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Impact of snowfall on the Utah preventive aerial hunting program

Kimberly K. Wagner and Michael R. Conover

Aerial hunting is one of the tools used by wildlife managers to reduce predation by coyotes (*Canis latrans*) on livestock and wildlife (Guthery and Beasom 1977, Sterner and Schumake 1978, Stout 1982, Smith et al. 1986). In research conducted by Wagner and Conover (1999), areas with preventive aerial hunting had fewer confirmed and estimated lamb losses to coyote predation and required significantly fewer hours of additional corrective predation management than areas without aerial hunting. Aerial hunting is perceived to be especially valuable for large areas and areas with rough terrain and limited access (United States Department of the Interior (USDI) 1973a,b; Sterner and Schumake 1978; Wade 1978). However, use of this technique is limited by many variables, including funding, helicopter availability, and environmental requirements for safe and effective hunting (Wade 1976, USDI 1978).

During aerial hunting, coyotes are shot by hunters from aircraft. Due to their greater maneuverability, helicopters are preferred to fixed-wing aircraft for aerial hunting in the steep, mountainous terrain used for summer grazing in the Intermountain West (Wade 1976, USDI 1978). Aerial hunting is generally restricted to winter, when cold, dense air is optimal for safe flying conditions and plant foliage is minimal. Snow cover improves hunting efficiency because coyotes and their tracks are more conspicuous on a white background (C. J. Packham, USDI, unpublished report, 1973; Wade 1976). The efficiency of aerial hunting can also be improved by coordinating the efforts of the team in the aircraft with ground personnel using sirens and calls to help locate coyotes

(Wade 1976). However, in many areas of the Intermountain West, access from the ground is unavailable or impractical and tracking in snow becomes especially important. Consequently, personnel of the United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services in the Intermountain West generally prefer to hunt within 48 hours of a snowfall when winds have been low, to facilitate tracking (J. Winnat, Utah Wildlife Services, personal communication).

Because of the importance of snow in aerial hunting programs in the Intermountain West (C. J. Packham, USDI, unpublished report, 1973), we examined the impact of low snowfall on aerial hunting as used by Wildlife Services personnel in Utah National Forests. Low snowfall can impact the programs by reducing the extent, intensity, or efficiency of aerial hunting. If aerial hunting teams always select optimal conditions, there may be a decrease in the extent of aerial hunting but no decrease in its intensity or efficiency. In contrast, if hunting teams accept less-desirable hunting conditions during years with low snowfall, there might not be a decline in the extent of aerial hunting, but there might be a decline in its intensity or efficiency.

Methods

To evaluate the impact of snowfall on aerial hunting programs, we obtained Utah Wildlife Services records for the Manti-La Sal and Wasatch National Forest summer grazing areas from 1990 to 1995. The study included sheep grazing areas in 3 regions: 1) the Ferron, Price, Manti, and Sanpete ranger districts of the Manti-La Sal National Forest

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(Manti); 2) the Bear River and Mountain View ranger districts of the Wasatch National Forest located on the north slopes of the Uinta mountain range (North Slope); and 3) the Logan and Ogden ranger districts of the Wasatch National Forest located east and south of Logan, Utah (Logan). Study areas were selected based on consistent woolgrower financial support of winter aerial hunting programs and the absence of legal bans on winter predator control from 1990 to 1995.

We obtained data on annual snowfall and average snowfall levels from the Utah Climate Center in Logan, Utah, and from Ashcroft et al. (1992). We arbitrarily selected <75% average snowfall as the definition of a low-snowfall year. We examined snowfall data to identify winters from 1990 to 1995 with <75% average snowfall for the period from January to March and the most recent 3 years with average or above average snowfall for each forest unit.

