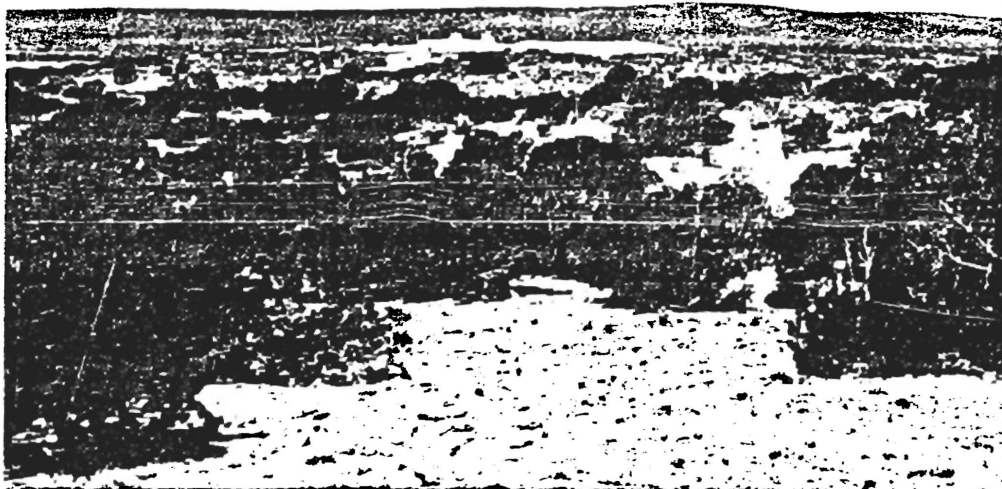


EARTH ENVIRONMENTAL CONSULTANTS INCORPORATED

VEGETATION OF
GRAN QUIVIRA NATIONAL MONUMENT



STUDY CONDUCTED FOR:
NATIONAL PARK SERVICE

BY
EARTH ENVIRONMENTAL CONSULTANTS, INC.
ALBUQUERQUE, NEW MEXICO

JUNE, 1979

RESOURCE EVALUATION PLANNING ENGINEERING

VEGETATION OF
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PETER H. PACHE
PRINCIPAL INVESTIGATOR

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION AND PURPOSE OF STUDY -----	1
METHODOLOGY -----	1
RESULTS	
Sandy grassland -----	3
Upland Shrub-grassland -----	7
Deep sand shrub-grassland -----	10
Juniper woodland -----	12
Subunit A -----	12
Subunit B -----	15
THREATENED AND ENDANGERED SPECIES -----	18
DISCUSSION -----	18
RECOMMENDATIONS -----	23
BIBLIOGRAPHY -----	26
APPENDIX - PLANT SPECIES, SCIENTIFIC NAMES AND GENERAL COMMUNITY DESIGNATIONS	

LIST OF TABLES AND FIGURES

TABLE 1 - PLANT COMMUNITIES, ACREAGE, AND THEIR GENERAL DISTRIBUTION ON GRAN QUIVIRA NATIONAL MONUMENT -----	3
FIGURE 1 - GENERAL LOCATION MAP - GRAN QUIVIRA NATIONAL MONUMENT -----	2
FIGURE 2 - GENERAL ELEVATION OF THE PLANT COMMUNITIES WITHIN GRAN QUIVIRA NATIONAL MONUMENT.-----	4
FIGURE 3 - SANDY GRASSLAND PLANT COMMUNITY WITH JUNIPER WOODLAND (SUBUNIT A) IN THE BACKGROUND -----	6
FIGURE 4 - REPRESENTATIVE GROUND COVER OF THE SANDY GRASSLAND PLANT COMMUNITY -----	7
FIGURE 5 - UPLAND SHRUB-GRASSLAND PLANT COMMUNITY AT THE WESTERN EDGE OF THE MONUMENT'S RUINS, FACING NE -----	9

LIST OF TABLES AND FIGURES (Cont'd.)

	<u>Page</u>
FIGURE 6 - A SELECTED PORTION OF THE UPLAND SHRUB-GRASSLAND SHOWING THE RESPONSE OF BLUE GRAMA TO THE LACK OF GRAZING PRESSURE SINCE 1923 (NW FACING SLOPE)----	9
FIGURE 7 - DEEP SAND SHRUB-GRASSLAND PLANT COMMUNITY: WESTERN PORTION OF THE MONUMENT -----	11
FIGURE 8 - REPRESENTATIVE GROUND COVER OF THE DEEP SAND SHRUB-GRASSLAND PLANT COMMUNITY -----	12
FIGURE 9 - JUNIPER WOODLAND PLANT COMMUNITY: SUBUNIT A (EAST OF MONUMENT'S RUINS) -----	14
FIGURE 10 - GROUND COVER IN THE JUNIPER WOODLAND PLANT COM- MUNITY (SUBUNIT A: EXCLUDED FROM GRAZING - 1923) -	14
FIGURE 11 - JUNIPER WOODLAND PLANT COMMUNITY (SUBUNIT A: EXCLUDED FROM GRAZING - 1967) -----	15
FIGURE 12 - JUNIPER WOODLAND PLANT COMMUNITY (SUBUNIT B: WESTERN PORTION OF THE MONUMENT) -----	17
FIGURE 13 - JUNIPER WOODLAND PLANT COMMUNITY (SUBUNIT B) IN BACKGROUND; FOREGROUND SHOWS THE DEEP SAND SHRUB- GRASSLAND PLANT COMMUNITY -----	17
FIGURE 14 - UPLAND SHRUB-GRASSLAND SHOWING THE GENERAL DIE- OFF OF WALKINGSTICK CHOLLA -----	20
FIGURE 15 - CHANGE OF PINYON-JUNIPER COVER WITH ELEVATION -----	22
FIGURE 16 - REPRESENTATIVE VIEW OF THE REVEGETATION TRIAL -----	23

INTRODUCTION AND PURPOSE OF STUDY

Gran Quivira National Monument is located within the Upper Sonoran Life Zone of New Mexico (Bailey, 1913). The Monument is administered by the National Park Service and has an elevation range of 6,448 to 6,712 feet. The general location within New Mexico is shown in FIGURE 1.

The main growing period, e.g. when the greatest amount of precipitation is received, is during the months of May, June, July, and August. The annual precipitation varies from 5 to 25 inches and averages about 14 inches. The summer rains occur as torrential thunderstorms, usually of short duration; spring storms are inclined to be more gentle. Summer temperatures may range up to 105°F during the day and to 60°F at night; winter temperatures may drop to as low as -20°F, and drops may be quite rapid. Spring winds of high velocity may occur from February to June and can be quite damaging to certain plant communities.

