Quality Deer Management at the McAlester Army Ammunition Plant: A Unique Approach

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Abstract: Quality management for white-tailed deer (*Odocoileus virginianus*) is becoming increasingly popular in the southeastern United States, yet surprisingly little information has been published that describes quality or trophy management strategies in detail. The quality deer program at the McAlester Army Ammunition Plant (McAAP) is unique because it maintains high hunter opportunity while producing high-quality white-tailed deer. Several strategies have been incorporated into the management program to help maintain its unique characteristics. The first is a regulation that limits hunters to traditional archery equipment (recurve or longbow), thereby reducing hunter success and providing bucks with greater opportunity to reach maturity. The second is a centrally located, 4,500-ha refuge that receives little hunting pressure and increases the proportion of mature bucks in the population. Finally, an antlerless harvest system has been implemented that encourages hunters to harvest does by allowing all hunters who harvest a doe to bypass the lottery system the following year. Antler measurements (e.g., basal circumference, number of points, beam length) and weights of harvested bucks and does have increased significantly since the quality management program began in 1989. In addition, the mean age of harvested bucks has gradually increased. These improvements can be attributed to management practices which have served to lower and maintain the population below carrying capacity and the buck:doe ratio above 1:2.5, and to increase the

proportion of mature bucks in the population. We describe the McAAP quality management program in detail and discuss the changes in deer herd quality that have occurred since the program began.

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White-tailed deer (*Odocoileus virginianus*) management objectives range from those that support a maximum harvest without long-term habitat damage, to those designed to produce high-quality deer (Ga. Dep. Nat. Resour. 1988). Until recently, most management strategies in the southeastern United States were designed to maximize harvest rates and hunter satisfaction while maintaining populations below carrying capacity (Newson 1984). However, improved information transmission to the public through television and popular periodicals have resulted in a greater demand for quality hunting opportunities. As a result, quality management programs are becoming increasingly prevalent on private lands in the Southeast where the costs of intensive management can be recovered from hunter fees (Newson 1984). However, increases in deer quality have placed deer leases beyond the affordability of most hunters. Many hunters, therefore, are limited to pursuing deer on public lands where there is usually a limited quantity of high-quality animals.

Because quality deer production is becoming increasingly important to hunters today (Hastings and Pelton 1988), demands exist for programs that increase the number of high-quality deer without decreasing hunting opportunities for the public. Such a strategy falls between maximum harvest and trophy management programs (Ga. Dep. Nat. Resour. 1988). Because trophy management systems reduce hunting pressure to allow male deer the opportunity to mature and usually require intensive management that inflates hunting costs, they are not suitable strategies for most managers of public lands. Programs designed to support a maximum harvest usually have high hunting pressure and harvest rates and thereby minimize the probabilities of producing high-quality bucks. As a result, most programs fail to provide both high hunter quality and a quality deer herd.

The deer management program currently employed at the McAlester Army Ammunition Plant (McAAP) in southeastern Oklahoma differs from most management systems because it produces a high number of quality bucks while maintaining high hunter opportunity. Because little published information exists that describes quality deer management programs in detail, we outline the major components of the McAAP deer management program with particular emphasis on its unique characteristics and document improvements in herd quality that have occurred since the program was instituted. We tested the hypothesis that mean antler dimensions, body mass, and age of harvested deer have increased since the inception of the quality management program at McAAP.

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Area Description and History

The McAAP is an 18,212-ha ammunition production and storage facility owned and operated by the U.S. Army. Because the McAAP is a Department of Defense military installation, there is limited public access. It has gained notoriety as one of the premier white-tailed deer hunting areas in the nation because of the quality of its deer herd and the large number of individuals (approximately 1,600 hunters annually) that hunt on it. Habitats on the area include tallgrass prairie interspersed with post oak (*Quercus stellata*)-blackjack oak (*Q. marilandica*) ridges and bisected by brushy draws and water oak (*Q. nigra*)-red oak (*Q. shumardii*) bottomlands. A more complete description of the area is provided by Ditchkoff et al. (1996).