To assess the impact of low snowfall on the extent, intensity, and efficiency of winter aerial hunting from helicopters, we obtained data from Utah Wildlife Services records on the area treated, hours of hunting, and number of coyotes killed during aerial hunting for each forest region during the high- and low-snowfall years. For each forest unit, the extent of aerial hunting was measured as the total hours of aerial hunting, total area (km²) treated, and total number of coyotes killed from aircraft. We calculated intensity as the hours of aerial hunting/area treated and number of coyotes removed/area treated. Hunting efficiency was the number of coyotes removed/hour of aerial hunting. We compared the measures of extent, intensity, and efficiency of aerial hunting between high- and low-snowfall years using an analysis of variance for studies with unequal sample size (Steele and Torrie 1980).

Results

Low-snowfall conditions occurred in the North Slope and Logan units during 1991 and 1992 and in the Manti unit in 1992. Average to above

average snowfall occurred in 1990, 1993, and 1995 for all 3 study areas. During the remaining periods, snowfall was below average but above the 75%-of-average criterion established for use as a low-snowfall year. Hence, data from these periods were not used in the data analysis.

Years with low snowfall had significant reductions in 2 of 3 measures of the extent of aerial hunting (area hunted [$P=0.04$] and hours of aerial hunting [$P=0.02$], Table 3.1). Although not significant ($P=0.09$), number of coyotes killed in years with low snowfall ($\bar{x}=15$, $SE=7$) was substantially lower than in years with normal or high snowfall ($\bar{x}=35$, $SE=8$). Hunting intensity and hunting efficiency did not differ significantly between years with and without low snowfall (Table 1). The only times when aerial hunting did not occur in a forest unit (Logan 1991, North Slope 1991) were during years with low snowfall.

Discussion and implications

During years with low snowfall, there was a significant reduction in the time spent aerial hunting and in the area covered. However, the areas that received aerial hunting did not differ in hunting intensity or efficiency (coyotes killed/km², coyotes killed/hour). Using aerial hunting in states with little or no snow suggests that it is possible to hunt without fresh snow. Even in Utah, aerial hunting from fixed-wing aircraft is used during periods of low or no snow for corrective and preventive control in lower elevations that are more accessible to ground crews. However, the consistency in the

Table 1. Winter aerial coyote hunting in Utah^a during years with low snowfall (<75% of average from January to March) or above average snowfall.

	≥ Average snowfall ^a		Low snowfall ^b		<i>P</i>
	\bar{x}	SD	\bar{x}	SD	
Extent of aerial hunting/forest unit					
Area hunted (km ²)	488	137	201	101	0.04
Hours hunting	20.1	5.1	6.5	2.9	0.02
Total coyotes killed	35	8	15	7	0.09
Intensity of aerial hunting					
Hunting intensity (hrs/km ²)	0.04	0.01	0.03	0.01	0.07
Kill intensity (coyotes killed/km ²)	0.09	0.02	0.07	0.03	0.44
Efficiency of aerial hunting					
Coyotes killed/hour	2.1	0.4	2.0	0.6	0.97

^a Data were from 1990, 1993, 1995 for all Manti, Logan, and North Slope study areas.

^b Data were from 1992 for Manti study area and 1991, 1992 for the North Slope and Logan study areas.

level of efficiency and the absence of hunting from helicopters in some years with low snowfall indicate that Wildlife Services field specialists are choosing to reserve hunting resources (money for aerial hunting from helicopters) for periods when conditions are optimal, even at the risk of having no aerial hunting. The lack of reduction in coyotes killed/hour and coyotes killed/km² also may be attributable to the fact that Wildlife Services personnel rely on fresh snow and not overall snow depth to facilitate tracking and locating coyotes from aircraft. Therefore, number of snowstorms may be a more critical factor.

The decline in the area receiving aerial hunting during low-snowfall years was probably the result of an interaction between fewer snowfall events and difficulties scheduling helicopters, not just low snowfall *per se*. Helicopter scheduling was an ongoing problem for Utah Wildlife Services, with only 5 pilots in the state authorized to fly helicopters for aerial hunting. Utah Wildlife Services must compete with other agencies for helicopter time. Consequently, even with appropriate weather conditions, hunting may not occur because helicopters are not available. Managers wishing to counteract the impact of low snowfall will have to find means of improving helicopter availability by establishing contracts with more pilots or by providing incentives for pilots to give their program greater priority when hunting conditions are suitable.

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