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RESIDENT UTAH DEER HUNTERS' PREFERENCES FOR MANAGEMENT OPTIONS

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ABSTRACT.—A total of 3291 resident deer hunters returned questionnaires distributed at checking stations in fall 1989 and 1990 providing opinions and management data concerning the Utah rifle hunt. Hunters reported hunter crowding and too few big bucks as critical reasons for possibly choosing to quit deer hunting in Utah. Indeed, hunter age structure and measured satisfaction suggested a negative future trend in hunter participation. Results suggested the adoption of several hunter-preferred management options would increase satisfaction, motivation, and success.

Key words: mule deer, questionnaires, checking stations, deer management, hunter opinions, wildlife methods, wildlife techniques.

Competition for wildlife recreation in the Rocky Mountain region will increase in the future, while projected populations of major wildlife species will show little change. In the next 30 years the number of big game hunters is expected to slowly increase from about 1.5 to 1.7 million, compared with the rapid increase in nonconsumptive users of 3.9 to 7.1 million (Flather and Hoekstra 1989). Certainly, the percentage of hunters in the total population will decline, while the percentage of nonconsumptive users will increase. Consequently, to balance resource use, wildlife managers must obtain a clear understanding of user preferences, particularly among those users who historically and currently have paid most management costs via license permit fees and excise taxes on sporting equipment.

In Utah, mule deer are preeminent among hunted wildlife species in terms of income received for wildlife management and hunter days afield. However, compared with the 1970s and in contrast to past regional trends (Flather and Hoekstra 1989), total big game license sales decreased slightly (0.8%) in the 1980s while total rifle hunters afield declined 3.1% (Jense and Shields 1990). These figures warn of possible negative trends for deer hunter participation and, along with uncertain hunter satisfaction, strongly suggest a need for constant and effective communication between state wildlife officials and Utah hunters.

One means of communicating information is through hunter opinion questionnaires, which have become an important data source for game management decisions. In Utah during the 1980s, six questionnaire surveys were conducted, and that number will likely double in the 1990s (Bunnell and Austin 1990). The use of postcard questionnaire surveys distributed to homeward bound hunters at deer checking stations is one method. This simple technique, developed in Utah during the late 1980s, is inexpensive, demographically unbiased, and accurately representative of hunters' opinions concerning deer management (Austin and Jordan 1989, Austin et al. 1990).

METHODS

Questionnaires[3] were printed on 4 1/4 × 6-inch postage-paid cards. During opening weekend of the 1989 Utah rifle deer hunt, 7040 questionnaires were distributed to hunters at 11 checking stations, and in 1990, 8750 questionnaires were distributed at 16 locations. One questionnaire was given to each licensed hunter checked until the supply was exhausted.

Data were analyzed within years using the Pearson chi-square statistic. The cross-tabulation method from the SPSS program on a VAX

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TABLE 1. Questionnaire return rates.

Region	Location	1989 Survey			1990 Survey		
		No. distributed	No. returned	% returned	No. distributed	No. returned	% returned
Northern	Snowville	500	107	21.4	500	109	21.8
	Blacksmith	500	95	19.0	500	83	16.6
	Ogden	1000	151	15.1	500	126	25.2
	Kamas	—	—	—	500	91	18.2
	Wellsville	72	20	27.8	—	—	—
Salt Lake	Canyons	—	—	—	250	48	19.2
Northeastern	Vernal	666	44	6.6	500	114	22.8
	Bookcliffs	650	131	20.2	500	113	22.6
	Current Ck.	—	—	—	500	120	24.0
Central	Thistle	1000	206	20.6	1250	291	23.3
	Tucker	300	37	12.3	—	—	—
	Sheepcreek	300	48	16.0	250	41	16.4
	Vernon	452	151	33.4	375	95	25.3
	Stansbury	—	—	—	300	57	19.0
Southeastern	Areawide	—	—	—	830	95	11.4
South central	Fishlake	—	—	—	300	14	4.7
	Oak Creek	—	—	—	195	63	32.3
Southern	Bloomington	1600	423	26.4	1500	418	27.9
Total		7040	1413	20.1	8750	1878	21.5

computer was used. For question number 18, 1990 survey, the values given were objectively placed into 11 monetary classes for analysis. The significance level for all data interactions was set at $P < .05$. For question number 20, 1990 survey, because the question was written with innumerable potential responses and many questionnaires contained more than one response, data were not statistically analyzed but are reported numerically. The responses were subjectively grouped into 71 categories. Data from the 1987 and 1988 surveys are added and compared where applicable.

