REPORT ON BIOLOGICAL STUDIES AT CAPULIN MOUNTAIN NATIONAL MONUMENT DURING THE LATE SPRING, SUMMER, AND EARLY FALL OF 1977 1978

by: A.L. Gennaro
INTRODUCTION

The Natural History Museum of Eastern New Mexico University began a grassland monitoring program on Capulin Mountain National Monument, New Mexico in May 1974. The purpose and detailed methods involved in that program were described by Gennaro (1974). Gennaro and Trujillo (1975) and Gennaro et al. (1976) continued the monitoring program during 1975 and 1976, respectively. The grassland monitoring program was continued during the late spring, summer, and fall of 1977 on an area under grazing permit by Carlos Cornay shown as Area 2 in Fig. 1. Area 1 in Fig. 1 is under permit by John Morrow. Because he has not grazed that area, it was not surveyed.

Other research projects conducted on the Monument in 1977 included surveys to determine the following: 1) annual browse utilization by deer in areas not under grazing permits, 2) index of the deer population, 3) kinds and distribution of herptiles (amphibians and reptiles) and mammals, 4) inventory of downed woody material, and 5) preparation of a vegetative map.

METHODS

The Big Game Browse Analysis Techniques for New Mexico was used as a
guide to determine vegetative composition and ground cover percentages on the area under grazing permit by Carlos Cornay, to determine annual browse utilization by deer on areas not under permits, and to interpret form and age class data from the browse utilization transects. References for plant identifications included Kearney and Peebles (1964), Hitchcock (1950), Harrington (1954), and Correll and Johnston (1970).

To study the effects of grazing on Area 2, three 100-point paced transects were read inside and two were read outside the exclosure during May, June, July, August, and September of 1977. Chi-square tests were used to determine whether or not significant differences existed between percentages of litter, plant cover, and bare ground inside as compared to outside the exclosure.

To study annual browse utilization on areas not under grazing permits, four 100-point paced transects were read from the same areas read in 1976. Those sites received the heaviest browse use.

Four deer transects, each consisting of ten 1/100 acre plots, were established on the Monument to derive an index to evaluate the annual trend in the deer population. One transect was placed within each of four associations; namely, Little Blue Stem-Blue Grama, Oak-Mountain Mahogany, Pinyon-Juniper-steep cinder slope, and Pinyon-Juniper-Oak-Blue Grama. A total of 40 plots was cleared of deer pellet groups 10 October 1976. Groups were counted from those plots 9-15 June 1977. The plots were cleared that June and groups were counted again 15-17 October 1977. The deer index was calculated by a formula presented by Dasmann (1964).

Vertebrate distributions were studied in relationship to 17 associations. Gennaro et al. (1976) described those associations and plotted them on a map of the Monument. They referred to the associations as habitat
types in their 1976 report. Herptiles were sighted or collected. Mammals were sighted, detected by signs, or captured with Museum Special snaptraps, commercial rat traps, Havahart live traps, or Sherman live traps. Bats were surveyed with nets at one site within and two sites adjacent to the Monument. Herptiles were preserved in alcohol; mammals were preserved in alcohol or prepared as round, dried study skins. All specimens were deposited in the Eastern New Mexico University (ENMU) Natural History Museum.

The Handbook for Inventorizing Downed Woody Material (Brown 1974) was used as a reference to inventory woody material. For the purpose of the inventory, as well as for the preparation of a vegetative map, five plant communities were delineated on the Monument--Grassland, Shrub, Pinyon-Juniper, Pinyon-Juniper-Shrub, and Pinyon-Juniper-Shrub-Grassland. The number of transects read in those communities to inventory downed material was as follows: Shrub (1 transect and 12 plots); Pinyon-Juniper (5 transects and 112 plots); Pinyon-Juniper-Shrub (13 transects and 176 plots); and Pinyon-Juniper-Shrub-Grassland (1 transect and 12 plots).

Aerial photographs and vegetative transects (Big Game Browse Analysis Techniques for New Mexico) were used to determine distributions and compositions of the five plant communities on the Monument. Browse utilization transects were read in communities designated as Shrub, Pinyon-Juniper, Pinyon-Juniper-Shrub, and Pinyon-Juniper-Shrub-Grassland to determine the variation in plant species composition of any one community on various areas of the Monument. One-hundred-point paced transects were read in areas designated as Grassland for the same reason. Each of the communities was plotted on a map of the Monument, and a planimeter was used to determine the size of each community.
Results and Discussion

Effects of Grazing. The results of grassland transects are shown in Tables 1, 2, and 3. Chi-square tests on Area 2 indicated that there was significantly less litter outside the exclosure than inside during May, July, August. There was also more bare ground and erosion pavement outside than inside the exclosure during May (Table 3). Those data indicate that eight or more times out of ten the differences in percentages of litter and bare ground are due to a factor or factors other than chance. In this case, grazing by livestock appears to be one factor causing the differences.

Gennaro and Trujillo (1975) and Gennaro et al. (1976) pointed out the consequences of litter reduction. They also commented on the percentages of cool season grasses. During 1975, Gennaro et al. noted that cool season grasses such as Squirrel Tail and Western Wheatgrass were lower in percentage outside than inside Exclosure 2. During 1977, Western Wheatgrass had about the same percentage inside and outside the exclosure, but Squirrel Tail was higher in percentages inside than outside the exclosure.

RECOMMENDATIONS: The reduced litter, increased bare ground, and reduction of cool season grasses outside Exclosure 2 as compared to inside the exclosure result in the same recommendation made by Gennaro et al. (1976), that grazing be eliminated on Area 2 or that the grazing schedule be changed from 20 February - 1 June to 20 November - 1 March, as well as a reduction of animal unit months from the allotted 18 to 9.

Annual Utilization of Browse Species. Annual browse utilization percentages are shown in Table 4. Thirty percent utilization for Mountain Mahogany was the highest recorded. James F. Johnson (personal communication, New Mexico Department of Game and Fish) stated that 60% or more utilization for several consecutive years was indicative of heavy browse.
Gennaro and Trujillo (1975) and Gennaro et al. (1976) noted the highest percentages during 1975 and 1976 to be 40% for Mountain Mahogany and 39% for Pinyon Pine, respectively.

The vigor rating for "A" species from the browse utilization transects was determined from Age Classes (Table 5) and Form Classes (Table 6). The vigor rating for the "A" species Gambel Oak and Common Chokecherry was high. The vigor rating for the "A" species Mountain Mahogany was low in that 41% of the plants surveyed was heavily hedged.

RECOMMENDATIONS: As long as deer occupy the Monument, annual utilization checks are necessary, especially since the vigor rating for Mountain Mahogany was low. The four transects surveyed in 1977 should be surveyed again in 1978.

