

STUDIES ON THE EFFECTS OF GRAZING ON
GRASSLAND UNDER PERMIT ON THE CAPULIN MOUNTAIN
NATIONAL MONUMENT, NEW MEXICO
1975

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Studies on the Effects of Grazing
on Grassland under Permit on the
Capulin Mountain National Monument,
New Mexico

1. Installation of Exclosures
and a Vegetative Survey
within the Exclosures

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INTRODUCTION

In 1972, 95 acres adjacent to Capulin Mountain National Monument, New Mexico were purchased by the National Park Service from the State of New Mexico. At that time the 95 acres were under lease from the state by John Morrow and Carlos Cornay. To compensate for loss of income to those ranchers, the National Park Service agreed under provision of Public Law 91-646 to reimburse Mr. Morrow 3 calves/year and Mr. Cornay 1½ calves/year. The National Park Service agreed to make a cash settlement or provide equivalent grazing under provision of Public Law 91-646. The latter was accomplished by designating two areas (one to each rancher) within the boundaries of Capulin National Monument to be used for grazing as long as such grazing proved not to be detrimental. These two areas (1 and 2) are shown in Fig. 1, and the grazing status of each one is described as follows:

- 1) Area 1--under permit by John Morrow since 1972, but no grazing has occurred since that date. Permit expires 1 September 1976. Grazing status prior to 1972 is not known.
- 2) Area 2--under permit since 1972 and has been grazed since that time. Permit expires 1 March 1978. Grazing status prior to 1972 is not known.

The purpose of the first phase of this study is to establish two controls (exclosures) one in each of Areas 1 and 2, and conduct a vegetative survey within those exclosures. Phase two of this study will involve vegetative surveys outside and inside the exclosures during subsequent growing seasons to determine the effect of grazing on Areas 1 and 2.

MATERIALS AND METHODS

Two 50m by 200m exclosures were established May 1974. One was placed on Area 1 and the other on Area 2. Both were enclosed with a 3-strand barbed wire fence. In addition, a study area of the same size was marked off by stakes on Area 3. There are apparently no future plans to issue permits for grazing on Area 3, and it has not been grazed in the past.

Species composition and ground cover percentage were determined within each plot by using 100-point paced transects as described in the Big Game Browse Range Analysis Techniques for New Mexico. Less than 1% of Areas 2 and 3 contained shrubs; whereas, Area 1 had at least a 1% coverage of shrubs and trees. Both annuals and perennials were recorded during the study. References for plant identifications included: Kearney and Peebles (1964), Hitchcock (1950), Harrington (1954), and Correll and Johnston (1970).

RESULTS AND DISCUSSION

Vegetative data collected for this study were obtained during a year of below average precipitation on the Capulin Mountain National Monument. During January 1974 Capulin was 0.61 inches above average, but from February through August, Capulin was 0.25, 0.26, 1.10, 2.08, 0.83, 1.3, and 1.29 inches below average, respectively. A precipitation dispersion diagram (Tuan *et al.* 1969) showing the normal average monthly precipitation for Raton, New Mexico, 39 miles west of the Monument, was used to determine the deviations from average precipitation at Capulin. Precipitation data for Capulin were obtained from United States Weather Bureau records. Data for September 1974 were not available during preparation of this paper.

During a year of average precipitation one might expect a higher ground cover index for May than the data indicated for 1974. Also, low precipitation may account for the high percentages of litter and bare ground in the early part of the summer. Identification of plants was also difficult during early summer. For example, Artemisia frigida Wild; Artemisia Carruthii Wood; and Artemisia ludoviciana Nutt. listed in the September transects were generally unidentifiable in the May and July transects and listed as Artemisia spp.

Average ground cover and bare ground percentages for study plots in Areas 1, 2, and 3 are listed in Tables 1, 2, and 3, respectively. The highest number of plant species was counted in July on all three plots. The low number in May was probably a result of low soil moisture; the low number in September was probably a result of running only one transect per exclosure. Tree and shrub species had approximately a 1% coverage within the plot on Area 1, including Pinus edulus Engelm, Quercus spp., Rhus aromatica Ait., and Cercocarpus montanus Raf. Pinus edulus was the dominant tree species on Area 1.

Data from the three plots from Areas 1, 2, and 3 were also compared. Schizachyrium scoparium (Michx.) Nash., Bouteloua gracilis (H.B.K.) Griffiths, Andropogon Gerardi Vitman, and Artemisia spp. were dominants common to all three plots. Considering all species, twelve were common to all the plots, seven were common to plots 1 and 2, one to plots 1 and 3, and one to plots 2 and 3. Eight species were recorded only on plot 1; two species were recorded only on plot 2, and six species were recorded only on plot 3 (Table 4).

