The Effect of Strip Width on Helicopter Censusing of Deer

SAMUEL L. BEASOM, JEFFREY C. HOOD, AND J. RICHARD CAIN

Abstract

Evaluation of the numbers of white-tailed deer observed in the first (inside) 50 m compared to the second (outside) 50 m strips from helicopter census transects on brush-covered rangelands in Texas revealed from 34–73% fewer animals in the latter. The average reduction of approximately 53% suggests that helicopter censuses yield density estimates about 25% low. Correction for these underestimates could lead to more efficient management of the resource as well as elevated income in areas commercializing hunting.

The basic line transect method of animal population enumeration has become widely accepted and is adaptable to a variety of specific applications. The major problem associated with the method appears to be a determination of actual strip width. Numerous mathematical and mechanical alterations have evolved to improve the results obtained from its application (Yapp 1956, Skellam 1958, Gates et al. 1968, Gates 1969).

Anderson and Pospala (1970) further determined that the number of animals detected along ground transect lines declined in proportion to the distance from the midline. In fixed wing aerial censusing, Caughley (1974) and Caughley et al. (1976) noted a direct correlation between strip width and speed and number of animals observed, with an indirect correlation between number observed and altitude.

The use of a helicopter theoretically overcomes many of the practical censusing difficulties because of the facility by which speed and altitude can be altered to achieve good sightability under a wide range of climatic, physiographic, and phytosociological conditions. The influence of strip width on animal sightability from a helicopter remains undetermined. The present investigation was designed to evaluate this relationship for white-tailed deer (*Odocoileus virginianus*) on brush-covered rangelands in southern and western Texas.

Methods and Materials

Study areas comprising approximately 80,000 ha were selected on 11 ranches in Zavala, Duval, Schleicher, Terrell, and La Salle counties, Texas. Vegetative types on the areas were predominantly mesquite (*Prosopis glandulosa*)-juniper (*Juniperus* spp.), mesquite-blackbrush (*Acacia rigidula*), mesquite-guajillo (*A. berlandieri*) or juniper-live oak (*Quercus virginiana*); canopy cover was estimated from aerial photos to range from approximately 30–70%.

The study was conducted from January 1978 through January 1979. The helicopter utilized was a Bell G4-A model except in

At the time of research, the authors were, respectively, associate professor and student assistant with the Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, and biologist with Game Management Associates, P.O. Box 9933 College Station, S.L. Beasom is now research wildlife biologist with the U.S. Dep. Agr.-Forest Service, Lubbock, Texas.

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January 1979 when a Bell Jet Ranger III was used. Three observers were used on each census. The two primary observers counted only those animals on their respective side of the transect midline. The pilot aided the other two observers by counting on both sides of the craft as well as maintaining an accurate compass course, an altitude of about 20 m, and a speed of 25–30 kph.

Strip width was estimated at 100 m on each side of the midline as was suggested by Saugstad (1942) for aerially censusing whitetails in wooded habitat in North Dakota. Observers were "calibrated" prior to each flight by airborne observation of known-distance objects at 50 and 100 m. Each respective side was sub-divided into two intervals, 0–50 m and 50–100 m. The 0–50 m divisions on either side of the line were termed "inside," and the 50–100 m divisions were referred to as "outside."

Upon the sighting of an animal, it was immediately judged as being "inside" or "outside" and identified as to age and sex when possible. All classifications were made audible to the observer recording the data to cause as little distraction from his work as possible. Any deer not positively identified as to sex were classified as "unknown." Animals sighted outside of the designated transect width were not counted. Transects were spaced at an estimated 400 m apart so that approximately 50% of each ranch would be censused. Transect length was measured from scaled aerial photos, however, to assess the actual amount flown.

Results and Discussion

Overall there were significantly ($P < 0.05$) fewer deer observed in the outside strip than in the inside strip. On a practical sense, this figure averaged approximately 53% lower in the outside strip with a range from about 34–73% (Table 1). Similar results have been shown with fixed-wing aerial censuses of caribou (*Rangifer arcticus*) in northern Canada (Banfield et al. 1955), elephants (*Loxodonta africana*) and wildebeeste (*Connochaetes taurinus*) in eastern Africa (Caughley 1974), and red kangaroos (*Megaleia rufa*) in New South Wales (Caughley et al. 1976).

These data suggest that a correction factor should be employed to improve population estimations of white-tailed deer when helicopter strip transects are utilized. It is also apparent that this correction should be derived for each area censused because of variability in canopy cover, terrain and potential different flushing behavior of the animals. Although canopy cover doubtless affects animal observability, at least at the extremes, no significant ($P > 0.05$) correlation was noted between the grossly estimated values in this investigation.

The obvious result of reduced visibility of animals at an increasing distance from the midline is an underestimation of true density. More refinement in the correction of bias in these data probably could be developed if the total strip width was broken down into smaller units than those deployed here, but we judged the 50-m intervals to be the minimum feasible under the conditions obtaining in this study. Regardless, in this study, the apparent underestimate of whitetails was at least 26% on the average. A correction for this bias doubtless would improve deer management efficiency.

Table 1. Differences in numbers of white-tailed deer observed in inside and outside 50-m strips of transects flown by helicopter on brush-covered rangeland.

Study area	Predominant vegetative type ¹	Estimated % canopy coverage	Date flown	Distance flown (km)	Total deer observed		% Difference O/I
					Inside 50m	Outside 50m	
Cameron	ME-BB	40	Jan 1978	234.3	199	131	-34.2
Cameron	ME-BB	40	Jan 1978	223.9	180	112	-37.8
Dobie	ME-BB	50	Jan 1978	141.0	90	45	-50.0
Cameron	ME-BB	50	Apr 1978	161.9	141	72	-48.4
Cameron	ME-BB	50	Apr 1978	161.9	139	80	-42.4
Cameron	ME-BB	50	Apr 1978	161.9	134	62	-53.4
Cameron	ME-BB	60	Aug 1978	175.4	151	65	-57.0
Kiefer	ME-BB	40	Aug 1978	96.7	56	33	-41.1
Rockhouse	ME-GO	60	Aug 1978	112.3	109	34	-68.8
Heirs	ME-GO	60	Aug 1978	164.0	157	47	-69.1
Maynard	JU-LO	60	Sep 1978	127.5	190	94	-50.5
Hayre	JU-ME	30	Sep 1978	127.8	97	39	-59.8
Oasis	JU-LO	70	Sep 1978	99.8	142	38	-73.3
Riggs	JU-ME	30	Sep 1978	132.8	148	72	-51.4
Turk	JU-ME	35	Sep 1978	125.2	118	41	-65.3
Wroe	JU-ME	35	Sep 1978	166.6	189	98	-48.2
Cannon	JU-ME	40	Sep 1978	106.1	69	28	-59.4
Dobie	ME-BB	50	Jan 1979	137.9	95	47	-51.5
Cameron	ME-BB	40	Jan 1979	179.3	147	62	-57.8
Cameron	ME-BB	40	Jan 1979	195.5	197	85	-57.9
Totals				3,031.8	2,748	1,285	-53.2

¹ME = mesquite, BB = blackbrush, GO = guajillo, JU = juniper, LO = live oak.

For example, if the true density of deer was 10 ha/animal, the correction for sightability may account for as many as 17-36 deer for every 1,000 ha of land. This would lead to the ability to elevate suggested harvest rates by the corrected amount without detriment to the population. On areas where harvesting is commercialized the benefits of this are obvious.

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