Deer index. Four transects provided data for monitoring trends in the deer population on the Monument. The 1976-1977 data from the associations from the June 1977 pellet count were as follows:

1) Little Blue Stem-Blue Grama, 0.03 deer/acre
2) Oak-Mountain Mahogany, 0.05 deer/acre
3) Pinyon-Juniper-steep cinder slope, 0.04 deer/acre
4) Pinyon-Juniper-Oak-Blue Grama 0.09 deer/acre

The 1977 data from the October 1977 pellet count were as follows:

1) Little Blue Stem-Blue Grama, 0.006 deer/acre
2) Oak-Mountain Mahogany, 0.018 deer/acre
3) Pinyon-Juniper-steep cinder slope, 0.02 deer/acre
4) Pinyon-Juniper-Oak-Blue Grama, 0.08 deer/acre

The average deer density derived from the two counting periods from all of the associations was 0.04 deer/acre or 32 deer (0.04 x 775 acres) on the Monument. That figure, although computed as a density, may best serve
as an index of the deer population for reasons stated by Gennaro et al. (1976).

RECOMMENDATIONS: The annual utilization check of browse species indicated that percentage browse was less than that which would be detrimental to browse plants, but the low vigor rating of Mountain Mahogany suggests an annual monitor to study the population size of deer in relationship to browse usage.

Vertebrate Survey. Nine kinds of herptiles and 32 kinds of mammals were recorded from Capulin Mountain National Monument, New Mexico (Table 7). Those counts include the 1977 additions which were the Long-legged Myotis (Myotis volans), Big Brown Bat (Eptecicus fuscus), Townsend's Big-eared Bat (Plecotus townsendii), Black-tailed Prairie Dog (Cynomys ludovicianus), Silky Pocket Mouse (Perognathus flavus), Long-tailed Weasel (Mustela frenata), and Black Bear (Ursus americanus). The Black Bear was observed by park personnel and visitors. All of the vertebrates known to occur on the Monument thus far, except bats and the Black Bear, are listed below with the plant community and association from which they were recorded.

Bat species listed above, as well as the Fringed Myotis (Myotis thysanodes) and Small-footed Myotis (Myotis leibii) captured in 1976 and 1977, and the Black Bear probably occur in all of the associations. A discussion of the mammal distributions on the Monument was included in Gennaro et al. (1976).

Grassland Community

Blue Grama-Prairie Sagewort.

Blue Grama abundant; Prairie Sagewort moderate in amount and dispersed; humus abundant; moderate to gentle slope; base of mountain on south side.

HERPTILES:

Lesser Earless Lizard
Eastern Fence Lizard
Six-lined Racerunner
Racer
Western Rattlesnake
Gopher Snake

MAMMALS:

Cottontail
Black-tailed Jack Rabbit
Botta's Pocket Gopher
Hispid Pocket Mouse
Ord's Kangaroo Rat
Deer Mouse
Porcupine
Mule Deer

Yucca-Blue Grama

Yucca dispersed throughout a dense mat of Blue Grama; humus abundant; gentle slope; abundant cinder deposits radiating out from the base of the mountain; base of mountain on east side.

HERPTILES:

Lesser Earless Lizard
Eastern Fence Lizard
Short-horned Lizard
Racer
Western Rattlesnake

MAMMALS:

Cottontail
Botta's Pocket Gopher
Silky Pocket Mouse
Hispid Pocket Mouse
Ord's Kangaroo Rat
Western Harvest Mouse
Deer Mouse
Northern Grasshopper Mouse
Porcupine
Mule Deer

Little Blue-Stem-Blue Grama

Both grass species abundant; humus abundant; level to gentle slope; base of mountain on west side.

HERPTILES:

Gopher Snake
MAMMALS:
Botta's Pocket Gopher
Hispid Pocket Mouse
Deer Mouse
Mexican Vole
Porcupine
Mule Deer

Blue Grama-lava extrusions
Blue Grama moderate; Pinyon and One-seeded Juniper very sparse; humus moderate; habitat traversed by lava ridges usually less than 10 ft high; west of visitor center, west-southwestern part of Monument.

HERPTILES:
Eastern Fence Lizard
Gopher Snake
Plains Garder Snake

MAMMALS:
Desert Cottontail
Colorado Chipmunk
Rock Squirrel
Botta's Pocket Gopher
Western Harvest Mouse
Deer Mouse
Mexican Vole
Porcupine
Mule Deer

Muhly Grassland-crater rim
*Muhlenbergia* spp. and *Poa* spp. dense; substrate a humus-cinder mixture; north-facing slope; outside and immediately below crater rim.

MAMMALS:
Botta's Pocket Gopher
Hispid Pocket Mouse
Deer Mouse
Mexican Vole
Porcupine
Mule Deer
Shrub Community

Oak-Mountain Mahogany

Dense stands of mixed Oak and Mountain Mahogany; homogeneous stands of either of those shrubs; humus abundant; northwest-facing slope.

MAMMALS:

Deer Mouse
Mexican Vole
Porcupine
Mule Deer

Oak-Squaw Bush-Chokecherry

Dense stands of Oak, Squaw Bush, and Chokecherry in eroded furrows perpendicular to contours and radiating out from the crater rim to the mountain base.

MAMMALS:

Deer Mouse
Mexican Vole
Porcupine
Mule Deer

Mountain Mahogany-Squaw Bush-Prickly Pear

Moderate amounts of Mountain Mahogany, Squaw Bush, and Prickly Pear (Opuntia spp.) dispersed among small and large lava rocks; moderate erosion; south-facing slope inside crater.

HERPTILES:

Eastern Fence Lizard

MAMMALS:

Colorado Chipmunk
Rock Squirrel
Deer Mouse
Brush Mouse
Porcupine
Mule Deer

Oak-Squaw Bush-Chokecherry-Mountain Mahogany

Dense mixed stands of Oak, Squaw Bush, Chokecherry, and Mountain Mahogany; large lava rocks dispersed throughout the area; north-facing slope inside crater.
HERPTILES:

Western Spadefoot
Eastern Fence Lizard
Gopher Snake

MAMMALS:

Cottontail
Colorado Chipmunk
Rock Squirrel
Western Harvest Mouse
Deer Mouse
Piñon Mouse
Mexican Vole
Porcupine
Mule Deer

Pinyon-Juniper Community

Pinyon-Juniper-steep cinder slope

Dense stands of Pinyon and One-seeded Juniper; no understory; cinder slope containing deep furrows perpendicular to the mountain contours; furrows formed from water runoff from culverts along mountain road; most of the furrows filled with large rocks; east-facing slope.

HERPTILES:

Eastern Fence Lizard
Six-lined Racerunner

MAMMALS:

Colorado Chipmunk
Rock Squirrel
Botta's Pocket Gopher
Deer Mouse
Brush Mouse
White-footed Mouse
Rock Mouse
White-throated Woodrat
Porcupine
Gray Fox
Mule Deer

*Prairie Dog mounds were not observed on the Monument; however, several mounds were noted about one-half mile east of the Monument boundary.
Pinyon-Juniper-Shrub Community

Pinyon-Juniper-lava outcrop.