During this study, species patterns and composition within each plot were representative of areas outside the plots. These data from within each plot will be a basis for comparison to determine the effects of grazing outside the plots in years subsequent to 1974.

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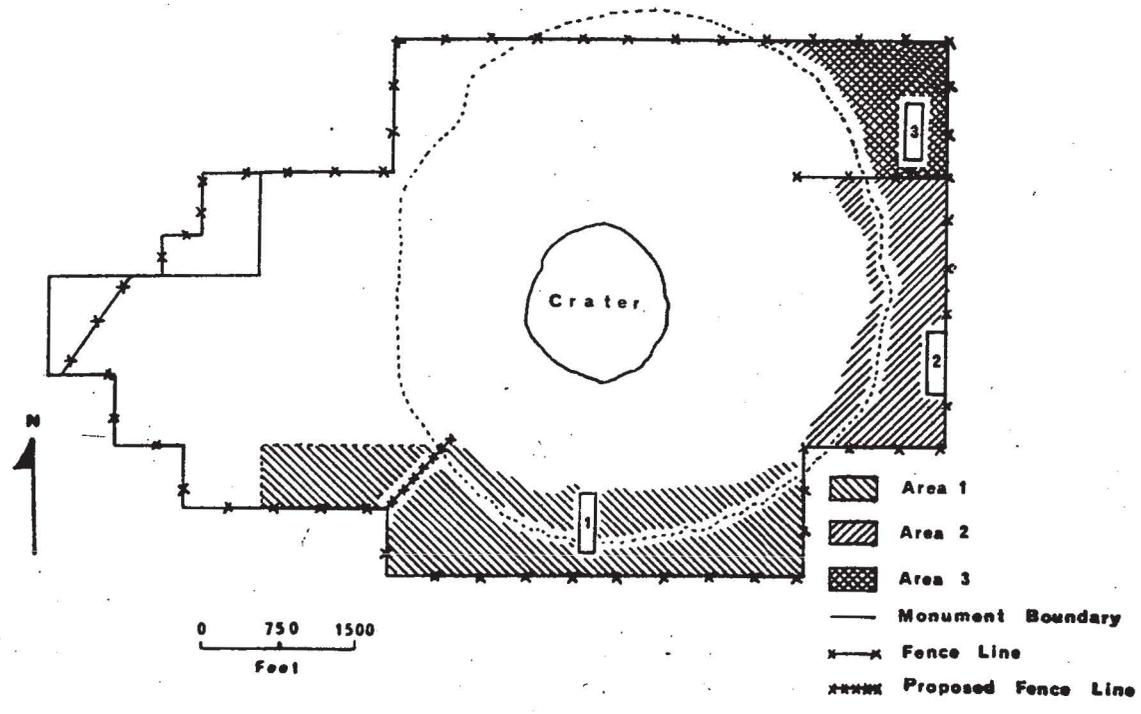


Fig. 1. Map of Capulin Mountain National Monument, New Mexico showing Areas 1, 2, and 3. The approximate base of the cinder cone is shown by a dashed line. The enclosures on Areas 1 and 2 and the study plot on Area 3 are shown as numbered rectangles.

Table 1 Average ground cover percentage for grass and forb species for May and July 1974 in the enclosure on Area 1. September is represented by only one transect. Number of transects is enclosed in parentheses; number(s) following parentheses represent dates of transect. Annuals are indicated by an asterisk.

Species	May (3) 13,21,22	July (3) 17,17,22	September (1) 14
<u>Bouteloua gracilis</u> , (H.B.K.) Griffiths.	2	23	47
<u>Andropogon Gerardi</u> , Vitman.	10	11	1
<u>Schizachyrium scoparium</u> , (Michx.) Nash.	1	7	23
<u>Artemisia</u> spp.	8	23	
<u>Artemisia Carruthii</u> , Carruth.			4
<u>Artemisia frigida</u> , Willd.			4
* <u>Kochia scoparia</u> , (L.) Roth.			5
<u>Pitanion hystrix</u> , (Nutt.) J.G. Smith	2	4	2
* <u>Salsola Kali</u> , L.		4	3
<u>Heterotheca villosa</u> , (Pursh.) Shimmers.	2	3	
<u>Yucca angustifolia</u> , Pursh.	2	<1	1
<u>Aristida divaricata</u> , Hump. & Bonpl.	3		
<u>Lupinus argenteus</u> , Pursh.	3		
<u>Verbena</u> spp.	1	2	
<u>Aster</u> spp.	2		
<u>Ratibida columnaris</u> , (Sims) D. Don		2	
<u>Mentzelia pumila</u> , (Nutt.) T. & G.		1	
<u>Argemone platyceras</u> , Link & Otto		1	
<u>Penstemon barbatus</u> , (Cav.) Roth.	1		
<u>Bouteloua curtispindula</u> , (Michx.) Torr.			1

Table 1 (cont.)