The purpose of this study was the delineation and general quantification of the existing plant communities located within the Monument (610 acres).

METHODOLOGY

Aerial photographs were analyzed for the study area. The stereoscopic coverage of the Monument allowed the delineation of the separate plant communities; these were then field checked in December, 1978, and May of 1979. A plant community map was compiled using the aerial photographs and transcribed onto a 7 1/2-minute U.S.G.S. topographic map of the Monument (this is presented as PLATE 1 and follows the RECOMMENDATIONS section).

Information on additional plant species was obtained from the plant collection at the Monument.

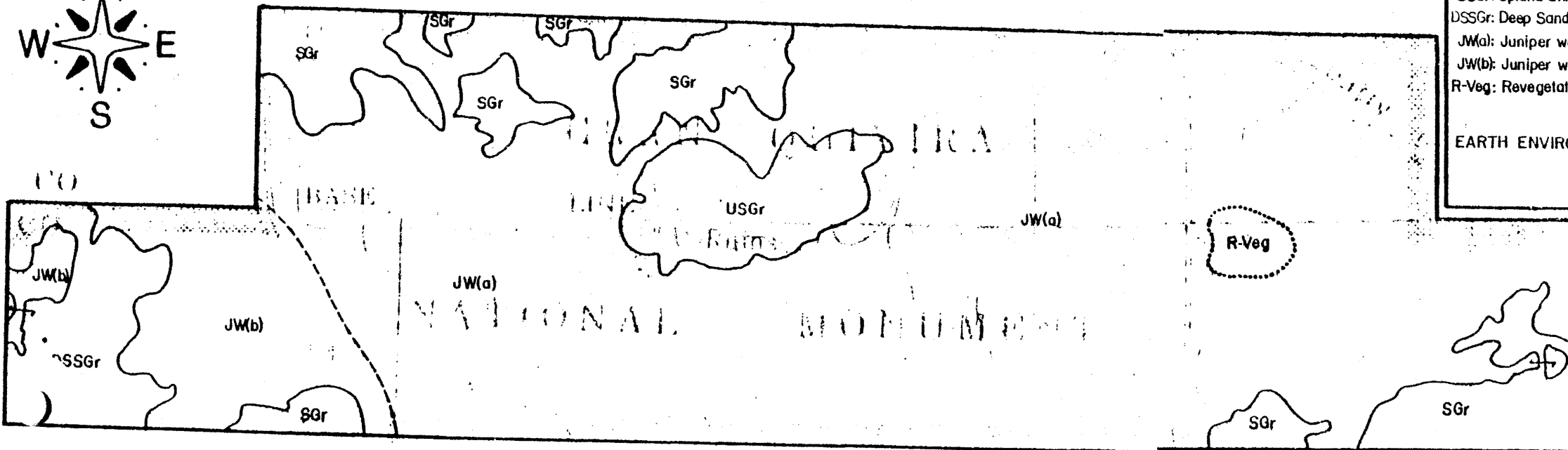
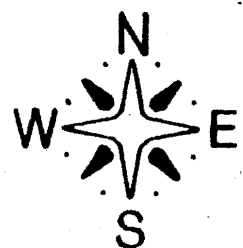


PLATE I
PLANT COMMUNITY DISTRIBUTION ON
GRAN QUIVIRA NATIONAL MONUMENT

Scale = 1:8,000

LEGEND

- SGr : Sandy grassland plant community
- USGr: Upland Shrub-grassland plant community
- DSSGr: Deep Sand Shrub-grassland plant community
- JW(a): Juniper woodland : Subunit A
- JW(b): Juniper woodland : Subunit B
- R-Veg: Revegetation