Moderate amounts of Pinyon and One-seeded Juniper; sparsely scattered Western Yellow Pine; substrate with small to large lava rocks forming extrusions frequently over 10 ft high; west, northwest from picnic area, west side of Monument.

HERPTILES:

Eastern Fence Lizard
Western Rattlesnake

MAMMALS:

Colorado Chipmunk
Rock Squirrel
Botta's Pocket Gopher
Deer Mouse
Brush Mouse
White-throated Woodrat
Mexican Woodrat
Porcupine
Gray Fox
Bobcat (skull)
Mule Deer

Pinyon-Juniper-lava extrusions

Sparsely scattered Pinyon and One-seeded Juniper and understory of Oak dispersed over lava extrusions; extrusions usually less than 10 ft high; southwest side of the mountain; adjacent to fire road.

HERPTILES:

Eastern Fence Lizard

MAMMALS:

Desert Cottontail
Colorado Chipmunk
Rock Squirrel
Botta's Pocket Gopher
Deer Mouse
Brush Mouse
Rock Mouse
White-throated Woodrat
Porcupine
Coyote
Mule Deer
Common Horehound-Four-wing Saltbush

Moderate stands of Common Horehound and Four-wing Saltbush; excessive erosion; sparsely scattered Pinyon and One-seeded Juniper; south-facing steep slope.

HERPTILES:
Lesser Earless Lizard
Eastern Fence Lizard
Six-lined Racerunner

MAMMALS:
Botta's Pocket Gopher
Ord's Kangaroo Rat
Western Harvest Mouse
Deer Mouse
Porcupine
Coyote
Mule Deer

Pinyon-Juniper-Mountain Mahogany belt

A tree-shrub vegetative belt that virtually surrounds the base of the mountain, the belt being interrupted only on the south-facing slope by the Common Horehound-Four-wing Saltbush association.

HERPTILES:
Eastern Fence Lizard
Six-lined Racerunner

MAMMALS:
Cottontail
Black-tailed Jack Rabbit
Botta's Pocket Gopher
Mexican Vole
Deer Mouse
Porcupine
Gray Fox
Mule Deer
Long-tailed Weasel (skull)

Pinyon-Juniper-cinder-humus substrate

Moderate amounts of Pinyon and One-seeded Juniper; understory of Mountain Mahogany; cinder-humus substrate; inside crater and immediately below rim; south-facing slope.

HERPTILES:
Eastern Fence Lizard
MAMMALS:

Colorado Chipmunk
Rock Squirrel
Deer Mouse
Porcupine
Mule Deer

Pinyon-Juniper-Shrub-Grass Community

**Pinyon-Juniper-Oak-Blue Grama**

Trees and shrubs evenly dispersed over Blue Grama; cinder more abundant than humus; west-facing steep slope.

HERPTILES:

Eastern Fence Lizard
Gopher Snake

**MAMMALS:**

Botta's Pocket Gopher
Mexican Vole
Porcupine
Mule Deer

RECOMMENDATIONS: The delineation of communities and associations provided a baseline for studying vertebrate distributions. Surveys each year should continue to determine habitat preferences of those species least known.

The 1977 survey provided us with the kind of information necessary to establish future goals as follows:

1) More than one kind of amphibian is expected to occupy the Monument; therefore, extensive surveys in mesic areas should continue.

2) More field time is needed to search for snakes, especially during the night time.

3) More than five species of bats are likely to occur on the Monument; therefore, more metal stock tanks outside the boundary and crevices on the mountain should be surveyed.

4) The identifications and distributions of *Peromyscus* such as the Brush Mouse, Piñon Mouse, and Rock Mouse are not clear. Larger
samples of those species from their preferred habitat types should be obtained.

5) The distribution of the White-throated Woodrat and Mexican Woodrat needs to be clarified. Again, larger series from all lava habitats need to be examined.

6) The habitat preferences of Cottontail species should be elucidated. Since only subtle differences separate the Desert Cottontail (*Sylvilagus auduboni*) from the Nuttall's Cottontail (*Sylvilagus nuttalli*), rabbits should be collected and identified from each habitat.*

7) Not enough time was devoted toward searching for carnivores or their signs in 1977. More time should be devoted toward that effort in the future.

8) A checklist of the Monument's avian fauna was prepared before ENMU Museum personnel began research on the Monument. A limited verification of that list has been in progress for the last three years. A full effort should be applied toward that verification as soon as possible.

9) As soon as habitat preferences for species are known, studies which determine their density and biomass need to be initiated.

**Inventory of Downed Woody Material.** Diagrams showing tons per acre of downed woody material, average duff depths, and average fuel depths were plotted on a map prepared for this report (Fig. 2), as well as on two 20 x 30 in (55 by 76 dm) overlays which accompany this report. Those

*Gennaro et al. (1976) stated that the Eastern Cottontail (*Sylvilagus floridanus*) was subtly different from the Desert Cottontail on the Monument. They were referring to Nuttall's Cottontail rather than the Eastern Cottontail.*
parameters and others to be obtained from future research on the Monument will be used in a fuel model. The model is a functional component of the National Fire-Danger Rating System (Deeming et al. 1974). The system, in its simplest form, will predict the behavior of a potential fire on the Monument.

RECOMMENDATIONS: Other parameters besides weight per unit area of dead fuel, average duff depth, and average fuel depth, need to be quantified for use in the fuel model. Some of those parameters such as weight per unit area of live fuels and fire history should be quantified during the 1978 summer.

Vegetative Map. The five plant communities designated for the Monument were plotted on a map prepared for this report (Fig. 3), as well as on two 20 x 30 in (55 by 76 dm) overlays which accompany this report. Within communities, plants were listed in the order of trees, shrubs, forbs, and grasses, with the most common species being listed first, the second most common second, etcetera. Sizes of communities in acres are listed in Table 8. Abbreviations for plants within communities were taken from or written as shown in the Big Game Browse Analysis for New Mexico as follows:

GRASSES:
Pofe, Mutten Grass, Poa fendleriana (Steud.) Varez
Agsm, Western Wheatgrass, Agropyron smithii Rydb
Sihy, Squirrel-tail, Sitanion hystrix (Nutt) J.G. Smith
Scsc, Little Bluestem, Schizachyrium scoparium (Michx.) Nash.
Ange, Big Bluestem, Andropogon Gerardi Vitman
MUHL, Muhlenbergia spp.
Bogr, Blue Grama, Bouteloua gracilis (H.B.K.) Griffiths
Bocu, Side-oats Grama, Bouteloua curtipendula (Michx.) Torr.
FORBS:
Saki, Russian Thistle, *Salsola kali* L.
CHEN, Goose Foot, *Chenopodium* spp.
HELI, Sunflower, *Helianthus* spp.
ARTE, *Artemisia* spp.