The McAAP has been open to public hunting via lottery since 1962, during which time herd quality at McAAP has significantly improved. Because white-tailed deer numbers in Oklahoma were significantly lower than surrounding states, the McAAP deer herd was originally managed to provide the maximum amount of hunting opportunities and supply deer to be relocated in other areas of the state (Rue 1978, Caire et al. 1989). Deer densities at the McAAP during the early 1970s were approximately 25 deer/km^2 (W. R. Starry, unpubl. data). However, as densities of deer around the state began to increase, McAAP management focused on producing quality deer, as opposed to quantity. McAAP managers initially addressed this issue by increasing harvest rates, thereby reducing herd densities. Finally, in 1989, a quality deer management plan was designed and instituted to achieve harvests of both male and female deer that would maintain the population below carrying capacity, maintain a high buck:doe ratio, and increase the quality of harvested bucks. Currently, the deer herd at McAAP is below carrying capacity (density is approximately 12–13 deer/km^2), the buck:doe ratio is 1:2.2, and harvest of mature bucks (≥3.5 years of age) is ≥35% of the antlered harvest.

Management Strategy

Organization of Hunts

Deer hunting at the McAAP is composed of archery, either-sex hunts, and shotgun antlerless hunts (shotgun antlerless hunts will be discussed later). Each year, 1,600 hunters are selected via lottery to participate in one of 6 archery hunts (250–275 per hunt) held during October–November. Each 3-day hunt is preceded by a scouting day to allow hunters to familiarize themselves with the area. Hunter density ranges from 1 hunter/45 ha to 1 hunter/60 ha. Density of hunters is maintained relatively low to increase hunter satisfaction (Stankey et al. 1973, Thomas et al. 1973, Kennedy 1974, Decker et al. 1980, Holbrook and McSwain 1991).

Archery hunters at the McAAP have been limited to traditional archery equipment (recurve or longbow) since 1989 in an effort to lower unacceptably high success rates of hunters using compound bows. Hunter success rates at the McAAP with traditional archery (10.7%) are lower than with compound (17.8%) equipment

(Ditchkoff et al. 1996). The primary goal of McAAP land managers is to provide bucks with the opportunity to reach maturity (≥3.5 years of age) and thus increase the overall quality of the deer herd. However, managers at the McAAP achieve this goal differently than most managers who limit hunter access, thereby reducing the number of bucks that are harvested. At the McAAP, hunter opportunity was not reduced when the quality management program was implemented, but hunter success was reduced with prohibition of compound archery equipment (Ditchkoff et al. 1996). This strategy enabled managers to improve herd quality without reducing hunter opportunity or implementing antler restrictions.

Unlike most quality or trophy management programs, harvest restrictions are not implemented to achieve management goals. Archery hunters at the McAAP are allowed to harvest 2 deer of either sex. It is a common practice in both quality and trophy management systems to impose antler size restrictions (i.e., minimum spread or number of points) to allow young bucks to mature (Fleming 1983, Gore et al. 1985, Franklin et al. 1985, Wall et al. 1988, Ruth et al. 1990). The lack of antler restrictions at the McAAP likely improves hunter satisfaction by providing hunters the opportunity to harvest any 2 deer of their choice.

Antlerless Harvest

Successful deer management programs often rely on the harvest of antlerless deer to maintain suitable buck:doe ratios and the herd below carrying capacity. Buck:doe ratios should be 1:2 or less for trophy management programs (Brothers and Ray 1982, Weishuhn 1982, Newsom 1984) while a buck:doe ratio of 1:2.5 to 1:3 is generally accepted as suitable for quality management programs (Adams 1985). These sex ratios help maintain population density below carrying capacity, balancing the provision of a suitable proportion of harvestable male deer with maintenance of an adequate number of does for recruitment purposes (Newsom 1984). The sex ratio at the McAAP (1 buck:2.2 does) (W. R. Starry, unpubl. data) falls between those ratios suggested for quality and trophy management programs.