RESULTS

Return Rates

Checking stations used for distribution by Utah Division of Wildlife Resources regions, the number of questionnaires distributed, and return rates are shown in Table 1. Although rates varied considerably by region and location, total return rates were 20.1% in 1989 and 21.5% in 1990, and consistent (Austin and Jordan 1989, Austin et al. 1990) with those reported for 1987 (25.8%) and 1988 (20.1%). Expected statewide return rates using this method are thus about 20–25%.

Hunter Demographics, Success, and Satisfaction

Most resident hunters are male (>90%), age 25–44 (52%), and have more than 10 years of Utah deer hunting experience (>60%). During 1989 and 1990, hunters had less than 50% party success for bucks on opening weekend and relatively low hunter satisfaction (Table 2). Hunter party success noticeably declined between 1987 and 1988 and again between 1988 and 1989, but remained about the same between 1989 and 1990.

The percentage of hunters (<20%) in the youngest age class (14–24 years) is lower than expected. Participation by hunters in this age class should be highest because few people begin hunting after about age 25. These figures, consistent over four years, alone suggest possible future declines in the number of Utah deer hunters. However, the sharp drop in hunter participation between the third and fourth age

TABLE 2. Demographics, party success (%), and hunter satisfaction of Utah resident deer hunters sampled, 1987–1990 (sample sizes in parentheses).

	Sex			Age class[a]						
Year	Male	Female	*N*	1	2	3	4	5	6	*N*
1987	90.4	9.6	(863)	19.0[e]	31.8	23.0	14.2	8.1	4.0	(869)
1988	89.6	10.4	(444)	19.7	33.0	23.4	13.8	8.3	2.0	(458)
1989	92.8	7.2	(925)	18.6	28.1	25.9	13.9	9.0	4.6	(936)
1990	92.7	7.3	(1429)	22.0	26.6	26.2	12.9	8.2	4.1	(1429)
Means	91.4	8.6		19.8	29.9	24.6	13.7	8.4	3.7	

	Experience class[b]								
Year	1	2	3	4	*N*	Success[c]		Satisfaction[d]	
1987	18.7	21.3	27.2	32.8	(867)	69.3[f]	(411)	5.3	(871)
1988	21.7	18.4	28.4	31.5	(461)	55.3	(459)	4.3	(456)
1989	22.7	15.2	25.2	36.8	(932)	48.0	(904)	4.1	(934)
1990	25.1	14.2	26.0	34.6	(1418)	47.9	(1406)	4.6	(1413)
Means	22.1	17.3	26.7	33.9		55.1		4.6	

[a]Age classes: 1 = 14–24, 2 = 25–34, 3 = 35–44, 4 = 45–54, 5 = 55–64, 6 = 65+ years
[b]Experience classes: 1 = 1–5, 2 = 6–10, 3 = 11–20, 4 = 21+ years
[c]Hunting party success for one or more bucks on opening weekend.
[d]Hunter satisfaction of current year's hunt in comparison to all previous deer hunts. A score of 5.0 would be expected for the average hunt.
[e]Age class 16–24. Hunters aged 14 and 15 years were ineligible for big game licenses.
[f]Hunting party success for bucks and antlerless deer on this hunt. For the 1987 season 62,516 bucks and 1168 antlerless deer were harvested.

classes (35–44 and 45–54) is also of concern because in these age groups many hunters' children are beginning to hunt, and parent participation is a key factor in long-term sustained interest of new hunters (Decker and Connelly 1989). Mean age of all hunters was 36.3, 35.4, 37.0, and 36.0 years for 1987–90, respectively. In a completely randomized survey of Utah hunters, Krannich et al. (1991) reported a mean age of 37 years and similar hunter age and sex characteristics.