SHRUBS:
YUCC, Spanish Bayonet, *Yucca augustifolia* Pursh.
QUER, *Quercus* spp.
RIBE, *Ribes* spp.
Rune, Thimbleberry, *Rubus neomexicanus* Gray.
Cemo, Mountain Mahogany, *Cercocarpus montanus* H.B.K.
Prvi, Common Chokecherry, *Prunus virginiana* L.
Rhar, Polecate Bush, *Rhus aromatica* Ait
OPUN, *Opuntia* spp.
Maru, Common Horehound, *Marribuim volgare* L.

TREES:
Pied, Pinyon Pine, *Pinus edulis* Engelm

Community compositions were listed on the overlays. Community compositions for the vegetative map within this report (Fig. 3) are as follows:
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A list of vegetative species encountered thus far by Museum personnel while conducting surveys on the Monument is presented in Table 9.
ACKNOWLEDGMENTS

This study was supported by funds from the National Park Service, Southwest Region. Gary Gregory, Natural Resources Specialist, was extremely helpful in providing advice for inventorying downed woody material. Dr. Troy Best, Assistant Professor, Natural History Museum, Eastern New Mexico University (ENMU) collected and prepared bats for the study. The major part of the field work was accomplished by Thomas Soapes and Ralph Johnson, both ENMU students. I wish to thank Thomas Soapes especially for his outstanding field work which led to the preparation of the vegetative map. Finally, I wish to thank John Chapman, Superintendent, and Jim Vukonich, Chief Park Ranger, for being extremely cooperative to my students and me at all times during this investigation.
Table 1. Average ground cover percentages inside Exclosure 2 on Area 2 during 1977. The number of 100-point transects is enclosed in parentheses; the number following the parentheses represents the date of the transect. Annuals are indicated by an asterisk.

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<th>August (3) 19</th>
<th>September (3) 19</th>
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<tbody>
<tr>
<td>Big Bluestem</td>
<td></td>
<td></td>
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<tr>
<td><em>Andropogon gerardii</em> Vitman</td>
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<td><em>Bouteloua gracilis</em> (H.B.K.) Griffiths</td>
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<td>Artemisia Carruthii Carruth.</td>
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<td>Russian Thistle</td>
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<td><em>Salsola kali</em> L.</td>
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<td><em>Stranion hisrix</em> (Nutt.) J.C. Smith</td>
<td>3</td>
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<tr>
<td>Side-oats Grama</td>
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<td><em>Bouteloua curtipendula</em> (Michx.) Torr.</td>
<td>41</td>
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<td>1</td>
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<td>3</td>
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<td>Western Wheatgrass</td>
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<tr>
<td><em>Agropyron smithii</em> Rydb.</td>
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<tr>
<td>Goosefoot</td>
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</tr>
<tr>
<td><em>Chenopodium</em> spp.</td>
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<td>&lt;1</td>
<td>&lt;1</td>
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</tr>
<tr>
<td>White Sage</td>
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</tr>
<tr>
<td>Artemisia judoviciana Nutt.</td>
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<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
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</tr>
<tr>
<td>Stick-leaf</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>* Mentzelia punila* (Nutt.) T. &amp; G.</td>
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<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<tr>
<td>Three Awn</td>
<td></td>
<td></td>
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<tr>
<td>Aristida* spp.</td>
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<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<td>Common Lupine</td>
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<tr>
<td>Lupinus* spp.</td>
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<td></td>
<td>&lt;1</td>
<td></td>
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<tr>
<td>Groundsel</td>
<td></td>
<td></td>
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<tr>
<td>Seneio multicapitatus Green &amp; Rydb.</td>
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<td>&lt;1</td>
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<tr>
<td>Green-thread</td>
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<td></td>
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<tr>
<td><em>Thaleocephra megapotamica</em> (Spreng.) O. Ktze.</td>
<td></td>
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<td>&lt;1</td>
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<tr>
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<td>Haploppappus* spp.</td>
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<td>&lt;1</td>
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<tr>
<td>Mutton Grass</td>
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<tr>
<td><em>Poa fendleriana</em> (Stevd.) Vasey</td>
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</table>
Table 1. (Cont.)

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<tr>
<th>Species</th>
<th>May (3) 17</th>
<th>June (3) 22</th>
<th>July (3) 19</th>
<th>August (3) 19</th>
<th>September (3) 19</th>
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<tbody>
<tr>
<td>Vervain</td>
<td></td>
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<tr>
<td>Verbena spp.</td>
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<tr>
<td>No Common Name</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Litter</td>
<td>28</td>
<td>13</td>
<td>11</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Grasses and Forbs</td>
<td>49</td>
<td>70</td>
<td>76</td>
<td>84</td>
<td>89</td>
</tr>
<tr>
<td>Browse (shrub) density</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Tree density</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Bare ground and erosion pavement</td>
<td>22</td>
<td>14</td>
<td>15</td>
<td>6</td>
<td>10</td>
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</table>
Table 2. Average ground cover percentages outside Exclosure 2 on Area 2 during 1977. The number of 100-point transects is enclosed in parentheses; the number following the parentheses represents the date of the transect. Annuals are indicated by an asterisk.

<table>
<thead>
<tr>
<th>Species</th>
<th>May (2) 18</th>
<th>June (2) 23</th>
<th>July (2) 19</th>
<th>August (2) 19</th>
<th>September (2) 19</th>
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</thead>
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<tr>
<td>Russian Thistle <em>Salsola kali</em> L.</td>
<td>24</td>
<td>30</td>
<td>36</td>
<td>37</td>
<td>35</td>
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<td>Blue Grama</td>
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<td>10</td>
<td>11</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Common Sunflower <em>Helianthus annuus</em> L.</td>
<td>5</td>
<td>5</td>
<td>12</td>
<td>10</td>
<td>15</td>
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<tr>
<td>No Common Name Artemisia Carruthii Carruth.</td>
<td>2</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Prairie-sage Sowthistle Artemisia Frigida Willd.</td>
<td>&lt;1</td>
<td>3</td>
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<td>5</td>
<td>7</td>
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<tr>
<td>Big Bluestem Andropogon Gerardi Vitman</td>
<td>&lt;1</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Squirrel-tail Sitanion hystrix (Nutt.) J.G. Smith</td>
<td>&lt;1</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>2</td>
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<tr>
<td>Goosefoot <em>Chenopodium</em> spp.</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Western Wheatgrass Agropyron smithii Rydb.</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<tr>
<td>Spanish Bayonet Yucca angustifolia Pursh.</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>&lt;1</td>
<td>2</td>
</tr>
<tr>
<td>Side-oats Grama Bouteloua curtipendula (Michx.) Torr.</td>
<td>&lt;1</td>
<td>1</td>
<td>3</td>
<td>1</td>
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</tr>
<tr>
<td>Stick-leaf Mentzelia pumila (Nutt.) T. &amp; G.</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<tr>
<td>Common Horehound Marrubium vulgare L.</td>
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<td>1</td>
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</tr>
<tr>
<td>Little Bluestem Schizachyrium scoparium (Michx.) Nash</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<td></td>
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<tr>
<td>Three Awn Aristida spp.</td>
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<td>Mint Family Labiatae spp.</td>
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<td>&lt;1</td>
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<tr>
<td>White Sage Artemisia ludoviciana Nutt.</td>
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<td>&lt;1</td>
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<tr>
<td>No Common Name Artemisia spp.</td>
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<td></td>
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<td></td>
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<tr>
<td>Purple Nightshade Quinuca lobata (Torr.) Raf.</td>
<td>&lt;1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Vervain Verbena spp.</td>
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</table>
Table 2. (Cont.)