State management programs typically allocate a specified quantity of doe permits or institute specific days on which does can be harvested to ensure sufficient antlerless harvest. Quality management programs commonly rely upon harvest restrictions that either require hunters to harvest does (Wall et al. 1988) or request hunters to harvest antlerless deer. In contrast, managers at McAAP encourage hunters to harvest does by issuing a Quality Pass to hunters who harvest a doe. Hunters who receive a Quality Pass can bypass the state-held lottery and hunt at McAAP the following year. The Quality Pass strategy is utilized only in years when herd demographics indicate a decrease in the buck:doe ratio.

In addition to the Quality Pass strategy for increasing antlerless harvests, 2 2-day antlerless shotgun hunts (70 permits per hunt) are held each year. Hunters are drawn via lottery for these hunts and are permitted to harvest 1 antlerless deer. These hunts help meet antlerless harvest goals to maintain the sex-ratio at McAAP (approximately 35% of the annual doe harvest at McAAP occurs during the shotgun hunts), as well as provide additional opportunities to hunt at McAAP.

Spatial Management

Another unique characteristic of the deer management program at the McAAP is the spatial arrangement of hunting areas (Fig. 1). The McAAP is composed of 3 deer hunting areas (Boggy, Hominy, and Deer Creek) and a fourth management unit, Bear Trap, that receives little hunting pressure and is nearly entirely surrounded by the 3 main hunting areas. The primary purpose of Bear Trap is to moderate potential changes in herd demographics in the surrounding hunting areas. Because the 3 main hunting areas lie along the perimeter of the McAAP, herd demographics are possibly influenced by hunting pressures off the base. Data from radio-collared deer indicate that most of the bucks that cross the base perimeter during the state-wide deer muzzleloader and rifle seasons are harvested by hunters off the base (E. R. Welch, Jr., unpubl. data). Deer movements on and off the base are not restricted because the perimeter is lined by only a 4-strand barbed-wire fence. Because Bear Trap receives little hunting pressure and deer densities appear to be greater than in the surrounding hunting areas, some young bucks likely disperse out of Bear Trap at the end of their first year (Holzenbein and Marchinton 1992). These dispersers help to replace males lost during the harvest, and maintain the buck:doe ratio above 1:2.5.

Bear Trap also serves as a place of refuge for deer during the fall archery hunts. Preliminary telemetry data (E. R. Welch, Jr., unpubl. data) suggest that some bucks whose home ranges border or overlap Bear Trap use this area when hunts are in progress. To ensure that herd demographics are maintained within Bear Trap and to provide supplemental hunting areas when portions of the main hunt areas are closed because of military activities, a limited number of hunters are annually selected to hunt within its borders. These individuals, however, are allowed to harvest only 1

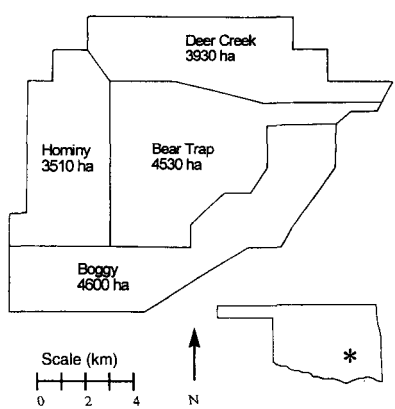

Figure 1. Spatial organization of Bear Trap and hunting areas at the McAlester Army Ammunition Plant in southeastern Oklahoma.

buck and 1 doe in Bear Trap, as compared to 2 deer of either sex for the other hunting areas. Herd density in Bear Trap, as well as in the 3 hunt areas, is partially regulated by a relatively large coyote (*Canis latrans*) population on the base. Preliminary data (E. R. Welch, Jr., unpubl. data) suggest that coyote predation accounts for a substantial amount of the adult buck mortality at the McAAP. Bartush and Lewis (1981) found that coyotes accounted for over 85% of the natural fawn mortality in a white-tailed deer population in western Oklahoma, and Stout (1982) noted that coyote removal increased fawn production by 250% in a southwestern Oklahoma deer population.

