; destruction of vegetative cover, generated by feeding habits and trampling, needed for nesting, roosting, and watering of birds and as protection and food sources for small mammals; and contamination of springs.

Following project completion and removal of structures, areas disturbed would be slow to recover through natural succession, and might provide ground suitable for the establishment of several exotics such as Russian thistle, cheatgrass, and tamarisk.

Prior to construction of additional traps, corrals, or other required facilities, archaeological clearance must be obtained for such site development to ensure that cultural resources will not be threatened or lost.

Site selection for traps and holding corrals would be partially based on effective site restoration in the future. Sites would be located on as level ground as is possible to prevent accelerated downslope erosion and soil loss. Critical habitat areas, including those containing threatened or endangered plant forms, will be avoided. Traps and corrals will be provided with adequate feed and water. The public will be informed about the availability of burros which may be obtained for pets or beasts of burden, thereby providing opportunities for live removal of a maximum number of animals.

(2) Trapping followed by euthanasia of captured individual burros, according to methods determined to be humane by professional veterinarians, form another alternative available for population control of the feral burro in the park. Such a management program would be based on consideration of humane treatment of animals, safety of personnel involved, economic feasibility of the method, compatibility with agency objectives and area needs, and potential environmental impact.

Following capture, and if burros cannot be relocated outside the park, professionally recommended pharmacological agents would be used by trained personnel to euthanize animals. This method requires effective restraint of each individual. Animals inhabiting sections of the park remote from trap sites, or that are exceptionally wary would remain at large. However, following capture, burro reductions would not depend on the availability of individuals or other land-administering agencies willing to accept transplanted or relocated burros from the park.

b. Retention of managed burro herds. This alternative considers retention of feral burros within Grand Canyon National Park in numbers considerably reduced from existing population levels. Population control methods specified in the preceeding alternative would also apply, but would not be aimed at total elimination.

Range investigations by Hansen suggest a park carrying capacity for burros of one animal per 15 square miles, based on optimum burro habitat (lands that are adequately watered, brush-covered, with rolling topography between 4,000 and 6,000 feet above sea level). If this optimum figure is expanded to more accurately reflect the park burro habitat including lands between elevations of 3,000 and 8,000 feet above sea level--and by applying a more subjectively derived carrying capacity of one animal per 10 square miles, the park's burro carrying capacity amounts to approximately 178 individuals.

Herd management would require continual surveillance of burro movements and population numbers and distribution. Intensive monitoring of habitat conditions would be essential for carrying capacity refinement and proper management. A minimum of several exclosures and associated vegetative transects per management area would be required to monitor habitat conditions and rates of recovery and succession. Boundary, drift, and barrier fencing required to exclude burros from neighboring lands and to ensure that herd dispersal and exclusion from critical habitats or sensitive resource areas--such as springs, archaeological sites, or areas supporting endemic, threatened or endangered species--is maintained.

Removal of the population annual increment, requiring at least a continuous trapping and relocation or trapping and euthanasia program, would be necessary to maintain the population within carrying capacity. If internal drift fences are installed permanently, captured individuals from sections of the park determined to be overpopulated would be relocated to sections of the park capable of accepting additional animals, if managed herds are maintained and vacant areas are available.

Burro competition with native fauna would be reduced over most of the park. However, waterhole competition--the most critical factor limiting the park's desert bighorn distribution--would remain locally high. The increased availability of alternative watering sites, or continued barrier fencing of those critical to desert bighorn, would reduce the significance of such competition to tolerable levels. The continued presence of feral burros at springs would affect endemic invertebrates. Systematic sampling of all park springs would probably disclose additional endemics. Research involving Grand Canyon burros would continue, possibly shedding light on burro management problems in other arid areas of the Southwest.

Localized browsing and trampling of vegetation would continue, as would soil compaction, trampling and wallowing. Reduced grazing pressure and mechanical damage to vegetation and soils would occur, allowing restoration without artificial rehabilitation. However, this damage would continue in the vicinity of waterholes and riparian habitat.

Cultural resources in areas frequented by a managed herd would continue to be subjected to damage and possible destruction by feral burros. Locally, erosion and vegetation changes are likely to continue, as might competition with native forms of wildlife. Visitors

would continue to be able to have opportunities to view wild, free-roaming burros within the park, rather than on adjacent lands. Continued maintenance of a managed herd of exotic animals within a natural area of the National Park System compromises management policies and park management objectives.

c. Establishment of a burro viewing area. This alternative proposes the elimination and exclusion of feral burros from the park, except for individuals retained in a viewing area accessible to visitors. An area of unspecified dimensions could be fenced in a manner which would not allow burros to move out of the enclosure. The area selected would require water, feeding, and maintenance as well as visitor access. One of the only areas in the park easily reached by visitors and park staff is at Indian Gardens.

This area currently is a burro stronghold. The presence of a burro herd in the Indian Gardens would conflict with the long-range use of the area and with resource management objectives for Grand Canyon National Park.

d. Sterilization of feral burros. This alternative involves sterilization of burros to eliminate annual increment and allow natural attrition to reduce the park's burro population. No immediate relief of environmental pressures to Grand Canyon ecosystems would result, and no long-term relief would result since untreated animals and their offspring and recent immigrants would be present.

Methods potentially suitable for sterilization of park feral burros include the use of chemosterilants, mechanical castration, irradiation, or ultrasonics. The use of chemosterilants, chemical compounds that can produce sterility, appears impractical because of the lack of acceptable, selective drugs and application methods. Sterilization by castration changes hormone balances, thereby inducing behavioral changes in all gelded individuals. Use of radioisotopes for irradiation of male burros has not been adequately developed for large animals and field conditions. Proper dosage, equipment, safety standards and follow-through techniques to determine effectiveness have not been adequately studied. Sterilization by means of ultrasonics, a frequency of mechanical vibrations above the range audible to the human ear, appears to have more potential application to field situations. Extensive experiments on rats, dogs, and primates conducted at the University

of Missouri show that either complete or temporary sterilization may be possible, depending on the dosage administered, without hormone level and subsequent behavior disruption. Equipment utilized is also much safer to field workers than those associated with the use of radioisotopes. The proper dosage for burros would require experimental determination, and histologic follow-up would be necessary to determine procedure effectiveness. Its effect on other forms of wildlife in the central area would not be known.

Sterilization, compared with direct reduction, would delay population reductions and environmental recovery. If programs for boundary fencing were not accomplished in conjunction with a trapping and sterilization program, burros entering the park from lands adjacent to the park would be subjected to treatment. These animals would then be free to move onto neighboring lands. Treatment would necessarily continue as long as fecund individuals frequent park lands. Such action would eventually alter the reproductive potential of the regional burro population. Fencing the boundary would restrict treatment to those individuals inhabiting the park.

