

# Responses of Selected Wildlife Species to the Removal of Mesquite from Desert Grassland

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## Abstract

Activities of selected wildlife species were observed from September 1976 to June 1978 in an undisturbed velvet mesquite (*Prosopis juliflora* var. *velutina*) stand, on range cleared of mesquite, and in a mesquite stand with spot clearings on the Santa Rita Experimental Range near Tucson, Ariz. More black-tailed jackrabbits (*Lepus californicus*), antelope jackrabbits (*Lepus alleni*), and Gambel's quail (*Lophortyx gambelii*), were seen in undisturbed mesquite and mesquite with clearings than on mesquite-free range. Likewise, more bird calls were heard in the undisturbed and partially cleared mesquite than on mesquite-free range. Apparent differences in bird and mammal populations between the undisturbed stand and the partially cleared stand were not significant and were generally small.

Desert grasslands in southeastern Arizona, south-central New Mexico, and southwestern Texas lie in broad belts around the bases of mountain ranges (Humphrey 1958). As mesquite invaded and increased on these grasslands, perennial grass stands declined (Parker and Martin 1952). Much mesquite has been cleared to restore grass production, but removal of mesquite is considered detrimental to some species of wildlife (Davis and Winkler 1968, McCulloch 1972, McCormick 1975). There are indications, however, that partial mesquite clearing, in strips or patches, may both increase forage for cattle and improve wildlife habitat (Whitson et al. 1977). The purpose of this study was to monitor responses of selected wildlife species to such partial clearing. Species observed were mourning dove (*Zenaidura macroura*), white-winged dove (*Zenaidura asiatica*), Gambel's quail (*Lophortyx gambelii*), scaled quail (*Callipepla squamata*), desert mule deer (*Odocoileus hemionus crooki*), javelina (*Dicotyles tajacu*), coyote (*Canis latrans*), black-tailed jackrabbit (*Lepus californicus*), antelope jackrabbit (*Lepus alleni*), and desert cottontail (*Sylvilagus audubonii*).

## Study Area

The study was done on the Santa Rita Experimental Range (USDA Forest Service) near Tucson, Ariz. The climate of the range is typical of the semiarid Southwest, with low relative humidity and daily temperatures sometimes exceeding 38° C during the summer. Average annual precipitation in the study pastures ranges from 350 to 400 mm. About 60% of the year's moisture falls during the summer rainy season and produces most of the perennial grass forage. Effective rainfall is unusual from April through June, the driest part of the year. The major shrubs are velvet mesquite, cacti, and burroweed (Martin and Reynolds 1973).

The study area involved two 300-ha pastures and about 300 ha of a third (1400-ha) pasture. These study pastures were grazed by cattle in a pilot study of a 1-herd, 3-pasture, 3-year rotation (Martin 1978). No mesquite was removed from the first pasture (Fig. 1A). Mesquite was removed from 7 patches ranging in area from 2.8 to 30.4 ha in the second pasture. The patches, comprising one

third of the total area, were cleared by chaining in July of 1976 (Fig. 1B). Mesquite in the third pasture was killed with diesel oil in 1955 (Fig. 1C). The pasture with undisturbed mesquite and the one with no mesquite are in different replications of the grazing study and were grazed March-October 1977. The spot-cleared unit was grazed twice (November 1976-February 1977 and March-October 1978). The herd in the undisturbed pasture consisted of 172 cows plus 9 bulls grazing from March through October. The herd in the cleared pasture was 52 cows and 2 bulls grazing from March through October. Forty to sixty percent of the perennial grass herbage remained ungrazed at the end of each grazing period. Habitat edge, quantified using a diversity index (Patton 1975), was about twice as great in the mesquite with clearings as in the other two pastures.

## Methods

Wildlife observations began September 1976 and ended in June 1978. Four 1,200-m census lines were established perpendicular to the drainage pattern in each pasture (Fig. 2). Observations made along each census line included (1) monthly visual sightings of each species from September 1976 to June 1978, made by walking 2 lines each morning starting at daylight; (2) call counts for Gambel's quail, scaled quail, mourning doves, and white-winged doves, made by walking the transect lines at 2-week intervals in April-June 1977 and 1978 (6 times a year); and (3) quarterly counts of scats, and pellet groups, made using concentric circular plots 4.05 m<sup>2</sup> in area for lagomorph pellets and 40.5 m<sup>2</sup> for deer pellet groups and other scats.