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<th>Species</th>
<th>May (2)</th>
<th>June (2)</th>
<th>July (2)</th>
<th>August (2)</th>
<th>September (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green-thread</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td><em>Thelesperma megapotamicum</em> (Spreng.) O. Ktze.</td>
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<td></td>
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<tr>
<td>Groundsel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Senecio multicapitatus</em> Green &amp; Rydb.</td>
<td>&lt;1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Litter</td>
<td>17</td>
<td>11</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Grasses and Forbs</td>
<td>52</td>
<td>67</td>
<td>78</td>
<td>87</td>
<td>82</td>
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<tr>
<td>Browse (shrub) density</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Tree density</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Bare ground and erosion pavement</td>
<td>35</td>
<td>21</td>
<td>15</td>
<td>10</td>
<td>12</td>
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</table>
Table 3. Comparisons of percentages of three categories: 1) litter, 2) grasses and forbes, and 3) bare ground and erosion pavement inside (numbers outside parentheses) and outside (numbers inside parentheses) Exclosure 2 on Area 2.

<table>
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<th>June</th>
<th>Month</th>
<th>August</th>
<th>September</th>
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<tr>
<td></td>
<td>28 (17)*</td>
<td>13 (11)</td>
<td>11 (4)*</td>
<td>11 (2)**</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Litter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grasses and forbes</td>
<td>49 (52)</td>
<td>70 (67)</td>
<td>76 (78)</td>
<td>84 (87)</td>
<td>89 (82)</td>
</tr>
<tr>
<td>Bare ground and erosion pavement</td>
<td>22 (35)*</td>
<td>14 (21)</td>
<td>15 (15)</td>
<td>6 (10)</td>
<td>10 (12)</td>
</tr>
</tbody>
</table>

* P = 0.05-0.20  
** P = <0.05
Table 4. Percentage utilization of browse plants classified as A-desirable, B-intermediate in desirability, and C-least desirable. All percentages are averages of 4, 100-point paced transects.

<table>
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<tr>
<th>Species</th>
<th>Classification</th>
<th>% Utilization</th>
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<td>Pinyon Pine</td>
<td>B</td>
<td>9</td>
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<tr>
<td>Pinus edulis Engelm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gambel Oak</td>
<td>A</td>
<td>18</td>
</tr>
<tr>
<td>Quercus gambelii Nutt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four-wing Saltbush</td>
<td>B</td>
<td>9</td>
</tr>
<tr>
<td>Atriplex canescens Nutt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Pursh)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gooseberry</td>
<td>C</td>
<td>0</td>
</tr>
<tr>
<td>Ribes spp.</td>
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<td></td>
</tr>
<tr>
<td>Thimbleberry</td>
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<td>3</td>
</tr>
<tr>
<td>Rubus neomexicanus Gray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain Mahogany</td>
<td>A</td>
<td>30</td>
</tr>
<tr>
<td>Cercocarpus montanus Raf.</td>
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<tr>
<td>Common Chokecherry</td>
<td>A</td>
<td>8</td>
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<tr>
<td>Prunus virginiana L.</td>
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</tr>
<tr>
<td>Squaw-bush</td>
<td>B</td>
<td>18</td>
</tr>
<tr>
<td>Condalia spathulata Gray</td>
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<tr>
<td>Prairie-sagewort</td>
<td>B</td>
<td>12</td>
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<tr>
<td>Artemisia frigida Willd.</td>
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<td>No Common Name</td>
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<td>Pericome caudata Gray</td>
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<tr>
<td>Artemisia spp.</td>
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<tr>
<td>One-seeded Juniper</td>
<td>B</td>
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<tr>
<td>Juniperus monosperma Sarg.</td>
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<tr>
<td>(Engelm.)</td>
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</table>
Table 5. Age classes for browse species surveyed for annual utilization. Numbers are average numbers of plants from 4, 100-point paced transects.

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<th>Age Class</th>
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<td></td>
<td></td>
<td>Young</td>
<td>Mature</td>
<td>Decadent</td>
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<td>Pinyon Pine</td>
<td></td>
<td>2</td>
<td>6</td>
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<tr>
<td><em>Pinus edulis</em> Engelm</td>
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</tr>
<tr>
<td>Gambel Oak</td>
<td></td>
<td>13</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><em>Quercus gambelii</em> Nutt.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four-wing Saltbush</td>
<td></td>
<td>2</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td><em>Atriplex canescens</em> Nutt.</td>
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<tr>
<td>(Fursh)</td>
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</tr>
<tr>
<td>Gooseberry</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><em>Ribes</em> spp.</td>
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<tr>
<td>Thimbleberry</td>
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<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Rubus neomexicanus</em> Gray</td>
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<td></td>
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<tr>
<td>Mountain Mahogany</td>
<td></td>
<td>5</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td><em>Cercocarpus montanus</em> Raf.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Chokecherry</td>
<td></td>
<td>8</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><em>Prunus virginiana</em> L.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squaw-bush</td>
<td></td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><em>Condalia spathulata</em> Gray</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prairie-sagewort</td>
<td></td>
<td>4</td>
<td>4</td>
<td>1</td>
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<tr>
<td><em>Artemisia frigida</em> Willd.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
<td>6</td>
<td>1</td>
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<tr>
<td><em>Artemisia</em> spp.</td>
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<td></td>
<td></td>
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<tr>
<td>No Common Name</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Pericome caudata</em> Gray</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One-seeded Juniper</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Juniperus monosperma</em> Sarg.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Engelm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6. Percentage composition and form classes for browse species surveyed for annual utilization. Numbers are average numbers of plants from 4, 100-point paced transects. Form classes are as follows: A—all available, no hedging; B—all available, moderately hedged; C—all available, severely hedged; D—partly available, little or no hedging; E—partly available, moderately hedged.