Internal drift fencing and barrier fencing would be restricted to eliminate duplication of effort in handling individuals, and to protect resource values. Trapping and sterilization of an estimated 20 animals per year for 5 years, following boundary fencing, would result in significant reduction of feral burro reproduction potential and eventual lowering of the population levels consistent with habitat carrying capacity. Because of the longevity of burros, from 10 to 25 years, the related time it would then take to reduce the population within carrying capacity, component changes within park vegetation communities, degradation of water sources and cultural resources, or extirpation of native Grand Canyon flora and fauna would likely occur.

H. CONSULTATION AND COORDINATION

Several sources were consulted for references input into the development of this burro plan. Consultation with other agencies and individuals include: B.L.M. offices in Arizona, Utah, and Colorado; Dr. Bob Ohmart, University of Arizona; Dr. Steve Carothers, Museum of Northern Arizona; Arizona Game and Fish; and various divisions and individual areas in the National Park Service.

Public release of this document is tentatively scheduled for November 1976. The release will announce to the public the document's availability to them and the park's management intents. No formal workshops or hearings are scheduled after the initial announcement. The public record will remain open for 30 days during which time the park will receive comments on the proposal. Following closure of this time period, careful study of all comments will be made towards evolving a final decision for implementation.

The forthcoming park Resource Management Plan will also be available for public review.

Feral Burro Management Plan and Environmental Assessment Distribution List:

Coconino County Board of Supervisors
Coconino County Planner and Director
Mohave County Planning and Zoning Commission

Cocopai Resource Conservation Development Project

City Manager, Kingman, Arizona
City Manager, Williams, Arizona
Mayor, Flagstaff, Arizona
Mayor, Kanab, Utah
Mayor, St. George, Utah

Arizona Academy of Science
Advisory Commission of Arizona Environment
Aircraft Owners and Pilots Association
Arizona Conservation Council
Arizona Desert Bighorn Sheep Society, Inc.

Arizona Friends of the Earth
Arizona Mountaineering Club
Arizona Parks and Recreation Association
Arizona State Clearing House
Arizona Wildlife Federation
Arizona Wildlife Society
Arizona-New Mexico Wildlife Society
Arizonans for Quality Environment
BLM State Office
Citizens for a Best Environment
Colorado Plateau Environmental Advisor Board

Colorado River Wildlife Council
Conservation Foundation
Desert Protection Council
DNA-People's Legal Services
Environmental Conscience Corporation
Environmental Protection Agency
Federation of Western Outdoor Clubs
Lord's Earth Committee
Maricopa Audubon Society
Mearns Wildlife Society
Museum of Northern Arizona
National Audubon Society
National Parks and Conservation Association
National Wildlife Federation
Nature Conservancy
Navajo Tribal Museum
Nevada Open Spaces Council
Saguaro Conservation and Ecology Club
S.A.V.E.
Save the Grand Canyon Committee
School of American Research
Sierra Club, Southwest Office
Sierra Club, Palo Verde Chapter
Southern Arizona Hiking Club
Southern Nevada Resources Action Council
Tucson Audubon Society
Utah Environment Center
U.S. Forest Service - State Office
Wilderness Society

American River Touring Association
Arizona Cattle Growers Association
Arizona Daily Star
Arizona Daily Sun
Arizona Public Service Co.
Arizona River Runners, Inc.
Babbitt Brothers Trading Co.
Canyon Food Mart
Canyon Squire Motel
Canyoneers, Inc.
Colorado River and Trail Expeditions, Inc.
Cross Tours and Explorations, Inc.
Flagstaff Chamber of Commerce
Fort Lee Company
Four Corners Regional Commission
Fred Harvey Company
Georgie's Royal River Rats
Globe Ranch
Grand Canyon Airlines
Grand Canyon Dories
Grand Canyon Expeditions
Grand Canyon Gas Company
Grand Canyon Scenic Rides

Grand Canyon Schools
Grand Canyon-Tusayan Chamber of Commerce
Grand Canyon Youth Expeditions, Inc.
Harris Boat Trips
Hatch River Expeditions
Hughes Air West
Kane County Record
Kolb Studio
Moki Mac River Expeditions
Moqui Lodge
Mountain States Telephone
O.A.R.S., Inc.
Outdoors Unlimited
Recreation Equipment, Inc.
Red Feather Lodge
ROMA
Salt River Project
Sanderson River Expeditions
Santa Fe Railway Co.
Scenic Airlines, Inc.
Skidmore, Owings and Merrill
Spencer, Lee, Stypula and Busse
Tour West, Inc.
Tri-State Flight Operations
Valley National Bank
Verkamp's
Western River Expeditions, Inc.
White Water River Expeditions
Wilderness World
Williams Chamber of Commerce
Williams News
Wonderland Expeditions

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APPENDICES

APPENDIX A
FERAL BURRO ACTION PLANS AND SUMMARY OF EFFECTS
GRAND CANYON NATIONAL PARK

Action Plan	Effect
Shooting with high-powered rifles	(a) Compliance with legislative mandates, management policies, and objectives. (b) Timely program completion that facilitates environmental recovery and elimination of competition between native and nonnative species. (c) Curtailed cultural resource degradation caused by feral burros. (d) Increased visitor opportunities to view native flora and fauna with decreased visitor opportunities to observe feral burros within the park. (e) Temporary anxiety in animals sought, and disturbance to native wildlife in the vicinity of direct reduction activities. (f) Artificial selection of individuals that are wary, protectively colored, or living in remote sections of the park where burro/bighorn competition may be relatively critical. (g) Increased likelihood that occasional individuals will not experience immediate death because of personnel and equipment limitation. (h) Scattered burro carcasses in areas subjected to direct reduction activities. (i) Short-term aesthetic displeasure to backcountry visitors encountering carcasses. (j) Short-term scavenger increases in sections of the park where direct reduction activities take place.

Action Plan	Effect
	(k) Increased opportunities to study natural desert ecosystems.
	(l) Eventual elimination of research opportunities to study wild, free-roaming burros in the park.
	(m) Implementation of a continuing direct reduction program to preclude future population recovery.
	(n) Temporary inconvenience to park visitors wanting to visit backcountry areas closed during direct reduction activities.
Exclusion	
Boundary fencing	(a) Compliance with management policies and management objectives.
	(b) Reduction of park ingress and egress by feral burros.
	(c) Interference with the movement of indigenous wildlife, such as bighorn and deer.
	(d) Preclusion of trespass cattle.
	(e) Demarcation of the park boundary.
	(f) Short-term disturbance to native wildlife and park visitors during fence construction and maintenance activities.
	(g) Disturbance of an intermittent strip of land of a presently unknown dimension surrounding the park.
	(h) Fenceline contrasts of varying magnitude generated by burros trailing along fence, use of outside habitat, and recovery of inside habitat.