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1979

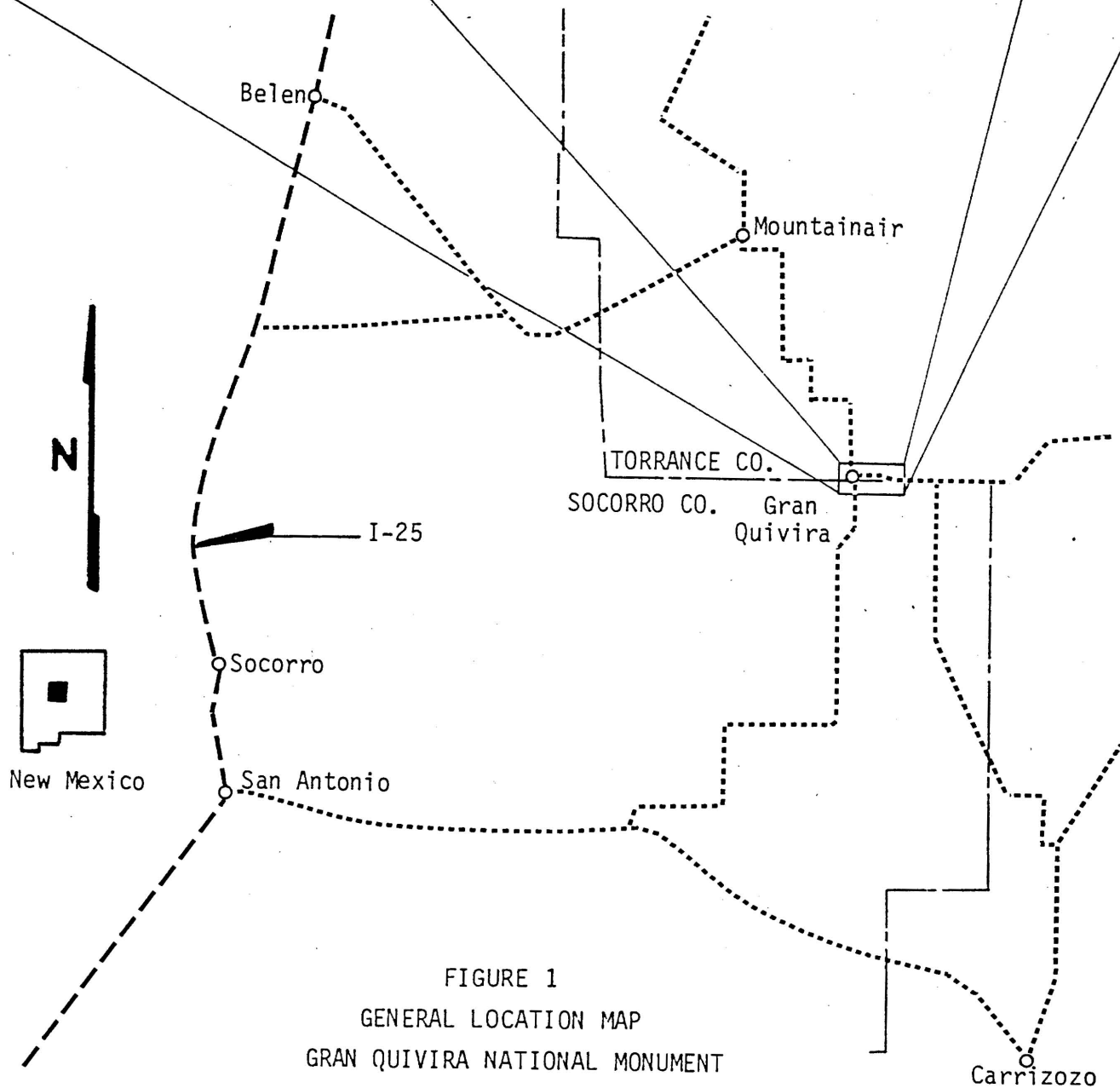
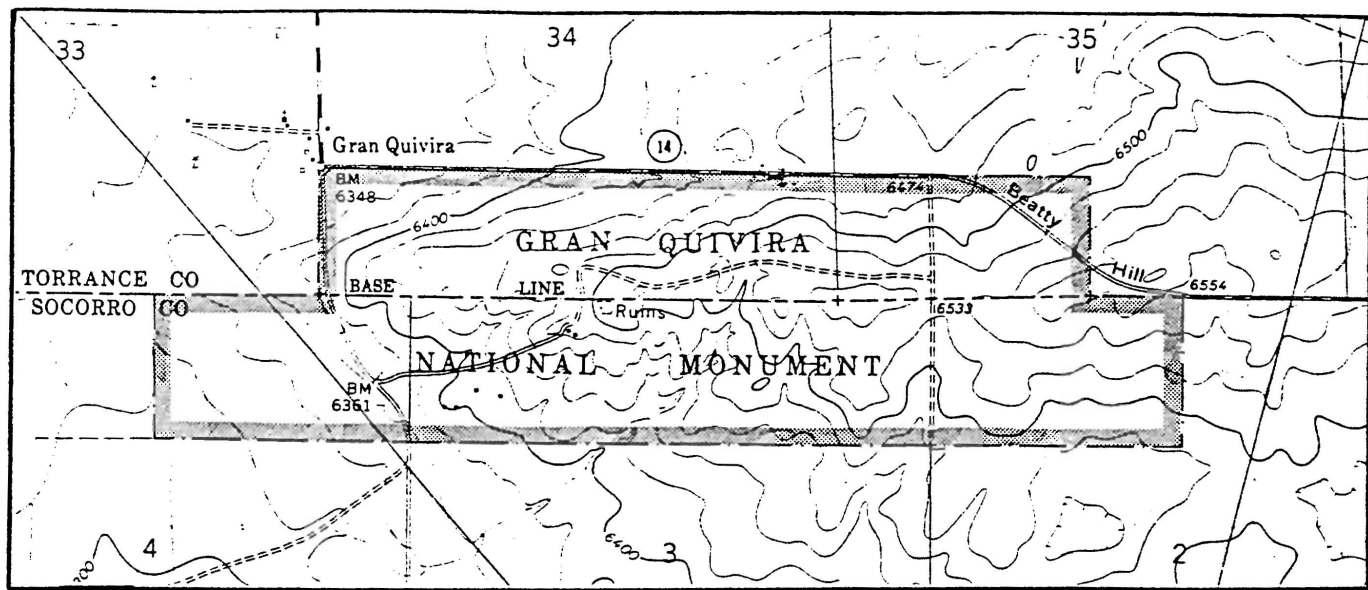


FIGURE 1
GENERAL LOCATION MAP
GRAN QUIVIRA NATIONAL MONUMENT

RESULTS

The dominant plant communities, acreages and their general locations within the Monument are presented on TABLE 1 (specific distributions are presented in PLATE 1).

TABLE 1
PLANT COMMUNITIES, ACREAGES, AND THEIR GENERAL
DISTRIBUTION ON GRAN QUIVIRA NATIONAL MONUMENT

Plant Community	Acreage	General Location
Sandy grassland	74.4	SE corner/N. central
Upland shrub-grassland	29.3	hill around ruins
Deep sand shrub-grassland	29.9	western portion
Juniper woodland		
Subunit A	417.8	central and eastern portions
Subunit B	52.5	western portion
Revegetation area	6.1	eastern portion within juniper woodland (subunit A)
TOTAL		610.0 acres

