Mourning Dove numbers on different seral communities in the Chihuahuan Desert

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MOURNING DOVES are the most commonly hunted game bird in New Mexico based on hunter harvest data collected by New Mexico Department of Game and Fish. Research is limited on the influence of rangeland ecological condition on Mourning Dove (Zenaida macroura) populations in the Chihuahuan Desert of New Mexico. Mourning Dove numbers were evaluated periodically (1988–1989) on ranges in late- and mid-seral conditions in south central New Mexico based on the Dyksterhuis quantitative climax procedure. Strip transect procedures were used to estimate Mourning Dove populations. Concurrently, vegetation canopy cover was determined by line intercept. On the basis of percent cover, grasses were the most abundant group on late-seral range while shrubs dominated mid-seral range. Mourning Dove sightings did not differ \((P > 0.05)\) between late- and mid-seral ranges, nor did they differ \((P > 0.05)\) among grassland, shrubland, and shrub-grass mosaic communities. Mourning Dove populations showed seasonal differences \((P < 0.05)\), with numbers highest in summer and fall and lowest in winter and spring. Data from our study indicate that Chihuahuan Desert ranges in either mid- or late-seral stages provide equally suitable habitat for Mourning Doves.

Key words: arid lands, Zenaida macroura, rangeland, grazing, Mourning Dove, wildlife.

Mourning Doves (Zenaida macroura) are important game birds in the southwestern United States and Mexico (Sadler 1993). Because of high interest in hunting this game bird, it has considerable economic and recreational importance to New Mexico and other southwestern states (Sadler 1993). Mourning Doves occur throughout New Mexico. Data collected by the U.S. Fish and Wildlife Service indicate New Mexico Mourning Dove populations were fairly stable in the 1989–1998 period (Dolton and Smith 1998). However, because of their economic importance, many managers on public and private lands would like to have better information on specific Mourning Dove habitat requirements so they can maintain and/or possibly increase populations.

New Mexico is characterized by >85% rangeland, with cattle grazing being the primary land use. Generally, New Mexico rangelands are managed extensively, with little use of herbicides or pesticides (McCormick and Galt 1993). Information is limited on how different seral classes of vegetation meet the habitat requirements of Mourning Doves in the Chihuahuan Desert. This information would permit range and wildlife managers to integrate the needs of Mourning Doves into programs involving grazing and brush management. For example, Smith et al. (1996) found higher numbers of Mourning Doves on sites in late-seral versus climax ecological conditions, but data are lacking on Mourning Dove populations on late-seral versus earlier seral classes. The objective of this study was to determine the influence of late- and mid-seral upland sandy sites on Mourning Dove numbers in the Chihuahuan Desert of south central New Mexico. About 32% of rangelands in southern New Mexico are in late-seral condition, and 47% are in mid-seral condition (U.S. Department of Interior 1993). Rangelands in early-seral condition account for 14% of southern New Mexico rangelands, while only 2% are in climax condition.

STUDY AREA

We conducted the study on the Chihuahuan Desert Rangeland Research Center (CDRRC) and adjacent Bureau of Land Management (BLM) rangeland in Doña Ana County, New
Mexico, 37 km north of Las Cruces. The CDRRC and BLM study areas are 12,993 ha and 10,342 ha, respectively, in the southern Jornada del Muerto Plain between the San Andres Mountains and the Rio Grande. Elevation of the study area varies from 1330 to 1348 m above sea level (Wood 1969, Valentine 1970).

The area is arid, with no permanent water except for the Rio Grande and stock watering points supplied by wells and temporary ponds. Annual precipitation during the study varied from 190 to 296 mm, with a 30-year (1961 to 1989) average of 248 mm. About half of the annual precipitation occurs between July and September, with the greatest precipitation amount in August. Wood (1969) described the climate of the area as semidesert with temperatures varying from –23°C to 42°C and extreme daily fluctuations of 30°C. June is the warmest month, January the coldest.