Three pellet plots were established at each of 10 points, (120 m apart) along each census line; one plot on the line; one 20 m east of the line, and one plot 20 m west of the line. Counts included deer pellet groups and individual pellets or scats of other species. Plots were cleared of pellets after each count.

Each data set was analysed by statistical procedures appropriate to the distribution of the data. Analysis of variance was used for lagomorph pellet counts and for call counts (after square root transformation). Visual census data and counts of deer pellet groups were converted to counts per transect for each pasture to provide an ordered category contingency table suitable for analysis by a method described by Bhapkar (1968).

## Results and Discussion

Sightings of white-winged doves and desert cottontails were too infrequent to establish trends, and mourning dove numbers were extremely variable (Table 1). Total sightings, excluding mourning doves, were 263 for mesquite with clearings, 201 for undisturbed mesquite, and 64 for mesquite-free range. Almost all species apparently preferred some mesquite to no mesquite, but differences between undisturbed mesquite and mesquite with clearings were not significant and were generally small.

Even though there were 4 times as many mourning doves in the mesquite with clearings as on mesquite-free range, the differences were not significant (Table 1). The fewest mourning doves were seen in the undisturbed mesquite range. More than half of all

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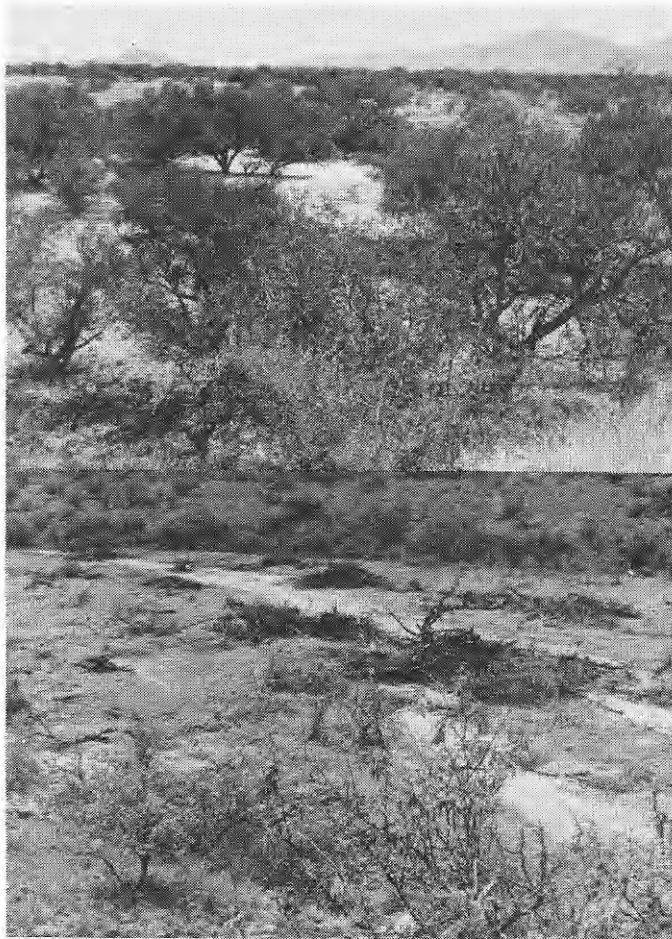


Fig. 1. Habitat conditions observed: (A) undisturbed mesquite stand, (B) opening in partially cleared pastures showing brush piles left after chaining, (C) mesquite-free range.

mourning dove sightings were recorded in September 1976, when 305 doves were seen. Most of these were in the recently cleared areas. Perhaps some immediate habitat response to chaining made the clearings especially attractive at that time. Counts of calling male mourning doves were significantly higher in undisturbed mesquite (268) and in mesquite with clearings (194) than in mesquite-free range (105), indicating a higher breeding population. Doves are highly mobile, however, and can fly great distances in a day to take advantage of a particular resource. Mourning doves seem to favor some mesquite, at least as perches for calling males.