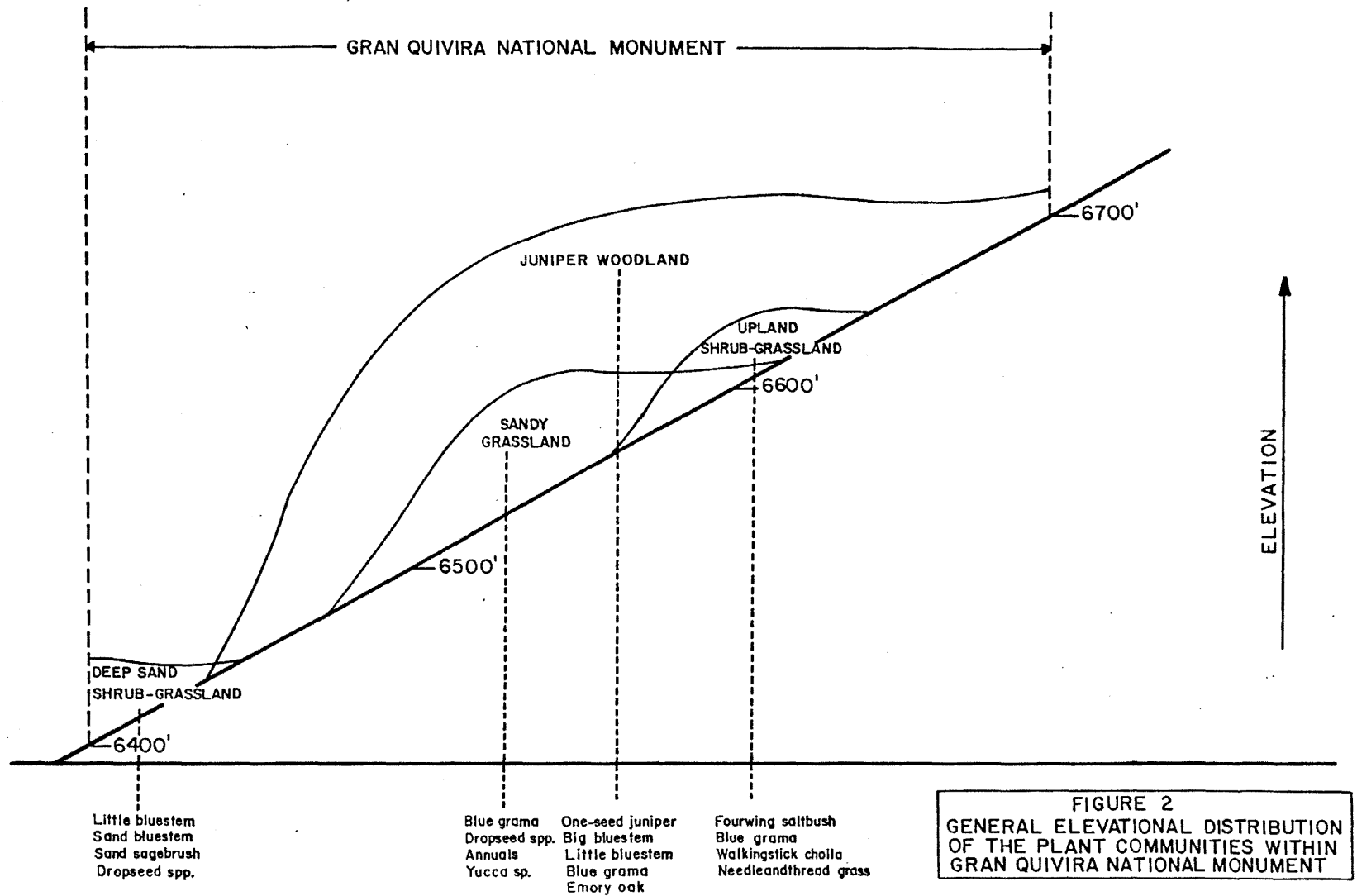
FIGURE 2 shows the general elevational distribution of the plant communities within Gran Quivira National Monument.

The individual plant community descriptions are as follows:

Sandy grassland:

Topography

This plant community occurs primarily on the southeastern and northwestern portions of the Monument. The topography is generally flat to gently undulating, although slopes may range up to ten percent.



Soils

The soils of this plant community are sandy on the surface and shallow to moderately deep with a rapid permeability and a low water holding capacity. Included within this community are fine sandy loams, sandy loams and loamy fine sands. (A detailed soil's description is found within the Gran Quivira soil's report; this plant community is dominated by the OP soil's mapping unit.)

Vegetation

The following is a general plant species' list for this plant community. Primary, secondary and invader are terms associated with a climax vegetational stand (generally considered in terms of abundance). Additional species found within the community are presented within the Appendix section of this report.

Primary	Secondary	Invader
*Blue grama	Indian ricegrass	*Walkingstick cholla
Hairy grama	Black grama	*Prickly pear
*Sand dropseed	*Little bluestem	Rabbitbrush sp.
*Mesa dropseed	Indiangrass	*One-seed juniper
Spike dropseed	Big bluestem	*Emory oak
Sand bluestem	Galleta	
*Needleandthread grass	*Three-awn sp.	
New Mexico feathergrass	*Ring muhly	
*Bush muhly	Tumble lovegrass	
	Purple lovegrass	
	*Soaptree yucca	
	*Broom snakeweed	
* observed within this plant community; December, 1978 and/or May, 1979.		

When this plant community is in top condition (e.g. climax) it produces a mixture of tall, mid, and short grasses. Blue grama is one of the primary species, but will generally not make up more than 60 percent of the plant composition. Oak, juniper and cholla will invade this community when under grazing pressure. (This appears to have been the case in the northcentral portion of the Monument.)

FIGURES 3 - 4 show representative views of this plant community.



FIGURE 3: SANDY GRASSLAND PLANT COMMUNITY WITH JUNIPER WOODLAND (SUBUNIT A) IN THE BACKGROUND.



FIGURE 4: REPRESENTATIVE GROUND COVER OF
THE SANDY GRASSLAND PLANT COMMUNITY.

Upland shrub-grassland:

Topography

This plant community is composed of gently rolling hillsides and small flats around and including the Monument's ruins. The slope is variable but averages ten percent.

Soils

The soils of this plant community are shallow to deep with loamy surface textures. The water intake rates are moderately high and the profile generally provides high water storage. Areas of limestone outcrop are common within this plant community. (A detailed soil's description is found within the Gran Quivira soil's report; this plant community is labeled as the DI mapping unit.)

Vegetation

The following is a general plant species' list for this plant community. Primary, secondary and invader are terms associated with a climax vegetational stand (generally considered in terms of abundance). Additional species found within this community are presented within the Appendix section of this report.

Primary	Secondary	Invader
*Needleandthread grass	Hairy grama	Mat muhly
Junegrass	Galleta	Walkingstick cholla
*Spike muhly	*Indian ricegrass	Prickly pear
Little bluestem	*Spike dropseed	*One-seed juniper
Blue grama	Sand dropseed	
*Texas-timothy	Mesa dropseed	
New Mexico feathergrass	*Three-awn sp.	
*Rubber rabbitbush	*Broom snakeweed	
*Fourwing saltbush	*Soaptree yucca	

* observed within this plant community; December, 1978 and/or May, 1979.

A good mixture of perennial grasses is present when this community is in top condition (e.g. climax). Blue grama is the dominant grass species, but will usually not exceed fifty percent of the total plant composition. Fourwing saltbush is the dominant woody species; with one-seed juniper invading this community if heavily disturbed.

FIGURES 5 - 6 show representative views of the plant community.



FIGURE 5: UPLAND SHRUB-GRASSLAND PLANT COMMUNITY AT THE WESTERN EDGE OF THE MONUMENT'S RUINS, FACING NE.



FIGURE 6: A SELECTED PORTION OF THE UPLAND SHRUB-GRASSLAND PLANT COMMUNITY SHOWING THE RESPONSE OF BLUE GRAMA TO THE LACK OF GRAZING PRESSURE SINCE 1923 (NW FACING SLOPE).

Deep sand shrub-grassland:

Topography

This plant community is composed of level or slightly hilly to rolling topography, occurring on the western portion of the Monument.