Soils of the CDRRC and BLM study areas are mainly sandy loams underlain by calcium carbonate hardpan (caliche) at depths varying from a few centimeters to 1 m or more (Valentine 1970, Tembo 1990). They are classified as fine, loamy, mixed, thermic Typic Haplargids and are in the Simona-Cruces associations (SCS 1980). In areas where groundcover is sparse, sandy dunes are formed around invading honey mesquite plants (*Prosopis glandulosa* Torr.; Wood 1969). Over most of the CDRRC range, the soil profile is relatively well preserved and stable.

Study area vegetation is characterized as Chihuahuan Desert grassland with scattered shrubs. Much of the BLM site has been invaded by honey mesquite. On the CDRRC vegetation consists largely of black grama (*Bouteloua eriopoda* Torr.), mesa dropseed (*Sporobolus flexuosus* [Thurb] Rybd.), and spike dropseed (*S. contractus* A. Hitch.). Broom snakeweed (*Gutierrezia sarothrae* Greene) dominates a few small, poor-condition areas. Detailed descriptions of vegetation on the CDRRC are provided by McNeely (1983) and Tembo (1990).

The CDRRC and BLM study areas were classified into late-seral and mid-seral ecological conditions, respectively (Dyksterhuis 1949, Tembo 1990), using the USDA Natural Resources Conservation Service procedure. Remaining climax vegetation during the study period (1988–1989) was approximately 65–70% on the CDRRC range and 35–40% on the BLM range (Tembo 1990). On a long-term basis (1968–1990), the CDRRC range has been stocked with cattle only for an average utilization level of about 30% of the key forage species compared with about 50% on the BLM range (Holechek et al. 1994). Between 1982 and 1991 a stocking rate reduction of nearly 50% was made on the BLM range. From 1982 to 1990 forage utilization on the BLM range was 20–40% of current year’s growth. During 1986–1990 actual stocking rates on the CDRRC and BLM ranges averaged 48 ha and 67 ha per animal unit, respectively.

Several detailed vegetation inventories have been made on both the CDRRC and BLM study areas since 1981 (Holechek et al. 1994). Forage production and range condition scores increased between 1982 and 1990 on both ranges as a result of above-average rainfall and conservative stocking. Grazing management on the BLM range has involved a yearlong grazing scheme. On the CDRRC range 45% of the area has been yearlong grazed and 55% has been grazed under a best pasture grazing system since 1967 (McNeely 1983, Tembo 1990).

**METHODS AND MATERIALS**

We delineated 2 sites each on the CDRRC and BLM study areas. Each of the 4 sites is about 1600 ha in size, with a livestock watering point near the center that was considered available to Mourning Doves. The 4 study sites, arranged linearly from north (BLM) to south (CDRRC), are 1.0–1.4 km east of Interstate 25; total length of the study area from north to south is 12 km. The CDRRC and BLM study areas adjoin and are separately fenced. The 2 study sites on the CDRRC (45% yearlong, 55% best pasture grazing) were in late-seral ecological condition, and the 2 study sites on the BLM area (yearlong grazing) were in mid-seral ecological condition (Dyksterhuis 1949). To count Mourning Doves within each of the 4 study sites, we used 4 transects (6.4 km in length) spaced 500 m apart. All transects were at least 500 m from watering points. To reduce boundary effects where the CDRRC and BLM areas adjoined, transects were 500 m from the division fence. We marked all transects with brightly colored plastic flagging at intervals of 200 m.
We counted Mourning Doves once per season from July 1988 through October 1989. Counts began approximately 30 minutes after local sunrise and continued for 2 hours. To minimize the possibility of bird movements confounding counts, 2 different observers (1 per ecological condition category) conducted surveys on the same day and at the same time. Because each transect was 6.4 km long, each observer was limited to 1 transect per day. Observers rotated between ecological condition classes to avoid confounding biases that may result from survey techniques of individual observers. We recorded only Mourning Doves observed within approximately 50 m on either side of the observer. Mourning Doves in flight that were observed but not flushed were omitted from counts, as were those that were heard but not seen. White-winged Doves (Zenaida asiatica) occur on the study area, but only 2 were observed during enumerations. They were omitted from our tabular and statistical analyses.

