The Life-Form Concept and Mule Deer Habitat in Oklahoma

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In Oklahoma the Rocky Mountain mule deer, *Odocoileus hemionus hemionus* (Rafinesque), presently occurs naturally in the foothill region in northwestern Cimarron County.

The objective of this study was identification of certain aspects of mule deer habitat in Oklahoma on a plant life-form basis. The presence of particular life-form elements may be taken as an aid in identifying mule deer habitat. The life-form concept already has been employed in the identification of habitats of wildlife species (Stebler and Schemnitz, 1955; Emlen, 1956; Jones, 1960; Donaldson, 1966).

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The study area was located in northwestern Cimarron County. Elevation there ranges from 4,000 to 4,978 ft on Mesa de Maya (Black Mesa), the highest point in Oklahoma. This region can be characterized as an alternation of mesas and canyons with slopes forming the common bond between the extremes. The height of the lava-capped table, and of some of the sandstone-capped erosional remnants is about 500 ft above the valley floor of the Cimarron River (Blair and Hubbell, 1938).

The biota of the mesa slopes or canyon walls has strong affinities with that of the foothills of the southern Rocky Mountains (Blair and Hubbell, 1938; Blair, 1939; Dice, 1943; Glass, 1949; Rogers, 1953 and 1954; Schemnitz, 1958). One-seeded juniper *(Juniperus monosperma)* is the tree growing commonly on the mesas. On the north-facing slopes, pinyon pine *(Pinus edulis)* occurs in close association with junipers. Characteristic plants of the canyon floors are tree cactus *(Opuntia imbricata)*, rabbit brush *(Chrysothamnus nauseosus)*, and various grasses. Certain woody plants grow on the banks of the Cimarron River and its tributaries forming lines of open and intermittent woods. The region was chosen for a study area since it had a naturally established mule deer population. Deer were observed there for this study from August 1965 to February 1966.

Vegetation was analyzed using the "point-centered quartered" method developed by Curtis and Cottam (1956) for forest sampling, and modified for grasslands by Dix (1958 and 1961). The plant life-form classification used was modified from DuRietz (1931) as follows:

(1) *Trees* — Woody plants with a distinct trunk remaining unbranched in its lower parts.

(2) *Shrubs* — Woody plants not developing a distinct main trunk with the stem branched from its basal parts above the soil surface.

(a) Shrub — $>$ 80 cm in height.
(b) Dwarf Shrub — $<$ 80 cm in height.

(3) *Grasses* — Narrow-leaved, herbaceous plants with parallel venation.

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(a) Mid Grasses — > 25 cm < 80 cm in height.
(b) Short Grasses — < 25 cm in height.

(4) *Forbs* — Broad-leaved, herbaceous plants, usually having netted venation.

(a) Mid Forbs — > 25 cm < 80 cm in height.
(b) Short Forbs — < 25 cm in height.

The study area was divided into zones for convenience of description and of reference, namely:

(1) *Mesa Tops* — The flat mesa tops.

(2) *Slopes* — The area between the mesa tops and the canyon floors.

(3) *Canyon Floors* — The area between the bases of the mesas.

Deer use of life-forms was investigated by observing the numbers and activities of deer in association with the various plant life-forms.

Deer on the study area were not known to be seasonally migratory. They occupied every physiographic zone of the region — mesa tops, slopes, and canyon floors — at some time during the course of this study. Despite their general occupation of the whole region, the deer showed marked preferences for particular situations. Those used for resting and retreat were two aspects of mule deer ecology selected for particular appraisal.

Resting Cover — Fifty-three mule deer were observed in resting cover, and 16 additional bed locations were examined. Of these resting places, 88.6% were located on the slopes and 11.3% on the mesa tops (Table I). No mule deer were observed resting, and no beds were found, on the canyon floors. Bed sites usually were located near the cap rock of the upper portions of the slopes. Generally, mule deer appeared to exploit the advantage of the topography when selecting bed sites. Dorrance (1965) reported that the slope aspect with its characteristic vegetation

TABLE I. NUMBER OF OBSERVATIONS AND PERCENT FREQUENCIES WITH WHICH CERTAIN ZONES AND PLANT LIFE-FORMS PROVIDED RESTING COVER FOR MULE DEER IN OKLAHOMA.