Soils

The soils of this plant community are deep, coarse textured, unstabilized surface sands. The water intake rates are high and the soils are very susceptible to wind erosion. (A more detailed soil's description is found in the Gran Quivira soil's report; the soil's mapping unit for this community is R0.)

Vegetation

The following is a general plant species' list for this plant community. Primary, secondary and invader are terms associated with a climax vegetational stand (generally considered in terms of abundance). Additional species found within this community are presented within the Appendix section of this report.

Primary	Secondary	Invader
*Little bluestem	Indian ricegrass	*Three-awn sp.
*Sand bluestem	Black grama	Cactus sp.
*Big bluestem	*Needleandthread grass	*Ring muhly
Indian grass	New Mexico feathergrass	*Broom snakeweed
Giant dropseed	Sand muhly	Rubber rabbitbush
*Blue grama	Hairy grama	

Primary	Secondary	Invader
Sand dropseed	Purple lovegrass	
*Sand sagebrush	Tumble lovegrass	
*Soaptree yucca	*Pinyon pine	
	Fourwing saltbush	
	*Squawbush	

*Observed within this plant community; December, 1978 and/or May, 1979.

When this plant community is in top condition (e.g. at or near climax) it is dominated by tall grasses with a mixture of mid-grasses. Sand sagebrush is the dominant woody species; however, under disturbed conditions, one-seed juniper will invade.

FIGURES 7 - 8 are representative of this plant community.



FIGURE 7: DEEP SAND SHRUB-GRASSLAND PLANT COMMUNITY:
WESTERN PORTION OF THE MONUMENT.



FIGURE 8: REPRESENTATIVE GROUND COVER OF THE DEEP SAND SHRUB-GRASSLAND PLANT COMMUNITY.

Juniper woodland:

This plant community is broken into two smaller subunits: Subunit A and Subunit B. This was done due to the soils and, thereby, resulting understory vegetational differences. The soil of Subunit A is moderately deep over limestone (described in the soil's report as mapping unit CA), while Subunit B is generally deep, unstabilized surface sands (described in the soil's report as mapping unit R0). However, one-seed juniper is the dominant plant species within this community; therefore, for general identification purposes, it was felt that a community level distinction was appropriate.

Subunit A:

Topography

This subunit is nearly level to undulating in topography with some slopes ranging up to ten percent.

Soils

The soils of this subunit generally consist of loamy fine sands which are moderately deep in depth. There are areas of limestone outcrop within this subunit. (A detailed soil's description is found within the Gran Quivira soil's report; the general soil's mapping unit for this subunit is CA.)

Vegetation

The following is a general plant species' list for this plant community subunit. Primary, secondary and invader are terms associated with a climax vegetational stand (generally considered in terms of abundance). Additional species found within this community subunit are presented within the Appendix section of this report.

Primary	Secondary	Invader
*Little bluestem	Sideoats grama	Western ragweed
*Blue grama	Hairy grama	Russian thistle
New Mexico feathergrass	Black grama	*Broom snakeweed
Sand dropseed	*Sand muhly	
*One-seed juniper	*Three-awn sp.	
*Indian grass	Sand bluestem	
*Soaptree yucca	*Bottlebrush squirreltail	
*Datil yucca	*Pinyon pine	
	*Squawbush	
	*Big sagebrush	
	*Emory oak	

*observed within this plant community; December, 1978 and/or May, 1979.

FIGURES 9 - 11 show representative views of this plant community.



FIGURE 9: JUNIPER WOODLAND PLANT COMMUNITY:
SUBUNIT A (EAST OF MONUMENT'S RUINS).



FIGURE 10: GROUND COVER IN THE JUNIPER WOODLAND PLANT
COMMUNITY (SUBUNIT A: EXCLUDED FROM GRAZING - 1923).



FIGURE 11: JUNIPER WOODLAND PLANT COMMUNITY
(SUBUNIT A: EXCLUDED FROM GRAZING - 1967).

Subunit B:

Topography

This community subunit occurs as level or slightly hilly to rolling topography. This subunit is present on the western portion of the Monument and is interspersed with the deep sand shrub-grassland plant community.

Soils

The soils of this plant community subunit are deep, coarse textured, unstabilized surface sands. The water intake rates are high and the soils are very susceptible to wind erosion. (A more detailed soil's description is found within the Gran Quivira soil's report; the soil's mapping unit for this subunit is R0.)

Vegetation

The following is a general plant species' list for this plant community subunit. Primary, secondary and invader are terms associated with a climax vegetational stand (generally considered in terms of abundance). Additional species found within this community subunit are presented within the Appendix section of this report.

Primary	Secondary	Invader
*Little bluestem	Indian ricegrass	*Three-awn sp.
*Big bluestem	Black grama	*Broom snakeweed
*Sand bluestem	*New Mexico feathergrass	Ring muhly
Indiangrass	Blue grama	Rabbitbrush sp.
*Needleandthread grass	Hairy grama	
*Sand muhly	Purple lovegrass	
Sand dropseed	Fourwing saltbush	
*Soaptree yucca	*Pinyon pine	
*One-seed juniper	Tumble lovegrass	
	*Sand sagebrush	
	*Squawbush	

* observed within this plant community; December, 1978 and/or May, 1979

When this community subunit is in high condition (e.g. at or near climax) it produces an understory dominated by tall grasses with a mixture of mid-grasses. One-seed juniper dominates this community.

FIGURES 12 - 13 show representative views of this community subunit



FIGURE 12: JUNIPER WOODLAND PLANT COMMUNITY
(SUBUNIT B: WESTERN PORTION OF THE MONUMENT).



FIGURE 13: JUNIPER WOODLAND PLANT COMMUNITY (SUBUNIT B)
IN BACKGROUND; FOREGROUND SHOWS THE DEEP
SAND SHRUB-GRASSLAND PLANT COMMUNITY.

THREATENED AND ENDANGERED SPECIES

The New Mexico State Heritage Program maintains a computer program on the known locations of the threatened and endangered plant species within New Mexico. In a letter dated 26 February, 1979 (included following the BIBLIOGRAPHY section), Bill Issacs and Janie Chavez stated that the following plant species may occur at the Monument:

1. Paper-spined cactus (*Pediocactus papracanthus*). This species is generally found in ungrazed blue grama stands and, if present on the Monument, is most likely to occur within the sandy grassland plant community.
2. Pricklepoppy species (*Argemone pleiacantha* spp. *pinnatisecta*).
3. Milkvetch species (*Astragalus siliceus*).
4. (no common name) (*Limonium limbatum*). Found in alkaline wet spots.