<table>
<thead>
<tr>
<th>Species</th>
<th>% Composition</th>
<th>Form Class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A  B  C  D  E</td>
<td></td>
</tr>
<tr>
<td>Pinyon Pine</td>
<td>8  2  1  6  1</td>
<td></td>
</tr>
<tr>
<td>Pinus edulis Engelm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gambel Oak</td>
<td>18 10 7 1</td>
<td></td>
</tr>
<tr>
<td>Quercus gambelii Nutt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four-wing Saltbush</td>
<td>8  4 4</td>
<td></td>
</tr>
<tr>
<td>Atriplex canescens Nutt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Pursh)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gooseberry</td>
<td>1 1</td>
<td></td>
</tr>
<tr>
<td>Ribes spp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thimbleberry</td>
<td>7 7</td>
<td></td>
</tr>
<tr>
<td>Rubus neomexicanus Gray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain Mahogany</td>
<td>22 3 10 9</td>
<td></td>
</tr>
<tr>
<td>Cercocarpus montanus Raf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Chokecherry</td>
<td>8 8 2 1</td>
<td></td>
</tr>
<tr>
<td>Prunus virginiana L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squaw-bush</td>
<td>12 7 5 1</td>
<td></td>
</tr>
<tr>
<td>Condalia spathulata Gray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prairie-sagewort</td>
<td>8 8</td>
<td></td>
</tr>
<tr>
<td>Artemisia frigida Willd.</td>
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<td></td>
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<tr>
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<td>6 7 1 1</td>
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<tr>
<td>Artemisia spp.</td>
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<td></td>
</tr>
<tr>
<td>No Common Name</td>
<td>1 1</td>
<td></td>
</tr>
<tr>
<td>Pericome caudata Gray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One-seeded Juniper</td>
<td>1 1</td>
<td></td>
</tr>
<tr>
<td>Juniperus monosperma Sarg.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Engelm.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 7. List of amphibians, reptiles, and mammals from Capulin Mountain National Monument, New Mexico. The ENMU Natural History Museum began the vertebrate survey in 1974. The Black Bear was sighted by visitors and Monument employees; all other species were sighted or collected by ENMU Museum personnel. Verification specimens are deposited within the ENMU Natural History Museum.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AMPHIBIANS:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Spadefoot</td>
<td><em>Scaphiopus hammondii</em></td>
<td>Baird</td>
</tr>
<tr>
<td><strong>REPTILES:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesser Earless Lizard</td>
<td><em>Holbrookia maculata</em></td>
<td>Girard</td>
</tr>
<tr>
<td>Eastern Fence Lizard</td>
<td><em>Sceloporus undulatus</em></td>
<td>(Bosc. in Latreille)</td>
</tr>
<tr>
<td>Short-horned Lizard</td>
<td><em>Phrynosoma douglasi</em></td>
<td>(Bell)</td>
</tr>
<tr>
<td>Six-lined Racerunner</td>
<td><em>Cnemidophorus sexlineatus</em></td>
<td>(Linnaeus)</td>
</tr>
<tr>
<td>Racer</td>
<td><em>Coluber constrictor</em></td>
<td>Linnaeus</td>
</tr>
<tr>
<td>Gopher Snake</td>
<td><em>Pituophis melanoleucus</em></td>
<td>(Raudin)</td>
</tr>
<tr>
<td>Plains Garter Snake</td>
<td><em>Thamnophis radix</em></td>
<td>(Baird and Girard)</td>
</tr>
<tr>
<td>Western Rattlesnake</td>
<td><em>Crotalus viridis</em></td>
<td>(Rafinesque)</td>
</tr>
<tr>
<td><strong>MAMMALS:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fringed Myotis</td>
<td><em>Myotis thysanodes</em></td>
<td>Miller</td>
</tr>
<tr>
<td>Long-legged Myotis</td>
<td><em>Myotis volans</em></td>
<td>(H. Allen)</td>
</tr>
<tr>
<td>Small-footed Myotis</td>
<td><em>Myotis leibii</em></td>
<td>(Auduboni and Bachman)</td>
</tr>
<tr>
<td>Big Brown Bat</td>
<td><em>Eptesicus fuscus</em></td>
<td>(Palisot de Beauvois)</td>
</tr>
<tr>
<td>Towsend's Big-eared Bat</td>
<td><em>Plecotus townsendii</em></td>
<td>Cooper</td>
</tr>
<tr>
<td>Desert Cottontail</td>
<td><em>Sylvilagus auduboni</em></td>
<td>Gray</td>
</tr>
<tr>
<td>Black-tailed Jack Rabbit</td>
<td><em>Lepus californicus</em></td>
<td>Gray</td>
</tr>
<tr>
<td>Colorado Chipmunk</td>
<td><em>Eutamias quadrivittatus</em></td>
<td>(Say)</td>
</tr>
<tr>
<td>Rock Squirrel</td>
<td><em>Spermophilis variegatus</em></td>
<td>Erxleben</td>
</tr>
<tr>
<td>Black-tailed Prairie Dog</td>
<td><em>Cynomys ludovicianus</em></td>
<td>(Ord)</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Author</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Botta's Pocket Gopher</td>
<td>Thomomys bottae</td>
<td>(Eydoux and Gervais)</td>
</tr>
<tr>
<td>Silky Pocket Mouse</td>
<td>Perognathus flavus</td>
<td>Baird</td>
</tr>
<tr>
<td>Hispid Pocket Mouse</td>
<td>Perognathus hispidus</td>
<td>Baird</td>
</tr>
<tr>
<td>Ord's Kangaroo Rat</td>
<td>Dipodomys ordii</td>
<td>Woodhouse</td>
</tr>
<tr>
<td>Western Harvest Mouse</td>
<td>Reithrodontomys megalotis</td>
<td>(Baird)</td>
</tr>
<tr>
<td>Deer Mouse</td>
<td>Peromyscus maniculatus</td>
<td>(Wagner)</td>
</tr>
<tr>
<td>White-footed Mouse</td>
<td>Peromyscus leucopus</td>
<td>(Rafinesque)</td>
</tr>
<tr>
<td>Brush Mouse</td>
<td>Peromyscus boylii</td>
<td>(Baird)</td>
</tr>
<tr>
<td>Piñon Mouse</td>
<td>Peromyscus truei</td>
<td>(Schufeldt)</td>
</tr>
<tr>
<td>Rock Mouse</td>
<td>Peromyscus difficilis</td>
<td>(J.A. Allen)</td>
</tr>
<tr>
<td>Northern Grasshopper Mouse</td>
<td>Onychomys leucogaster</td>
<td>(Wied-Neuwied)</td>
</tr>
<tr>
<td>White-throated Woodrat</td>
<td>Neotoma albigula</td>
<td>Hartley</td>
</tr>
<tr>
<td>Mexican Woodrat</td>
<td>Neotoma mexicana</td>
<td>Baird</td>
</tr>
<tr>
<td>Mexican Vole</td>
<td>Microtus mexicanus</td>
<td>(Saussure)</td>
</tr>
<tr>
<td>Porcupine</td>
<td>Erethizon dorsatum</td>
<td>(Linnaeus)</td>
</tr>
<tr>
<td>Coyote</td>
<td>Canis latrans</td>
<td>Say</td>
</tr>
<tr>
<td>Gray Fox</td>
<td>Urocyon cinereoargenteus</td>
<td>(Schreber)</td>
</tr>
<tr>
<td>Black Bear</td>
<td>Ursus americanus</td>
<td>Pallas</td>
</tr>
<tr>
<td>Long-tailed Weasel</td>
<td>Mustela frenata</td>
<td>Lichtenstein</td>
</tr>
<tr>
<td>Bobcat</td>
<td>Lynx rufus</td>
<td>(Schreber)</td>
</tr>
<tr>
<td>Mule Deer</td>
<td>Odocoileus hemionus</td>
<td>(Rafinesque)</td>
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Table 8. List of vegetative communities and the acreage they include on Capulin Mountain National Monument, New Mexico.