Action Plan	Effect
	(i) Intrusions upon the wilderness setting of park backcountry adjacent to or or within sight of boundary fencing.
	(j) Implementation of a maintenance program to ensure the fenceline is in good repair.
	(k) Possible restrictions of burro exits prior to commencement of control activities.
Internal drift fencing	(a) Compliance with management.
	(b) Prevention of feral burro scattering during control activities.
	(c) Prevention of feral burro re-entry into areas already cleared.
	(d) Short-term disruption of movements of native wildlife as long as fences remain in place.
	(e) Short-term disturbance to native wildlife and park visitors during construction and maintenance activities.
	(f) Disturbance to native vegetation along fencelines caused by construction activities and subsequent trailing by feral burros.
	(g) Short-term intrusion upon the wilderness setting of park back-country adjacent to or within sight of drift fencing, as well as scarring caused by burro trailing and construction activities apparent after fence removal.

Action Plan	Effect
	(h) Implementation of a maintenance program to ensure fenceline repair and effectiveness.
	(i) Opportunity for comparative "enclosure/exclosure" studies.
	(j) Habitat improvement.
Barrier fencing	(a) Compliance with management policies and park management objectives.
	(b) Concentration of feral burros at alternate areas unprotected by barrier fencing.
	(c) Short-term disturbance to native wildlife and backcountry visitors during construction of activities.
	(d) Intrusion upon wilderness setting of park backcountry adjacent to or within sight of barrier fencing.
	(e) Implementation of a maintenance program to ensure fencing remains an effective barrier to feral burros.

APPENDIX B
MANAGEMENT ALTERNATIVES CONSIDERED AND SUMMARY OF EFFECTS
GRAND CANYON NATIONAL PARK

Option	Effect
No action	(a) Failure to comply with legislative mandates, management policies, and objectives. (b) Continued competition between feral burros and native wildlife, such as desert bighorn. (c) Continued erosion, soil disturbance, and landscape scarring generated by feral burros. (d) Continued change in the structure of park vegetation communities and possible elimination of endemic, threatened, or endangered plants and animals. (e) Continued feral burro range expansion within the park and concomitant adverse impact on lands presently not inhabited by burros. (f) Continued damage to cultural resources. (g) Reduced visitor opportunities to observe native wildlife, and increased visitor opportunities to view Grand Canyon burros. (h) Reduced opportunities to study natural desert ecosystems. (i) Continued opportunities for research of feral burros within the park. (j) Effectiveness of other resource management options is reduced or nullified.

Option	Effect
Elimination	
Trapping and relocation	(a) Compliance with legislative mandates, management policies, and objectives. (b) Low-significance, high-magnitude environmental disturbance to trap site vicinities. (c) Anxiety in individuals trapped for and during relocation. (d) Extensive holding corral facilities for captured animals awaiting relocation. (e) Program dependence on people or landmanaging agencies willing to receive captured animals. (f) Disturbance to native wildlife in the vicinity of trapping activities. (g) Pleasure and associated satisfaction for burros placed with individuals. (h) Failure to reduce burro numbers in a timely manner to levels that allow environmental recovery and eliminate competition with native wildlife. (i) Opportunities for continued public observation of feral burros in park for duration, after which time opportunities will have to be sought on adjacent lands. (j) Program delay caused by the need to relocate every burro trapped, and requirements for holding captured individuals awaiting placement.

Option	Effect
	(k) Eventual increased opportunities for the study of natural desert ecosystems.
	(l) Eventual elimination of research opportunities to study the feral burro in the park.
	(m) Implementation of a continuing trapping and relocation program to preclude future population recovery.
Trapping and euthanasia	(a) Compliance with legislative mandates, management policies, and objectives.
	(b) Low-significance, high-magnitude environmental disturbance at trap site vicinities.
	(c) Program delay caused by requirement to handle animals individually during euthanasia procedures, or the need to approach each animal to the extent that pharmacological agents can be administered.
	(d) Failure to achieve timely population reductions to levels that facilitate environmental recovery and elimination of competition.
	(e) Anxiety in burros trapped and awaiting euthanasia.
	(f) Increased likelihood that trapped burros will be eliminated reliably through use of fast-acting pharmacological agents.
	(g) Continued and possibly increased damage to cultural resources.
	(h) Implementation of a continuing trapping and euthanasia program preclude future population recovery.

Option	Effect
	(i) Eventual increased opportunities to study natural desert ecosystems.
	(j) Eventual elimination of opportunities to study feral burro in the park.
Shooting with pharmacological agents	(a) Compliance with legislative mandates, management policies and objectives.
	(b) Timely program completion that facilitates environmental recovery and the elimination of competition between native and nonnative species.
	(c) Increased stress to burros because of the limited range of capture guns and the resultant need to approach individuals more closely.
	(d) Decreased stress to nearby wildlife caused by quieter capture gun discharge.
	(e) Increased likelihood that subject individuals will be painlessly destroyed.
	(f) Reduced adverse impact on cultural resources by feral burros.
	(g) Increased visitor opportunities to view native flora and fauna in the park with decreased visitor opportunities to observe feral burros within the park.
	(h) Artificial selection of individuals that wary, protectively colored, or living in remote sections of the park where burro/bighorn competition may be relatively critical.
	(i) Scattered burro carcasses in areas where direct reduction occurs.

Option	Effect
	(j) Short-term aesthetic displeasures to backcountry visitors encountering carcasses left in place to decompose.
	(k) Temporary population increases in the scavenger population in the park.
	(l) Increased opportunities to study natural desert ecosystems.
	(m) Eventual elimination of research opportunities to study wild, free-roaming burros in the park.
	(n) Implementation of a continuing direct reduction program to preclude future population recovery.
	(o) Temporary inconvenience to park visitors wanting to visit backcountry areas closed to visitors during direct reduction activities.
Retention of managed burro herds	(a) Compromise of management policies and management objectives.
	(b) Continued competition between feral burros and native wildlife.
	(c) Continued erosion, soil disturbance, and landscape scarring generated by feral burros.
	(d) Continued change in the structure of park vegetation communities, and possible elimination of key forage species.
	(e) Reduced but continued visitor opportunities to observe wild, free-roaming burros within the park.

Option	Effect
	(f) Continued opportunities for research of feral burros within the park, but limited to a manipulated population. (g) Reduced likelihood of timely environmental recovery. (h) Requirement for continued population survey and control measures and related environmental impact.
Establishment of a burro view area	(a) Compromise of resource management objectives for Grand Canyon National Park. (b) Require elimination and exclusion of the feral burro from the park except for that number retained within the viewing area. (c) Requirement for continued population control measures and related environmental impact. (d) Concentrate all impacts generated by feral burros into one confined area. (e) Allow visitors to view feral burros within the park only within the viewing area. (f) Opportunity to interprete the historical role of the burro as a miner's companion and beast of burden. (g) Provide for burro research appropriate for "pasture" studies.