DISCUSSION

As stated previously, Gran Quivira National Monument is located within the Upper Sonoran Life Zone of New Mexico (Bailey, 1913). This zone is often characterized by pinyon pine and/or species of juniper.

The two primary areas of the sandy grassland plant community, e.g. southeastern and northcentral, represent different topographic exposures and, thereby, climatic regimes. The southeastern portion is generally flat with a slight southern exposure; the northcentral portion is north-facing with a 10 to 15 percent slope. This difference in slope and exposure results in the southeastern portion being hotter and drier than the northcentral area. Therefore, although the species present are nearly the same, their abundance, in terms of percent composition, is different. It is expected that the northcentral portion will have a greater basal (vegetational) ground cover due to the increased moisture and cooler temperatures.

Both of these sandy grassland areas were excluded from grazing in 1967. The north-central portion is presently dominated by annual forbs (the seed source is apparently just north of the Monument's boundary), with some dropseed species and blue grama. This area shows past invasion by one-seed juniper which is probably attributable to grazing. As grazing occurred, the grasses, being preferred forage species, were reduced in abundance, thereby allowing the juniper to invade. This juniper invasion has been reduced, or stopped, due to the grass and forb species return to dominance and outcompeting the juniper seedlings (primarily in terms of moisture). The southeastern portion is dominated by dropseed species and blue grama, with some annual forbs. Both of these areas are rapidly returning to a climax state; either the grazing pressure was light, or the surrounding seed source was good and has allowed natural revegetation to occur relatively rapidly.

The upland shrub-grassland community occurs on the hillsides around, and including, the Monument's ruins. This community is dominated by two species: fourwing saltbush and blue grama. The walkingstick cholla are slowly dying off; their "stage" of succession has passed and their dominance in this plant community is ending. While under grazing pressure (prior to 1923) there was an overall reduction in vegetative ground cover, which allowed the walkingstick cholla to invade. This cholla species is presently (1979) declining because its seedlings are not able to compete (e.g. in terms of moisture, space, etc.) with the existing grass and shrub species. FIGURE 14 shows the general die-off of walkingstick cholla.

The deep sand shrub-grassland occurs on the western portion of the Monument. This community is interspersed with the juniper woodland (Subunit B) and is dominated by sand sagebrush and species of blue-stem. This area has been excluded from grazing since 1967 and the recovery (from a disclimax stage) is progressing slowly. This plant community is very fragile due to the unstabilized surface sands.



FIGURE 14: UPLAND SHRUB-GRASSLAND SHOWING
THE GENERAL DIE-OFF OF WALKINGSTICK CHOLLA.

The bluestem species are usually rapidly overgrazed and then disappear from the plant community. This results in a loss of basal ground cover and an increase in wind erosion. At the time of this report (1979), this community was stabilizing well, but was still suffering some wind erosion. This community should become stabilized within a decade if grazing is continued to be excluded and the yearly moisture is good. (A good seed source is already present due to the existing bluestem species.)

The juniper woodland is the most extensive plant community on the Monument. It was decided to split this community into two subunits due to the distinct differences in the understory vegetation (a result of soil differences). The smaller subunit (B) occurs on the western portion of the Monument and is interspersed with the deep sand shrub-grassland community. The larger subunit (A) occurs on the central and eastern portions of the Monument.

As can be seen from FIGURE 11 of the RESULTS section, there are large areas of bare ground located within Subunit A of the juniper woodland. These bare areas occur primarily east of the dirt road in the NW 1/4 of Section 2. This north-south dirt road used to serve as a fence boundary: east of this road the area was excluded from grazing in 1923, west of this road the area was excluded from grazing in 1967. Although the western area has some bare, eroded areas, it is the eastern portion which has the most extensive areas of bare ground. As the plant species and soils are similar on both sides of the road, it is felt that the cause of these bare areas is over-grazing by livestock.

At this level of study, one of the most difficult items to judge is the trend (improving, declining, or stable) of the different plant communities. One valid assumption is that the communities are improving, in terms of diversity and abundance, due to the exclusion of livestock grazing. However, the speed of improvement cannot be adequately assessed on a couple of brief visits; this requires years of quantitative data from standard range techniques. Therefore, a statement concerning how soon any of the bare, eroded areas will recover is invalid.

There are a very small number of pinyon pine (probably less than twenty-five) on Gran Quivira National Monument. The Monument is too low in elevation to support any extensive stands of pinyon pine. Pinyon, in this area of New Mexico, requires a cooler, moister climate. The areas where pinyon pine does occur on the Monument are generally on the north-facing slopes of gullies where the microhabitat is cooler and moister. The general elevational relationship between pinyon and juniper is presented in FIGURE 15.

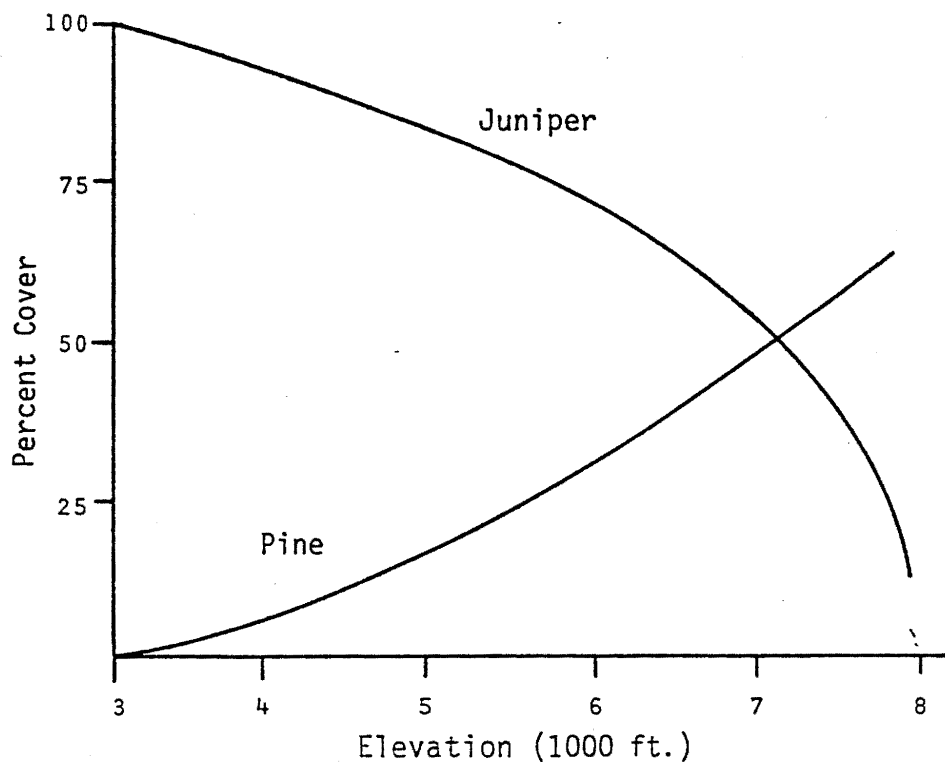


FIGURE 15: CHANGE OF PINYON-JUNIPER COVER
WITH ELEVATION (from Woodin and Lindsey, 1954).