<table>
<thead>
<tr>
<th>Community</th>
<th>Acreage</th>
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<tbody>
<tr>
<td><strong>Grassland</strong></td>
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</tr>
<tr>
<td>G-1</td>
<td>80.5</td>
</tr>
<tr>
<td>G-2</td>
<td>50.0</td>
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<td>G-3</td>
<td>60.5</td>
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<tr>
<td>G-4</td>
<td>10.8</td>
</tr>
<tr>
<td>G-5</td>
<td>64.4</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>266.2</td>
</tr>
<tr>
<td><strong>Shrub</strong></td>
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</tr>
<tr>
<td>S-1</td>
<td>9.8</td>
</tr>
<tr>
<td>S-2</td>
<td>15.1</td>
</tr>
<tr>
<td>S-3</td>
<td>17.8</td>
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<tr>
<td>S-4</td>
<td>7.5</td>
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<tr>
<td>S-5</td>
<td>2.4</td>
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<tr>
<td><strong>Total:</strong></td>
<td>52.6</td>
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<tr>
<td><strong>Pinyon-Juniper</strong></td>
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</tr>
<tr>
<td>PJ-1</td>
<td>6.7</td>
</tr>
<tr>
<td>PJ-2</td>
<td>152.5</td>
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<tr>
<td>PJ-3</td>
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<tr>
<td><strong>Total:</strong></td>
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<tr>
<td><strong>Pinyon-Juniper-Shrub</strong></td>
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<tr>
<td>PJS-1</td>
<td>70.0</td>
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<tr>
<td>PJS-2</td>
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<td>PJS-3</td>
<td>6.7</td>
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<tr>
<td>PJS-4</td>
<td>28.1</td>
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<tr>
<td>PJS-5</td>
<td>4.8</td>
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### Table 8. (Cont.)