Zone and Life-Form	Numbers of Observations	Percent Frequency
Mesa Tops:		
Trees	6	11.3
Shrubs	0	0.0
Subtotal	6	11.3
Slopes:		
Trees	35	66.0
Shrubs	12	22.6
Subtotal	47	88.6
Canyon Floors:		
Subtotal	0	0.0
Total	53	100.0

was probably one of the most important factors in mule deer distribution. He further pointed out that distribution of cover types used for resting was more important in determining the distribution of deer than were vegetative types used for food.

Five species of trees and shrubs provided resting cover during the period of this study. These were: one-seeded juniper, recorded as being used 29 times (60.4%); Gambel's oak *(Quercus Gambelii)*, 7 (14.6%): pinyon pine, 6 (12.5%); mountain mahogany *(Cerocarpus montanus)*, 4 (8.3%); and skunk brush *(Rhus trilobata)*, 1 (2.1%).

Retreat Cover — One hundred and fifty-four retreats were observed as follows: 108 on mesas, and 46 from cultivated fields. The alfalfa and wheat fields (1 or 2 acres in size) lay at the bases of certain mesas. No escape flights were made to the canyon floors. Of 108 mule deer encountered on the mesas, 102 (95.0%) were on the slopes, while six (5.0%) were under trees on the mesa tops. Ten (9.3%) of the mule deer encountered on the slopes made their escape to the mesa tops, 92 (85.2%) made their escape around the slope, and six (5.6%) retreated down the slopes and across the floor to the other side of the canyon.

Forty-six deer were spotlighted in cultivated fields during the night. Of these, 44 retreated to the mesas, while only two entered the nearby riparian woodland association. During the rutting season, at least two different bucks, each with four or five does, were found eating alfalfa. Upon spot-lighting, the does immediately retreated to the mesas, while the lone buck headed in the opposite direction toward riparian woodlands. The buck did not enter the woodlands but paralleled them for several hundred yards before circling back toward the mesa used by the does. The majority of retreat flights (98.0%) were made in association with the slopes. The distribution of plant life-form categories in relation to physiographic zones is shown in Figure 1. This figure is based on percentage occurrence of each life-form element found on the mesa tops, slopes, and canyon floors of the study area. An approach on this basis appears helpful in yielding insight into the matter of habitat selection by mule deer.

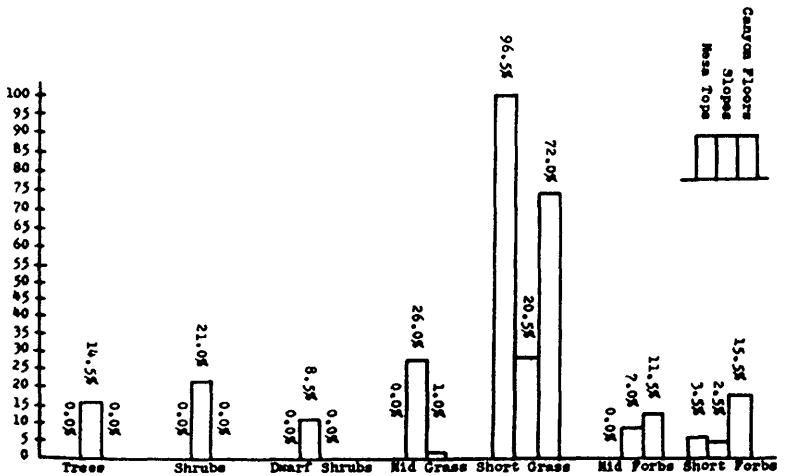

Figure 1. Life-Form of the Mesa Tops, Slopes, and Canyon Floors of the Study Area Respectively, Based on Percent of Occurrence of Each Life-Form Element.