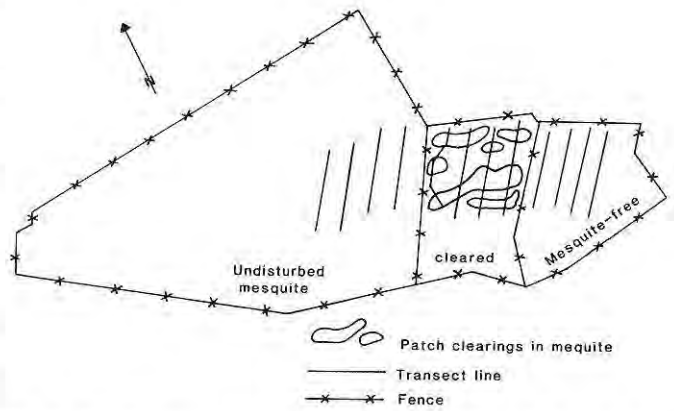


Fig. 2. Sketch map of the three pastures used in this study showing placement of transect lines and the size and shape of the 7 clearings in the partially cleared pastures.

Openings produce more seeds for food however. Clearings in mesquite should benefit mourning doves by increasing the food supply while leaving mesquite trees as nesting and calling sites.

Too few white-winged doves were seen to test significance, but more white-winged doves calls were heard in the undisturbed mesquite (55) and the mesquite with clearings (22) than in the mesquite-free pasture (11). Grasslands provide little food or cover for white-winged doves, but spot clearings in mesquite can provide suitable habitat.

Only one Gambel's quail was seen and only one male was heard calling in two years of censusing on the mesquite-free range. The large difference in Gambel's quail seen in undisturbed mesquite (22) and in mesquite with clearings (77) was not statistically significant (Table 1).

Twice as many Gambel's quail calls were recorded in mesquite with clearings (111) as in the full stand (52). Gambel's quail were often associated with edges of clearings. Many males called from the piles of dead mesquite left by the chaining operation (Fig. 1C). Gambel's quail greatly benefited from the clearings where the dead mesquite trees were left. This agrees with the view that dense mesquite stands are not good quail habitat because shade prohibits the growth of small herbs and grasses used as food and shrubs used as roosts (Gorsuch 1934). Gambel's quail used both mesquite and clearings in the partially cleared pasture. Clearings can be very beneficial if mesquite is close by.

Table 1. The number of mammals and birds sighted per kilometer of transect during the visual census of the 3 pastures.<sup>1</sup> The numbers in parenthesis are the number of animals sighted.

Species	Vegetative characteristics		
	Mesquite with clearings	Undisturbed mesquite	Mesquite-free
Desert mule deer	0.24(27)	0.30(33)	0.16(18)
Javelina	0.15(17)	0.24(26)	0(0)
Coyote	0.06(7)	0.05(5)	0.01(1)
Black-tailed jackrabbit	0.36a(38)	0.37a(39)	0.06b(6)
Antelope jackrabbit	0.56a(59)	0.37a(39)	0.09b(10)
Desert cottontail	0.02(2)	0.04(4)	0.03(3)
Mourning dove <sup>3</sup>	3.78(399)	0.56(59)	1.02(108)
White-winged dove	0(0)	0.01(1)	0.01(1)
Scaled quail	0.34(36)	0.30(32)	0.23(24)
Gambel's quail	0.76a(77)	0.21ab(22)	0.01b(1)
Total	27(662)	1.62(172)	1.62(172)

<sup>1</sup>Significant differences ( $P < .05$ ) in numbers on the same line are indicated by suffixes that do not include a common letter.

<sup>2</sup>Differences evaluated by method of Bhapkar (1968).

<sup>3</sup>2.89 of these were seen in the first observation—September 1976.

The numbers of scaled quail seen were not significantly different among pastures (Table 1), but significantly more scaled quail were heard calling in the undisturbed mesquite area (61) than the mesquite-free range (16). And, although the test did not show a significant difference, almost three times as many scaled quail calls were recorded in the mesquite with clearings (43) as in the mesquite-free range. This shows a definite preference for mesquite by scaled quail, at least seasonally when shrubs may be preferred sites for male advertisement. Davis et al. (1975) stated that it would be wise to leave some mesquite in clearing operations. We agree that spot clearing is advantageous for scaled quail.