Species	May	July	September
<u>Ambrosia confertiflora</u> , D.C.			1
* <u>Helianthus annuus</u> , L.	<1	<1	
<u>Lesquerella</u> spp.	<1		
<u>Aristida Wrightii</u> , Nash.			1
* <u>Monarda pectinata</u> , Nutt.		<1	
* <u>Chenopodium</u> spp.			1
<u>Aster hirtifolius</u> , Blake.		<1	
<u>Gilia aggregata</u> , (Pursh.) Sprengel		<1	
<u>Opuntia polyacantha</u> , Haw.	<1		
<u>Senecio longilobus</u> , Benth.		<1	
<u>Homoea leptophylla</u> , Torr.		<1	
Total Grasses and Forbs	337.5	82.78	94
Litter	45.6	10.33	4
Total Ground Cover Percentage	83.1	93.11	98
Bare Ground	16.9	6.89	2

Table 2 Average ground cover percentage for grass and forb species for May and July 1974 in the enclosure on Area 2. September is represented by only one transect. Number of transects is enclosed in parentheses; number(s) following parentheses represent dates of transect. Annuals are indicated by an asterisk.

Species	May (3) 20,23,23	July (5) 18,19,22,23,23	September (1) 14
<u>Schizachyrium scoparium</u> , (Michx.) Nash.	11	18	21
<u>Bouteloua gracilis</u> , (H.B.K.) Griffiths	9	14	26
<u>Artemisia</u> spp.	6	25	
<u>Artemisia frigida</u> , Willd.			16
<u>Artemisia Carruthii</u> , Carruth.			4
<u>Artemisia ludoviciana</u> , Nutt.			6
<u>Andropogon Gerardi</u> , Vitman.	15	11	1
<u>Yucca angustifolia</u> , Pursh.	2	11	3
<u>Bouteloua curtipendula</u> , (Michx.) Torr.		1	8
<u>Mentzelia pumila</u> , (Nutt.) T. & G.		4	2
<u>Heterotheca villosa</u> , (Pursh.) Shinnars	1	2	2
* <u>Helianthus annuus</u> , L.		2	2
<u>Sitanion hystrix</u> , (Nutt.) J.G. Smith	3	<1	
<u>Lupinus argenteus</u> , Pursh.	2	<1	
<u>Argemone platyceras</u> , Link. & Otto.	1	1	
<u>Opuntia polyacantha</u> , Haw.	1	<1	
<u>Eriogonum cognatum</u> , Greene	<1	<1	
<u>Ratibida columnaris</u> , (Sims) D. Don		1	
* <u>Salsola Kali</u> , L.	<1		1
<u>Aristida divaricata</u> , Hump. & Bonpl.		<1	

Table 2 (cont.)

Species	May	July	September
<u>Bouteloua hirsuta</u> , Lag.		<1	
<u>Gilia aggregata</u> , (Pursh) Sprengel		<1	
<u>Penstemon barbatus</u> , (Cav.) Roth.		<1	
<u>Monarda pectinata</u> , Nutt.		<1	
<u>Veratrum californicum</u> , Durand.	<1		
Total Grasses and Forbs	52.6	93.6	92
Litter	28	4.8	0
Total Ground Cover Percentage	80.6	98.4	92
Bare Ground	19.4	1.6	8

Table 3 Average ground cover percentage for grass and forb species for May and July 1974 in the enclosure on Area 3. September is represented by only one transect. Number of transects is enclosed in parentheses; number(s) following parentheses represent dates of transect. Annuals are indicated by an asterisk.

Species	May (3) 20,24,24	July (2) 19,20	September (1) 14
<u>Bouteloua gracilis</u> , (H.B.K.) Griffiths	1	16	38
<u>Schizachyrium scoparium</u> , (Michx.) Nash.	9	24	5
<u>Artemisia</u> spp.	14	31	
<u>Artemisia Carruthii</u> , Carruth.			10
<u>Artemisia frigida</u> , Willd.			10
<u>Andropogon Gerardi</u> , Vitman.	6	14	12
<u>Elymus angustifolia</u> , Pursh.	7	5	8
<u>Mentzelia pumila</u> , (Nutt.) T. & G.		7	1
<u>Aster arenosus</u> , (Heller) Blake.	2		
<u>Aster hirtifolius</u> , Blake.	2		
<u>Penstemon barbatus</u> , (Cav.) Roth.			2
<u>Ratibida columnaris</u> , (Sims) D. Don		2	
<u>Bouteloua hirsuta</u> , Lag.		2	2
<u>Bouteloua curtipendula</u> , (Michx.) Torr.	1	1	
<u>Opuntia polyacantha</u> , Haw.	<1	<1	
<u>Xanthocephalum Sarothrae</u> , (Pursh) Shinnars	<1		
* <u>Helianthus annuus</u> , L.		<1	
<u>Lupinus argenteus</u> , Pursh.	1	1	
<u>Heterotheca villosa</u> , (Pursh.) Shinnars		<1	1

Table 3 (cont.)