Supplemental Feeding

The quality management program employed at the McAAP has been specifically designed to reduce management expenditures, thereby reducing hunter fees. Management costs are kept low primarily by not providing supplemental feed for deer. Many commercial management programs provide large quantities of feed (i.e., pelleted rations, corn, etc.) as nutrient supplementation in an attempt to improve antler growth and thereby maximize profits (Kroll 1991). Because the strategy at the McAAP is not to maximize harvest rates or profits, supplemental feed is not provided and management costs are minimized. However, land managers at the McAAP have incorporated the use of food plots into their management program. The 200 ha of wheat-rye-clover food plots ($N = 77$) dispersed across the McAAP serve 2 purposes other than as a nutrition supplement. First, food plots are used as a tool to disperse hunters throughout the hunt areas. Food plots serve as focal points for many hunters because these areas often concentrate deer, and as a result, McAAP managers can increase or decrease hunter densities in specific areas with the addition of food plots. The second purpose of the food plot at the McAAP is to manipulate deer feeding patterns and reduce poaching. A 10-m strip around the entire perimeter of the base is maintained as a fire guard and is planted in wheat and rye to reduce erosion. Consequently, some deer concentrate at the base perimeter during feeding periods. By strategically placing some food plots within 200–400 m of the perimeter, managers have reduced deer concentrations on the perimeter strip and have decreased the susceptibility of the herd to poaching.

Management Results

Harvest data (e.g., weight, antler measurements) collected from the McAAP from 1983–1996 was analyzed (Ditchkoff et al. 1996) for differences between the periods before and after the institution of the quality management program using nested analysis of variance (year was nested within management period). Mean field-dressed mass of harvested male deer increased ($P < 0.001$) from 36.3 kg (SE = 0.5) to 42.2 kg (SE = 0.5) after quality management began (Fig. 2). With the exception of fawns, all age classes of males had greater mass ($P < 0.05$) during the period of quality management (Table 1). Mean female mass increased ($P = 0.001$) from 28.5 kg (SE = 0.3) to 31.6 kg (SE = 0.4) (Fig. 3) following the change in management strate-

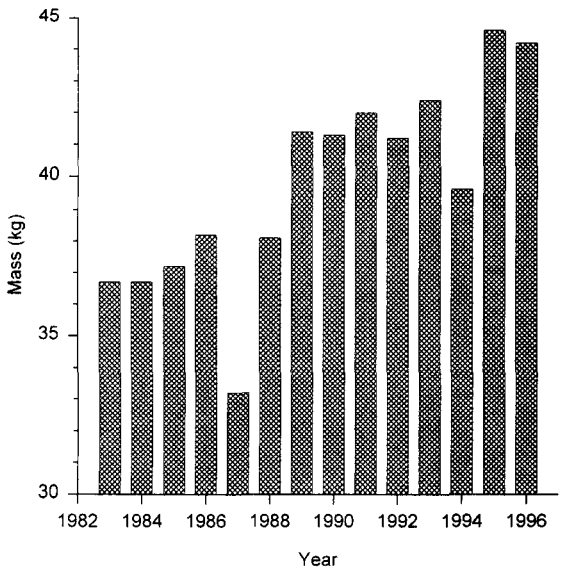

Figure 2. Mean field-dressed carcass masses of male white-tailed deer harvested at the McAlester Army Ammunition Plant in southeastern Oklahoma during 1983–1996. The quality management program began in 1989.

Table 1. Dressed carcass mass (kg) of male and female white-tailed deer harvested at the McAlester Army Ammunition Plant in southeastern Oklahoma during periods of maximum harvest (1983–1988) and quality management (1989–1996).