Option	Effect
Sterilization of feral burros	(a) Compliance with management policies and objectives, but inadequate for immediate environmental needs. (b) Development of suitable methods. (c) Temporary stress to burros through capture, treatment, and release activities. (d) Continuation of competition between feral burros and native wildlife. (e) Continued erosion, soil disturbance, and landscape scarring generated by feral burros. (f) Continued change in the structure of park, vegetation communities, and possible elimination of endemic, threatened, or endangered plants and animals. (g) Gradually decreasing visitor opportunities to view wild, free-roaming feral burros. (h) Reduced opportunities to study natural desert ecosystems. (i) Continued opportunities for research of wild, free-roaming--though treated--feral burros. (j) Long-term regional burro population losses (without concurrent fencing).

APPENDIX C

A SUMMARY OF BURRO STUDIES CONDUCTED
BY THE MUSEUM OF NORTHERN ARIZONA
IN FULFILLMENT OF NPS CONTRACT NO. CX 82150007;
RESEARCH REPORT ENTITLED: AN ECOLOGICAL SURVEY OF THE RIPARIAN ZONE
OF THE COLORADO RIVER BETWEEN LEES FERRY AND
THE GRAND WASH CLIFFS, ARIZONA June 1976

The scope of this project was designed to cover two central themes. First, there was an effort to inventory the biotic resources of the riparian zone of the Colorado River, and second, there was an attempt to evaluate the ecological relationships between the biotic resources of Hoover and Glen Canyon Dams and river runners and other backcountry enthusiasts.

Chapter IX. Distribution of Feral Asses

a) The areas occupied by feral asses in the Grand Canyon are from Tanner Canyon to Crystal Creek on the south side of the river. From Crystal Creek to Tapeats Creek, asses inhabit both sides of the river. This area between Crystal Creek and Tapeats Creek is the only area where feral asses appear above the Redwall of the canyon in any numbers. Havasupai Point and Pasture Wash on the South Rim have resident ass populations. On the north side of the river, asses occasionally go above the Redwall on Point Sublime and Swamp Point.

b) From Tapeats Creek to Havasupai Creek, asses inhabit only the south side of the river. From Whitmore Canyon to 220 Mile Canyon, asses occur on the north side of the river. From 125 mile to Lake Mead, asses inhabit the south side of the river.

c) Areas of highest feral ass densities appear to be from Red Canyon to Hermit Canyon on the south side of the river, the Shinumo Amphitheater, Parashant Canyon to 220 Mile Canyon on the north side of the river, and mile 215 to Bridge Canyon on the south side of the river.

d) The area from mile 215 to Lake Mead is part of the Hualapai Indian Reservation and is not included in Grand Canyon National Park. However, this area appears to contain extremely large populations of feral asses.

Chapter X. Feral Asses on Public Lands: An Analysis of Biotic Impact

a) The results of this investigation demonstrate conclusively that the feral ass has a negative effect on the natural ecosystem of the lower reaches of the Grand Canyon. The principal impact of the feral ass is habitat destruction through grazing and trampling.

b) On the study area where feral asses occur the vegetation cover and rodent populations were significantly reduced when compared to the study area where feral asses were absent. On the control plot, 28 species of vascular plants were found compared to 19 on the impact plot. The total vegetation cover on the control plot was 80 percent, compared to 20 percent on the impact plot. The mean area (m_2) occupied by each individual catclaw or mesquite shrub was 27.9m_2 on the control plot and 20.7m_2 on the impact plot.

c) The mammal species diversity (H') was higher on the control plot (.78652) than it was on the impact plot (.69022). In addition, the average absolute density of small mammals from March 1974 to January 1975 on the control plot was 128 mammals/acre (51.8/ha.) approximately four times the 32.6/acre (13.2/ha.) found on the impact plot. Thus, differences between the two areas in mammalian species composition and diversity were attributed to the depauperate flora, particularly the forbs and grasses, on the 209 Mile Canyon impact area.

APPENDIX D

MANAGEMENT PROGRAM

The management program that is appended to the plan is the action document that is designed to implement the plan. The management program consists of:

A list of Natural Resource Project Statements specific to the Feral Burro Plan and which are currently active in budget planning will complete the appended program.

Natural Resources Project Statements that will serve as "blueprints" for proposed actions.

A Natural Resources Project Programming Sheet on which each project will be listed and shown in relation to park priority funding and a time sequence for the 5-year period.

The Feral Burro Management Plan is concerned with a proposed 5-year action program. The program presented here begins with Fiscal Year 1977. Each year the program will be updated and revised as work is completed.

LIST OF NATURAL RESOURCE PROJECTS
PERTINENT TO THE FERAL BURRO PLAN

The following is a list of those projects proposed for implementation of the Burro Plan:

Reference Number	Project Title	Status of Project
RM-1	Control of Feral Burro Populations by Shooting	Will Begin FY'77
RM-2	Sanup Plateau Boundary Survey	Scheduled in FY 79-83, 5-Year Program
RM-3	Sanup Plateau Boundary Fence	Scheduled in FY 79-83, 5-Year Program

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Grand Canyon National Park, Western Region

2. PROJECT NAME AND NUMBER: Control of Feral Burro Population by Shooting RM-1

3. STATEMENT OF PROBLEM: Exotic and feral burro have altered the habitat in the park and adversely affected native biota.

4. WHAT HAS BEEN DONE: Past management practices have included direct reduction by shooting. A periodic program of reduction over a 45-year period resulted in 2,800 asses being removed from the park. Public sentiment against killing feral burros altered the program in 1969. Since then, no management of the park's herd has occurred.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: A combined effort of foot, raft, and aircraft patrols will be implemented to locate and destroy feral burros. All animals will be shot with high powered rifles.

6. LENGTH OF TIME NEEDED: 5 years.

7. WHAT WILL HAPPEN IF NOT UNDERTAKEN: Continued overuse of park's vegetative communities will continue with resultant adverse effects on wildlife. Competition with native vegetative will occur to its detriment. Soil erosion and land scarring will worsen in presently impacted areas and spread to new areas.

8. WHAT ARE THE ALTERNATIVES:

    1. Do nothing.
    2. Trap and relocate burros.
    3. Trap and destroy animals by euthanasia.
    4. Shooting with pharmacological agents.
    5. Retain a managed herd.
    6. Establish a burro viewing area and eliminate all other animals.
    7. Sterilization of feral burros.