One probable explanation for the sharp drop in hunters in the 45–54 age class is the significant interaction between age and hunter experience with hunter satisfaction ($P < .04$). Hunters with 20+ years of experience, who generally hunted deer before the 1970s when the number of hunters was lower (Fig. 1) and hunter success rate was higher (Jense and Shields 1990), show lower satisfaction scores than younger, less-experienced hunters. Mean satisfaction scores of experience classes 1–3 versus 4 (Table 2) for both years combined were 4.5 and 3.9, respectively. Similarly, mean satisfaction scores of age classes 1–3 versus 4 were 4.5 and 3.7, respectively. Consequently, hunting motivation for hunters with 20+ years of experience has likely decreased because of perceived lower-quality hunting.

Another concern for hunter participation is noted by comparing the trend of hunter participation by experience classes between survey years (Table 2). No trends in hunter participation were evident for hunters with 11 or more years of experience. However, hunters with 6–10 years of experience decreased 7.1% between 1987 and 1990, while hunters with 1–5 years of experience increased 6.4%.

Comparison Between Hunt Types

Utah has had four basic types of hunts since 1951, with each hunt type having a variable number of antlerless control permits. Either-sex hunts dominated from 1951 to 1973, with buck-only hunts dominating from 1974 to 1990, as well as before 1951. From 1985 to 1990 hunter-number-restrictive (limited-entry and high-country) hunts, and from 1984 to 1989 antler-restrictive (three-point-and-better) hunts were established on some units.

BUCK-ONLY HUNTS.—Total buck harvest averaged 63,250 per year with 8633 antlerless harvest and 181,235 hunters afield (Fig. 1). The number of unretrieved deer reported per 100 buck-only hunters in these surveys for 1987–90 was 19.9, 21.7, 15.9, and 16.0, respectively. Using the weighted mean of 17.9, total unretrieved deer for this period was 32,441 per