		Maximum harvest			Quality management			
	Age (years)	*N*	$\bar{x}$	SE	*N*	$\bar{x}$	SE	*P*[a]
Males	0.5	213	19.7	0.3	94	20.8	0.4	0.694
	1.5	303	34.3	0.3	250	36.8	0.3	0.002
	2.5	87	44.3	0.6	124	47.9	0.5	0.048
	3.5	93	48.7	0.6	74	53.5	0.8	0.004
	≥4.5	130	53.8	0.9	103	59.9	0.7	0.001
	Total	826	36.3	0.5	645	42.2	0.5	0.001
Females	0.5	165	18.1	0.3	116	19.1	0.3	0.047
	1.5	115	30.6	0.3	94	32.0	0.3	0.024
	2.5	75	33.0	0.5	102	36.2	0.4	0.001
	3.5	71	32.8	0.4	64	36.6	0.5	0.001
	≥4.5	159	33.9	0.3	135	36.2	0.4	0.002
	Total	585	28.5	0.3	511	31.6	0.4	0.002

a. Comparisons were made between the periods of maximum harvest and quality management using a nested analysis of variance.

Table 2. Mean antler characteristics of white-tailed deer harvested at the McAlester Army Ammunition Plant in southeastern Oklahoma during periods of maximum harvest (1983–1988) and quality management (1989–1996).

		Maximum harvest			Quality management			
	Age (years)	*N*	$\bar{x}$	SE	*N*	$\bar{x}$	SE	*P*[a]
Basal circumference (cm)								
	1.5	251	4.9	0.1	249	5.9	0.1	0.003
	2.5	82	7.7	0.2	125	8.1	0.1	0.275
	≥3.5	206	9.6	0.2	179	10.7	0.1	0.001
	Total	539	7.1	0.1	553	8.0	0.1	0.007
Beam length (cm)	1.5	254	18.4	0.4	248	20.4	0.5	0.321
	2.5	80	36.8	0.8	125	38.3	0.5	0.596
	≥3.5	206	47.4	0.6	179	49.9	0.6	0.017
	Total	540	32.2	0.7	552	34.0	0.6	0.231
Antler points	1.5	296	3.2	0.1	247	3.6	0.1	0.036
	2.5	85	6.6	0.2	125	6.9	0.2	0.519
	≥3.5	216	8.7	0.2	179	9.1	0.2	0.006
	Total	597	5.6	0.1	551	6.2	0.1	0.013

a. Comparisons were made between the periods maximum harvest and quality management using a nested analysis of variance.

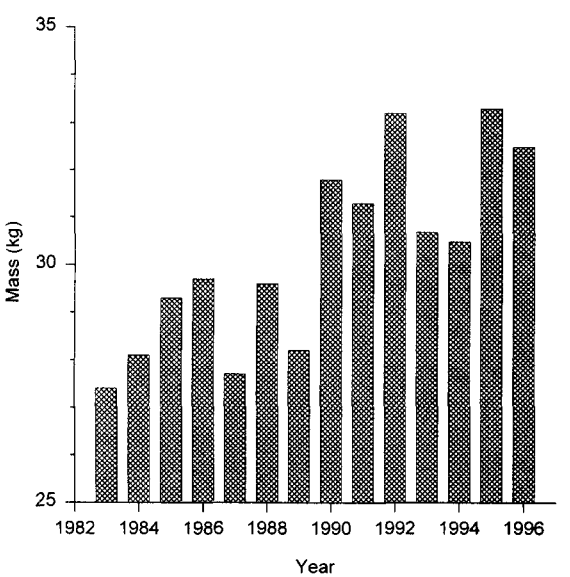

Figure 3. Mean field-dressed carcass masses of female white-tailed deer harvested at the McAlester Army Ammunition Plant in southeastern Oklahoma during 1983–1996. The quality management program began in 1989.