9. PERSONNEL: Grand Canyon National Park; Resource Management Specialist and existing Park Ranger staff.

10. ADMINISTRATION AND LOGISTICS:

FUNDING	YEAR IN PROGRAM SEQUENCE				
	1st	2nd	3rd	4th	5th
Personal Services	-	-	-	-	-
Other than Personal Services	30,000	17,000	17,000	17,000	17,000
Funds Available in Park Base	-	-	-	-	-
Funds Requested from Region	30,000	17,000	17,000	17,000	17,000

On Form	Date Submitted
10-237 / X /	January 1976
10-238 / /	
10-250 / /	
10-451 / /	

11. REFERENCES AND CONTACT:

a. Resource Management Plan, Grand Canyon National Park

b. Dr. Steve Carothers, Museum of Northern Arizona, Flagstaff, Arizona 86001

12. DATE OF SUBMISSION: October 1976

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Grand Canyon National Park, Western Region

2. PROJECT NAME AND NUMBER: Fencing program to exclude feral burros - North side (North Boundary Fencing) RM-2

3. STATEMENT OF PROBLEM: A fencing program is needed to complement elimination of feral burros in the park. This project is designed to control ingress points of burros from surrounding non-managed areas i.e., B.L.M. lands.

4. WHAT HAS BEEN DONE: Nothing.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: A complex of boundary, drift and barrier fencing will be constructed at recommended locations. These locations will be based upon a preliminary survey of the area and topographic situations. This fence will be of specific construction type to allow the passage of deer and bighorn sheep. A survey will be needed for boundary portions.

6. LENGTH OF TIME NEEDED: 1 year.

7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: The project of feral burro removal will be ineffective. Ingress will continue from surrounding non-control lands and necessitate the need for a continued reduction program beyond the planned 5-year project. Grand Canyon National Park's reduction program will effect surrounding, protected herds as ingress continues and individuals are eliminated.

8. WHAT ARE THE ALTERNATIVES:

   a. No action.
   b. Complete drift fences only.
   c. Fence canyon mouths only.

9. PERSONNEL: Survey work to be done by the National Park Service to be contracted. Supervision provided by the park staff.

10. ADMINISTRATION AND LOGISTICS:

	1st Year
Personal Services	$ -
Other than Personal Services	50,000 (20 miles)
Total	$50,000
Funds Available in Park Base	-
Funds Requested from Region	50,000

ON FORM

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11. REFERENCES AND CONTACTS

1. Helvie, J. B., 1971. Bighorns and Fences in Desert Bighorn Council Transactions, Las Vegas, Nevada.

2. Carothers, Steve, Ph.D., Museum of Northern Arizona, Flagstaff, Arizona.

12. DATE OF SUBMISSION: October 5, 1976.

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Grand Canyon National Park Complex, Western Regional Office

2. PROJECT NAME AND NUMBER: Natural Resources Basic Inventory (GRCA-N-1) This project includes the recommended large mammal census and the inventory of hydrologic and soils resources recommended in conjunction with the Burro Management Plan.

3. STATEMENT OF PROBLEM: Grand Canyon National Park has a growing set of resource management problems which seem to compound themselves day by day. Many of our problems pre-exist the establishment of the park in 1919. By then, the basic layout and physical facilities of the park were fixed and a number of adverse uses were well established. Early administrators faced difficult problems when dealing with the new park area in a very isolated portion of the country. These problems were so great that adverse uses apparently seemed benign and the great "outback" was largely ignored. Even today, the park still has the same problems: tourist accommodation, business enterprise, mining, grazing, trespass, road building, wood cutting, transportation, trail construction and maintenance, confusing boundary legislation and location, water development, solid and liquid waste disposal, and wildlife management. With few exceptions, resource planning and management have been shortsighted, based on expediency or not done at all. Resource management in the past has been a hit or miss affair. During the past 30 years, resource management has been on a downward course. Backcountry patrol activity has been sharply reduced. The park now has only one Resource Management Specialist, and he has been engulfed in paperwork for the past 3 years; the new Research Unit is totally occupied on long-term crisis research without the time for proper attention to long-range goals; until very recently funding for resource management was nil and is still inadequate. Since the demise of the Civilian Conservation Corps in the early 1940's, there has been and still continues to be a low priority placed on resource management in comparison with visitor protection activities. The proportion of time and effort spent on resource protection has been in an inverse ratio to the number of park visitors, although the resource impact has been a direct ratio to visitation. These phenomena have limited resources. Natural resource management is one area that is easily deleted from the operating program, since the consequences of neglect are only slowly felt.

However, now in 1976, this neglect is beginning to be apparent. The Service has been sued for mis-management on the Colorado River. Congress has deleted thousands of acres of the park, great pressure is being brought to bear for increased visitor accommodations, and for the export of water outside of the park. The lack of hard data input into Master Plans, Development Concept Plans, Environmental Impact Statements, Construction Contracts, etc., means that all pressure groups are instant experts and are able to make proposals advantageous to themselves, since they know more about their area of special resource interest than does the park staff. Most Grand Canyon employees know little of the resource beyond the settled area. At best, there are only four or five people on the staff that would recognize a Peregrine Falcon (one of our endangered species) if they saw one, let alone where they are to be found. These people are little involved in the decisions about resource management or the utilization of natural resources. For all of these reasons, the park staff, as a whole, is unable to successfully meet the challenge of defending the long-established and ratified principles of resource management at Grand Canyon. We manage in the face of ignorance about the things that we are to manage. Therefore, basic resource information is urgently needed.

4. WHAT HAS BEEN DONE: In the past, scattered and sporadic attempts have been made to gather resource information. To date, there has been no unified concerted effort to pull these scattered fragments together. Because Grand Canyon National Park was established some time ago, and because it is an area of considerable scientific interest, there is information available, but it is rather spotty and scattered. The Forest Service, Geological Survey, Bureau of Sport Fisheries and Wildlife, and several other Federal agencies have conducted some scientific work in the park from time to time, generally on very specific problems. In most cases, this work was geographically very confined. Private or university researchers have undertaken work in the park, again, in very limited geographical areas. A synopsis of where we stand follows.

    a. Geology. Because the Grand Canyon is one of the premier geological show cases of the work, geological studies are quite advanced. The stratigraphy is well known generally, although in some cases not in detail. Stratigraphic studies are too numerous to even cite the more important publications. The entire park has been geologically mapped, and this map is currently undergoing further revision. Canyon stratigraphy is therefore well enough known that further information for the R.B.I. will not be needed in the foreseeable future. The paleontology is less well known. The cost

and effort involved in improving this data base will be enormous. Readily reached fossil localities have mostly been collected. There is enough information on this subject to give management the information necessary to identify and protect this resource, except in areas that are to be intensively developed. In the areas where significant development is to take place, detailed paleontological investigations should be undertaken as part of the EIS process.

b. Hydrology and Water Resources. The hydrology and water resources of the park are not well known except on the broadest level. All significant sources of water that are large enough to be of economic interest are known. Only one list is known that enumerates some of the smaller and non-economic sources. Further information is needed about these because of their crucial importance to park wildlife and hiker safety. There is some information in hiker's logs and diaries and this information should be pulled together and added to the results of field investigations.