Differences in mesquite cover did not result in significant differences in numbers of deer seen (Table 1) or in numbers of pellet groups counted (46 groups in the mesquite with clearings, 29 groups in the undisturbed mesquite, and 46 groups in the mesquite-free pasture). The lack of significance may be due, in part, to the small size of the study area, because the average home range for mule deer on the Santa Rita Experimental Range is 7.4 km<sup>2</sup> (Rodgers 1977). Deer could utilize most of the mesquite-free pasture without venturing more than 0.5 km from mesquite cover. In any event, the partial clearings of mesquite in this study did not appear to be harmful to deer populations.

There were no significant differences in the number of javelina sighted among treatments (Table 1), and scat counts did not provide enough data for testing. Seventeen javelina in one herd were seen in the mesquite with clearings. Twenty-six javelina from several herds were seen in the undisturbed mesquite range. No javelina were seen in the mesquite-free range. These trends are generally consistent with results of other research. Removal of all the mesquite over large areas apparently reduces or eliminates javelina populations. Clearing mesquite in spots, as was done in this study, leaves the habitat suitable for javelina.

There were no significant differences in sightings or scat counts among treatments for coyotes (Table 1). However, coyotes were more abundant where jackrabbit numbers were high (in pastures with mesquite) than on cleared range where jackrabbits were scarce. This is what would be expected based on availability of preferred prey.

Fewer black-tailed and antelope jackrabbits were seen on mesquite-free ranges than in undisturbed mesquite or in mesquite with clearings (Table 1). Pellet numbers for lagomorphs were significantly lower on mesquite-free range (3705) than the other two pastures, but differences between undisturbed (8866) and partially cleared mesquite (9948) were negligible. These results match those for visual sightings.

The mesquite-free pasture in this study always has a thicker growth of grass, but the undisturbed mesquite and partially clear mesquite pastures have more burrowweed. Rank grass growth and lack of shrubby vegetation apparently work to the disadvantage of antelope jackrabbits on mesquite-free range. Numbers of black-tailed and antelope jackrabbits apparently were not affected by partial mesquite clearing but were much reduced on mesquite-free range. Although few cottontails were seen during this study, their habitat requirements suggest that they, too, would suffer declines in large mesquite clearings.

Within the partially cleared pasture, approximately the same number of mammals were sighted in the mesquite (76) as in the clearings (74). The only species preferences found were slight (i.e., javelina for mesquite and blacktailed jackrabbits and coyotes for clearings). Among birds, greater visibility undoubtedly contributed to counts that were 190% higher for quail and 450% higher for

mourning doves in the clearings. Additionally, though, birds were attracted to the brush piles created by chaining.

The number of mammals seen per kilometer of transect was 0.90 with cattle present and 0.89 with cattle absent. Comparable values for quail were 0.57 and 0.51. More mourning doves (1.95/km) were seen when cattle were absent than when cattle were present (0.82/km) but this difference was almost entirely the result of the large number of doves that congregated on the clearings in September 1976 soon after they were created. The pastures were stocked conservatively, and the presence of cattle apparently had little if any influence on use of the study pastures by wildlife.

## Conclusions

Partial clearing of mesquite was far less detrimental to wildlife than was complete clearing. For some species partial clearing was beneficial. Gambel's quail benefited greatly from the increased edge created by the irregularly shaped clearings. Scaled quail, which seem to prefer a more open habitat, may increase more rapidly where clearings are surrounded by mesquite. Numbers of most mammals and birds were lowest in the mesquite-free range. Additionally, Germano and Hungerford (1981) found that lizards were also least abundant in areas without mesquite.

Where desert grassland has been occupied by mesquite, the response of wildlife to spot clearing will be predominantly favorable. The response to large scale complete mesquite removal will be unfavorable. Compared with total clearing, spot clearing in mesquite gives a greater diversity of habitat, less visual impact and is less detrimental to wildlife; yet, it still increases forage production for livestock.

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