A revegetation trial was performed on about 6-8 acres on the eastern portion of the Monument, located within the juniper woodland (Subunit A) plant community. Apparently this area was primarily bare ground and it was thought that juniper branches would increase the soil moisture and prevent further erosion; thus allowing grass and forb species to grow. It is uncertain how long this trial has been continuing, but plant species, diversity and abundance appears to be no different than the surrounding juniper woodland. It is difficult to assess how much erosion has been prevented by this practice. Aesthetically the area is displeasing, with juniper trees trimmed six feet above the ground and dead branches everywhere. FIGURE 16 shows a representative view of the revegetation effort.



FIGURE 16: REPRESENTATIVE VIEW OF THE REVEGETATION TRIAL.

Of all the plant communities discussed, the western deep sand communities (e.g. juniper woodland [Subunit B] and deep sand shrub-grassland) are the most fragile and easily disturbed. Any significant disruption will result in increased wind erosion; thereby reducing the plant community structure and diversity.

RECOMMENDATIONS

The following list of recommendations is made concerning soils, vegetation and aesthetics:

1/ soil erosion:

- A. A small monitoring program should be set up with stakes marked off in tenths-of-a-foot and read once a year. These can be placed on both the sideslopes and hilltops. The areas of special concern are the eastern hillsides

(juniper woodland), where large areas of bare ground are present, and the deep sand plant communities on the west side. Both of the areas are subject to erosion (water and wind, respectively). This could be easily set up and provide a relative handle on soil loss.

B. Small rocks would work as well as tree limbs in the erosion channels already present (especially on the east side). The juniper trees are relatively slow-growing and long-lived; use of their branches in these erosion channels is not aesthetically pleasing. The erosion stakes can also be used here; placed at the start of the cut and measured yearly would place a relative handle on the rate of actual erosion.

C. Further information on the prevention of soil loss by erosion can be obtained by contacting the local Soil Conservation Service Office.

2/ Photographic stations should be set up in order to get a related handle on any vegetational changes. These should be positioned so that they are easily located by present and future Monument personnel (i.e. along fence lines, a flagged stake or tree, etc.). This is done so that photographs of the same area can be taken yearly. The best time for these photographs would be in October when plant growth for that year has been completed. A variety of topographic exposures within each plant community is recommended.

3/ It is our recommendation that no more revegetation trials, of the type presently used, be done. As stated previously, it appears that vegetational diversity and abundance is the same on the trial

plot as that of the surrounding juniper woodland. It is, therefore, of no direct benefit and is also not aesthetically pleasing.

- 4/ As the Monument's plant communities are presently (1979) recovering from past grazing practices, there are areas that are actively eroding and others that are susceptible to erosion. Natural revegetation will slowly reduce the active erosion areas; however, in order not to cause any new erosional channels, off-road vehicle use should be restricted to a minimum.
- 5/ Plant species which Monument personnel wish to plant around the headquarters and residential areas should be native species found within the nearby surrounding plant communities. These are adapted to the Monument's soils and climate (care must be taken not to over water).

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February 26, 1979

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Albuquerque, New Mexico 87112

Dear Mr. Pache:

In response to your inquiry concerning threatened and or endangered plants species in the Gran Quivira National Monument, our program was unable to document any occurrences of these species in the area. There is a chance although, that the following species might show up in the area if an intensive field survey were conducted by a knowledgeable botanist.

1. Pediocactus papyracanthus (found in ungrazed blue grama grass stands)
2. Argemone pleiacantha ssp. pinnatisecta
3. Astragalus siliceus
4. Limonium limbatum (found in alkaline wet spots).

We would recommend that to confirm the presences or absences of these species in the monument area that Dr. Richard Spellenberg be contacted (New Mexico State University, Biology Department) to conduct a plant survey.

Sincerely,

Janie Chavez
Janie Chavez, Environmental Analyst
New Mexico State Heritage Program

Bill F. Isaacs
Bill F. Isaacs, Program Coordinator
New Mexico State Heritage Program

RECEIVED FEB 28 1979

APPENDIX

PLANT SPECIES, SCIENTIFIC NAMES, AND
THEIR GENERAL COMMUNITY DESIGNATIONS

PLANT SPECIES 1/

SCIENTIFIC NAME

PLANT COMMUNITY
DESIGNATION 2/GRASSES:

Big bluestem	<i>Andropogon gerardii</i> Vitman	JW(A); DSSGr
Sand bluestem	<i>Andropogon halli</i> Hack.	DSSGr; JW(B)
Little bluestem	<i>Andropogon scoparius</i> Michx.	JW(A); DSSGr
Three-awn	<i>Aristida</i> sp.	SGr; JW(A)
(?) Sideoats grama	<i>Bouteloua curtipendula</i> (Michx.) Torr.	JW(A)
Black grama	<i>Bouteloua eriopoda</i> (Torr.) Torr.	JW(A); USGr
Blue grama	<i>Bouteloua gracilis</i> (H.B.K.) Steud.	JW(A); USGr; SGr
Hairy grama	<i>Bouteloua hirsuta</i> Lag.	JW(A); SGr
Cheatgrass brome	<i>Bromus tectorum</i> L.	disturbed areas
(?) Galleta	<i>Hilaria jamesii</i> (Torr.) Benth.	JW(A)
Texas-timothy	<i>Lycurus phleoides</i> H.B.K.	JW(A); SGr
New Mexico muhly	<i>Muhlenbergia pauciflora</i> Buckl.	JW(A)
Bush muhly	<i>Muhlenbergia porteri</i> Scribn.	SGr; USGr
(?) Sandhill muhly	<i>Muhlenbergia pungens</i> Thurb.	DSSGr; JW(B)
Mat muhly	<i>Muhlenbergia richardsonis</i> (Trin.) Rydb.	SGr; USGr
Ring muhly	<i>Muhlenbergia torreyi</i> (Kunth) Bush	SGr; JW(A); USGr
Indian ricegrass	<i>Oryzopsis hymenoides</i> (R. & S.) Ricker	JW(A); SGr
Plains bristlegrass	<i>Setaria macrostachya</i> H.B.K.	SGr
Bottlebrush squirreltail	<i>Sitanion hystrix</i> (Nutt.) J.G.Sm.	SGr; JW(A)
Spike dropseed	<i>Sporobolus contractus</i> Hitchc.	USGr; SGr
Sand dropseed	<i>Sporobolus cryptandrus</i> (Torr.) Gray	SGr; JW(A)
Mesa dropseed	<i>Sporobolus flexuosus</i> (Thurb.) Rydb.	USGr; DSSGr
Giant dropseed	<i>Sporobolus gigantens</i> Nash	DSSGr; JW(B)
Needleandthread grass	<i>Stipa comata</i> Trin. & Rupr.	JW(A); JW(B)
New Mexico feathergrass	<i>Stipa neomexicana</i> (Thurb.) Scribn.	JW(A); SGr