c. Soils. The soils of Grand Canyon are unknown, with the exception of a few studies and very broad publications. A lack of information on soils has led to structural failures in the Shrine of the Ages Chapel and the new cabins at the South Rim auto lodge and frequent problems with sewer and waterlines. Much information is needed on this subject and does not lie in the literature.

d. Archaeology. There has been some work done on the archaeological resources of Grand Canyon. However, information is scattered and some of it was collected long ago and may now be invalid. Many of the old archaeological surveys need to be redone or verified because the location information was faulty. Also, much of the work done in the past does not conform to modern standards of location or nomenclature. Much of the data in the park files cannot, therefore, be related to current work. There is much information that is useful, but more needs to be done.

e. Plants. Fortunately, there has been considerable work done with the plants of Grand Canyon, but unfortunately, much of the work was done long ago before there was adequate transportation in the region. Plant collections were therefore limited to areas easily reached. For example, recent work in the riparian zone along the Colorado River has uncovered three taxa of plants new to science and 30 species not previously known from the park. These discoveries have all been related to the new ease of access to the river via raft

trips. Large areas of the Grand Canyon proper and the North Rim have not been intensively collected. In 1936, the Civilian Conservation Corps completed a cover map for the park using a unique classification system developed by the National Park Service. Although this map is a remarkable accomplishment, considering the short length of time available for the project, the difficulties encountered i.e., primitive transportation, no air photos, etc., it is unsuited for use by modern management. Therefore, areas of plant study that need critical attention in a R.B.I. are vegetation mapping, floristics mapping of rare and endemic species, and the location of rare and threatened ecosystems. There are now two floras that cover the Grand Canyon. Therefore, plant identification will be simplified.

f. Vertebrates. Most of our knowledge about vertebrates present in the park comes from sight observation records, most of which are quite old, with very few recent additions. The park has a small collection of mammals and birds. These collections have largely resulted from accidental road kills, etc. Reptiles and fish are largely unrepresented in the collection. Species distribution data, particularly of those taxa that are endemic, rare, or endangered, are badly needed. There is a semi-popular book on Grand Canyon mammals and a checklist of mammals, birds, and reptiles available. All of these lists are quite incomplete.

g. Invertebrates. Sporadic efforts in the past have resulted in a small insect collection for the park. This collection emphasized butterflies, at the expense of other taxa. A recent collecting trip in connection with the Colorado River Project yielded nearly 2,000 taxa new to the park. In the past, there has been one publication on the insects of Grand Canyon. Other invertebrates are nearly unknown.

h. Ecology. Little ecological work has been accomplished at Grand Canyon, but we have an excellent study on the distribution of the pinyon-juniper and ponderosa pine on the South Rim. Other projects have been much less extensive. Grand Canyon lies in a unique ecological setting. It has a variety of biomes, and in some cases, lies in a central position along biome gradients. The canyon, therefore, is a place of great ecological interest. We hope that the R.B.I. will stimulate further research on the topic. At the present time, there are a number of ecological projects underway, most of them directed toward management problems. To date, there has been little published on Grand Canyon ecology.

i. Adverse Uses. The history of adverse use at Grand Canyon appears only briefly and in scattered form. Much of the material that tells how it is, how it was, and why it was, lies in archival documents and park files. The history of the inseparable management components: politics and resource management, needs preparation. This need was early felt by the park during our recent series of political and resource hassles.

5. DESCRIPTION OF THE WORK TO BE UNDERTAKEN: We propose to undertake an inventory of the natural resources of the park stepwise by priority. We use the term "inventory" to include the type of resource present, the number of individuals that comprise the resource, and the location of the individuals or components of the resource. As the Resource Basic Inventory is now designed, the thematic thread that runs through the project is a geographical one. Wherever possible, data is to be organized, stored, and retrieved geographically through the use of Universal Mercator Grid coordinates. Such a scheme will permit the organization and recall of diverse types of data.

The project will be pursued in a priority order through the use of three priority tables, each having equal weight:

a. Geographic Priorities.

1. Area west of South Rim Village.
2. Desert View area.
3. North Rim Village.
4. North tier of sections along north boundary.
5. Area one-half mile each side of north entrance road.
6. Park areas under special permit or adverse use.
7. South Rim undeveloped.
8. North Rim undeveloped.
9. Tuweep and Toroweap area.
10. Grand Canyon above the Inner Gorge.

b. Taxonomic Units.

1. Bibliography.
2. Vegetation (not floristics).
3. Water resources.
4. Mammals.
5. Birds.
6. Soils.
7. Insects.
8. Reptiles.
9. Flora.
10. Fish.
11. Other invertebrates.

12. Archaeological resources.
13. Historical geological resources.
14. Geological resources.

c. Risk Type.

1. Impacted or developed areas.
2. Rare or endemic units.
3. Things out of place through natural processes.
4. Other.

Using this list, R.B.I. project priorities are calculated:

a + b + c equals R.B.I. priority

The highest priority would be: 1 + 1 + 1 equals 3 or "bibliography of impacted or developed areas west of the Grand Canyon Village." The next priority with level would be: a + b + c equals 4. This could be:

1 + 1 + 2 bibliography of endangered features west of Village or 1 + 2 + 1 vegetation of impacted areas west of Grand Canyon Village or 2 + 1 + 1 bibliography of impacted areas in Desert View area.

As the priority number increases, so does the number of possible projects, each having the same priority. Therefore, projects should be combined where possible. For example, there is little sense in making a literature search for endangered features west of Grand Canyon Village while ignoring all other citations relevant to the park. The bibliography portion of the project for the entire park could be completed in nearly the same length of time as would be needed for the target area; the western portion of the South Rim. So, the bibliography, in effect, becomes the number one priority. Such priority combination will reduce the list of projects considerably.

This method of data gathering will be dependent upon the type of subject matter under study at the moment. The project will involve a good deal of field work and will involve the collection of documentation specimens and materials where such methods do not conflict with the 1973 Rare and Endangered Species Act or significantly impact rare features of the park. All field data is to be stored on computer. This work will be done in the South Rim laboratory.

6. LENGTH OF TIME NEEDED: If all phases of this project are carried out, and if only 10 minutes per acre for the entire park complex is taken, the project will run something on the order of 100 man years. The 100 man-year figure is obviously much too high to be of interest to management. In reality, therefore, the lower priorities of the R.B.I. will probably not be undertaken during the course of this study. We propose a 6-year time limitation on the Resource Basic Inventory. This 6-year period should allow us to consider the first five or six items under each of the topics in the priority table. Certainly, the achievement of this goal will give management most of the data that will be required in the foreseeable future for the management of the natural resources of the park.