Our enumeration technique for Mourning Doves involved tabulating birds seen along 100 × 6.4-km transects. We acknowledge that this procedure involves a certain amount of subjectivity by the observer as to whether birds are in the census corridor. To minimize this source of error and distribute it evenly among transects, 2 well-trained, experienced observers did all enumerations. Another potential problem with the technique is that some birds previously counted can move ahead of the observer and potentially be counted again. The low level of Mourning Dove encounters relative to distance traveled, the sparse nature of the vegetation, and the relatively flat terrain minimized this problem, and we considered this source of error to be evenly distributed among transects in our study.

Brush cover was generally below the shoulder and of similar height on both late- and mid-seral pastures. However, visibility on shrubland compared to grassland areas was impaired to some extent and could have caused underestimation of Mourning Doves on brushier areas. Nevertheless, we believe our methods provided a reasonable estimation of relative dove numbers among transects, study sites, and plant communities.

We recorded 1 of 3 plant communities for each Mourning Dove sighting. These included (1) grassland (high-seral) community, which consisted mainly of black grama and mesa dropseed; (2) shrub-grass (mid-seral) mosaic, which consisted primarily of a mix of honey mesquite, mesa dropseed, and broom snakeweed; and (3) shrubland (low-seral) community, which consisted mostly of honey mesquite and broom snakeweed. The percentage of Mourning Doves recorded for each plant community was divided by the percentage area of each plant community to obtain relative observation values. A certified range consultant was used to determine the percentage area of each plant community on each study pasture. Ocular estimates and aerial photos were used for these determinations.

Vegetation Inventories

Vegetation inventories were made once per season along the same transects used for Mourning Dove counts between October 1988 and October 1989 (Saiwana 1990). Percentages of herbaceous and woody canopy cover were sampled by the line intercept procedure (Canfield 1941), as modified by Holechek and Stephenson (1983). Cover measurements using a meter stick were collected every 64 m along the 6.4-km transects. Because the meter stick was divided into 100-cm units, vegetational intercepts were expressed as percentages of the meter stick. In each transect the percent intercept of each plant species was summed and divided by the total number of sampling points (64) to obtain the percent cover per sampling unit (transect).

Standing crop of Mourning Dove food plants (Davis and Anderson 1973) was determined in October 1988 and 1989. Primary dove food plants in the Chihuahuan Desert are redroot pigweed (Amaeanthus pubescens [Uline and Bray] Rybd), leather leaf croton (Croton pottsii Lam.), and Russian thistle (Salsola iberica L.; Davis and Anderson 1973). These data were collected by clipping the standing crop of individual plant species at ground level in 0.5-m² quadrats. Eighty quadrats (10 per transect) were clipped in each study area during each sampling period. All estimates are expressed on a dry matter basis.

Statistical Analysis

We summarized Mourning Dove numbers by ecological condition class and season. Using a randomized factorial analysis of variance, we compared vegetation cover and dove numbers
among ecological condition classes and seasons (Steel and Torrie 1980). Following procedures of Saiwana et al. (1998), we estimated dove densities in different habitat types. We used the 16 transects on late-seral and mid-seral sites (4 per site × 4 per site) as sampling units (replicates). The least significant difference (LSD) test was performed at the 5% level for determination of ecological condition effects, season effects, and ecological condition × season interactions on Mourning Dove sightings (Steel and Torrie 1980). We divided percent Mourning Dove observations on grassland, shrubland, and shrub-grass communities by the percent total area each of these communities occupied. These values were then subjected to chi-square goodness-of-fit analysis (Steel and Torrie 1980) to determine if more Mourning Doves were observed than would be expected if doves were randomly choosing community types.