Species	May	July	September
<u>Eragrostis curvula</u> , (Schrad.) Nees.		<1	
<u>Muhlenbergia Wrightii</u> , Vasey		<1	
<u>Cowania mexicana</u> , Don.		<1	
<u>Muhlenbergia montana</u> , (Nutt.) Hitchc.			1
<u>Aster</u> spp.	<1		
<u>Geranium caespitosum</u> , James	<1		
Total Grasses and Forbs	45.6	95	90
Litter	42	2	5
Total Ground Cover Percentage	87.6	97	95
Bare Ground	12.4	3	5

Table 4. Species of plants recorded on the study plots in Areas 1, 2, or 3 are marked with an "X".

Species	Area 1	Area 2	Area 3
<u>Bouteloua gracilis</u>	X	X	X
<u>Andropogon Gerardi</u>	X	X	X
<u>Artemisia</u> spp.	X	X	X
<u>Schizachyrium scoparium</u>	X	X	X
<u>Yucca angustifolia</u>	X	X	X
<u>Mentzelia pumila</u>	X	X	X
<u>Lupinus argenteus</u>	X	X	X
<u>Ratibida columnaris</u>	X	X	X
<u>Opuntia polyacantha</u>	X	X	X
<u>Bouteloua curtipendula</u>	X	X	X
<u>Heterotheca villosa</u>	X	X	X
<u>Helianthus annuus</u>	X	X	X
<u>Sitanion hystrix</u>	X	X	
<u>Salsola Kali</u>	X	X	
<u>Aristida divaricata</u>	X	X	
<u>Penstemon barbatus</u>	X	X	
<u>Argemone platyceras</u>	X	X	
<u>Monarda pectinata</u>	X	X	
<u>Gilia aggregata</u>	X	X	
<u>Aster</u> spp.	X		X
<u>Bouteloua hirsuta</u>		X	X

Table 4. (cont.)

Species	Area 1	Area 2	Area 3
<u>Ambrosia confertiflora</u>	X		
<u>Verbena</u> spp	X		
<u>Lesquerella</u> spp.	X		
<u>Senecio longilobus</u>	X		
<u>Ipomoea leptophylla</u>	X		
<u>Kochia scoparia</u>	X		
<u>Chenopodium</u> spp.	X		
<u>Aristida Wrightii</u>	X		
<u>Eriogonum cognatum</u>		X	
<u>Veratrum californicum</u>		X	
<u>Muhlenbergia montana</u>			X
<u>Xanthocephalum Sarothrae</u>			X
<u>Eragrostis curvula</u>			X
<u>Muhlenbergia Wrightii</u>			X
<u>Cowania mexicana</u>			X
<u>Geranium caespitosum</u>			X

PROPOSED RESEARCH PROJECTS
FOR CAPULIN NATIONAL MONUMENT

1. Continuation of grassland surveys to monitor the influence of grazing on land under permit on the Monument. This project should involve annual surveys during each growing season to include 6, 100-point paced transects within each enclosure and at least 10, 100-point paced transects outside each enclosure on each of Areas 1 and 2. Also, Area 3 should be surveyed by 6-10, 100-point transects each year.
2. Surveys of scientific value dealing with the biota on the Monument are lacking. Some plants and butterfly identifications have been verified and the specimens have been deposited within scientific collections. However, reliable identifications of most of the biota to include plants, insects, amphibians, reptiles, birds, and mammals have not been accomplished. Furthermore, to publish distributional data from the Monument, representative species of the above biota must be deposited in a maintained scientific collection.
3. The trees on Mt. Capulin are apparently of unquestionable value to the beauty of the area. Porcupine damage to these trees is quite obvious. Systematic studies to determine the extent and significance of such damage is needed.
4. The road to the summit of Mt. Capulin contains a surface of cinder. Because of vehicular traffic and wind and water erosion, cinders are in continuous movement from the road to the slopes of the mountain. The influence of this material on the biota should be examined.
5. The infestation of the Monument area by an insect referred to as Nysius raphanus during 1974 caused a great deal of discomfort to visitors. A means to control this insect during subsequent summers is recommended.