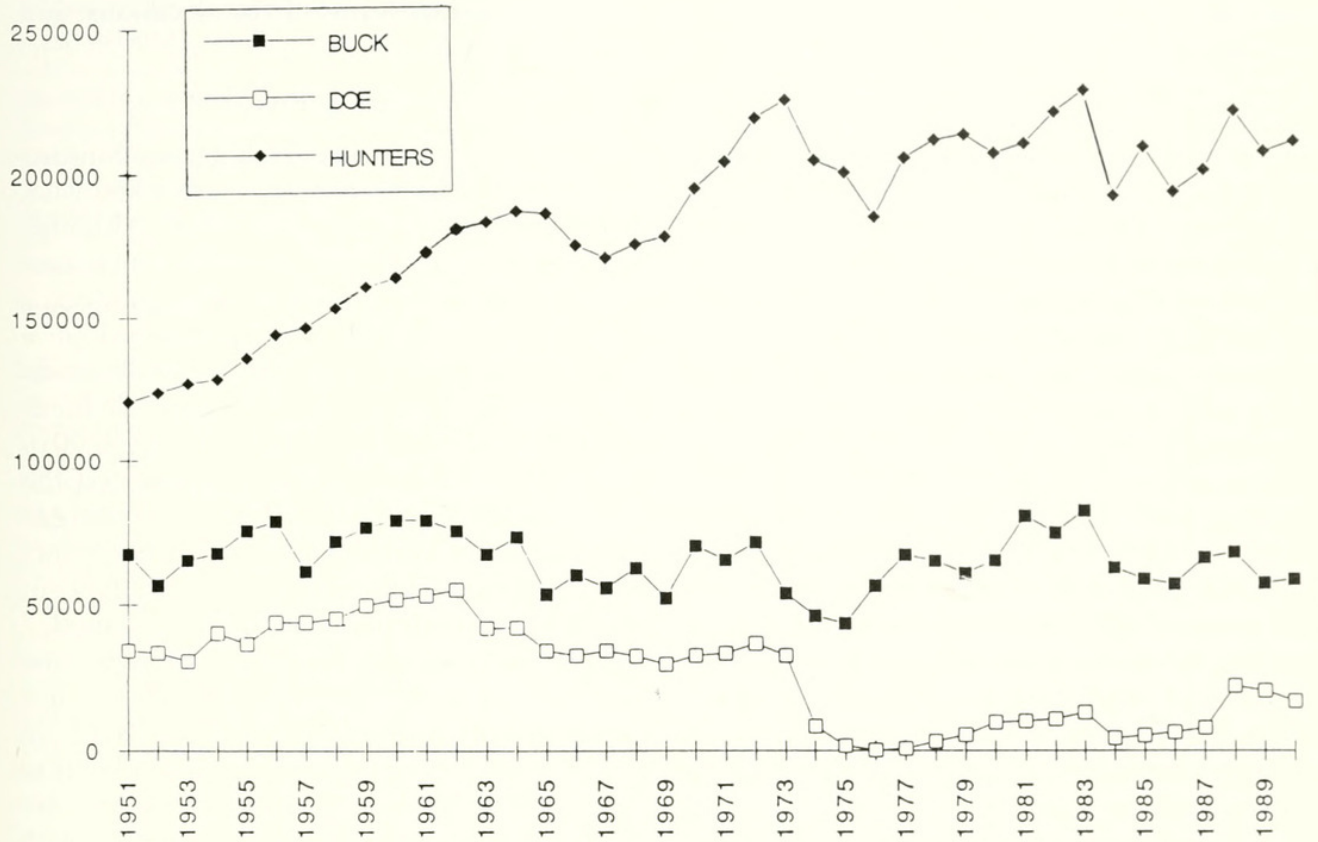

Fig. 1. Total harvest of buck and antlerless deer and combined hunters afield from all buck hunts in Utah, 1951–90.

year, and mean total annual hunting mortality was 104,324. Mean hunter satisfaction (1987–90), with 0 representing the worst hunt and 10 the best hunt, was 4.4. Hunting party success was 45.8%.

EITHER-SEX HUNTS.—During 23 years of either-sex hunting, the statewide total buck harvest averaged 66,992, and the antlerless harvest was 39,228. Using the estimated mean for unretrieved deer (Robinette et al. 1977, Stapley 1970) of 8.0 deer per 100 hunters and the mean number of rifle hunters afield (153,666), a calculated yearly loss of 12,293 unretrieved deer is obtained, bringing the mean total annual hunting mortality to 118,513. Hunter preference for buck-only versus either-sex hunting has not been addressed.

ANTLER-RESTRICTIVE HUNTS.— Three-point-and-better, antler-restrictive hunts were available on some units during 1984–89, and then discontinued. In comparison with buck-only hunts, three-point-and-better hunts showed a reduction in hunters afield, buck harvest, and hunter success (Jense 1990). However, these hunts also showed a small increase in the post-season total buck to doe ratios, but a large decrease in the number of post-season, mature bucks counted. These areas also showed a large decrease in the small buck (two-point-and-less) to doe ratio between preseason and post-season classification counts (Jense 1990).

Our analysis confirmed the adverse impacts of three-point-and-better hunts reported by Jense (1990), with the highest number of unretrieved deer at 39.6 per 100 hunters, including 21.7 bucks. This number of bucks, mostly two-point-and-less, is compared to 4.6 bucks per 100 hunters on buck-only areas. However, hunters from antler-restrictive areas were moderately satisfied, with a mean index of 4.8, and mean hunting party success was 55.6%. During 1989, the last year of three-point-and-better hunts, 40.0% (n = 931) of Utah resident hunters had hunted at least once on three-point-and-better areas, but only 26.7% (n = 906) preferred to continue this type of hunt. Indeed, less than half (47.7%) of hunters who chose to hunt these units in 1989 preferred to continue them.