7. WHAT WILL HAPPEN IF THE PROJECT IS NOT UNDERTAKEN: The results of nonaction are now before us for all to see. We will continue to have inadequate data for input into the planning process. We can therefore assume that there will continue to be unfortunate and unforeseen results from future management activities. These results will probably be untenable, and we will, therefore, continue to be involved in a series of interim and crisis management decisions.

8. WHAT ARE THE ALTERNATIVES: The alternative is to continue the management and planning process as it now exists, and the consequent results will probably be those that now exist. Alternatively, the project can be delayed until pressure groups or political pressure or court action forces us to take inventory action for input into planning documents.

9. WHO WILL ACCOMPLISH THE PROJECT: A considerable portion of the project will be undertaken by Research Scientist at Grand Canyon National Park. When our manpower or expertise is not sufficient, portions of the project will be let out on contract to independent investigators. The job of coordination will be undertaken by the Research Biologists at Grand Canyon National Park. As many independent and unsalaried or uncontracted investigators as possible will be encouraged to work and participate in the investigations. To what extent this latter effort will be successful is unknown at this time.

   Grand Canyon National Park will be called upon to provide support personnel for routine labor activities, such as equipment transportation, etc. Such needs will be minimal. Other than this, there are no other personnel needs anticipated at this time.

10. ADMINISTRATION AND LOGISTICS: Grand Canyon National Park will provide all personal services and support costs unless specified otherwise in contracts with other investigators.

Grand Canyon National Park will issue the necessary permits to allow for helicopter access to experimental areas that are determined by the Superintendent to be unaccessible by conventional means. Since experimental sites will partially be selected on the basis of their accessibility, this should not be frequently necessary. The Superintendent's approval may occasionally be needed for the establishment of small base camps near experimental areas, when distances from developed areas to experimental sites are great enough to make daily travel between them impractical. Field work will be undertaken during all months of the year. Laboratory and statistical analysis will take place as needed on the South Rim.

FUNDING	YEAR IN PROGRAM SEQUENCE					
	1st	2nd	3rd	4th	5th	6th
Personal Services	38,500	38,500	38,500	38,500	38,500	38,500
Other than Personal Services	10,500	10,500	10,500	10,500	10,500	10,500
GRAND TOTAL	55,000	55,000	55,000	55,000	55,000	55,000
Funds Available in Park Base	-	-	-	-	-	-
Funds Requested from Region	55,000	55,000	55,000	55,000	55,000	55,000

On Form	Date Submitted
10-237 / X /	March 1975
10-238 / /	
10-250 / X /	October 1976
10-451 / /	

11. REFERENCES AND CONTACTS:

a. Bennett, Peter S., Research Scientist, Grand Canyon National Park.
b. Johnson, R. Roy, Research Scientist, Grand Canyon National Park.
c. Carothers, Steven, Curator of Biology, Museum of Northern Arizona, Flagstaff, Arizona.
d. Kolipinsky, Milton, Western Regional Office, National Park Service.
e. Bibliography of some 600 references is available at Grand Canyon National Park.

12. DATE OF SUBMISSION: March 1975

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Grand Canyon National Park Complex, Western Regional Office.

2. PROJECT NAME AND NUMBER: Desert Bighorn and Feral Burro Ecology Investigations (GRCA-N-2)

3. PROBLEM: This project proposes the study of two interrelated problems. The desert bighorn population in Grand Canyon has decreased and distribution is limited. At the same time, feral burros, introduced into Grand Canyon in 1880's and 1890's, have flourished, increased their populations and distribution and caused vegetation destruction. The competition between the bighorn and burro needs to be investigated as well as other factors which might limit bighorn population. Information is needed as to where ranges of these animals overlap and the exact impact on bighorn because of this overlap.

   The role of fencing in managing both bighorn sheep and burro population must be understood before control fences can be installed. The type and dimensions of these fences must be determined.

   Full understanding of the relationship of burros and their environmental impact is not known. Body analysis of burros and a comparison of vegetation conditions needs to be investigated to evolve a sound tool for monitoring habitat recovery.

4. WHAT HAS BEEN DONE: This project was just barely started by an assigned research biologist when he was promoted and transferred. The study was begun in February 1970. Historical information was compiled, observation records sorted, and selected references reviewed. Limited field observations were made and a postcard observation record form was distributed to river runners. After expenditures of about $10,000, the project virtually came to a standstill.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: Historical data has been compiled in previous studies. This historical data and all previous work on bighorns and burros must be reviewed. Then investigations continued on the population and habitat studies of bighorn and burros. Investigations include field surveys and visual observation surveys. Burro investigations include: aircraft flights over the park to determine fencing needs; and the autopsy of 100 burros during the elimination exercise.

During the process of burro elimination, 100 animals will be selected from representative plant communities throughout the park. A collection of reproductive organs; body measurements; stomach contents; eye lens; lower jaw; and tissues from the heart, liver, lungs, and diseased organs will be made from each animal. The tissues will be submitted for analysis to suitable research institutions. In addition, line transects will be established to measure plant recovery.

Since bighorn and burro management will be a long-term management problem, the information gathered will be quantified to permit a systematic approach and provide a basis for future reexaminations. After information is gathered and evaluated, recommendations will be made for proper management of bighorns in the total Grand Canyon ecosystem. This project should lead to the development of an ecologically and politically sound bighorn management program.

6. LENGTH OF TIME NEEDED: With adequate funding, this project can probably be completed in 4 years. Actual progress in realizing interim goals may dictate the final amount of time needed.

7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: We will not have enough knowledge to properly manage adverse impacts that might affect the future existence and welfare of Desert Bighorn at Grand Canyon. Damage to Grand Canyon ecosystem from feral burros will continue because of the lack of effective exclusion fencing.

   A valuable tool for measuring the impact of burros on the environment within the park will be lost. A method of measuring future management program effectiveness will be unavailable. Recovery rates for presently impacted vegetation will not be measured.

8. WHAT ARE THE ALTERNATIVES:

   1. Cross our fingers and hope the bighorn adapt to any adverse influences and that burros will not damage canyon ecosystem further.

   2. Contract the execution of this project.

   3. Make superficial decisions on bighorn and burro management based on inadequate knowledge.

   4. Attempt correlate bighorn and burro studies in other desert areas to the burro/bighorn at Grand Canyon.

   5. Do nothing.

9. WHO WILL ACCOMPLISH PROJECT: This study should be carried out under the supervision of a research biologist assigned to Grand Canyon National Park. Cooperative assistance may be available on an infrequent basis from technical personnel of other agencies interested in bighorn and burros. Laboratory analyses of materials collected during certain phases of the study will be performed by the Museum of Northern Arizona or other contract research agencies.

10. ADMINISTRATION AND LOGISTICS: Much of the equipment needed to accomplish this study is available at the park. Technical equipment needed for tissue analysis will be supplied by contract reseachers. The greatest costs will be in connection with transportation and maintenance of field parties.