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<tr>
<th>Community</th>
<th>Acreage</th>
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<tbody>
<tr>
<td>PJS-6</td>
<td>25.0</td>
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<tr>
<td>PJS-7</td>
<td>36.5</td>
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<tr>
<td>PJS-8</td>
<td>52.4</td>
</tr>
<tr>
<td>PJS-9</td>
<td>33.9</td>
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<tr>
<td><strong>Total</strong>:</td>
<td><strong>262.0</strong></td>
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<tr>
<td><strong>Pinyon-Juniper-Shrub-Grassland</strong></td>
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<tr>
<td>PJSG-1</td>
<td>20.2</td>
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<tr>
<td>PJSG-2</td>
<td>13.7</td>
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<tr>
<td><strong>Total</strong>:</td>
<td><strong>33.9</strong></td>
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Table 9. List of vegetative species from Capulin Mountain National Monument, New Mexico. The list is not complete and results from species encountered during browse utilization and grassland surveys conducted by ENMU personnel. Verification specimens are deposited within the ENMU Natural History Museum.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponderosa Pine</td>
<td><em>Pinus ponderosa</em></td>
<td>Laws</td>
</tr>
<tr>
<td>Pinyon Pine</td>
<td><em>Pinus edulis</em></td>
<td>Engelm</td>
</tr>
<tr>
<td>One-seeded Juniper</td>
<td><em>Juniperus monosperma</em></td>
<td>(Engelm.) Sarg.</td>
</tr>
<tr>
<td>Western Wheatgrass</td>
<td><em>Agropyron smithii</em></td>
<td>Rydb.</td>
</tr>
<tr>
<td>Mutten Grass</td>
<td><em>Poa Fendleriana</em></td>
<td>(Steud.) Varez</td>
</tr>
<tr>
<td>Squirrel-tail</td>
<td><em>Sitanion hystrix</em></td>
<td>Raf.</td>
</tr>
<tr>
<td>Little Bluestem</td>
<td><em>Schizachyrium scoparium</em></td>
<td>(Michx.) Nas.</td>
</tr>
<tr>
<td>Big Bluestem</td>
<td><em>Andropogon Gerardi</em></td>
<td>Vitman</td>
</tr>
<tr>
<td>Weeping Lovegrass</td>
<td><em>Eragrostis curvula</em></td>
<td>(Schrad.) Nees.</td>
</tr>
<tr>
<td>Muhly</td>
<td><em>Muhlenbergia Wrightii</em></td>
<td>Schreb.</td>
</tr>
<tr>
<td>Mountain Muhly</td>
<td><em>Muhlenbergia montana</em></td>
<td>(Nutt.) Hitchc.</td>
</tr>
<tr>
<td>Blue Grama</td>
<td><em>Bouteloua gracilis</em></td>
<td>(H.B.K.) Griffiths</td>
</tr>
<tr>
<td>Hairy Grama</td>
<td><em>Bouteloua hirsuta</em></td>
<td>Lag.</td>
</tr>
<tr>
<td>Side-oats Grama</td>
<td><em>Bouteloua curtipendula</em></td>
<td>(Michx.) Torr.</td>
</tr>
<tr>
<td>Three Awn</td>
<td><em>Aristida spp.</em></td>
<td>Nash.</td>
</tr>
<tr>
<td>No Common Name</td>
<td><em>Aristida Wrightii</em></td>
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</tr>
<tr>
<td>No Common Name</td>
<td><em>Aristida divaricata</em></td>
<td>Willd.</td>
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<td>Spanish Bayonet</td>
<td><em>Yucca angustifolia</em></td>
<td>Pursh.</td>
</tr>
<tr>
<td>Oak</td>
<td><em>Quercus spp.</em></td>
<td></td>
</tr>
<tr>
<td>Gambel Oak</td>
<td><em>Quercus gambelii</em></td>
<td>Nutt.</td>
</tr>
<tr>
<td>Wild Buckwheat</td>
<td><em>Eriogonum cognatum</em></td>
<td>Michx.</td>
</tr>
<tr>
<td>Goosefoot</td>
<td><em>Chenopodium spp.</em></td>
<td></td>
</tr>
<tr>
<td>Four-wing Saltbush</td>
<td><em>Atriplex canescens</em></td>
<td>(Pursh) Nutt.</td>
</tr>
</tbody>
</table>
Table 9. (Cont.)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belvedere</td>
<td>Kochia scoparia</td>
<td>(L.) Roth.</td>
</tr>
<tr>
<td>Russian Thistle</td>
<td>Salsola kali</td>
<td>L.</td>
</tr>
<tr>
<td>Careless Weed</td>
<td>Amaranthus Palmeri</td>
<td>Wats.</td>
</tr>
<tr>
<td>Rough Pigweed</td>
<td>Amaranthus retroflexus</td>
<td>L.</td>
</tr>
<tr>
<td>No Common Name</td>
<td>Veratrum californicum</td>
<td>Durand</td>
</tr>
<tr>
<td>Prickly Poppy</td>
<td>Argemone platyceras</td>
<td>L.</td>
</tr>
<tr>
<td>Scrambled Eggs</td>
<td>Corydalis spp.</td>
<td>Vent.</td>
</tr>
<tr>
<td>Tansy-mustard</td>
<td>Descurainia spp.</td>
<td>Webb &amp; Berth</td>
</tr>
<tr>
<td>Crucifer</td>
<td>Erysimum capitatum</td>
<td>(Dougl.) Greene</td>
</tr>
<tr>
<td>Bladder-pod</td>
<td>Lesquerella spp.</td>
<td></td>
</tr>
<tr>
<td>Gooseberry</td>
<td>Ribes spp.</td>
<td></td>
</tr>
<tr>
<td>Thimbleberry</td>
<td>Rubus neomexicanus</td>
<td>Gray</td>
</tr>
<tr>
<td>Polecat Bush</td>
<td>Rhus aromatica</td>
<td>Ait</td>
</tr>
<tr>
<td>No Common Name</td>
<td>Cowania mexicana</td>
<td>D. Don</td>
</tr>
<tr>
<td>Mountain Mahogany</td>
<td>Cercocarpus montanus</td>
<td>Raf.</td>
</tr>
<tr>
<td>Common Chokecherry</td>
<td>Prunus virginiana</td>
<td>L.</td>
</tr>
<tr>
<td>Bluebonnet</td>
<td>Lupinus argenteus</td>
<td>L.</td>
</tr>
<tr>
<td>No Common Name</td>
<td>Geranium caespitosum</td>
<td>James</td>
</tr>
<tr>
<td>Squaw-bush</td>
<td>Condalia spathulata</td>
<td>Gray</td>
</tr>
<tr>
<td>No Common Name</td>
<td>Mentzelia pumila</td>
<td>(Nutt.) T. &amp; G.</td>
</tr>
<tr>
<td>Plains Prickly Pear</td>
<td>Opuntia polyacantha</td>
<td>Haw.</td>
</tr>
<tr>
<td>Bush Morning Glory</td>
<td>Ipomoea leptophylla</td>
<td>Torr.</td>
</tr>
<tr>
<td>No Common Name</td>
<td>Gilia aggregata</td>
<td>R. &amp; P.</td>
</tr>
<tr>
<td>Stickseed</td>
<td>Lappula spp.</td>
<td></td>
</tr>
<tr>
<td>Vervain</td>
<td>Verbena spp.</td>
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</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Author</td>
</tr>
<tr>
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<td>Common Horehound</td>
<td>Marrubium vulgare</td>
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<td>Plains Beebalm</td>
<td>Monarda pectinata</td>
<td>Nutt.</td>
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<tr>
<td>No Common Name</td>
<td>Penstemon barbatus</td>
<td>(Cav.) Roth</td>
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<td>No Common Name</td>
<td>Heterotheca villosa</td>
<td>(Pursh) Shinners</td>
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<tr>
<td>Golden Aster</td>
<td>Heterotheca canescens</td>
<td>(D.C.) Shinners</td>
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<tr>
<td>Gum Weed</td>
<td>Grindelia spp.</td>
<td>Willd.</td>
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<tr>
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<td>Xanthocephalum sarothrae</td>
<td>(Pursh) Shinners</td>
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<tr>
<td>Aster</td>
<td>Aster spp.</td>
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<td>Aster hirtifolius</td>
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<td>Aster arenosus</td>
<td>(Heller) Blake</td>
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<td>Ragweed</td>
<td>Ambrosia acanthicarpa</td>
<td>Hook</td>
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<td>Ratibida columnaris</td>
<td>(Sims) D. Don</td>
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<td>Common Sunflower</td>
<td>Helianthus annuus</td>
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<td>No Common Name</td>
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<td>Gray</td>
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<td>Prairie-sagewort</td>
<td>Artemisia frigida</td>
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<td>White Sage</td>
<td>Artemisia ludoviciana</td>
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<td>Groundsel</td>
<td>Senecio spp.</td>
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<td>Senecio longilobus</td>
<td>Benth.</td>
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<td>Mint Family</td>
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Fig. 1. Map of Capulin Mountain National Monument, New Mexico showing Areas 1 and 2. The approximate base of the mountain is shown by a dashed line. Exclosure 1 on Area 1 and Exclosure 2 on Area 2 are shown as numbered rectangles.
FUEL INVENTORY

by

Planar Intersect Method
Location of Transect

FUEL INVENTORY

by

Planar Intersect Method
Location of Transect

Fuel >3"-Av. Diam.

Community Fuel <3"-Duff-Fuel

(Vegetative Type)

Av. Depth

Fig. 2. Map of Capulin Mountain Monument New Mexico, showing sites where transects were read to determine tons/acre of downed woody material; average duff depth, and average fuel depth. Abbreviations refer to the plant communities where transects were read: G-Grassland; S-Shrub; PJ-Pinyon-Juniper; PJS-Pinyon-Juniper-Shrub; PJSG-Pinyon-Juniper-Shrub-Grassland.
Fig. 3. Map of Capulin Mountain National Monument, New Mexico, showing locations of the five plant communities. Plant species compositions vary within each community. For example, G-1 (Grassland-1) has a different composition than G-2, etcetera (see p.17 in text for lists of plant species compositions). Abbreviations for plant communities are G-Grassland, S-Shrub, PJ-Pinyon-Juniper, PJS-Pinyon-Juniper-Shrub, and PJSG-Pinyon-Juniper-Shrub-Grassland.
LITERATURE CITED

Big Game Browse Range Analysis Techniques for New Mexico. No date. Participating Agencies: New Mexico Dept. of Game and Fish, Bureau of Land Management, and U.S. Forest Service.