Even though antler-restrictive hunts were not successful over entire deer management units, selection of conscientious hunters to avoid high unretrieved deer losses may lead to successful antler-restrictive management. For example, at the East Canyon Resort (10,000 acres) in northern Utah, protecting only 2 × 2 point bucks (1988–90) increased the mean

number of total antler tines of harvested bucks from 4.5 (1985–87) to 6.1 (1988–90). The percent of harvested bucks 2 × 2 or smaller decreased from 60 to 35%, while the number of trophy bucks larger than 4 × 4 increased from 0 to 8 (unpublished data, East Canyon Resort).

HUNTER-NUMBER-RESTRICTION HUNTS.—Limited-entry hunts have been used on some units since 1985. In comparison with buck-only hunts, they provide higher hunter success ($P < .01$) and satisfaction ($P < .001$), with an index of 6.3, but no difference in the total number of unretrieved deer (17.7 total deer per 100 hunters with 9.1 bucks and 8.6 antlerless). Hunting party success (1987–90) was high at 68.8%. In 1989, 22.8% of resident hunters (n = 935) had hunted deer on limited-entry areas, and most (65.6%) indicated the fee of $22.00 was fair. While most hunters (n = 908) favored the same (37.8%) or increased (38.9%) number of limited-entry units, hunter preferences for various permit drawing and landowner hunting options were unclear.

A second type of hunter-number-restrictive hunt is the high-country hunt. This uncrowded, high-quality hunt—but one that harvests bucks not then available during the October rifle hunt—received positive support from most (59.6%) Utah hunters.

Vehicle Access to Public Lands

A strong majority of hunters (76.2%) indicated that at least some lands should be closed to vehicle access during the deer hunt to increase the quality of the hunting experience. However, the percentage of hunters indicating at least half of all public lands should be open to vehicles was 74.5%. Overall, hunters indicated that a mean of 37.5% of public lands should be closed to vehicle access, varying by location from 28.9 to 45.4% The percentage of hunters who hunted on areas with vehicle restrictions was 33.8%, while the percentage of hunters who indicated preference to hunt on areas with vehicle restrictions was 45.2%. Using the logical assumption that the percentage of areas restricted to vehicles should be closely proportional to the percentage of hunters preferring them, our data suggest the current amount of area with restricted vehicle access is close to hunter preference, but that an additional 3.7% (37.5–33.8) to 11.4% (45.2–33.8) of public lands should be restricted. More information is needed on hunter preferences for vehicle-restricted areas in terms of size, locations, and number of areas.

License Fees

With the current cost of a big game hunting license set at $15.00, hunters were asked what they believed to be the fair value. Although Schreyer et al. (1989) reported increased license fees were opposed by most hunters, a mean value of $15.90 was determined ($n$ = 1391) in our study. Most hunters (58.8%) indicated $15.00 was the fair value. Sixty-eight hunters (4.9%) indicated the fair value was $30.00 or more, while 58 hunters (4.1%) indicated the value was less than $10.00. It was interesting to note that costs were not related to hunter success, satisfaction, hunter choice of hunt type, or whether private or public lands were hunted.

Although license fees are strongly and broadly approved by Utah hunters, few improvements in the quality of the deer hunt can be made without the economic trade-off of increased hunter fees. Hunter preferences for balancing potential increased fees with increased hunt quality need to be defined.

Hunter Concerns

Twenty-five categorical responses were given by 1% or more hunters as reason to quit deer hunting (Table 3). Although the list contains several areas of low management influence, such as old age, high associated costs of hunting, and personal attitude, most areas of responses are influenced by management decisions. The most common reasons, directly influenced by management decisions, included too many hunters, too few deer, bucks, and big bucks, private land problems, and poor game management.

DISCUSSION

Reasons to Quit Deer Hunting

The proportion of mature bucks in the harvest is an area of management control. It is clear most hunters prefer harvesting large bucks infrequently as opposed to harvesting smaller bucks frequently (Austin et al. 1990), as well as reducing some hunting opportunity to increase the proportion of mature bucks in the harvest (Austin and Jordan 1989, Toweill and Allen 1990). Furthermore, with the hunting media emphasis on trophy bucks, the potential harvest of mature bucks adds considerably to hunter

TABLE 3. Utah resident deer hunters' responses to the question: If you were to quit deer hunting in Utah, what reason would you list?