    Since it is generally agreed that the feral burro competes vigorously with bighorn or occupies potential bighorn habitat, simultaneous information gathering and cost sharing is viewed as a practical approach.

FUNDING	YEAR IN PROGRAM SEQUENCE			
	1st	2nd	3rd	4th
Personal Services	49,000	49,000	49,000	49,000
Other Services	21,000	21,000	21,000	21,000
Grand Total	70,000	70,000	70,000	70,000
Funds Available From Park Base	-	-	-	-
Funds Requested From Region	70,000	70,000	70,000	70,000

On Form	Dated Submitted
10-237 / X /	January 1976
10-238 / /	
10-250 / /	
10-451 / /	

11. REFERENCES AND CONTACTS:

a. Buechner, H. K. 1960. The bighorn sheep in the United States, its past, present, and future. Wildl. Monog., No. 4, The Wildl. Soc. 174 pp. May.

b. Carothers, S. W., M. E. Stitt and R. R. Johnson. 1975. Feral Asses on Public Lands. An Analysis of Biotic Impact, Legal Considerations, and Management Alternatives. Paper for 41st North American Wildlife and Natural Resource Conference.

c. Dellenbaugh, F.S. 1887. The great walled river. Amer. Geog. Soc. Bull. XIX (2):113-163.

d. Means, E. A. 1907. Mammals of the Mexican boundary of the United States. Part one, U.S. Nat. Mus. Bull. No. 56. 530 pp.

e. Merriam, C. Hart. 1890. Results of a biological survey of the San Francisco Mountain Region and desert of the Little Colorado, Arizona. No. Amer. Fauna. No. 3. Govt. Print. Office. 136 pp.

f. Powell, J. W. 1875. Exploration of the Colorado River of the West and its tributaries, explored in 1869, 1870, 1871, and 1872. Govt. Print. Office. 291 pp.

g. Wright, G. M. and B. H. Thompson. 1934. Fauna of the National Parks of the United States. Fauna Series No. 2, Natl. Park Serv. Govt. Print. Office. 142 pp. July.

12. DATE OF SUBMISSION: June 1973.

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Grand Canyon National Park, Western Region

2. PROJECT NAME AND NUMBER: Sanup Plateau Boundary Survey (GRCA-RM-2).

3. STATEMENT OF PROBLEM: A fencing program is needed to complement elimination of feral burros in the park. This project is designed to control ingress points of burros from surrounding non-managed area i.e., B.L.M. lands. To establish an accurate boundary, a professional survey is needed.

4. WHAT HAS BEEN DONE: No previous work has been done.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: Survey and establish the park boundary as indicated in P.L. 93-620. Identify burro ingress points and determine where drift fences might be utilized.

6. LENGTH OF TIME NEEDED: 6 months.

7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: The park boundary will remain unknown. Encroachment and trespass by adverse users will continue. Control measures aimed at feral burros will be delayed or eliminated from lack of data. Areas where drift fencing is needed will remain unknow.

8. WHAT ARE THE ALTERNATIVES:

   a. Erect fences without survey in cooperation with Lake Mead National Recreational Area.
   b. Maintain fence in conjunction with wilderness proposals for Lake Mead National Recreation Area.

9. WHO WILL ACCOMPLISH PROJECT: Project should be contracted to NPS team or private survey company.

10. ADMINISTRATION AND LOGISTICS OF THE PROJECT:

Funding:	Year in Program Sequence	
		1st Year
Personnel Services	—	
Other than Personal Services		$50,000
Total		$50,000
Funds Available in Park Base		-
Funds Requested from Region		$50,000

On Form: 10-237 Date: 10/76

11. REFERENCES AND CONTACTS:
    1. National Park Service - Western Region

12. DATE OF SUBMISSION: October 1976

NATURAL RESOURCES PROJECT STATEMENT

1. PARK AND REGION: Grand Canyon National Park, Western Region

2. PROJECT NAME AND NUMBER: Sanup Plateau Boundary Fence (GRCA-RM-3).

3. STATEMENT OF PROBLEM: A fencing program is needed to complement elimination of feral burros in the park. This project is designed to control ingress points of burros from surrounding non-managed area i.e., B.L.M. lands.

4. WHAT HAS BEEN DONE: No previous work has been done.

5. DESCRIPTION OF WORK TO BE UNDERTAKEN: A complex of boundary and drift fences are to be constructed along the Sanup Plateau section of the park. Fences designed to allow passage of bighorn sheep will be erected at sections determined by the pre-construction survey.

6. LENGTH OF TIME NEEDED: To be determined by survey.

7. WHAT WILL HAPPEN IF PROJECT NOT UNDERTAKEN: Cattle grazing within the park from other than permittees will continue. Encroachment from possible adverse users remain a potential. The Feral Burro Management Plan will be reduced in its effectiveness.

8. WHAT ARE THE ALTERNATIVES:

   a. Do not build a boundary fence.
   b. Utilize proposed fences in Lake Mead National Recreation Area plan.

9. PERSONNEL: Project to be contracted.

10. ADMINISTRATION AND LOGISTICS OF THE PROJECT:

    The contractor will supply all labor, construction equipment, and material.

Funding:	Year in Program Sequence 1st 2nd 3rd 4th 5th
Personnel Services	
Other than Personal Services	(Funds to be determined by
Total	preliminary survey)
Funds Available in Park Base	
Funds Requested from Region	

    On Form: 10-237

11. REFERENCES AND CONTACTS:
    1. National Park Service - Western Regional Office

12. DATE OF SUBMISSION: October 1976

CULTURAL AND NATURAL RESOURCES PROJECTS PROGRAMMING SHEET

Grand Canyon National Park, Arizona

October 1976

NPS Costs Expressed in $1000

Increase or Package No.	Area Priority	Reference No.	Project Title	Yr. 1(77) BASE	Yr. 1(77) NEW	Yr. 2(78) BASE	Yr. 2(78) NEW	Yr. 3(79) BASE	Yr. 3(79) NEW	Yr.4 (80) BASE	Yr.4 (80) NEW	Yr. 5 (81) BASE	Yr. 5 (81) NEW	Form No. & Date 10-250	Form No. & Date 10-237	Form No. & Date 10-238	No. of Contract
N.A.	N.A.	RM-1	Burro Control Program	30		17		17		17					10/76		
190	77	RM-2	Sanup Plateau Boundary Survey					50							10/76		
19	20	RM-3	Sanup Plateau Boundary Fence	(Cost to be determined by survey)												10/76	

BASE - Funds Available in Park Base NEW - Funds Requested from Regional Office

Page___ of_

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, parks and recreation areas, and to ensure the wise use of all these resources. The Department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration. NPS 1111

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