On the study area, the various zones with their included life-forms were available for mule deer use, but the deer showed a marked preference for specific zones and life-forms (Table I). Mule deer activity was predominantly associated with the slope zone. Here they were more frequently associated with the tree and shrub life-forms. The slope zone contained 14.5% trees, 21.0% shrubs, 8.5% dwarf shrubs, 33% mid grasses and forbs and 23% short grasses and forbs (Fig. 1).

The life-form of the mesa tops was comprised of short grasses, and that of the canyon floors of mid and short grasses and forbs. Only six deer were seen in the latter zone, making their way from one mesa slope to another, a distance of a few hundred yards.

It appears that mule deer on the study area had marked preferences for specific ecological situations. Plants of the tree and shrub life-forms received intense use by them and apparently provided essential elements of mule deer habitat. On the study area this combination of life-form elements was found only on the steep slopes of the mesas. The pronounced inclination of mule deer to use the slopes may be explained by combination of life-form elements and topography. In northwestern Cimarron County, 88.6% of the resting mule deer and 98.0% of those seen in retreat were in association with the slope zone. Only two mule deer were observed retreating into the riparian woodlands, six were seen retreating from one mesa slope to another across an expanse of canyon floor prairie, a distance of a few hundred yards. The combination of plant life-form elements (trees and shrubs) used predominantly by mule deer on slope zones was lacking on the mesa tops and canyon floors of the study area.

These data on plant life-form use by mule deer are representative only of the fall and early winter periods. In order to complete a picture of mule deer regional habitat identification, data must be expanded not only to include other seasons but also other aspects of mule deer habitat, e.g. fawning situations, etc. Only a limited number of life-form situations were present in the study area. These apparently are sufficient to satisfy the habitat needs of mule deer on a perennial basis.

Literature Cited

Blair, W. F. 1939. Faunal relationships and geographic distribution of mammals in Oklahoma. Amer. Midland Natur. 22(1): 85.133.

Blair, W. F. and T. H. Hubbell. 1938. The biotic districts of Oklahoma. Amer. Midland. Natur. 20: 425-454.

Curtis, J. T. and G. Cottam. 1956. The use of distance measurements in phytosociological sampling. Ecology 37: 451-460.

Dice, L. R. 1943. *The Biotic Provinces of North America.* Univ. Mich. Press, Ann Arbor, Mich. 78 p.

Dix, R. L. 1958. Some slope-plant relationships in the grasslands of the Little Missouri Badlands of North Dakota. J. Range Manage. 11: 88-92.

..... 1961. Application of the point-centered quartered method to the sampling of grassland vegetation. J. Range Manage. 14: 63-69.

Donaldson, D. D. 1965. Effect on lesser prairie chickens of brush removal in western Oklahoma. Okla. Coop. Wildl. Res. Unit, Quarterly Prog. Rep. 19(2): 4-20.

Dorrance, J. J. 1965. Mule deer behavior on seasonal ranges. Colorado Dept. Game, Fish and Parks. Game Res. Rep. Part 5. 90 p.

DuRietz, E. G. 1931. Life-forms of terrestrial flowering plants I. Acta Phytogeogr. Suecica III (1). 95 p.

Emlen, J. T. Jr. 1956. A method for describing and comparing avian habitats. Ibis 98: 565-576.

Glass, Bryan P. 1949. Report on the mammals of the Black Mesa Region, Oklahoma. Proc. Okla. Acad. Sci. 30:26-30.

Jones, R. E. 1960. The life-form concept applied to prairie chicken habitat in Oklahoma. Proc. Okla. Acad. Sci. 40: 134-136.

Rogers, C. M. 1953. The vegetation of the Mesa de Maya region of Colorado, New Mexico and Oklahoma. Lloydia 16(4): 257-290.

..... 1954. Some botanical studies in the Black Mesa Region of Oklahoma. Rhodora 56(670): 205-212.

Schemnitz, S. D. 1958. The habitat of the scaled quail *(Calipepla squamata)* (Vigors) in the Oklahoma Panhandle. Ph. D. Thesis. Okla. State Univ., Stillwater, 133 p.

Stebler, A. M. and S. D. Schemnitz. 1955. Habitat description and the life-form concept. Proc. Okla. Acad. Sci. 36: 154-157.