Number of questionnaires returned:	1430
Number of questionnaires with no response:	88
Number of questionnaires with "would not quit, none":	46
Number of questionnaires with responses:	1296
Number of total responses:	2087

Response categories	Number of responses	% hunters
Too many hunters	479	37.0
Too few deer	199	15.4
Private land problems	164	12.7
Too few big bucks	122	9.4
Old age or physical impairment	108	8.3
High associated costs of hunting	83	6.4
No areas to hunt or access to public lands	81	6.3
Too few bucks	79	6.1
Poor game management	75	5.8
Unethical hunters	72	5.6
Low success or no limit on statewide license sales	63	4.9
Children aged 14 and 15 years can hunt	48	3.7
Deer are too small	44	3.4
Too much ATV use or too many road hunters	41	3.2
Safety	39	3.0
High costs of licenses	35	2.7
Personal attitude	33	2.5
Too few vehicle access roads	31	2.4
Too many nonresident hunters	30	2.3
Poor hunt quality	29	2.2
Proclamation too long or complicated	27	2.1
No either-sex or antler-restriction hunts	19	1.5
Too many limited-entry areas	17	1.3
Too few limited-entry areas	16	1.2
Too many does	14	1.1
46 other categories	139	10.7

motivation, and Krannich et al. (1991) reported that about two-thirds of hunters (66.3%) were dissatisfied with the size of bucks.

Compared with either-sex hunting, age structure of the male population declines under buck-only hunting (McCullough 1979). In Utah (Austin 1991), the percentage of mature bucks, age 3 1/2 years and older, harvested decreased from about 44% during the pre-1951 buck-only hunts to about 30% during the period of either-sex hunting (1951–73). The percentage of mature bucks harvested sharply decreased and has remained at about 10% during the period of reestablished buck-only hunting (1974–90). On limited-entry hunts, the percentage of mature bucks in the harvest has exceeded 30% on most units. Not only has size of harvested bucks decreased due to decreasing mean age, but age-specific size has also declined (Austin et al. 1989).

The authors believe a reasonably high percentage (20–40%) of mature bucks in the harvest is critical to successful deer management and hunter motivation. It is clear to us that decreased hunting pressure on the buck population is necessary. The data strongly suggest a need to establish statewide minimum standards for (1) age structure of the buck harvest, (2) post-season buck:doe ratios, and (3) hunter success for bucks.

Problems associated with private lands are important to hunters. These problems include poorly marked lands, trespass, private lands curtailing access to public lands, and depredation. Private lands provide deer hunting for 14.8% (1990 survey) of Utah resident hunters, and 14.7% of hunters reported owning 10 or more acres used by wildlife (1989 survey). One possible, partial solution may be to give landowners more flexibility in management by allowing

either-sex hunting on private lands. Advantages include increased landowner control over deer numbers on their lands, decreased unretrieved deer kill (Austin et al. 1990), reduced depredation complaints, and improved opportunity for harvest. Furthermore, liberal hunts on private lands may increase incentives for landowners to mark their boundaries and allow additional hunting opportunity.

The categories of unethical hunters, safety, and minimum age for hunters are closely related to hunter education courses. Since the beginning of the hunter education program (1958) and the required wearing of hunter-orange clothing (1973), the mean number of total Utah hunting accidents and fatalities per year has averaged 11.1 and 3.4, respectively, with about three accidents and one fatality occurring during the rifle hunt. Before about 1958 when neither hunter education nor hunter orange was required, over 100 accidents and about 20 fatalities occurred yearly from all hunts combined. Hunter preference to allow persons aged 14 and 15 years to hunt big game has not been addressed.

The length and complexity of the proclamation is a concern of hunters. Before 1979, the one-page Utah deer proclamation measured 17.5 × 22.5 inches and was printed on high-quality paper, with the rules and regulations on one side and a multicolored map of Utah's deer units on the reverse. In 1990, the newsprint proclamation sheets were close to the same size (14.5 × 23.0 inches), but contained six pages.