**RESULTS**

Mourning Dove sightings pooled across seasons averaged 14.8 per 6.4-km transect on the mid-seral site and 17.3 per 6.4-km transect on the late-seral site and were not different ($P > 0.23$; Table 1). Differences occurred among periods ($P = 0.04$) within each seral stage. Mourning Dove sightings were highest in fall 1989 and lowest in winter 1989. The absence of Mourning Doves on both ranges in winter 1989 is attributed to the fact that Mourning Doves in southern New Mexico are migratory and generally have vacated the area by early November. They begin moving back into the area in March and April. The interaction between condition classes and periods was not significant ($P = 0.78$).

Mourning Dove observations in grassland, shrub-grass, and shrubland communities did not differ from expectation ($\chi^2 = 5.64, P = 0.69$; Table 2). These data indicate Mourning Doves had no definite preference for any of the 3 vegetation types.

Total vegetation cover did not differ between mid- and late-seral study sites ($P = 0.28$; Table 3). However, grass cover was higher on the late-seral sites ($P = 0.04$). Both broom snakeweed and honey mesquite had higher cover on mid-seral sites.

Standing crop of dove food plants differed between mid- and late-seral sites for leatherleaf croton ($P = 0.04$; Table 4). However, red-root pigweed ($P = 0.39$) and Russian thistle ($P = 0.04$; Table 5).

### Table 1. Mourning Dove sightings (sightings · km$^{-2}$) on late-seral and mid-seral study areas in the Chihuahuan Desert of south central New Mexico (summer 1988–fall 1989).

<table>
<thead>
<tr>
<th>Time</th>
<th>Mid-seral stage</th>
<th>Late-seral stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{x}$</td>
<td>$s_x$</td>
</tr>
<tr>
<td>Summer 1988</td>
<td>17</td>
<td>6.8</td>
</tr>
<tr>
<td>Fall 1988</td>
<td>20</td>
<td>8.9</td>
</tr>
<tr>
<td>Winter 1989</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Spring 1989</td>
<td>8</td>
<td>4.3</td>
</tr>
<tr>
<td>Summer 1989</td>
<td>22</td>
<td>7.9</td>
</tr>
<tr>
<td>Fall 1989</td>
<td>22</td>
<td>8.2</td>
</tr>
</tbody>
</table>

### Table 2. Relative observations of Mourning Doves on different vegetation types (% of birds sighted · % plant community area) for upland sites on south central New Mexico (summer 1988–fall 1989).

<table>
<thead>
<tr>
<th>Season</th>
<th>Year</th>
<th>Shrub-grass</th>
<th>Shrubland</th>
<th>Grassland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>1988</td>
<td>1.54</td>
<td>1.49</td>
<td>0.36</td>
</tr>
<tr>
<td>Fall</td>
<td>1988</td>
<td>0.05</td>
<td>0.97</td>
<td>1.47</td>
</tr>
<tr>
<td>Spring</td>
<td>1989</td>
<td>0.25</td>
<td>1.21</td>
<td>1.18</td>
</tr>
<tr>
<td>Summer</td>
<td>1989</td>
<td>1.23</td>
<td>1.27</td>
<td>0.68</td>
</tr>
<tr>
<td>Fall</td>
<td>1989</td>
<td>1.74</td>
<td>1.77</td>
<td>0.05</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>0.96</td>
<td>1.34</td>
<td>0.75</td>
</tr>
</tbody>
</table>

<sup>a</sup> Grassland was 44%, shrubland was 35%, and shrub-grass was 21% of the area.

<sup>b</sup> Chi-square analysis ($\chi^2 = 5.64, P = 0.69$) indicated Mourning Dove sightings were not different from expected for the plant communities.
A standing crop did not differ between sites.