FORBS:

Sand verbena sp.	<i>Abronia</i> sp.	JW(A)
Aster sp.	<i>Aster</i> sp.	SGr; JW(A)

PLANT SPECIES 1/	SCIENTIFIC NAME	PLANT COMMUNITY DESIGNATION 2/
<u>FORBS:</u> (Cont'd.)		
Whole-leaf painted cup	<i>Castilleja integra</i> Gray	JW(A)
Thistle	<i>Cirsium</i> sp.	SGr; USGr
*Golden-smoke	<i>Corydalis aurea</i> Willd.	JW(A)
*-----	<i>Cryptantha angustifolia</i> (Torr.) Greene	roadsides
Tansymustard	<i>Descurainia</i> sp.	SGr; USGr
*Buckwheat	<i>Eriogonum annuum</i> Nutt.	JW(A)
*Treacle-mustard	<i>Erysimum capitatum</i> (Dougl.) Greene	JW(A)
*Fire-wheel	<i>Gaillardia pulchella</i> Foug.	JW(A); roadsides
*Scarlet gaura	<i>Gaura coccinea</i> (Nutt.) Pursh	JW(A)
*Ray flower	<i>Happlopappus gracilis</i> (Nutt.) Gray	JW(A)
Sunflower	<i>Helianthus</i> sp.	SGr
*Bush morning glory	<i>Ipomoea leptophylla</i> Torr.	SGr
*Stickseed	<i>Lappula redowskii</i> (Hornem.) Greene	disturbed areas
*Bladderpod	<i>Lesquerella fendleri</i>	JW(A)
*Bladderpod	<i>Lesquerella intermedia</i>	JW(A)
*Manyflower gromwell	<i>Lithospermum multiflorum</i> Gray	JW(A); JW(B)
Common hoarhound	<i>Marrubium vulgare</i> L.	USGr
Colorado four-o'clock	<i>Mirabilis multiflora</i> (Torr.) Gray	JW(A); SGr; DSSGr
*Beebalm	<i>Monarda punctata</i>	JW(A)
*Nama	<i>Nama hispidum</i>	SGr; DSSGr
*Evening primrose	<i>Oenothera albicaulis</i>	JW(A)
*Evening primrose	<i>Oenothera hartwegii</i>	JW(A)
*Prairieclover	<i>Petalostemon compactus</i> (Spreng.) Swezey	JW(B); SGr
*Phacelia	<i>Phacelia arizonica</i>	JW(A)
*Groundcherry	<i>Physalis hederifolia</i>	JW(A)
*Wooly paperflower	<i>Psilostrophe tagetina</i> (Nutt.) Greene	JW(A)
Common Russianthistle	<i>Salsola kali</i> L.	disturbed areas
Groundsel sp.	<i>Senecio</i> sp.	SGr; JW(A)
*Silverleaf nightshade	<i>Solanum elaeagnifolium</i> Cav.	roadsides; SGr
*Verbena	<i>Verbena bipinnatifida</i> Nutt.	SGr

PLANT SPECIES <u>1/</u>	SCIENTIFIC NAME	PLANT COMMUNITY DESIGNATION <u>2/</u>
<u>TREES AND SHRUBS:</u>		
Sand sagebrush	<i>Artemisia filifolia</i> Torr.	DSSGr; JW(B)
Big sagebrush	<i>Artemisia tridentata</i> Nutt.	JW(A)
Fourwing saltbush	<i>Atriplex canescens</i> (Pursh) Nutt.	JW(B); DSSGr
Rubber rabbitbrush	<i>Chrysothamnus nauseosus</i> (Pall.) Britt	JW(A)
Threadleaf snakeweed	<i>Gutierrezia microcephala</i> (DC.) Gray	disturbed areas
Broom snakeweed	<i>Gutierrezia sarothrae</i> (Pursh) Britt. & Rusby	disturbed areas
One-seed juniper	<i>Juniperus monosperma</i> (Engelm.) Sarg.	JW(A); JW(B)
Wolfberry	<i>Lycium</i> sp.	JW(A)
Prickly pear	<i>Opuntia erinacea</i> Engelm. & Bigel.	JW(A)
Walkingstick cholla	<i>Opuntia imbricata</i> (Haw.) DC.	USSGr; JW(A)
Juniper mistletoe	<i>Phoradendron juniperinum</i> Engelm.	JW(A); JW(B)
Pinyon pine	<i>Pinus edulis</i> Engelm.	JW(A); JW(B)
Emory oak	<i>Quercus emoryi</i> Torr.	JW(A)
Skunkbush sumac	<i>Rhus trilobata</i> Nutt.	JW(A); JW(B)
Datil yucca	<i>Yucca baccata</i> Torr.	JW(A)
Soaptree yucca	<i>Yucca elata</i> Engelm.	JW(A); JW(B)

1/ Question mark = species may occur on Monument but not located.

2/ SGr = Sandy grassland plant community; DSSGr = Deep sand shrub-grassland plant community; USGr = Upland shrub-grassland plant community; JW(A) = Juniper woodland plant community (Subunit A); JW(B) = Juniper woodland plant community (Subunit B). These community designations are general and not intended as specific boundaries for each species.

* Gran Quivira National Monument plant collection.