The quality of the hunt in terms of the ratio of deer or bucks harvested per hunter is controlled by management. Although management can alter the buck:doe ratio, the total number of deer is limited by habitat, and, conversely, hunters have not been numerically limited. The Utah buck harvest has remained rather constant, mostly 50,000–80,000, since 1951 (Fig. 1), while the antlerless harvest has sharply decreased since 1974 with the resumption of buck-only hunting. Total buck hunters afield from all combined hunts increased steadily between 1951 and 1964, decreased for three years (1964–67), slowly increased during 1967–69, but abruptly increased between 1969 and 1973. After a second three-year period of decreasing hunters afield (1973–76), hunter numbers have fluctuated but remained high throughout the 1970s and 1980s. Consequently, the hunter responses of poor game management, poor hunt quality, the lack of either-sex hunts, and too many does, especially since changes to buck-only management were made beginning in 1974, have merit.

Hunter crowding before about 1969 when license sales were less than 180,000 (Fig. 1) was probably a much smaller problem (Bureau of Government and Opinion Research 1971). However, the crowding problem of increased human population and finite resources (Leopold 1930) has been exacerbated because of the long-term (Leopold 1919) and more recent increasing urbanization, closures of private lands to public hunting, and increased vehicle access on both private and public lands (Mann 1977, Reed 1981).

Our findings indicate the majority of hunters prefer reduced hunting opportunity for higher quality. When hunters were asked to indicate the effect of crowding on their hunt quality, using an 11-point scale where 0 means crowding greatly decreased the quality and 10 means crowding had no negative effect, only 27.8% of hunters (scale: 8,9,10) indicated crowding had little effect compared to 60.2% of hunters (scale: 0–5) who indicated a large effect ($\bar{x}$ = 4.92). Krannich et al. (1991) reported 71% of hunters believed there were too many hunters in their areas. Crowding effects were not significantly related to hunter age, sex, years of experience, unretrieved deer reported, or whether hunters were on private or public lands. Surprisingly, the means for hunters from successful (5.04) and unsuccessful parties (4.96) were not different. These data indicate the effects of crowding are felt by almost all groups equally. However, hunters from limited-entry areas ($P < .002$), where hunter numbers are limited, rated the effect of crowding less negatively ($\bar{x}$ = 6.16), while hunters preferring to hunt in areas restricted from vehicles were more ($P < .001$) negatively affected ($\bar{x}$ = 4.61) than hunters preferring no restrictions ($\bar{x}$ = 5.50).

Management Options to Reduce Hunter Crowding

Several options are available to reduce hunter crowding. Split deer hunting seasons were opposed by Utah hunters in recent studies (Krannich and Cundy 1989, Austin et al. 1990, Krannich et al. 1991). This option would likely increase hunting pressure on bucks by increased hunter days, longer seasons, and hunting during the more vulnerable rutting

period; it would thereby further decrease mean age and size of harvested bucks.

A second option is to require hunters to choose either a buck or doe tag. Our survey indicated 78.4% of resident hunters would choose a buck tag, which would reduce buck hunting pressure by about 21.6%.

A third option is to require hunters to choose and hunt only one season. Since mean hunters afield for 1988–89 combined were archery = 26,613, rifle = 180,298, and muzzleloader = 8832, this option would reduce crowding during the rifle hunt up to approximately 20% assuming hunter proportions remained about the same. Hunters favor this option: in our 1989 and 1990 surveys, 63.8 and 64.0%, respectively. In a 1990 completely randomized telephone survey of 14,305 deer hunters, 58.0% of Utah hunters indicated preference for this option. Krannich et al. (1991) reported a similar level of support (mean score = 6.19) using a scale of 0–10.

Probably the most effective option to permanently reduce hunter crowding, while at the same time establishing a minimum standard for quality in terms of hunter pressure on bucks, is to limit license sales of buck tags. Hunters consistently favor this option. In our 1990 survey, 60.6% of resident hunters preferred to limit buck license sales to 150,000, with up to 35,000 antlerless tags available to unsuccessful buck tag applicants; 39.4% favored unlimited license sales. Since hunters who favored limiting license sales also favored having to choose sex of tag ($P < .004$), most hunters would favor having to choose sex of tag. Krannich et al. (1991) determined most hunters (61.7%) supported choosing the sex of tag and having yearly harvest restricted to one deer per hunter.