**DISCUSSION**

Mourning Doves had no definite preference \( (P = 0.69) \) for shrubland, shrub-grass, or grassland communities based on results of chi-square analysis (Table 2). Jackson (1940) and Clark (1969) reported that mesquite is important to nesting Mourning Doves. However, Soutiere and Bolen (1976) found that Mourning Doves in Texas compensated for the loss of mesquite trees as nesting sites by nesting on the ground. In their study nesting success was actually higher for ground than tree nests. This may explain why Mourning Dove numbers were similar on the late- and mid-seral condition ranges in our study even though honey mesquite cover was higher on mid-seral range (Table 3). It is also possible that adequate honey mesquite cover was available on the late-seral rangeland to meet Mourning Dove nesting cover needs.

There is other evidence that honey mesquite is an important component of Mourning Dove nesting habitat in the Chihuahuan Desert. Smith et al. (1996) reported that Mourning Doves were nearly absent \((1.6 \text{ sightings} \cdot \text{km}^{-2})\) from climax Chihuahuan Desert grassland in New Mexico with <1% honey mesquite cover, but observations were common \((22.3 \text{ sightings} \cdot \text{km}^{-2})\) on late-seral rangelands where honey mesquite cover was about 7%. In this study availability of Mourning Dove foods, primarily leatherleaf croton, was similar on both rangeland condition classes. If Smith et al. (1996) are correct, it appears that at some point a lack

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**TABLE 3.** Percent vegetation cover on late-seral and mid-seral Chihuahuan Desert rangeland in south central New Mexico for data pooled across periods (fall 1988–summer 1989).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Late-</td>
<td>Mid-</td>
<td>Late-</td>
<td>Mid-</td>
</tr>
<tr>
<td>GRASSES</td>
<td>seral</td>
<td>seral</td>
<td>seral</td>
<td>seral</td>
</tr>
<tr>
<td><em>Sporobolus flexuosus</em></td>
<td>13.1</td>
<td>9.2</td>
<td>8.0</td>
<td>5.9A</td>
</tr>
<tr>
<td><em>Aristida spp.</em></td>
<td>4.7A</td>
<td>5.4B</td>
<td>5.0A</td>
<td>1.4B</td>
</tr>
<tr>
<td><em>Bouteloua cribopoda</em></td>
<td>2.1A</td>
<td>0.5B</td>
<td>7.4A</td>
<td>0.8B</td>
</tr>
<tr>
<td><em>Eriogonum pulchellum</em></td>
<td>1.4</td>
<td>0.9</td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td><em>Sporobolus airoides</em></td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><em>Bouteloua gracilis</em></td>
<td>0.1</td>
<td>0.4</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><em>Bouteloua curtipendula</em></td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TOTAL GRASSES</td>
<td>21.6A</td>
<td>13.5B</td>
<td>22.4A</td>
<td>10.2B</td>
</tr>
</tbody>
</table>

**FORBS-SHRUBS**

| *Gutierrezia sarothrae* | 12.5 | 15.9 | 8.8A | 15.5B | 8.5A | 14.5B | 7.7A | 14.0B |
| *Prosopis glandulosa* | 2.4A | 23.8B | 2.4A | 11.4B | 3.2A | 9.7B  | 6.0A | 17.1B |
| *Croton pottsii* | 3.0A | 0.1B  | 0.0   | 0.0   | 0.0   | 0.0   | 2.1A | 0.0B  |
| *Yucca elata* | 0.6   | 0.5   | 0.8A  | 1.7B  | 0.1A  | 1.2B  | 0.2A | 3.4B  |
| TOTAL FORB-SHRUBS | 18.5A | 40.3B | 12.0A | 28.6B | 11.6A | 25.4B | 16.0A | 34.5B |
| TOTAL COVER       | 40.1  | 53.8  | 34.4  | 38.8  | 27.6 | 32.3  | 34.0 | 43.3  |

*Row means within periods with different letters differ \((P > 0.05)\).*

**TABLE 4.** Standing crop \((g \cdot m^{-2})\) of forbs on late-seral (LS) and mid-seral (MS) rangelands in south central New Mexico.