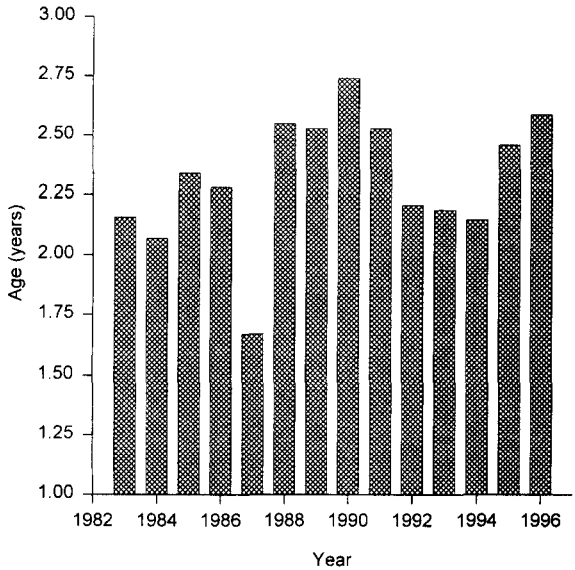

Figure 4. Mean ages of male white-tailed deer harvested at the McAlester Army Ammunition Plant in southeastern Oklahoma during 1983–1996. The quality management program began in 1989.

gies: this trend was apparent in all age classes (Table 2). Mean age of harvested bucks tended to increase ($P = 0.054$) from 2.18 years of age (SE = 0.12) to 2.43 years of age (SE = 0.07) with the inception of the quality management strategy (Fig. 4).

Antler measurements also increased after the quality management program was implemented at McAAP. Number of antler points increased ($P = 0.013$) from 5.64 (SE = 0.13) to 6.15 (SE = 0.13), and basal circumference increased ($P = 0.007$) from 7.1 cm (SE = 0.1) to 8.0 cm (SE = 0.1) when the quality management program began (Table 2). Antler beam length did not increase ($P = 0.231$) from the period of maximum harvest ($\bar{x} = 32.2 \pm 0.7$ cm) to that of quality management ($\bar{x} = 34.0 \pm 0.6$ cm). Only bucks ≥3.5 years of age showed an increase ($P = 0.017$) in beam length with the change in management strategies (Table 2).

Discussion

The quality management strategy in practice at the McAAP has been successful as illustrated by increases in body mass and antler characteristics of harvested deer. These changes are comparable to those reported for other quality management programs (Adams 1985, Cook and Fuchs 1989). Although land managers at McAAP have indicated that visual sightings of high-quality bucks during deer censuses have increased since the quality management program began, changes in the mean age of harvested males were not detected. This lack of statistical significance could be

explained by differential vulnerability of mature and immature bucks to hunting pressure (Roseberry and Klimstra 1974, McCullough 1979, Roseberry and Woolf 1988). This effect may be compounded by limitations (e.g., range, accuracy) of traditional archery equipment. One drawback to the McAAP management program is that some mature bucks are lost to natural mortality factors because of the limited harvest (DeYoung 1990). However, unlike some management programs that strive to harvest deer before they are lost to natural mortality agents, managers at the McAAP accept that natural mortality is unavoidable in their system. Their goal is to provide the opportunity to hunt high quality white-tailed deer, not to harvest each mature male that is produced.

The deer management program employed at the McAAP incorporates several unique tools (Bear Trap, Quality Pass) to provide a high-quality hunting experience for the public without severely limiting opportunities or charging exorbitant access fees. This system is a quality management program that was tailored to improve herd quality based upon existing land-use patterns, habitat characteristics, and population demographics. We suggest that the individual strategies discussed within this manuscript be considered as tools to be incorporated into existing management programs. White-tailed deer management is not a science whereby a particular formula or recipe can be applied with guaranteed success. Rather, it is an art that requires specialized management applications designed for local climatic conditions, habitats, and herd characteristics.

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