In the 1989 survey, only 36.6% of hunters indicated preference to hunt every year regardless of future growth in hunter numbers, while the majority (63.4%) selected some level of hunter number limitation (Austin et al. 1990). Of hunters preferring the limitation, 38.2% selected the limit at 160,000 and 25.2% selected the 200,000 limit. Previously in 1987, 55.8% of hunters showed preference to limit hunters to less than 200,000 (Austin and Jordan 1989).

It is apparent to the authors that some restrictions are needed. We believe the increased buck hunting pressure beginning in 1970 (Fig. 1) has had negative effects on hunter success, satisfaction, motivation, and harvested-buck size. These negative effects appear to outweigh the values of increased wildlife management income and hunting recreation opportunity. Indeed, hunter responses from these surveys confirm our view that hunting pressure on bucks should be reduced to the pre-1970 level.

LITERATURE CITED

AUSTIN, D. D. 1991. Age specific antler tine counts and carcass weights of hunter-harvested mule deer from Utah checking stations, 1932–1988. Division of Wildlife Resources, Salt Lake City, Utah. 35 pp.

AUSTIN, D. D., S. D. BUNNELL, AND P. J. URNESS. 1990. Responses of deer hunters to a checking station questionnaire in Utah. Western Association of Game and Fish Commissioners Proceedings 69:208–229.

AUSTIN, D. D., AND L. JORDAN. 1989. Responses of Utah deer hunters to a checking station questionnaire. Great Basin Naturalist 49:159–166.

AUSTIN, D. D., R. A. RIGGS, P. J. URNESS, D. L. TURNER, AND J. F. KIMBALL. 1989. Changes in mule deer size in Utah. Great Basin Naturalist 49:31–35.

BUNNELL, S. D., AND D. D. AUSTIN. 1990. Hunter opinions and questionnaires. Pages 10–47, 87 *in* Deer management workshop, June, August 1990. Utah Division of Wildlife Resources, Salt Lake City. 94 pp.

BUREAU OF GOVERNMENT AND OPINION RESEARCH. 1971. Opinion survey of the people of Utah for wildlife resources and outdoor recreation. Utah State University, Logan. 73 pp.

DECKER, D. J., AND N. A. CONNOLLY. 1989. Motivations for deer hunting: implications for antlerless deer harvest as a management tool. Wildlife Society Bulletin 17:455–463.

FLATHER, C. H., AND T. W. HOEKSTRA. 1989. An analysis of the wildlife and fish situation in the United States: 1989–2040. USDA Rocky Mountain Forest and Range Experiment Station General Technical Report RM-178. 147 pp.

JENSE, G. 1990. Three-point strategy in Utah. Pages 78–88 *in* Deer management workshop, June, August 1990. Utah Division of Wildlife Resources, Salt Lake City. 94 pp.

JENSE, G. K., AND W. SHIELDS. 1990. Utah big game annual report. Utah Division of Wildlife Resources Publication No. 90-7.

KRANNICH, R. S., AND D. T. CUNDY. 1989. Perceptions of crowding and attitudes about a split deer hunting season among resident and nonresident Utah deer hunters. Institute for Social Science Research on Natural Resources, Utah State University, Logan. 29 pp.

KRANNICH, R. S., J. S. KEITH, AND V. A. RHEA. 1991. Utah deer hunters' opinions about deer hunting and alternative season formats. Project Summary Report. Institute for Social Science Research on Natural Resources, Utah State University, Logan. 75 pp.

LEOPOLD, A. 1919. Wildlifers vs. game farmers: a plea for democracy in sport. AGPA Bulletin. Pages 54–60 *in* D. E. Brown and N. B. Carmony (1990), Aldo Leopold's wilderness. Stackpole Books, Harrisburg, Pennsylvania. 249 pp.

_____. 1930. Game management in the national forests. American Forester (July): 412–414.