<table>
<thead>
<tr>
<th>Species</th>
<th>September 1988</th>
<th>April 1988</th>
<th>September 1989</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LS1</td>
<td>MS</td>
<td>LS2</td>
<td>MS</td>
</tr>
<tr>
<td><em>Croton pottsii</em></td>
<td>2.0A</td>
<td>0.8B2</td>
<td>2.9A</td>
<td>0.0B3</td>
</tr>
<tr>
<td><em>Salsola iberica</em></td>
<td>0.1</td>
<td>0.5</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td><em>Amaranthus pubescens</em></td>
<td>0.1</td>
<td>0.4</td>
<td>0.1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

1*LS = late-seral area, MS = mid-seral area.*
2*Row means with different letters are significantly different \((P < 0.05)\) for different ranges within sampling periods using least significant difference (LSD) tests.
3*A trace amount (<0.1 g \cdot m^{-2}) occurred in samples.*
of shrubs, particularly honey mesquite, will limit Mourning Dove populations on Chihuahuan Desert rangelands.

Mourning Doves seem to avoid densely vegetated areas for nesting and feeding (Soutiere and Bolen 1976, Baker and Guthery 1990). In studies by Bock et al. (1984) and Baker and Guthery (1990), Mourning Dove densities were higher on moderately to heavily grazed areas with a dispersion of bare ground than on ungrazed or densely vegetated areas. Nelson et al. (1997) found no difference ($P > 0.10$) in Mourning Dove sightings between moderately and conservatively grazed Chihuahuan Desert rangelands although the data suggested there was a tendency toward higher sightings on the moderately grazed areas.

Leatherleaf croton (also known as dove-weed) standing crop was higher ($P < 0.05$) on late-seral than mid-seral areas (Table 4). Another study found that Russian thistle and redroot pigweed were more available in areas within 500 m of livestock watering points than in areas 500–1700 m from water (Tembo 1990). Moderate retrogression in ecological condition from the climax caused by livestock grazing appears to favor these plants. From the standpoint of optimizing cover and food for Mourning Doves, a mix of mid-seral and late-seral stages may be ideal.

All 4 of our experimental sites are located within the home range of a Mourning Dove. They are surrounded by large areas of rangeland in mid-seral or late-seral conditions. Therefore, we believe that Mourning Doves had opportunity to readily display habitat preferences. Our selection of study areas surrounded by large tracts of native rangelands also minimized potential confounding from outside influences, such as agricultural lands, roads, water points, and trees, whose locations could have caused doves to use one seral stage differently compared with another.

MANAGEMENT IMPLICATIONS

During 2 years of study, Mourning Dove numbers were similar on late- and mid-seral Chihuahuan Desert upland sites. Another Chihuahuan Desert study (Smith et al. 1996) indicates higher Mourning Dove numbers on sites in late-seral compared to near-climax condition as judged by the quantitative climax approach developed by Dyksterhuis (1949). The best approach for maximizing abundance of Mourning Doves in the Chihuahuan Desert may be to maintain a mixture of late- and mid-seral plant communities. A checkerboard pattern of mid-seral and late-seral pastures 1000 to 3000 ha in size may be ideal, but this needs study. We believe this mixture should maximize diversity in vegetation composition and structure. Mid-seral communities are favored by moderate grazing intensities that involve removal of 40–50% of current year growth of key forage species (black grama, mesa dropseed, threeawn; Paulsen and Ares 1962). Late-seral communities are favored by conservative grazing intensities (30–40% removal of key forages; Paulsen and Ares 1962, Holechek et al. 1994). Our findings regarding Mourning Dove habitat in the Chihuahuan Desert may not apply to other ecosystems, such as the shortgrass prairie and southern high plains of eastern New Mexico and western Texas, because of differences in climatic conditions and vegetation composition. However, we consider this study somewhat exploratory. Long-term research is needed to better evaluate Mourning Dove population responses to livestock grazing and plant communities in the Chihuahuan Desert.

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LITERATURE CITED


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